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NTIAC HANDBOOK

Revision/Supplement No. 1

NTIAC-82-3

Compiled by

Byron E. Leonard
Southwest Research Institute
Senior Research Scientist
San Antonio, Texas

June 1982

Nondestructive Testing Information Analysis Center

2

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Nondestructive Testing Information Analysis Center

This document was prepared by the Nondestructive Testing Information Analysis Center (NTIAC), Southwest Research Institute, 6220 Culebra Road, San Antonio, Texas 78284. NTIAC is a full service information analysis center sponsored by the U.S. Department of Defense, serving the information needs of the Department of Defense, other U.S. Government agencies, and the private sector, in the field of nondestructive testing.

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(Revision/Supplement No. 1)

ACKNOWLEDGEMENTS

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Those assisting in the production of the 1982 Revision/Supplement were Mrs. Frances Hicks, Mrs. B. E. Leonard and members of the editorial staff at Southwest Research Institute. The advice, suggestions, and co-operative efforts on the part of these individuals is greatly appreciated.

1. INTRODUCTION

A. General Remarks

This 1982 Revision/Supplement is basically an update of the 1979 NTIAC Handbook, with some revisions. Generally, all materials in this supplement are listings of items entered into the NTIAC data base since January 1, 1978. With few exceptions, all entries in this supplement were published during the last 5 years. Moreover, the last section, "Directory of Organizations", is not only a recent update of old organizations but also contains many new listings. This Revision/Supplement is intended to be used as an adjunct to the 1979 Handbook.

Selection of material for the 1982 Revision/Supplement was based primarily on searches made from the NTIAC data base. This supplement reflects the material in the data base and is not a critical assessment of that material.

A concerted effort was made to be comprehensive and consistent within the general framework of the original 1979 Handbook. Needless to say, there are numerous ways to accomplish this task, and no claim is made that the Revision/Supplement covers all aspects of the entire NDE field or that it is all things to all NDE personnel. Nevertheless, this material should offer varying degrees of benefit to everyone in the NDE community.

B. Purpose

The purpose of the 1982 Revision/Supplement is to provide the user with a major, quick-reference source covering several areas, all of which are either directly or indirectly related to NDE. Specifically, six major areas are covered: (1) a comprehensive listing of literature surveys and reviews, including state-of-the art reviews; (2) a listing of references selected to introduce or aid the user in finding reference material for over 90 NDE techniques or methods. Many of these techniques are considered new, sophisticated, state-of-the-art, and perhaps esoteric NDE methods — even though they are still in the so-called laboratory state of development, they have strong potential for future applications; (3) a short section on bibliographies, textbooks and handbooks; (4) literature covering standards, specifications, and recommended practices; and (5) an extensive catalog and directory of NDT-NDE organizations. Items 1 through 5 correspond to Handbook Sections 2 through 6, respectively.

C. Suggestions for Obtaining References and Incorporating the 1982 Revision/Supplement Material into the 1979 Handbook

NTIAC does not supply documents. The NTIAC numbers are for internal identification only; they denote the order in which documents are entered into the NTIAC data base. To aid the user in obtaining a specific reference, an attempt has been made to include at least one source for each reference listed. In order to achieve a reasonable degree of consistency in referencing documents, the following format is used and should help in securing documents. This format denotes the order in which available information is presented, depending on whether it is a periodical, a technical or special report, a proceedings document or a book.

PERIODICAL

NT-number
Author(s)
Title
Name of periodical with publication information

TECHNICAL REPORT OR SPECIAL REPORT (i.e., LECTURE SERIES)

NT-number
Author(s)
Title
Report description (final, interim, technical, etc.)
Date/Pages
Report numbers
Contract Number
NTIS Number
Corporate author or sponsors
AD-A number

PROCEEDINGS OR BOOK

NT-number
Author(s)
Title of article or paper
Title and date of proceedings or book
Publisher
AD-A number

"AD" and "AD-A" numbered reports, as well as most other government reports, are available from (usually for sale by) The National Technical Information Service (NTIS), Springfield, VA 22161; an exception would be reports prepared and for sale by NTIAC.

To incorporate this revised supplement into the 1979 Handbook, the following procedure is recommended:

> The material in Sections 2, 3, 4, and 5 in this Revision/Supplement should be inserted as a unit after each of the respective sections in the 1979 Handbook. All of Section 6 of the 1979 Handbook should be removed and replaced by Section 6 of this 1982 Revision/Supplement.

2. SURVEYS, REVIEWS, AND STATE-OF-THE-ART REVIEWS

2.1 Introduction

This section contains a listing of surveys, reviews and state-of-the-art reviews with abstracts which have been published, with few exceptions, since January 1, 1978. These references are either entire survey or review documents or are documents which have a section pertaining to the subject of surveys or reviews.

2.2 Surveys and Reviews

NTIAC-021872

Adams, A. L.; DeSterke, A.

"Report No. 1: A Description of the PISC Project"; Nondestructive Examination in Relation to Structural Integrity, 1st International Seminar Proceedings, 22 August 1979, Berlin, West Germany, 134-158; Applied Science Publishers Ltd., Ripple Rd., Barking, Essex, England

This report, written as a historical review of the Plate Inspection Steering Committee Project, records the background of the project and refers fn general to the reasons why decisions were made during the five years the project has been running. Details are given in further reports of which the full list is as follows: Report No. 1-A Description of the PISC Project, Report No. 2-Ultrasonic Examination of the PVRC Plates, Report No. 3-Destructive Examination of the PVRC Plates, Report No. 4-Method of Evaluation and the Results of the PISC Trials, and Report No. 5-Discussion of NDE/DE and Summary Conclusions. A list of all participants is given. Data and results of the test program are detailed in the other reports above, but to maintain confidentiality of data, the individual teams have been allocated a code number known only to the team and the PISC management. Data is only identified against code numbers. (Author)

NTIAC-018515M

Bonded Joints and Preparation for Bonding; Lecture series. (Preface in French), March 1979, 317 pp, AGARD-LS-102; Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine, France, AD-A068806

After more than thirty years of application in aircraft construction in roles with various degrees of structural importance, adhesive bonded joints are expected to see an increased use in more primary structural applications, both in conjunction with metals as well as with advanced composites. The basis for such advanced applications of bonded joints, however, must be ample knowledge on: structural design aspects, durability aspects of bonded joints in order to provide the required static and dynamic strength of the bonded structure during its operational life time. It is with these demands in mind that the lectures have been planned. The material in this publication was assembled to support a Lecture Series under the sponsorship of the Structures and Materials Panel and the Consultant and Exchange Programme of AGARD. (Author)

NTIAC-021961

Alers, G. A.

"The Inspection of Bonding and Layers"; Ultrasonic Materals Characterization, 1st International Symposium Proceedings, 7-9 June 1978, Gaithersburg, MD, NBS SP 596, 393; National Bureau of Standards, Washington, DC 20234

This paper actually constitutes the introductory remarks to a series of papers on inspection of bonding and layers. The papers addressed in this particular session are concerned with the interaction of ultrasonic waves with a layered medium, particularly the case in which the layer is very thin. (NTIAC)

NTIAC-017748

Alwang, W. Gilbert

"Applications of Electro-Optical Instrumentation in Turbine Engine Development"; Instrumentation in the Aerospace Industry-Vol. 24 (Advances in Test Measurement - Vol. 15) Part 1, 24th International Symposium Proceedings, Albuquerque, NM, 1-5 May 1978, 305-313; Instrumentation Society of America, 400 Stanwix St., Pittsburgh, PA 15222

The importance of electro-optical instrumentation in turbine engine development has been increasing rapidly over the past several years. Many difficult measurement problems have been solved using electro-optical technology and it is likely that this trend will continue. This paper will review the various applications of electro-optics to date, including all the most successful devices and some not so successful. Among the topics which will be included in the review are: holography, laser velocimetry, pyrometry, Raman spectroscopy, optical proximity sensors, image photography. The current state-of-the-art in these areas will be briefly assessed along with probable future trends. A short bibliography will be provided as a guide to more detailed information on the various specific applications. (Author)

NTIAC-023595

"Trends in Testing and Inspection Technology"; *Metal Progress*, 119, 1, January 1981, 79-81; American Society for Metals, Metals Park, OH 44073

This is a short review article and technology forecast for 1981 in the field of testing and inspection technology. Some new testing equipment is described, predictions and trends discussed, along with needs that will shape future developments. (NTIAC)

NTIAC-019861

Paper Summaries: National Spring Conference American Society for Nondestructive Testing, American Society for Nondestructive Testing National Spring Conference, Philadelphia, PA, March 14-27, 1980; American Society for Nondestructive Testing, 4153 Arlingate Plaza, Caller No. 28518, Columbus, OH 43228

The summaries are included for sessions on metallography, aerospace, sonics, penetrating radiation, electrical/magnetic, penetrants, leak teasting, silver recovery from radiographic materials, acoustic emission, and military and government activities. Approximately 45 summaries are included. (NTIAC)

NTIAC-016558

Arrington, M.

"Some Industrial Applications of Acoustic Emission Monitoring"; *NDT International*, 11, 3, June 1978, 117-120; IPC (America) Inc., 105 E. 42nd Street, New York, NY 10017

This paper introduces acoustic emission and outlines the various ways in which it is used to interrogate materials. The approach to using acoustic emission techniques in a range of industrial situations is described in conjunction with examples from material selection; process monitoring and control; component testing and quality control; and structural testing. The relation of acoustic emission to other NDT techniques is briefly discussed together with the future development of the instrumentation. (Author)

NTIAC-017731

Ash, J. Ivan

Liquid Crystals for Nondestructive Evaluation; NTIAC, Southwest Research Institute, P. O. Drawer 28510, San Antonio, TX 78284; Nondestructive Testing Information Analysis Center, San Antonio, TX

This document presents a review of the use of liquid crystals in nondestructive evaluation and provides an introduction to the literature. The text begins with an historical background and then discusses the three classes of liquid crystals: The smectic, nematic, a cholesteric or twisted nematic. The properties of liquid crystals are summarized, including optical, thermal, mixtures of different compounds, and dynamic properties. Applications presented include temperature measurement and mapping, thermal mapping, surface flaw and leak detection, bond and composite testing, flaw testing with nematics, liquid crystals in fatigue, flow, and fracture tests, fluid flow measurements, acoustic detection and imaging, electronics components and assemblies, RF, microwave, and infrared imaging. The book closes with a bibliography of 84 entries. (Author/NTIAC)

NTIAC-023056

Babel, Hubertus

"Destructive and Nondestructive Test Methods to Determine the Life of Wire Ropes—Part II"; *Wire*, 30, 1, January/February 1980, 38-44

This section begins with a survey on available measuring techniques for nondestructive tests, and includes a matrix chart listing the test principle, methods, representations, and procedure/advantage/disadvantage. Methods discussed in more detail include optical, electromagnetic, acoustical, x-ray, and ultrasonic. The author presents interesting matrix charts to show the historical development of the electromagnetic method utilizing both AC and DC magnetization. He concludes that the electromagnetic method is at present time the best one to detect breaks, notches, corrosion and wear. (NTIAC)

NTIAC-018672

Balasubramanian, N.

"Principles of Optical Gauging"; SPIE Proceedings, Optics in Quality Assurance II, V. 170, 1979, 26-28; Society of Photo-optical Instrumentation Engineers

The various significant optical gauging concepts are identified and references are given that describe in detail the concepts and their hardware implementation. Other general references in the field of optical metrology are also provided. (Author)

NTIAC-016089

Ballard, Douglas W.

"Nondestructive Evaluation of LWR Spent Fuel Shipping Casks"; Work supported by U. S. Dept. of Energy, February 1978, 25 pp, SAND78-0309, AT(29-1)-789; Sandia Labs, Albuquerque, NM; Also published in Nondestructive Evaluation in the Nuclear Industry, Proceedings of an International Conference; 13-15 Feburary 1978, Salt Lake City, UT, 466-486 (American Society for Metals)

This report summarizes an analysis of nondestructive testing (NDT) methods currently being used to evaluate the integrity of light water reactor (LWR) spent fuel shipping casks. An assessment of anticipated NDT needs related to breeder reactor cask requirements is included. Specific R&D approaches to probable NDT problem areas such as the evaluation of austenitic stainless steel weldments are outlined. A comprehensive bibliography of current NDT methods for cask evaluation in the USA, Great Britain, Japan and West Germany was compiled for this study. (Author)

NTIAC-021560

Baron, J. A.; Leemans, D. V.; Kupcis. O. A.

"Acoustic Emission Development Program Status Report—August 1978"; November 1978, 12 pp; Ontario Hydro, 800 Kipling Ave., Toronto, Ontario M8Z 5S4, Canada

The research and development work performed over the past two years on a program aimed at establishing a structural integrity monitoring capability with acoustic emission is reviewed. An assessment of the technique and recommendations for future work are presented. (Author)

NTIAC-022563

Bassim, M. Nabil

"Nondestructive Testing of High Temperature Nonmetallic Materials"; *Reviews on High-Temperature Materials*, 4, 3, 1980, 169-194; Freund Publishing House Ltd., Israel

A review of the application of current techniques of nondestructive testing to high temperature nonmetallic materials, namely ceramics, refractories and glasses is presented. Of particular importance is the technique of acoustic emission, which is shown to be suitable in prediction of failure time in materials as well as in evaluation of crack propagation rates. Failure of these materials is analyzed in terms of linear elastic fracture mechanics and the correlation between acoustic emission and fracture mechanics is reviewed. (Author)

NTIAC-020997

Baum, Michael

"The Sounds of Failure—Developments in Acoustic Emission Research"; *Dimensions*, 64, 4, May/June 1980, 12-18; National Bureau of Standards, U. S. Department of Commerce, Washington, D.C. 20234

This paper reviews developments in acoustic emission research at the National Bureau of Standards. (NTIAC)

NTIAC-016796

Bekeshko, N. A.

"Methods and Apparatus for Thermal Nondestructive Testing of Weld Joints"; *Soviet Journal of Nondestructive Testing*, 13, 5, September-October 1977, 559-565 (English translation, July 1978); Consultants Bureau, 227 W. 17th Street, New York, NY 10011

The author presents a review article concerning the thermal method of nondestructive testing of weld joints, which is based upon the correlation between the termperature distribution in the weld pool and other parameters of the welding of the joint, etc. The author discusses each of these parameters and its effect upon the temperature distribution. (NTIAC)

NTIAC-017847

Berger, Harold, Mordfin, Leonard

"Annual Report 1978, Office of Nondestruction Evaluation"; *1978*, 51 pp, NBSIR 78-1581; National Technical Information Service, Springfield, VA 22161; National Bureau of Standards, Washington, DC

This report summarizes the activities of the National Bureau of Standards (NBS) nondestructive evaluation (NDE) program. It emphasizes activities over the fiscal year, 1978. However, since this is the program's first annual report, some material is included to summarize activities since the program was formally instituted in June 1975. (Author)

NTIAC-020348

Berger, Harold, Mordfin, Leonard

"Annual Report 1979—Office of Nondestructive Evaluation"; Annual report, March 1980, 97 pp, NBSIR IR 80-2162; National Bureau of Standards, Washington, DC

This report is the second in the series of annual reports on the National Bureau of Standards (NBS) program in nondestructive evaluation (NDE). These reports summarize the program's activities and plans. The focus of the present report is on the program's activities in fiscal year 1979 and on its plans for the next five years. (Author)

NTIAC-020976

Berger, Harold

"Nondestructive Testing in the 80's"; *Metal Progress*, 118, 3, August 1980, 33-38; American Society for Metals, Metals Park, OH 44073

The author discusses the possible variations or new methods which may be utilized in the 1980's. Trends discussed include computers, stress data, and traceability. Specific NDT advances include real time x-rays, tomography, sound studies, new transducer concepts, microwave methods, and signal processing. (NTIAC)

NTIAC-022371

Berger, Harold, Mordfin, Leonard

"Technical Activities 1980 Office of Nondestructive Evaluation"; November 1980, 116 pp, NBS IR 80-2162; National Technical Information Service, Springfield, VA 22161; National Bureau of Standards, Washington, DC

A review of nondestructive evaluation programs at NBS, for FY 1980 is presented in this annual report. (Author)

NTIAC-020277

Berko, Stephan

"Positron Annihilation Experiments in Metals: Electronic Structure and Fermi Surface Studies"; *Scripta Metallurgica*, 14, 1, January 1980, 23-29; Pergamon Press

This paper discusses the use of the positron (e+) annihilation technique in the study of pure metals and of metallic alloys. The behavior of slow e+-s in condensed matter has been the subject of intense experimental and theoretical investigation during the last two decades and the field has been reviewed throroughly. By studying the various properties of the annihilation quanta one obtains information about the electrons sampled by positrons injected from a radioactive source into the material under investigation. In metal physics the e+ technique has been successfully applied to problems in two distinct fields, electronic structure studies (momentum densities, Fermi surfaces, etc.) and defect studies (vacancy formation energies, dislocations, radiation damage, etc.). More recently, the development of monochromatic low energy positron beams has opened up the possibility of metallic surface studies by positrons. In the first part of our paper we sketch briefly the main experimental techniques used in the e+ experiments and outline the underlying physical concepts. The second part deals with applications, in particular to momentum density and Fermi surface studies. The reader is referred to the extensive review and the 'mini-reviews' in previous issues of this journal dealing with other applications of the e+ annihilation technique in more detail. (Author)

NTIAC-022318

Birks, A. S.; Posakony, G. J.

"Development of Advanced NDE Ultrasonic Equipment"; DARPA/AFML Review of Progress in Quantitative NDE Proceedings, 8-13 July 1979, Scripps Institution of Oceanography, La Jolla, CA, 605-611; Rockwell International Science Center, 1049 Camino Dos Rios, Thousand Oaks, CA 91360

Recent studies to determine the probability of detection of nondestructive examination methods by the Air Force indicate that these capabilities are severely limited. One of the factors contributing to the insufficiency of ultrasonic testing is related to a general lack of versatility and capability of commercial ultrasonic equipment. Inadequate instrument reliability, inconsistent components including transducers, and uncertain calibration standards further compromise the potential utility of this method. Battelle Pacific Northwest Laboratories, under the sponsorship of the Manufacturing Technology Division of the Air Force Materials Laboratory, is developing an advanced ultrasonic nondestructive testing system directed at resolving these deficiencies. As a result, this program will establish a modular ultrasonic system specification that will prevent near term obsolescence by permitting the addition of new technology such as ARPA developments in the form of additional or replacement modules. This paper will describe the Phase I and II tasks and objectives which are planned to establish an equipment specification, demonstrate initial prototype systems, and provide a procurement specification and technical manuals. Progress to date will be summarized. (Author)

NTIAC-019732

Birnbaum, G.; Eitzen, D. G.

"An Appraisal of Current and Future Needs in Ultrasonic NDE Standards"; Report prepared for Defense Advanced Research Projects Agency, October 1979, 80 pp, NBSIR 79-1907; For Official Distribution; National Bureau of Standards, Washington, DC

The purpose of this study, supported in part by DARPA, is to asses the current status of NDE ultrasonic standards and calibrations and to determine current and future needs in this area. The source material includes surveys of the literature and patents, a study of foreign practice, surveys of NBS and consensus standards (e.g., ASTM) programs, discussions, visits and letters, and a workshop on ultrasonic NDE standards, "Current Needs and Future Directions", held 17-18 October 1977 for the purpose of implementing the objectives of this study. Recommendations for improvement in existing standards will impact primarily on conventional pulse echo systems and include work on transducers, the electronic system and reference blocks. (Author)

NTIAC-023059

Birnbaum, George; Free, George

Eddy-Current Characterization of Materials and Structures; Symposium Sponsored by ASTM Committee E-7 on Nondestructive Testing, 5-7 September 1979, Gaithersburg, MD; American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103, (ASTM STP-722)

This book contains 31 papers concerned with eddy current techniques and applications. Topics covered include theoretical analysis of fields, defects, and structures, calibrations and standards, applications, materials properties, measurement methods, automation, data analysis and display. (NTIAC)

NTIAC-023291

Bittence, John C.

"Exotic Metals: From Glassy to Superplastic"; *Materials Engineering*, 93, 2, February 1981, 41-45; Penton/IPC, 1111 Chester Ave., Cleveland, OH 44114

A portion of this article is given to recent NDE techniques which may be used for newer materials. Small angle neutron scattering, holography, ultrasonic beam CAT-scan and double crystal x-ray defractometry are among the techniques discussed briefly. (NTIAC)

NTIAC-021513

Bobrenko, V. M.; Kutsenko, A. N.; Sheremetikov, A. S.

"Acoustic Tensometry I: Physical Principles (Review)"; *Soviet Journal of Nondestructive Testing*, 16, 2, February 1980 (English translation, October 1980), 120-134; Consultants Bureau, 227 West 17th Street, New York, NY 10011

The most widely distributed theoretical articles on acoustoelasticity are analyzed. The results of different authors are presented using a common notation. The constitution of the acoustoelastic coefficients is investigated and quantitative evaluations are given for them. A method is proposed for determining stresses that does not require knowledge of third-order elastic moduli. (Author)

NTIAC-023492

Bobrenko, V. M.; Kutsenko, A. N.; Sheremetikov, A. S.

"Acoustic Tensometry II: Methods and Apparatus (Survey)"; *Soviet Journal of Nondestructive Testing*, 16, 12, December 1980, 910-924 (English translation, August 1981); Consultants Bureau, 227 West 17th Street, New York, NY 10011

In the second part of this survey, the authors analyze acoustic methods of determining the stress-strain state of a solid, basing this on the result of the first article in Ref. 1, on the literature and patent information of the subject, and on their own practical experience. This analysis is relevant to conditions in the factory. The authors consider the structure of ultrasonic (U/S) measuring equipment, the features of the acoustic and electronic units, and the demands imposed on the transducers. Recommendations are given relating to cases of practical interest. (Author)

NTIAC-018799

Bobrov, V. T.; Demchenko, A. S.; Pranitskii, A. A.; Yablonik, L. M.

"Production Ultrasonic Inspection of Pipe and Problems of Its Development"; *Soviet Journal of Nondestructive Testing*, 14, 12, December 1978, 1075-1082 (English translation, August 1979)

A review is given of the state of ultrasonic inspection of pipe. Features of the design and operation of a number of automated units for the inspection of seamless and welded pipe developed in the all-union Scientific-Research Institute for Nondestructive Testing are considered and some results of their testing under production conditions are analyzed. The basic problems in the area of inspecting pipe quality are formulated. (Author)

NTIAC-018095

Bobrov, V. T.; Koryachenko, V. D.

"Improved Sensitivity and Reliability in Automatic Ultrasonic Monitoring of Tube Butt Welds"; *Soviet Journal of Nondestructive Testing*, 14, 9, Semptember 1978, 798-800, (English translation, May 1979); Consultants Bureau, 227 W. 17th St., New York, NY 10017

A survey is presented of sensitivity in monitoring joints welded in various ways, with particular emphasis on the effects of nonuniformity in the structure in and around the weld. It is shown that the sensitivity is frequently inadequate, particularly in automatic scanning, and any improvement requires a reduction in the effects of structural noise. It is recommended that signal accumulation and partial frequency decorrelation of the noise should be used in order to improve the sensitivity. Brief information is given on automatic systems developed at the All-Union Nondestructive Testing Scientific Research Institute for monitoring weld quality; the AIST-2, DUK-70, and DUK-30 M. (Author)

NTIAC-022119

Bortz, S. A.; Larsen, D. C.

"Properties of Structural Ceramics"; *SAMPE Journal*, 17, 1, January/February 1981, 16-31; Society for the Advancement of Material and Process Engineering, 668 South Azusa Ave., P. O. Box 613, Azusa, CA 91702

An overview is presented of the pertinent thermal and mechanical properties of structural ceramics that are candidates for advanced heat engine applications. Data are presented for flexure strength, strength degradation at long times due to subcritical crack growth, long term oxidation effects, burner rig exposure, creep resistance, fracture toughness, thermal expansion, thermal diffusivity, and thermal shock resistance. Emphasis is placed on predominant behavioral trends as related to material microstructure. Also contained in this paper are discussions of design methodology, materials development, and quality assurance which summarize the current state-of-the-art. (Author)

NTIAC-022895

Bouche, Raymond R.

Calibration of Shock and Vibration Measuring Transducers; 1979, 177 pp, SVM-11; The Shock and Vibration Information Center, Naval Research Laboratory, Code 8404, Washington, DC 20375

This book has chapters devoted to fundamentals for calibration, theory of seismic transducers, transducers and auxiliary instruments (primarily accelerometers), calibration shakers, primary shock and vibration standards, sinusoidal comparison calibrations, shock motion calibrations, force gages and impedance heads, and an extensive bibliography. (NTIAC)

NTIAC-016986M

Brackett, R.

"Underwater Inspection and Nondestructive Testing of Offshore Structures"; Technical report, 14 June 1978, 16 pp, ONRL-R-2-78; Office of Naval Research, London, England, AD-A057425

Regulations have been established by the governments of countries bordering the North Sea which require annual inspection of offshore structures. This has resulted in a much more intensive use of nondestructive testing (NDT) techniques for underwater inspection than currently exists in the United States. This report presents a review of the NDT techniques and equipment currently used in the North Sea area and discusses some of the research being conducted in the UK and Norway to improve the quality of underwater NDT inspection. (Author)

NTIAC-016551M

Breazeale, M. A.

"Ultrasonic Wave Reflection at Liquid-Solid Interfaces"; Interim technical report, January 1975-April 1978, February 1978, 75 pp, NOOO14-76-C-0177; Tennessee University, Ultrasonics Laboratory, Knoxville, TN, AD-A053842

This technical report comprises ten publications on the reflection of ultrasonic waves at liquid-solid interfaces. Description is given of both experimental and theoretical advances in the understanding and utilization of reflection phenomena. Attention is concentrated primarily on the angles at which leaky surface waves are excited along the interface. Rayleigh angle phenomena are described, as well as the backward shift resulting from a periodicity superimposed on the interface. Utilization of these phenomena in nondestructive evaluation and in underwater acoustics is mentioned.

NTIAC-023592

Britton, Colin

"Corrosion Monitoring: Recent Developments"; *Anti-Corrosion Methods and Materials*, 27, 12, December 1980, 8-9; Sawell Publications Ltd., 127 Stanstead Rd., London SE23 1JE, England

This is a brief review of several recent conferences held in Europe on the subject of corrosion monitoring. Techniques described include thin layer activation (TLA) being developed by Harwell Laboratory, and the development of automated custom built NDT systems using multiple probe arrays, such equipment being used to inspect oil risers, heat exchanger tubes, and oil storage tanks. (NTIAC)

NTIAC-019001

Brook, Richard A.

"Development of Techniques for Automated Industrial Inspection in the United Kingdom in the Age of Microprocessors"; Society of Photo-Optical Instrumentation Engineers Proceedings, Imaging Applications for Automated Inspection and Assembly, Vol. 182, 19-29 April 1979, Washington, DC, 79-82; Society of Photo-Optical Instrumentation Engineers, 405 Fieldston Road, Bellingham, WA 98225

This paper reviews some of the activity in the UK directed towards realization and exploitation of practical shop-floor automatic inspection systems. There are still considerable barriers to widespread applications because of the generally specialized nature of each situation, and the complexity and cost associated with achieving satisfactory solutions to image analysis problems. However, rugged solid-state imagers and microprocessor-based signal processing systems are beginning to advance the state-of-the-art to the point at which autonomous and robust equipment of moderate sophistication can be built at reasonable cost. The impact of microelectronics on performance and cost of equipment for inspection applications, and the problems of justifying and maintaining this equipment, are examined. Projects in which SIRA Institute has been involved are referred to briefly to illustrate some of the points made. (Author)

NTIAC-018257

Buckley, Michael J.

"The DARPA Investment Strategy in Quantitative NDE"; DARPA/AFML Review of Progress in Quantitative NDE Proceedings, Scripps Institution of Oceanography, La Jolla, CA, July 17-21, 1978, 1-2; National Technical Information Service, Springfield, VA 22161

Some of the contributions that quantitative NDE may make in support of the mission of the Department of Defense are presented. In addition, the general DARPA investment criteria is reviewed along with the current and possible future directions of the DARPA NDE program. (Author)

NTIAC-022928

Bucklow, I. A.

"Possible Methods for the Nondestructive Testing of Sprayed Coatings"; *Materials in Engineering*, 2, 3, March 1981, 141-148; Scientific and Technical Press, Chilberton House, Doods Rd., Reigate, Surrey, England

The increasing demand for the nondestructive testing of sprayed coatings has prompted a general examination of some of the basic physical properties of solids, and ways of measuring them, in the hope that pointers would emerge to indicate at least an alleviation of, if not a solution to, this problem. The viewpoint adopted was firstly to identify properties of coatings that could be reliably measured, and then to choose those properties that could be related to features of a coating of engineering interest. A further restriction imposed was the existing availability of instruments and techniques for the measurements. The resultant suggestions are therefore largely speculative and embrace thermal, acoustic, and magnetic properties among others. The purpose of the paper is to encourage exploration along possibly unconventional lines; thus no firm conclusions are drawn but a list of coating flaws, etc., is given with some suggestions for the techniques that might be suitable for their assessment. It is emphasized that all tests must be regarded as comparative. (Author)

NTIAC-016932M

Cahall, R.

"Nondestructive Evaluation Systems for the Naval Avaiation Maintenance Environment Technology Assessment"; Final report, August 1972-September 1977, 5 July 1978, 128 pp, NAEC-GSED-120; Naval Air Engineering Center, Ground Support Equipment Dept., Lakehurst, NJ, AD-A058146

Under NAVAIRSYSCOM direction, NAEC-GSED conducted an investigation and analysis of the field of nondestructive evaluation as it relates to the Naval aviation community. This report finalizes that task. Areas of discussion include: general description of what NDE is and why it is practiced, how inspection requirements are established and suggested methods for improvement, assessment of the positive impact expanded utilization of NDE could provide, discussion of present and future field inspection requirements, technology base assessment/projection, and recommended research program options. (Author)

NTIAC-019853

Carpenter, Steve H.; Heiple, Clinton R.

"Acoustic Emission Generated by Dislocation Mechanisms during the Deformation of Metal"; Fundamentals of Acoustic Emission, Joint Meeting of Acoustical Society of America and Japan, Honolulu, 27 November-1 December 1978, 49-104

A review of acoustic emission data generated by dislocation processes during the deformation of metals will be presented. The information, developed from an extensive review of the acoustic emission literature and from current unpublished results, will be analyzed to identify source mechanisms and characteristics of the emissions. The analysis will concentrate on the influence of the metallurgical condition of the test material on the observed acoustic emission. The effects of testing parameters and techniques will also be examined. Examples of major concerns in these areas will include: the effects of crystal structure, purity, grain size, heat treatment, prior mechanical work, strain rate, test temperature, stacking fault energy and sample size; difference in acoustic emission obtained during tensile, compressive and biaxial deformation; and a comparison of acoustic emission data presented as ringdown counts, burst rate and RMS voltage. Some examples of acoustic emission results mistakenly attributed to dislocation mechanisms will also be discussed briefty. (Author)

NTIAC-018901

Carson, Paul L.

"Status of Diagnostic Ultrasound Techniques"; IEEE Transactions on Nuclear Science, NS-26, 1, February 1979, 27-33; Institute of Electrical and Electronics Engineers, 345 East 47th St., New York, NY 10017

Diagnostic ultrasound may be of interest to a relatively large fraction of this group because of the strong similarities between equipment used in ultrasonic NDT, nuclear medicine, and diagnostic ultrasound, as well as the complementary and competitive positions of radionuclide and ultrasonic techniques in medical applications. Basic principles and applications of various pulse echo diagnostic ultrasound techniques will be described briefly. Included will be: modern compound B scanners and their use in abdominal, obstetrical and other applications; the use of various real time or auto scanning systems including transducer arrays for general purpose scanning, obstetrics and gynecology and echocardiography. (Author)

NTIAC-021868

Caussin, P.

"Ultrasonic Testing Applied to Austenitic Steel"; Nondestructive Examination in Relation to Structural

Integrity, 1st International Seminar Proceedings, 22 August 1979, Berlin, West Germany, 85-105; Applied Science Publishers Ltd., Ripple Rd., Barking, Essex, England

The physical background of the interaction of ultrasonic waves with an austenitic structure is reviewed in terms of effect on the attenuation and the velocities of waves. It is shown that no general rule can be drawn from available data. The examination techniques in use and under development are described. The emphasis is put on the performances of dedicated search units routinely used in the field. (Author)

NTIAC-017958

Cederquist, J.; Lee, Sing H.

"The Use of Feedback in Optical Information Processing"; *Applied Physics*, 18, 4, April 1979, 311-319; Springer-Verlag New York, Inc., 175 Fifth Avenue, New York, NY 10010

The use of feedback techniques in optical information processing systems is growing rapidly. This review describes methods by which feedback has been produced, and discusses their applications to processing problems. The methods are classified according to the coherence length of the light source used, ranging from long (single axial mode lasers) through medium (multimode lasers) to short (incoherent light sources). Particular attention is paid to their potential for complex feedback, and for the nonlinear and space-variant processing. The temporal characteristics of the systems and the means by which gain can be introduced into the feedback loop are considered. A current bibliography is given. (Author)

NTIAC-023337

Chen, J. N. C.; Dolbey, M. P.

"The Effects of High Radiation Dose on the Performance of Ultrasonic Transducers"; Nondestructive Evaluation in the Nuclear Industry-1980, 3rd International Conference Proceedings, 11-13 February 1980, Salt Lake City, UT, 219-237; American Society for Metals, Metals Park, OH 44073

The use of ultrasonic testing for the inservice inspection of components in nuclear plants is well established. In 1975, Ontario Hydro Research Division undertook the development of equipment for the inspection and gauging of pressure tubes in its Candu reactors. These zirconium alloy tubes contain the reactor's nuclear fuel. Studies indicate that the conditions inside a water-filled defuelled pressure tube, 24 hours after reactor shutdown, will be 1,000,000 roentgens/hour (R/H) of gamma radiation, 3×10^9 neutrons/cm^2 second of neutron flux and 50°C ambient temperature. To achieve the inspection and gauging requirements, an ultrasonic system utilizing approximately 20 conventionally designed transducers of various geometrical configurations has been suggested. The viability of this method will depend very much on the reliable performance of all the transducers for a minimum of 100 hours when subjected to the severe environmental conditions encountered during the inspection. This paper reports work that has been carried out by Ontario Hydro to evaluate the performance of conventional ultrasonic transducers subjected to such conditions. The relevant literature is reviewed and the effects of radiation on component materials is discussed. Results of irradiation tests on commercial transducers and units manufactured in our own laboratory are given. (Author)

NTIAC-018512M

Chodorow, Marvin

"JSEP Achievements 1961-1978 (Update of 15-Year Report dated September 1976)"; Interim report, February 1979, 12 pp, GL-2922, N00014-75-C-9632; Stanford University, Edward L. Ginzton Lab., CA, AD-A065670

This report updates the information provided in the Fifteen Year Report (dated September 1976), setting forth a number of the significant accomplishments under Joint Services Electronics Program (JSEP) sponsorship in the E. L. Ginzton Laboratory (formerly the Microwave Laboratory) of Stanford University. The report summarizes, as well, the flow of some of this research from the JSEP Contract to other sponsored research contracts and grants within the university, and outside of the university, to other research and educational institutions, as well as industry. (Author)

NTIAC-023841

Clifton, James R.; Anderson, Erik D.

"Nondestructive Evaluation Methods for Quality Acceptance of Hardened Concrete"; January 1981, 51 pp, NBSIR 80-2163; National Technical Information Service, Springfield, VA 22161 (PB81-159618)

Nondestructive test methods which can be used in quality acceptance programs for hardened concrete have been critically reviewed and are described in this report. Methods have been identified which provide information on the strength, quality and uniformity, thickness, air content, stiffness, finish, density of concrete as well as the location and condition of steel reinforcement. Both commonly used methods and possible test methods are covered. In addition, the feasibility of combining two or more test methods for improving the prediction of the strength or quality of concrete is explored. (Author)

NTIAC-020726M

Cohen, Jerome B.

"X-Ray Techniques for the Measurement of Residual Stresses in the Real World"; Technical report, 8 April 1980, 14 pp, TR-27, N00014-75-C-0580; Northwestern University, Dept. of Materials Science, Evanston, IL, AD-A083796

The principles of the x-ray method of measuring residual stresses are reviewed, with special emphasis on the latest developments in both procedures and equipment. Rapid in-the-field measurements are now being performed. It is possible to obtain stress gradients without layer removal and to obtain the entire stress tensor (not just the surface stress). (Author)

NTIAC-021642

Corsepius, H. W.

"Practical Ultrasonic Testing. XXIV"; *Mess. & Pruef.* (Germany), No. 3, March 1980, 161-163 (In German) English Abstract Published in Physics Abstracts

The detailed survey continued with the description of ultrasound beams generated by the normal (symmetrical) and angled transducer heads, with diagrams of sound pressure fields and interference field, with more detailed analysis of the useful range between 0.7 and 7X near-field.

NTIAC-019113

Dau, G. J.

"The EPRI NDE Program"; 9th World Conference on NDT Proceedings, 19-23 November 1979, Melbourne, Australia, 2B-2, 10 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia

This paper summarizes the motivation, goals, organization, technical thrusts, and recent results from an NDE program implemented to benefit U. S. electrical utilities. (Author)

NTIAC-020053

Dau, G. J.; De Young, G.; Gelhaus, F.; Lapides, M. E.; Quinn, J. R.

"Nondestructive Evaluation Program: Progress in 1979"; December 1979, 384 pp, EPRI NP-1234-SR; Electric Power Research Institute Inc., 3412 Hillview Ave., Palo Alto, CA 94304

This report presents for the first time a comprehensive review of the EPRI Nondestructive Evaluation (NDE) Program. The main section of the report consists of contractor-supplied summaries of each current project, which are intended to summarize progress and its significance. An overview of the organizational plan of the program is presented. (Author)

NTIAC-022950M

Dayou, Ma

"Thirty Years of Acoustics in China"; Edited translation of *Acta Acoustica* (China), 4, 11, 1979, 241-

250, 4 February 1981, 36 pp, FTD-ID(RS)T-1839-80; Foreign Technology Div., Wright-Patterson AFB, OH, AD-A098435

NTIAC-018089

Dean, D. S.

"A Review of Ultrasonic Transducer Arrays"; *British Journal of Non-Destructive Testing*, 21, 3, May 1979, 140-146; British Institute of Non-Destructive Testing, 1 Spencer Parade, Northampton NN1 5AA, England

Ultrasonic transducer arrays have not been used in industrial NDT to the extent that they have in medical and sonar applications. Mosaics of transducers have been constructed and have proved effective, but there are problems in matching and switching transducers which increase as the number of elements increase. These problems are reduced by using a linear array, which can be scanned relative to the ultrasonic field to be recorded. Imaging of defects can be by using ultrasonic lenses, correctly phased addition of multiple signals from the transducer elements, or by holographic techniques. In most cases complex signal conditioning is necessary and recent mini and micro computers have rendered this feasible at a reasonable cost. (NTIAC)

NTIAC-019448

Dorofeev, A. L.

"Use of the Electromagnetic Method of Inspection of the Quality of Parts in Machine Building (A Review)"; *Soviet Journal of Nondestructive Testing*, 15, 3, March 1979, 183-193 (English translation, November 1979); Consultants Bureau, 227 West 17th Street, New York, NY 10011

Experience is summarized on the development and use of the eddy current method for inspecting the quality of parts. Information is given on the use of electromagnetic instruments for solving problems of thickness measurement, structure determination, and revealing defects in continuity. (Author)

NTIAC-016555

Coyle, P. A.; Scala, C. M.

"Crack Depth Measurement by Ultrasonics: A Review"; *Ultrasonics*, 16, 4, July 1978, 164-169; IPC Science and Technology Press, 32 High Street, Guildford, Surrey, GU1 3EW, England

A review is given of both bulk and surface wave ultrasonic methods for the measurement of the depth of surface-breaking cracks. Research is considered which relates to techniques for measuring crack depth by studying the scattered pulse amplitude, by using time-of-flight methods, or by carrying out ultrasonic spectroscopic analysis. Measurement of the transit time of bulk waves appears most likely to provide simple and reliable depth measurement in the near future. Further work in the other two areas should also prove valuable. Some suggestions are made of promising directions for future research. (Author)

NTIAC-019438

Drobot, Yu. B.; Lazarev, A. M.

"Use of Acoustic Methods for Detecting and Rating Fatigue Cracks (Review)"; *Soviet Journal of Nondestructive Testing*, 15, 2, February 1979, 109-125 (English translation, October 1979); Consultants Bureau, 227 West 17th Street, New York, NY 10011

The basic features of acoustic emission in cyclic loading and existing theoretical models and relationships making it possible to relate the parameters of acoustic emission and a fatigue crack are considered. A short description is given of the apparatus and methods of conducting investigations. An analysis of experimental results has made it possible to reveal possible areas of the use of acoustic emission in laboratory fatigue tests and also to outline the basic problems the solution of which will make possible a transition to full-size objects of inspection. Together with literature data, some results obtained by the authors are given. (Author)

NTIAC-022722M

Ellingson, William A.

"Advances in Nondestructive Evaluation Methods for Inspection of Refractory Concretes"; March 1980, 27 pp; National Technical Information Service, Springfield, VA 22161 (CONF-800393-1); Argonne National Lab, IL

Refractory concrete linings are essential to protect steel pressure boundaries from high-temperature aggressive erosive/corrosive environments. Castable refractory concretes have been gaining more acceptance as information about their performance increases. Economic factors, however, have begun to impose high demands on the reliability of refractory materials. Accordingly, nondestructive evaluation methods are being developed to assist the refractory user. Radiographic techniques, thermography, acoustic emission detection, and interferometry have been shown to yield information on the structural status of refractory concrete. Methods using 60_{Co} radiation sources are capable of yielding measurements of refractory wear rate as well as images of cracks and/or voids in pre- and post-fired refractory linings up to 60 CM thick. Thermographic (infrared) images serve as a qualitative indicator of refractory spalling, but quantitative measurements are difficult to obtain from surface-temperature mapping. Acoustic emission has been shown to be a qualitative indicator of thermomechanical degradation of thick panels of 50 and 95% AL_2O_3 during initial heating and cooling at rates of 100 to 220°C/H. Laser interferometry methods have been shown to be capable of complete mappings of refractory lining thicknesses. This paper will present results obtained from laboratory and field applications of these methods in petrochemical, steel, and coal-conversion plants. (Author)

NTIAC-022223

Engl, G.; Meier, W.

"A Practical Comprehensive Survey on Inservice Experience with Improved Techniques"; Periodic Inspection of Pressurized Components, Institution of Mechanical Engineers Conference, 8-10 May 1979, Longdon, England, Paper C34/79, 247-256; Mechanical Engineering Publications Ltd., P. O. Box 24, Northgate Ave., Bury St., Edmunds, Suffolk IP32 6BW, England

The basic philosophy of using searching and, if doubt is left, analyzing techniques demands a high signal significance of the searching techniques. So the improvement of searching techniques has two aims: a maximum defect detectability and a high ability to classify into relevant and irrelevant or spurious indications. Major contributions for the improvements of the inspection techniques come from various fields. Three of them are shown in this paper: theoretical echodynamic models, data acquisition and processing and alternative techniques. As the shown examples and results demonstrate, all three possibilities are of big importance for an optimization of inservice inspections. (Author)

NTIAC-021393

"Test Train Program, Ninth Progress Report"; Annual Progress Report, 1 July 1976-30 June 1977, October 1978, 110 pp, FRA/ORD-78/23, DOT-FR-64113; National Technical Information Service, Springfield, VA 22161 (FRA/ORD-78/23); ENSCO, Inc., Springfield, VA

This report describes progress on the engineering and test support services for railroad instrumentation, data acquisition, processing and evaluation program from 1 July 1976 through 30 June 1977. The report covers operation of the FRA track geometry measurement and data acquisition fleet, track survey operations and vehicle dynamic tests on lightweight flat cars, DoD cars, passenger cars and locomotives. Also, the report describes test activities on the facility for accelerated service testing, aerodynamic validation, track structures, vehicle vibration and ride quality, trailer-on-a-flat-car combinations, and investigations of the automated wayside inspection station concept. (Author)

NTIAC-016198

Ermolov, I. N.

"Current Trends in the Development of Acoustical Testing Methods"; *Soviet Journal of Nondestructive Testing*, 13, 4, July-August 1977, 371-380 (English translation, May 1978)

Papers and exhibits presented at the Eighth World Conference on Nondestructive Testing are reviewed; the main trends are discussed in the development of acoustical testing methods and equipment. (Author)

NTIAC-022812

Ervine, R. W.; Watkins, B.
"A Review of the Inspectability Inservice of Some Typical Construction Features Currently Employed in PWR Pressure Vessels"; Trends in Reactor Pressure Vessel and Circuit Development; International Atomic Energy Agency Specialists Meeting Proceedings; 5-8 March 1979; Madrid, Spain; 251-259; Applied Science Publishers Ltd., Ripple Rd., Barking, Essex, England

The widespread demand for pressurized water reactor systems has been met by a number of manufacturing organizations in the United State, Japan, and Europe, including the capability to manufacture reactor pressure vessels (RPV). Each manufacturer has its own preferred production methods, and in consequence a number of vessel design variants are evolving. The integrity of the RPV is a prime factor in consideration of the safety and reliability of the PWR system. Periodic inservice inspection of this vessel can make a significant contribution toward increased safety assurance. Some typical RPV design variants have been reviewed and the inspectability inservice of their different construction features has been assessed. The increasing use of large forged sections in construction, their influence on weldments and the possibility of reduced inspection requirements are also commented upon. (Author)

NTIAC-022684

Evlampiev, A. I.; Karpov, V. I.; Levina, L. E.
"Modern Halogen Leak Detectors (Review)"; *Soviet Journal of Nondestructive Testing*, 16, 9, September 1980, 653-657 (English translation, May 1981); Consultants Bureau, 227 West 17th St., New York, NY 10011

The literature on the halogen method of monitoring airtightness in modern production is reviewed. Both improvements to existing commercial instruments and basically new methods and instruments having a number of advantages are considered. (Author)

NTIAC-016879

Foerster, F.
"Inspecting Tubing and Other Round Profile Parts by the Magnetic Leakage Flux Method"; *Soviet Journal of Nondestructive Testing*, 13, 6, November-December 1977, 617-631 (English translation, September 1978); Consultants Bureau, 227 W. 17th St., New York, NY 10011

This review discusses the historical development and application of the magnetic leakage flux method. The method was first introduced into practical inspection in 1950. The article goes on to describe a number of the applications made using this method during the subsequent time right up to the present. The author concludes that it is essential that a close contact with a particular industry having need of the equipment be maintained during the development and production of the units. As an example, the author stresses the importance of the environmental condition in actual use, dust, scale, temperature, vibration, variations in line voltage, interference in electrical apparatus, etc., in affecting the design consideration of the equipment. (Author)

NTIAC-019276

Forest, G.; Carson, H. L.
"Report on the Nondestructive Testing Work of Commission V of the International Institute of Welding since the Eighth World Conference"; 9th World Conference on NDT Proceedings, 19-23 November 1979, Melbourne, Australia, 3A-1, 7 pp; Australian Institute for Nondestructive Testing, 292 Royal Parade, Parkville 3052, Victoria, Australia

This paper reports on the activities of Commission V of the International Institute of Welding during the period since the Eighth World Conference in 1976. A list of published items is appended. (Author)

NTIAC-023171

Fu, L. S.
"On the Feasibility of Quantitative Ultrasonic Determination of Fracture Toughness—A Literature Re-

view"; Final report, November 1980, 38 pp, NASA CR-3356, NSG-3269; National Technical Information Service, Springfield, VA 22161 (N81-14337); Ohio State University, Columbus, OH

The report covers three main topics: (1) fracture toughness and microstructure, (2) quantitative ultrasonics and microstructure, and (3) scattering and related mathematical methods. Literature in these areas is reviewed to give insight to the search of a theoretical foundation for quantitative ultrasonic measurement of fracture toughness. The literature review shows that fracture toughness is inherently related to the microstructure and, in particular, it depends upon the spacing of inclusions or second phase particles and the aspect ratio of second phase particles. There are indications that ultrasonic velocity and attenuation measurements can be used to determine fracture toughness. This leads to a review of the mathematical methods available in solving boundary value problems related to microstructural factors that govern fracture toughness and wave motion. A framework towards the theoretical study for the quantitative determination of fracture toughness is described and suggestions for future research are proposed. (Author)

NTIAC-016730

Gardner, C. G.

Automated Radiography, A State-of-the-Art Survey; June 1978, 36 pp, NTIAC-78-1; Nondestructive Testing Information Analysis Center, P. O. Drawer 28510, San Antonio, TX 78284, Nondestructive Testing Information Analysis Center, San Antonio, TX

Radiography employing x-rays and gamma rays is the oldest of the sophisticated methods of nondestructive evaluation. As conventionally practiced, the method involves the use of photographic film or paper, specially prepared for radiography, with the attendent steps of exposure, processing, and finally, visual examination by a skilled 'reader' for indications of flaws in the test piece. While film radiography has certain inherent advantages, such as sensitivity, resolution, and a permanent graphic record of the test, there are many instances where the elimination of film or human interpretation of the image or both would be highly desirable. This publication surveys briefly the current status of those technologies which are crucial to automated radiography, as well as progress to date in the realization of automated radiography. Two major impediments to fully automated radiography have prevented implementation on an appreciable scale. First, filmless image receptors of sensitivity, resolution, and equivalent image size to radiographic film have yet to emerge. Second, until quite recently, the technical means for automatic image interpretation have not been available. It now appears that both these impediments are likely to be overcome, and that cost-effective fully automated inspection for certain applications, such as artillery shells or components thereof, will become a reality in the next few years. (NTIAC)

NTIAC-016661M

Gladden, James W.

"Review of Photosensitive Materials for Holographic Recordings"; Technical report, (Errata sheet inserted); April 1978, 87 pp, ETL-0128; Army Engineer Topographic Labs, Fort Belvoir, VA, AD-A055013

There is a program objective to systematically evaluate photosensitive recording materials that can be used in holographic and other coherent optical systems. In association with this, a detailed literature search was undertaken in which considerable information was obtained and compiled in this report. An objective of this report is to describe aspects of the recording materials in a way that will aid in their future development and use in holography. Over 100 references were reviewed that treat electrostatic imaging materials, photoresists, hardened dichromated gelatin, photopotymers, photochromic materials, and bleached silver halide materials. Subcategories include Scott Graphics TEP film, photoplastic film, diazos, diazo-oxides and azides; Shipley's AZ 1350 positive photoresists; Hughes-NRC, DuPont and Bell Laboratories photopolymers, photochromic lithium niobate; and different halide bleaches for silver halide bleached holograms. The report compares a number of holographic recording materials.

NTIAC-020015

Gerold, V.; Kostorz, G.

"Small-Angle Scattering Applications to Materials Science"; *Journal of Applied Crystallography*, 11, 5, 1 October 1978, 376-404

The review describes results of the last three or four years from the application of both x-ray and neutron small-angle scattering (SAS) to problems in the general field of materials science. A wide range of topics has been covered including phase separation in binary and ternary systems (early stages as well as the determination of the metastable miscibility gap), density and concentration fluctuations in single-phase systems, and studies of various structural defects such as voids, radiation damage, dislocations, and surfaces and interfaces. The interaction between magnetic moments and neutrons has made possible SAS research on the long-range interaction of spins in complicated magnetic systems and flux-line studies in type-II superconductors, and this work is also reviewed. (Author)

NTIAC-023613

Gitis, M. B.

"Transducers for Pulsed Ultrasonic Flaw Detection. Fundamental Theoretical Aspects (Review)"; *Soviet Journal of Nondestructive Testing*, 17, 2, February 1981, 131-145 (English translation, October 1981); Consultants Bureau, 227 West 17th Street, New York, NY 10011

A survey is made of the fundamental theoretical articles on the computation of conversion ratios and acoustic fields for piezoelectric transducers in a pulsed mode. Attention is focused on the physics of the processes that are responsible for their characteristics in the pulsed mode. (Author)

NTIAC-020971M

Golan, Sam

"A Comparison of American nnd European Ultrasonic Testing Standards"; August 1979, 74 pp, NBS IR-79-1790; NTIS, Springfield, VA 22161 (PB 298809); National Bureau of Standards, Washington, DC

In this report, 27 general ultrasonic testing standards from 11 countries and international organizations are reviewed and evaluated. Also, 37 ultrasonic testing standards for specific products, from five countries, are examined in order to evaluate their utilization of the general ultrasonic testing standards, i.e., the extent to which the procedures outlined in the general standards are applied by the product standards. Finally, the 'universal' concept of ultrasonic testing standards versus the 'specific' product-oriented concept is discussed. (Author)

NTIAC-018955

Goldfinch, T. E.

"The Qualification of NDT Personnel in Australia—'A Critical Review' "; Nondestructive Testing—Australia; October 1978, 9-15; Australian Institute for Nondestructive Testing, P. O. Box 250, North Sydney, N.S.W. 2060, Australia

The author examines the principal features of the A.I.N.D.T. scheme for the qualification of NDT personnel in the light of similar schemes operating overseas. The effect of low specific work volume on the basic philosophy used in formulating the scheme together with the relationship to the uniquely Australian organization of N.A.T.A. are discussed. (Author)

NTIAC-018709

Gorbunov, V. I.; Lukin, A. L.

"Nondestructive Testing of Materials and Articles with Heavy Charged Particles"; *Soviet Journal of Nondestructive Testing*, 14, 10, 886-899 (English translation, June 1979); Consultants Bureau, 227 West 17th Street, New York, NY 10011

Work on proton radiography since its inception in 1968 is reviewed. Its advantages and disadvantages over other radiation methods of nondestructive testing are pointed out. Areas of practical application of proton radiography and its future prospects are considered. Examples of radiograms obtained using film and solid-state detectors are given. (Author)

NTIAC-019419

Gorbunov, V. I.; Rudenko, V. N.
"Use of Accelerated Electrons for Nondestructive Testing (Review)"; *Soviet Journal of Nondestructive Testing*, 15, 4, April 1979, 267-280 (English tranlation, December 1979); Consultants Bureau, 227 W. 17th Street, New York, NY 10011

The use of accelerated electrons as penetrating radiation to solve problems in nondestructive testing is considered. The use of beams of monoenergetic electrons in some cases enables one to increase the sensitivity compared with x-rays, to monitor composite (layered) materials, the thickness of surface layers, coatings with single-sided access, and tne density of materials. The advantages and disadvantages of various detectors used in electron flaw detection are pointed out, and sources of monoenergetic electron beams are described. The advantages of electron flaw detection over other methods of nondestructive testing are discussed. (Author)

NTIAC-018381

Green, Allen T.
"Acoustic Emission Technology 1979"; *Metals Progress*, 116, 3, August 1979, 41-45, 48-49; American Society for Metals, Metals Park, OH 44073

This is a brief survey article of the applications of acoustic emission. Included is a discussion of work concerned with the acoustic emission signals generated in ferromagnetic materials when the level of an applied field is varied. (NTIAC)

NTIAC-020883

Green, Allen T.; Landy, Robert J.
"Acoustic Emission NDE for Advanced Composite Structures"; Advanced Composites Special Topics, Papers Presented at Conference on Advanced Composites—Special Topics, 4-6 December 1979, El Segundo, CA, 228-245

This paper presents a brief review of acoustic emission and its application to the nondestructive evaluation of composite structures. Considering that only fifty of 2,000 references on AE refer to composite materials, one might ask why is AE of importance? We hope to answer this question by describing some of the practical applications currently in use and also some of the research uses of AE in composite structures. A brief bibliography is presented which will bring the reader quickly up-to-date in this important use of acoustic emission. (Author)

NTIAC-017250

Green, Robert E.
"Overview of Residual Stress (Residual Strain) Measurements"; ASNT National Fall Conference, Paper Summaries, Denver, CO, October 2-5, 1978, 44-46; American Society for Nondestructive Testing, 4153 Arlingate Plaza, Caller No. 28518, Columbus, OH 43228

A general review of the various types of residual stress is given and an overview is presented as to various means of nondestructively measuring residual stress including x-ray diffraction, ultrasonic, electromagnetic, and more exotic methods based on solid state physics techniques. (Author)

NTIAC-016950

Grigorev, M. V.; Grebennikov, V. V.; Gurvich, A. K.
"Ultrasonic Determination of Crack Dimensions"; *Soviet Journal of Nondestructive Testing*, 14, 2, February 1978, 100-103 (English translation, November 1978); Consultants Bureau, 227 W. 17th Street, New York, NY 10011

A survey is given of studies made by Soviet and foreign authors concerning the ultrasonic determination of crack dimensions. (Author)

NTIAC-022257

Gudas, J. P.; Joyce, J. A.; Vanderveldt, H. H.

"J-Integral Elastic-Plastic Fracture Mechanics Technology in the U. S. Navy"; DARPA/AFML Review of Progress in Quantitative NDE Proceedings, 8-13 July 1979, Scripps Institution of Oceanography, La Jolla, CA, 181, (Abstract Only); Rockwell International Science Center, 1049 Camino Dos Rios, Thousand Oaks, CA 91360

The United States Navy has historically been interested in the development of fracture-safe materials for ship construction, and in developing fracture mechanics criteria for design considerations. Recently, a substantial research effort has been directed to the development of J-Intergral technology. The purpose of this presentation is to review recent Navy advances in this area. The main points will include a discussion of the applicability of the J-Integral to fracture in ductile materials, the development of test procedures for J (Sub IC), recent results in the areas of J-controlled J (Sub I) versus crack growth resistance curve. (Author)

NTIAC-019622

Gurvich, A. K.; Shcherbinskii, V. G.

"Progress of Ultrasonic Flaw Detection in Welded Joints in the U.S.S.R. (Survey)"; *Industrial Laboratory,* 44, 5, May 1978, 661-666 (English translation, November 1978); Consultants Bureau, 227 West 17th Street, New York, NY 10011

The authors present the historical development and applications of ultrasonics to the detection of flaws in welded joints in the U.S.S.R. They also list the scientific and organizational problems to be solved in the immediate future to bridge the gap between the capabilities of ultrasonics and the sharply escalating demands of the national economy. (NTIAC)

NTIAC-016605

Hagemaier, Donald; Fassbender, Robert

"Nondestructive Testing of Adhesive Bonded Structure"; *SAMPE Quarterly,* 9, 4, July 1978, 36-58; Society for the Advancement of Material and Process Engineering, P. O. Box 613, Azusa, CA 91702

Thousands of test specimens and hundreds of test panels have been fabricated and tested as part of the primary adhesively bonded structure technology under contract to the U. S. Air Force Materials Laboratory. Nondestructive testing (NDT) methods, such as neutron and x-ray radiography, ultrasonic, and a variety of reference standards were developed, built-in defect specimens were fabricated and tested, and numerous destructive correlations were made to verify NDT results. This paper describes the significant findings to date concerning NDT of adhesive bonded structure. (Author)

NTIAC-023667

Harman, George G.

"Semiconductor Measurement Technology: Nondestructive Tests Used to Insure the Integrity of Semiconductor Devices with Emphasis on Acoustic Emission Techniques"; *International Advances in Nondestructive Testing,* Vol. 7, 1981, 105-179; Gordon and Breach Science Publishers Inc., One Park Ave., New York, NY 10016

This paper reviews a number of important nondestructive tests used frequently in the semiconductor industry to test mechanical integrity of semiconductor devices. The discussion is divided into two major sections. The first begins with a review of device assembly techniques and problems and concludes with an introduction to some factors that result in the choice of tests and to production line statistical sampling. The second section begins with an introduction to acoustic emission and the status of its theory as it can be applied to microelectronics. (NTIAC/Author)

NTIAC-022883

Harrison, J. D.

"The 'State-of-the-Art' in Crack Tip Opening Displacement (CTOD) Testing and Analysis—Part 1.

Background and Testing Methods"; *Metal Construction*, 12, 9, September 1980, 415-422; Welding Institute, Abington Hall, Abington, Cambridge CB1 6AL, England

This is a major three part review of this most important technique for evaluating toughness and assessing the significance of defects in low and medium strength engineering materials. The first two parts summarize the background development leading to the current test procedure and describe practical problems encountered fn carrying out the test and interpreting the test records obtained. Part 3 will deal with the application of the CTOD approach, and will include the bibliography for all parts. (Author)

NTIAC-016919

Hayward, Gordon P.

"Introduction to Nondestructive Testing"; American Society for Quality Control, 161 W. Wisconsin Ave., Milwaukee, WI 53203

This short handbook contains a brief overview of NDT describing visual, magnetic, radiographic, ultrasonic, and eddy current testing, followed by appendices containing a glossary of terms frequently used in nondestructive testing and excerpts from the *Nondestructive Evaluation Technique Guide*, prepared by Mr. Alex Vary of NASA Lewis Research Center. (NTIAC)

NTIAC-020345

Healey, J. J.; Wu, S. T.; Murga, M.

"Structural Building Response Review"; May 1980, 169 pp, NUREG/CR-1423, FIN NO. A0130; National Technical Information Service, Springfield, VA 22161, (NUREG/CR-1423); California University, Lawrence Livermore Laboratory, Livermore, CA

The body of this report is organized in six chapters: Chapter 2 treats the subject of structural modeling including methods of discretization, basic modeling approaches, decoupling and other important modeling topics; Chapter 3 covers the various methods of linear and nonlinear structural dynamic analysis, numerical methods, damping, etc.; Chapter 4 contains a discussion of the nonlinearity as it relates to nuclear plant structures and presents a discussion of basic analytical considerations and computational algorithms for treating nonlinearity; Chapter 5 treats the subject of combining seismic and nonseismic load effects with particular reference to the state-of-the-art in this area as related to the probabilistic methodology. This material was not fully elaborated on in this report since the SSMRP has a special project to address this topic; Chapter 6 presents a summary of the various sources of uncertainty in seismic dynamic analysfs together with a discussion of the sources of data available to quantitatively define these uncertainties; Chapter 7 provides a summary of the principal observations and recommendations of the study. (Author)

NTIAC-018990

Hebbert, R. A.

"NDT Calls for Speed and Versatility in On-Site Test Equipment"; *Metals and Materials*, September 1978, 37-42

While analytical equipment, as seen in our August Issue, is usually confined to the metallurgical or chemical laboratory, nondestructive testing instruments nowadays more often find their place on the production line or the work site, carrying out vital checks without interrupting the flow of production. Associate editor R. A. Hebbert here reviews some of the advanced NDT equipment now available. (Author)

NTIAC-019929

Herr, James C.

"Soft Aluminum Overview—Detection Methods and Aerospace Industry Findings"; National Spring Conference American Society for Nondestructive Testing Paper Summaries, 24-27 March 1980, Philadelphia, PA, 198-199; ASNT, 4153 Arlingate Plaza, Caller No. 28518, Columbus, OH 43228

Initial identification of the problem and actions to detect and evaluate the effects are described. Coordination, interchange and data exchange in the aerospace industry are described. (Author)

NTIAC-023243

Higham, E.

"A Summary of the PISC 1 Programme"; *British Journal of Non-Destructive Testing*, 23, 4, July 1981, 175-180; British Institute of Non-Destructive Testing, 1 Spencer Parade, Northampton NN1 5AA, England

The PISC Programme was initiated in 1974 and was designed to augment a similar project which had been underway in the USA since 1965 under the auspices of the Pressure Vessel Research Committee (PVRC). These projects were intended to provide much needed reliability data regarding ultrasonic inspection of thick reactor pressure vessel grade material. The PISC Programme was set up with the following terms of reference, to determine the capability of an ultrasonic testing procedure devised by the USPVRC (which complied with the requirements of the ASME Code Section XI, 1974, Appendix I), to detect, size and locate flaws or discontinuities in heavy section steel. This was achieved by comparing the results of the ultrasonic inspections carried out by several teams, with the results of the destructive examination of the three test plates. Teams were also invited to present results from their own alternative ultrasonic procedures, some of which are in regular use for reactor inspections in Europe. The report describes briefly the PISC Programme and gives a summary of the results of the analysis of both the standard PISC procedure and of the alternative procedures used. Comparisons are made between the two sets of results and, where possible, conclusions drawn. (Author)

NTIAC-018875

Hill, David A.; Wait, James R.

"Theory of Electromagnetic Methods for Nondestructive Testing of Wire Ropes"; 4th Conference on Coal Mine Electrotechnology Proceedings, 2-4 August 1978, Morgantown, WV, Paper 16, 16-1—16-13; Institute of Electrical and Electronics Engineers

Past and current techniques for electromagnetic nondestructive testing of wire ropes are briefly reviewed. Recent theoretical work is also discussed. In particular, we mention prolate spheroidal void model for a broken strand or individual wire. Here we assume the wire rope is excited by an electric current loop. This primary field, in turn, induces both electric and magnetic dipole moments in the small void. The resulting external scattered field is then derived and numerical results are presented which suggest an effective configuration of sensing coils. The dual source of a magnetic current loop which is a model for a toroidal coil is also considered. (Author)

NTIAC-022159

Hollamby, D. C.

"Ultrasonic Flaw Detection and Characterization—An Australian View"; *Non-Destructive Testing—Australia*, 17, 10, October 1980, 9-13, 15; Non-Destructive Testing—Australia, P. O. Box 250, North Sydney, N.S.W. 1060, Australia

A large variability of test results was found to result from differing probe and instrument characteristics. The need for standards and specification to better reflect the capabilities of NDT methods is emphasized. (Author)

NTIAC-022236

Holler, P.; Becker, R.; Betzoid, K.

"Overview of Eddy Current Research at Saarbrocken"; DARPA/AFML Review of Progress in Quantitative NDE Proceedings, 8-13 July 1979, Scripps Institution of Oceanography, La Jolla, CA, 54-61; Rockwell International Science Center, 1049 Camino Dos Rios, Thousand Oaks, CA 91360

The development of an eddy current testing system is described which encloses a 4-frequency test device as well as extensive computer programs to optimize layout and adaptation to practical problems. Results obtained on the testing of welds and heat exchanger tubes are presented. The testing aim is to detect defects and to determine their type and size. (Author)

NTIAC-018205

Hsu, Nelson N.; Hardy, Stephen C.

"Experiments in Acoustic Emission Waveform Analysis for Characterization of AE Sources, Sensors and Structures"; Elastic Waves and Nondestructive Testing of Materials, Vol. 29, Annual Winter Meeting, American Society of Mechanical Engineers Proceedings, 10-15 December 1978, San Francisco, CA, 85-106; American Society of Mechanical Engineers, 345 E. 47th Street, New York, NY 10017

While industrial acoustic emission (AE) applications and instrumentation developments have progressed well in recent years, the precise interpretation of AE signals remains a problem. In this paper, we review various signal processing techniques which have been used to characterize the detected signals and then report a simple experimental system consisting of a large plate, a mechanical step-impulse simulator, and a capacitive transducer. The transfer function of the plate can be theoretically computed; thus it provides a basis for detailed analysis. The transfer function of the capacitive transducer is shown to be true displacement measurements. The system is used to determine unknown sources in terms of force-time functions explicitly through a time-domain deconvolution algorithm. The system also provides means to characterize sensors and structures. Finally, we compare the spectral and direct time-domain analyses and discuss their limitations. (Author)

NTIAC-019115

Huang, G. J.; Lue, T. C.; Chang, K. T.

"A Review of the Techniques Using Ultrasonic Testing for Inspecting Reactor Control Rod Drive Housings at a Nuclear Project in Taiwan"; 9th World Conference on Nondestructive Testing Proceedings, 19-23 November 1979, Melbourne, Australia, 2B-4, 9 pp; Australian Institute for NDT, 191 Royal Parade, Parkville 3052, Victoria, Australia

This paper describes the development of an ultrasonic technique used to examine fillet welds on reactor control rod drive housings in a nuclear power plant. An immersion technique is described which uses a scanning fixture holding a 3/4-inch diameter, 2.25 MHZ straight beam transducer connected to a 'C' scan recorder in addition to 'A' scan display of signals. Initial difficulties were experienced with development of the method and the steps taken to overcome them are discussed. (Author)

NTIAC-023510

Hunt, B. R.

"Digital Image Processing"; *Optical Engineering*, 10, 5, September/October 1981, 677-680; Society of Photo-Optical Instrumentation Engineers, 405 Fieldston Rd., Bellingham, WA 98225

Digital image processing has been one of the more active fields at the interface between optics and computing. In particular, image displays have begun to assume many of the characteristics of general purpose computers, but with the full computational power of the system devoted to image manipulation. Where can the trends established in the past ten years be expected to take us in the coming years? We try to answer this question, after first reviewing and summarizing the current state of digital image processing. (Author)

NTIAC-022180

Ivanov, V. I.

"Application of the Acoustic Emission Method for the Nondestructive Monitoring and Investigation of Materials (Survey of Fundamental Problems and Objectives)"; *Soviet Journal of Nondestructive Testing*, 16, 5, May 1980, 375-390 (English translation, January 1981); Consultants Bureau, 227 W. 17th St., New York, NY 10011

Problems in the application of the acoustic emission method for nondestructive monitoring are reviewed, the potential capabilities of the method are indicated, advances in special areas are described, specific problems are stated, and approaches to their solution are set forth. (Author)

NTIAC-022401

James, M. R.; Cohen, J. B.

"The Measurement of Residual Stresses by X-Ray Diffraction Techniques"; *Treatise on Materials Science and Technology—Experimental Methods*, Vol. 19, Part A, 1980, 1-63; Academic Press Inc., 111 Fifth Ave., New York, NY 10003

The need to consistently monitor and preserve the strength characteristics of materials during manufacture and service, coupled with advanced design techniques utilizing a greater percentage of the available strength of such materials has necessitated rapid advances in the use of nondestructive testing, and characterization of residual stresses in particular. In response to this need, important developments in equipment and measuring techniques and a greater understanding of the theoretical background have led to wider acceptance of the analysis of stress with x-rays, both as an experimental technique and as an engineering tool. The idea of measuring residual stresses by x-ray diffraction was first proposed by Lester and Aborn (1925-1926). The technique has long been used in the study of such manufacturing processes as shot peening, carburizing, and heat treating. A bibliography on x-ray stress analysis prior to 1953 (Isenburger, 1953) lists 240 references, and this was before widespread use of the diffractometer. Only within the last few years, however, has the portability of the equipment and the rapidity of the technique been sufficient for its application to such areas as on-site inspection during fabrication, or in-field measurements for maintenance. The main aim of this report is to present, in a single chapter, many of the recent instrumental advances and to explain the fundamental limitations associated with the measurement of residual stresses, in the hopes of providing an insight into its proper application. In doing so, many current applications are described in those areas where the measurement has already proven to be useful. (Author)

NTIAC-019528

Jarvis, J. F.

"Experiments in the Automation of Visual Inspection"; 1978 Joint Automatic Control Conference Proceedings, Pt. 1, Philadelphia, PA, 15-20; October 1978, 307-313, Instrumentation Society of America

The paper includes a survey of current applications, and guidelines for the application of automatic visual inspection technique. (NTIAC)

NTIAC-019371M

Jost, G. S.

"A Review of Australian Investigations on Aeronautical Fatigue During the Period April 1977 to March 1979"; *Structural technical memo.* April 1979, 68 pp, ARL/STRUC-TM-303; Aeronautical Research Labs, Melbourne, Australia, AD-A071641

A summary is presented of the aircraft fatigue research and associated activities which form part of the programs of the Aeronautical Research Laboratories, Commonwealth Aircraft Corporation Pty. Ltd., Department of Transport (Airworthiness Branch), Royal Australian Air Force and the Government Aircraft Factories. The major topics discussed include the fatigue of both civil and military aircraft structures, fatigue of materials and components and fatigue life monitoring and assessment.

NTIAC-020334

Kahn, Sherwin; Miller, Dennis

"Acoustic Emission Detection Part I—Theory, Review of Research and Development, Summary of Western Electric Applications"; *Western Electric Engineer*, 23, 4, October 1979, 3-13; Western Electric, 222 Broadway, New York, NY 10038

The meanings of some of the sounds of failure processes within materials have been known for centuries, but sounds outside of the audible range were not detected until about 30 years ago. After that, detection of acoustic emission mostly served to furnish clues to the integrity of large structures. Its application to small component manufacture is relatively new. Today, detection of acoustic emission is being used in a wide variety of applications within Western Electric, following initial work at Bell Laboratories and subsequent development beginning in 1972 at Western Electric's Engineering Research Center. In addition to the origin, propagation and detection of acoustic emission energy, some applications of acoustic emission detection at a number of Western Electric manufacturing locations are summarized here, and the details of applications at the Allentown works, Dallas works and Clark shops are described in Parts II, III, and IV of this article. (Author)

NTIAC-018167

Kaiserlik, J.

"Nondestructive Testing Methods to Predict Effect of Degradation of Wood; A Critical Assessment"; Final report, 1978, 55 pp, N68305 77 MIPR-7-06; Forest Products Laboratory, Madison, WI

Results are reported for an assessment of methods for predicting strength of wood, wood-based, or related material. Research directly applicable to nondestructive strength prediction was very limited. In wood, strength prediction research is limited to vibration decay, wave attenuation, and multiparameter 'degradation models.' Nonwood methods with potential application to wood include spectral response and techniques based on the ratio of energy dissipated per bending cycle and bending elastic energy at maximum amplitude. Conclusions drawn summarize the current status of nondestructive strength prediction research in various materials. Several research options are discussed for nondestructively predicting strength loss in treated piling. (Author)

NTIAC-016923

Kaplan, B. Z.; Mishal, R.; Fetman, A.; Gressel, C.

"Inductive Impedance Transducer for Recording Displacements of Ferromagnetic and Nonferromagnetic Conductive Objects"; *Review of Scientific Instruments*, 49, 11, November 1978, 1583-1588; American Institute of Physics, 335 E. 45th St., New York, NY 10017

The paper describes an inductive magnetic transducer for on-line recording of translations and vibrations. The transducer consists of an iron cored sensor coil and simple accompanying circuitry. The main features which are peculiar to the present transducer are (A) facility for linearizing the voltage versus displacement characteristic for certain regions of distances, (B) ability to measure vibrations and translations of both ferromagnetic objects and nonferromagnetic conductive objects, (C) relative simplicity of circuitry, and (D) the fact that only passive components are used for the transducer and an output voltage enhancement is attained by the employment of resonance. The paper is introduced by a comprehensive review of various types of magnetic transducers. (Author)

NTIAC-022485M

Kelly, D.

"Report on Engineering Investigation of Various Types of Welded Rail Joints"; August 1980, 112 pp; Mare Island Naval Shipyard, Vallejo, CA, AD-A094198

A literature search of current rail joining methods was conducted. In addition, several rail weldments were fabricated and subjected to nondestructive and destructive testing. The purpose was to evaluate rail joining methods for use at Naval facilities as well as to develop a suitable nondestructive test procedure for use on welded rail joints. Bolted rail joints were found to be the least expensive upon initial installation followed by thermite and then flash butt type welded joints (depending on the quantity of joints to be fabricated). Flash butt joints were found to provide the longest service life followed by thermite and then bolted joints. An ultrasonic test procedure and a thermite welding procedure were developed for use with welded rail joints. (Author)

NTIAC-023398

Kessler, Lawrence W.; Yuhas, Donald E.

"Acoustic Microscopy—A Tutorial Review"; *Acoustical Imaging*, Vol. 9, 9th International Symposium on Acoustical Holography Proceedings, 3-6 December 1979, Houston, TX, 275-299; Plenum Press, New York, 227 West 17th Street, New York, NY 10011

Acoustic microscopy is emerging as an important analytical technique serving the needs of both biomedical and materials technology. By means of very high frequency elastic waves, acoustic microscopes reveal structural-mechanical properties of specimens at high magnification. A review of the techniques and applications is presented in this reprinted article entitled, "Acoustic Microscopy — 1979". (Author)

NTIAC-023120

Kolerus, J.
"Acoustic Emission Analysis. II—Methods and Instrumentation"; *Technisches messen tm.* (Germany), 47, 12, December 1980, 417-434 (In German); *Physics Abstracts,* 84, 1162, 15 June 1981 (Abstract No. 53392)

In the first part of this paper fundamentals and application of acoustic emission analysis were discussed. The corresponding measurement engineering is the topic of this second part. After a survey on measuring and analyzing methods being used today, a novel measuring system is introduced and its application is demonstrated by practical examples.

NTIAC-023117

Kopineck, H. J.
"Technical Research into Methods for Measuring Defects in Plate"; Production and Use of Heavy Plate, Information Symposium Proceedings, 20-21 February 1979, Luxembourg, 121-137; IPC Science and Technology Press Ltd., P. O. Box 63, Westbury House, Bury St., Guildford, Surrey GU1 5BH, England

Plate quality is described by a number of property parameters which are determined partly by destructive and partly by nondestructive testing methods. Only the nondestructive approach can offer an economic increase in the number of properties measured and only nondestructive systems can be applied on-line. It is, therefore, of considerable industrial interest to increase the number of values obtained by these methods. Consequently, the community has commissioned and is continuing to do so, research with this aim. Continuous collection of data on plate geometry during the production process is necessary. While gauge measurement by radiation methods is commonplace, it has recently become possible to apply reliable equipment, photodiode scanners, to the measurement of plate width. Surface defects can have a limiting effect on the use of plate. Early detection of such defects using electrooptical methods is distinctly advantageous. Qualitative knowledge of the plate interior is also essential. The classical ultrasonic method has been improved so that no liquid link-up is necessary. Analysis of the signal can provide more comprehensive information on defect significance. Structural analysis is also increasing in importance. In addition to ultrasound, a new method is of great interest which is intended to provide information on precipitates and microcracks by means of low-angle scatter in low-energy neutrons. Plate for further processing is subjected to extensive investigation. The total analysis of structural components made from it during their use is of great importance. Emission techniques offer much promise in this connection.(Author)

NTIAC-019336

Kriesz, H.
"Radiographic NDT—A Review"; *NDT International,* 12, 6, December 1979, 270-273; IPC Business Press LTD., Oakfield House, Perrymount Road, Haywards Heath, Sussex RH16 3DH, UK

This year marks the silver jubilee of Andres Radiation Products as the Danish X-Ray Equipment Company. Today, with some 20% of the market, the company can claim to be the world's leading manufacturer of portable x-ray equipment, supplying a comprehensive range of units to some seventy different countries. This article reviews the company's history, reflects changes in equipment and market influences, and indicates future trends in radiographic NDT. (Author)

NTIAC-021565

Kupcis, O. Allan
"Detection, Sizing and Monitoring of Defects by Nondestructive Evaluation: An Overview"; *Canadian Metallurgical Quarterly,* Vol. 19, 1980, 23-34; Canadian Institute of Mining and Metallurgy

The increasing application of fracture mechanics analysis to defects uncovered by nondestructive examination of components and structures has placed new and difficult demands on nondestructive testing techniques. Any analysis of the significance of defects on the continued structural integrity of components will at least require an estimate of the defect size. If such defects are assessed as not being 'critical' then an ability to periodically monitor defect growth during service becomes important. Thus, a nondestructive inspection technique must be judged as to its sensitivity in detecting significant defects, its accuracy in measuring defect size and position, and its ability to monitor defect growth. All inspection techniques have limitations in these areas, which must be accounted for in critical applications. This paper will discuss and illustrate the factors affecting defect size estimation and crack growth monitoring with particular reference to the ultrasonic inspection technique, since it comes closest in best fulfilling the three criteria for the columetric inspection of most structures. (Author)

NTIAC-018094

Lange, Y. V.; Moskovenko, I. B.

"Low-Frequency Acoustic Nondestructive Test Methods"; *Soviet Journal of Nondestructive Testing*, 14, 9, September 1978, 788-797 (English translation, May 1979); Consultants Bureau, 227 W. 17th St., New York, NY 10011

A brief survey is presented of the main low-frequency acoustic methods of nondestructive testing. Physical principles are considered, together with applications and equipment. (Author)

NTIAC-022220

Lautzenheiser, C. E.; Greer, A. S.

"Ultrasonic Inspection for Stress Corrosion Cracking in Stainless Steel"; Periodic Inspection of Pressurized Components, Institute of Mechanical Engineers Conference, 8-10 May 1979, London, England, Paper C50/79, 219-224; Mechanical Engineering Publications Ltd., P. O. Box 24, Northgate Ave., Bury St., Edmunds, Suffolk IP32 6BW, England

Ultrasonic inspection of stainless steel, especially for the detection of intergranular stress corrosion cracks, has been and continues to be a problem. Commensurate with the importance of this problem, a great amount of research has been and continues to be performed. In August 1977, the Electric Power Research Institute reported results of a round robin test utilizing five different inspection companies to determine the statistical ability to detect stress corrosion cracking in stainless steel pipes. This paper reviews the results of that program and discusses significant transducer developments resulting from research conducted subsequent to that program. (Author)

NTIAC-021869

Lautzenheiser, C. E.; Whiting, A. R.; Flach, W. T.

"Problems Associated with Repetitive Inspection of Reactor Pressure Vessels and Research toward Solutions"; Non-Destructive Examination in Relation to Structural Integrity, 1st International Seminar Proceedings, 22 August 1979, Berlin, West Germany, 107-111; Applied Science Publishers Ltd., Ripple Rd., Barking, Essex, England

Over the past ten years, technology has successfully developed equipment and ultrasonic techniques for the inspection of reactor pressure vessels (RPVS); and the detection of flaws and reproducibility of data have been satisfactorily demonstrated. However, accurate sizing, location, and analysis of the flaws remain a principal problem. Intensive research is underway to improve the techniques and the hardware for flaw analysis. Examples of the reproducibility of data taken during the inspection of RPVS and advanced computer-assisted, ultrasonic inspection techniques for precise flaw analysis are discussed. (Author)

NTIAC-022851

Lemon, D. K.

"A Review of Advanced Acoustic Emission Sensors"; Interim report, April 1981, 134 pp, NADC 81087-60, 23111-04210, N62269-80-C-0243, DARPA Order 3905; Battelle Pacific Northwest Labs, Richland, WA, AD-A098989

This report describes work done to evaluate emerging, advanced sensors for detection of acoustic emission from fatigue crack growth. This task is part of an overall project whose objective is to develop acoustic emission monitoring of fatigue crack growth in aircraft. In Section 1, the operation of each candidate sensor is summarized. Section 2 describes the criteria used to evaluate the suitability of each sensor for near-term use on this acoustic emission project. Recommendations are provided regarding which sensor concepts appear to be most promising within the context of the project's needs. The appendices contain papers that were submitted to Battelle by various experts discussing the sensor concepts.

NTIAC-023178

Levina, L. E.; Sazhin, S. G.
"Manometric Method of Inspection for Airtightness"; *Soviet Journal of Nondestructive Testing*, 16, 11, November 1980, 807-812 (English translation, July 1981); Consultants Bureau, 227 West 17th St., New York, NY 10011

A brief survey is made of published material on the manometric method of inspection for airtightness, which has appeared during the 1975-1979 period. Attention is drawn to a growing interest in basic application of this method to high-efficiency product airtightness testing systems in mass production. (Author)

NTIAC-018958

Lewis, W. H.; Sproat, W. H.; Boisvert, B. W.
"A Review of Nondestructive Inspection Reliability on Aircraft Structure"; 12th Symposium on Nondestructive Evaluation Proceedings, 24-26 April 1979, San Antonio, TX, 1-16; Nondestructive Testing Information Analysis Center, P. O. Drawer 28510, San Antonio, TX 78284

The results of a four-year U. S. Air Force Logistics Command program to determine the reliability of Air Force nondestructive inspection capability are presented. The paper provides an overview of the program objectives, scope, planning and logistics, participants, data collection, analysis, conclusions, and recommendations. Actual aircraft structural samples containing fatigue damage were transported to 21 different Air Force bases and depots, where approximately 300 Air Force technicians performed ultrasonic, eddy current, penetrant, and radiographic nondestructive inspections (NDI) on the samples. The same detailed NDI procedures were followed by all participating technicians. The individual results were recorded and accumulated in terms of 'finds', 'misses', and 'false calls' compared with preliminary knowledge of actual flaw locations. A detailed teardown inspection of the samples at the end of the program verified and refined actual flaw tabulations. Results were computerized for data storage and retrieval and analyzed for each (NDI) method and structure sample type to provide detection probability versus flaw size (POD) curves. Other analyses provided POD curves for technician years training, experience, age, etc. The program results indicate that improvement in several specific areas is desired to meet existing requirements for critical inspection of Air Force hardware. Several conclusions are derived concerning factors that affect Air Force inspection reliability. Recommendations for making both short-term and long-term improvements in NDI proficiency are presented. (Author)

NTIAC-016188

Lomaev, G. V.
"Magnetic Noise Method in Nondestructive Inspection of Ferromagnetics"; *Soviet Journal of Nondestructive Testing*, 13, 4, July-August 1977, 425-440

The aim of this study is to systematically describe the principles of the magnetic noise method and survey the instrumentation most widely used at the present time. The physical principles of this method are shown. The Barkhausen effect is considered on the basis of the Becker model, the latter augmented with the dynamics of motion of rigid domain walls. Magnetization reversal techniques suitable for implementing this method are classified and analyzed. The design of probes and meters is also described. (Author)

NTIAC-021132

Lord, W.
"A Survey of Electromagnetic Methods of Nondestructive Testing"; Mechanics of Nondestructive Testing; Conference Proceedings, 10-12 September 1980, Virginia Polytechnic Institute, Blacksburg, VA, 77-100; Plenum Press, 227 West 17th St., New York, NY 10011

The major objective of this paper is to provide a survey of the topic by describing both practical and theoretical developments to date and indicating current and future trends, thus characterizing the general philosophy of the field. An extensive bibliography is included with the paper which should enable the reader to obtain further in-depth information concerning most aspects of electromagnetic NDT techniques, and which also serves to indicate the general resurgence of interest in the field. (Author)

NTIAC-023060

Lord, W.; Palanisamy, R.
"Development of Theoretical Models for Nondestructive Testing Eddy-Current Phenomena"; Eddy-Current Characterization of Materials and Structures, ASTM STP-722, Symposium on Nondestructive Testing, 5-7 September 1979, Gaithersburg, MD, 5-21; American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103

Eddy current methods of nondestructive testing rely for their operation on the interaction of induced alternating currents and fields with defects to produce noticeable changes in search coil impedance. To date, analytical techniques have been largely ineffective in providing a model suitable for the basis of a general defect characterization scheme because of the inherent complexity of the field equations describing the phenomena. After an overview of the available analytical models, this paper describes the development of a numerical model that shows promise of providing a solution to the inverse eddy-current problem. Impedance plane trajectories are predicted for a differential probe passing through a tube with axisymmetric inside-diameter and outside-diameter slots to illustrate the use of the numerical approach. (Author)

NTIAC-021241

Lumb, R. F.; Bennett, A.; Ward, C. R.
"A Review of NDT at British Gas Engineering Research Station"; *British Journal of Non-Destructive Testing*, 22, 5, September 1980, 217-225; The British Institute of Non-Destructive Testing, 1 Spencer Parade, Northampton NN1 5AA, England

This paper reviews the NDT developments at ERS, since its inception in 1966. It deals with past, present and potential future problems related to the construction and maintenance of transmission pipelines and high pressure storage vessels, repair and maintenance of cast iron mains, construction of plastic mains, offshore technology and safety in NDT operations. (Author)

NTIAC-018879

Luxmoore, A. R.
"Speckle Pattern Interferometry"; Methods and Practice for Stress and Strain Measurement, Part 3-Optical Methods for Determining Strain and Displacement, Monograph, July 1978, 92-97

This survey paper discusses basic principles and the measurement of the in-plane stains and displacement by the use of speckle pattern interferometry. (NTIAC)

NTIAC-020279

Lynn, K. G.
"Slow-Positron Studies on Metals"; *Scripta Metallurgica*, 14, 1, January 1980, 9-14

This is a brief review of positrons interacting with well-characterized surfaces. Although this field is presently in the initial stages, a number of new results are presented. No theoretical calculations are available for quantitative comparisons of the prospective branching ratios of the particular processes involved. Hopefully, these theoretical results will be forthcoming in the near future. One would expect that these types of experiments will prove useful in studying near surface defects in bulk and thin film samples and also in the study of defects which reside at interfaces on both metals and semiconductors. If even more efficient positron moderators can be developed, researchers might find it useful to complement many of the areas utilizing electrons with positrons. Definitive answers on the usefulness of slow positrons as a probe of the surface region await new theoretical and experimental findings. (Author)

NTIAC-017660

McClung, R. W.

"Needs for Development in Nondestructive Testing for Advanced Reactor Systems"; Nondestructive Evaluation in the Nuclear Industry, Proceedings of an International Conference, 13-15 February 1978, Salt Lake City, UT, 487-509; American Society for Metals, Metals Park, OH 44073

The needs for development of nondestructive testing (NDT) techniques and equipment were surveyed and analyzed relative to problem areas for the liquid-metal fast breeder reactor, the molten-salt breeder reactors, and the advanced gas-cooled reactor. Generally, nondestructive techniques should be improved to provide better reliability and quantitativeness, improved flaw characterization, and more efficient data processing. Specific recommendations relative to such methods as ultrasonics, eddy currents, acoustic emission, radiography, etc., are made. NDT needs common to all reactors include those related to materials properties and degradation, welds, fuels, piping, steam generators, etc. The scope of applicability ranges from initial design and material development stages through process control and manufacturing inspection to inservice examination. (NTIAC)

NTIAC-020927

McGonnagle, Warren J.

"Nondestructive Measurements Applied Experimental Engineering Science"; International Advances in Nondestructive Testing, Vol. 6, 1979, 287-297; Gordon and Breach Science Publishers Inc., One Park Ave., New York, NY 10016

This is a general paper discussing the scope and objectives of nondestructive measurements. (NTIAC)

NTIAC-018625

Muir, G.

"Certification for In-Water Survey and Inspection"; *British Journal of Non-Destructive Testing*, 21, 5, September 1979, 256-266; The British Institute of Non-Destructive Testing, 1 Spencer Parade, Northampton NN1 5AA, England

This paper reviews the training and certification of nondestructive testing personnel for in-service maintenance and inspection of offshore structures. Consideration is also given to current schemes already in vogue onshore. (Author)

NTIAC-017665

Nakasa, Hiroyasu; Kusanagi, Hideo; Ohno, Hironori

"Review of Japanese Research and Development Activities of Acoustic Emission Applications in the Nuclear Industry"; Nondestructive Evaluation in the Nuclear Industry, Proceedings of an International Conference, 13-15 February 1978, Salt Lake City, UT, 206-220; American Society for Metals, Metals Park, OH 44073

Japanese activities on acoustic emission (AE) research and development works have recently been more and more active, and AE application field have become wider and wider, as well as in the USA, Europe and elsewhere. Especially, the expectation of the AE technology for assurance of the structural integrity in nuclear components increases due to its high potentiality to detect incipient failure, to monitor crack-growth and leakage and to give warning against catastrophic damage. This review starts with the general survey on Japanese AE research and development activities, and then describes some topics of recent AE applications in the nuclear industry. (Author)

NTIAC-021691

Nemzek, T. A.

"The EPRI NDE Center"; EPRI Special report, October 1980, 10 pp, RP-1570-2; Electric Power Research Institute, 3412 Hillview Avenue, Palo Alto, CA 94304

The author describes the organizational structure of the new center and details the staffing plan over the next five years. He also describes the building layout and its facilities. (NTIAC)

NTIAC-023877

"Nondestructive Testing of Pavements and Pavement Bases"; July 1981, 139 pp; National Technical Information Service, Springfield, VA 22161 (PB31-807562)

Nondestructive methods for quality assurance of pavements and pavement bases are investigated in these government-sponsored research reports. Vibration, nuclear activation, radiometry, and acoustic detection are among the various techniques employed.

NTIAC-023164

Noyan, I. C.; Cohen, J. B.

"The Nature of Residual Stress and its Measurement"; Presented at 1981 U. S. Army Sagamore Conference, 13-17 July 1981, Lake Placid, NY; Tech. Report No. 4, July 1981, 19 pp, N00014-80-C-0116; Northwestern University, Dept. of Materials Science, Evanston, IL

The origins of residual stress and changes during fatigue are discussed. A new mechanism for fading is proposed. Practical (destructive and nondestructive) methods for measuring this stress are critically reviewed. Each technique has major problems requiring further study, but acoustic, magnetic and x-ray methods are all poised for more widespread use. (Author)

NTIAC-021425

"Investigation and Evaluation of Cracking Incidents in Piping in Pressurized Water Reactors"; September 1980, 244 pp, NUREG-0691; Nuclear Regulatory Commission, Washington, DC

This report summarizes an investigation of known cracking incidents in pressurized water reactor plants. Several instances of cracking in feedwater piping in 1979, together with reported cases of stress corrosion cracking at Three Mile Island Unit 1, led to the establishment of thetthird pipe crack study group—the PWR Pipe Crack Study Group. Major differences between the scope of the third PCSG and the previous two are (1) the emphasis given to systems safety implications of cracking, and (2) the consideration given all cracking mechanisms known to affect PWR piping, including the failure of small lines in secondary safety systems. The present PCSG reviewed existing information on cracking of PWR pipe systems, either contained in written records or collected from meetings in the United States, and made recommendations in response to the PCSG charter questions and other major items that may be considered to either reduce the potential for cracking or to improve licensing bases. (Author)

NTIAC-019851

Ono, Kanji

"Fundamentals of Acoustic Emission"; Presented at Joint Meeting Acoustical Society of America and Japan, Honolulu, 27 November-1 December 1978, (Kanji Ono is Editor); *Abstracts in Journal Acoustical Society of America*, 64, Sup. 1, Fall 1978, 154-155, 174-175

The articles in this volume emphasize fundamental approaches to acoustic emission. These cover both theoretical and experimental investigations in topics including source and signal characterization, transducer calibration and acoustic emission behavior of physical and mechanical processes. This publication is intended to provide a research review and current status report on these subjects. It is also to be broadly educational in scope, serving as a reference text to a wide audience from the graduate students to the research specialists and those industrialists who need the scientific basis of this emerging field of physical acoustics/materials science. (Author)

NTIAC-019840

Pekarskii, G. S.
"Neutron Absorption Radiometric Testing of Materials and Products (Review)"; *Soviet Journal of Nondestructive Testing,* 15, 6, June 1979, 501-517 (English translation, February 1980)

The article examines the application of fast neutron absorption in the nondestructive testing of materials and products. It theoretically and experimentally studies the transfer of neutrons in single and multilayer barriers and calculates the principal macroscopic constants of transfer. The work of the neutron radiometric detector is studied and the principal relationships for optimizing the test conditions are given. On the basis of the results obtained, the testing conditions of a number of materials and products were optimized. (Author)

NTIAC-017666

Pollock, Adrian A.
"Progress in Acoustic Emission Monitoring of Nuclear Plant—A Review"; Nondestructive Evaluation in the Nuclear Industry, Proceedings of an International Conference, 13-15 February 1978, Salt Lake City, UT, 221-239; American Society for Metals, Metals Park, OH 44073

The motivations for using acoustic emission in nuclear plants are identified and a chronological review of work conducted in the United States and Europe to date is presented. This perspective shows major progress from early pioneering efforts through the EBOR Program to successful primary hydro-tests, leak detection and limited-area on-line monitoring accomplished today. Comments are made on some specific technical issues. A list of commercial reactors on which AE work has been performed is included. (Author)

NTIAC-018203

Posakony, G. J.
"Acoustic Imaging—A Review of Current Techniques for Utilizing Ultrasonic Linear Arrays for Producing Images of Flaws in the Solids"; Elastic Waves and Nondestructive Testing of Materials, Vol. 29, Annual Winter Meeting of American Society of Mechanical Engineers Proceedings, 10-15 December 1978, San Francisco, CA, 53-69; American Society of Mechanical Engineers, 345 E. 47th Street, New York, NY 10017

The term 'ultrasonic imaging' is used to describe many different techniques and instrumentation systems designed to produce an image of ultrasonic reflectors in solid opaque structures. These techniques include pulse-echo and pulse-transmission B-scan and C-scan procedures, ultrasonic imaging tubes, synthetic aperture and holographic technology, and ultrasonic microscopy. Imaging systems are intended to produce a more definitive picture of interfaces and flaws within a structure and, in this way, provide a more accurate means for sizing and characterizing internal interfaces, surfaces, flaws, and discontinuities. This paper describes two different demonstration systems under development which employ long linear ultrasonic arrays for the inspection of materials. One system uses a 64-element, nonsteered array designed for high-speed C-scan examination. The second system employs a 240-element linear array for pulse echo isometric (combined B-C scan) imaging of flaws within a volume and a 120-element linear receiver array for developing synthetic aperture or holographic images of internal flaws. Further, the potential and capabilities of linear array technology for materials inspection is reviewed. (Author)

NTIAC-020113

Potapov, A. I.
"Use of Impulse Low-Frequency Methods for Inspecting the Quality of Parts of Coarse-Structure Materials"; *Soviet Journal Nondestructive Testing,* 15, 7, July 1979, 584-593 (English translation, March 1980)

A review is given of the use of the impulse low-frequency ultrasonic method for nondestructive testing of physicomechanical properties and testing of defects of coarse-structure materials. An analysis is given of the reasons limiting the use of ultrasonic methods in inspection of parts of coarse-structure materials. It is shown that an increase in the effectiveness of the impulse low-frequency method involves a reduction in the length of the ultrasonic impulses and the use of one-sided inspection and the echo-impulse method. (Author)

NTIAC-019750

Prigorovskii, N. I.; Cherpakova, N. S.
"Holographic Methods in Mechanical Tests (Review)"; *Industrial Laboratory*, 44, 6, June 1978, 830-842 (English translation, December 1978)
This is a review article on holographic methods in mechanical tests, and includes measurement methods and examples of application. (NTIAC)

NTIAC-021185

Quate, C. F.
"Ultrasonic Imaging"; Electronic Imaging, Conference Proceedings, 11-13 September 1978, London, England; Academic Press, London, England
This paper gives an overview of the technique of ultrasonic imaging, including the equipment used, the performances and the advantages over other forms of imaging, especially for the medical field. Future trends are also mentioned. (NTIAC)

NTIAC-018721

Quate, Calvin F.
"The Acoustic Microscope"; *Scientific American*, 241, 4, October 1979, 62-70
This is a survey article on history and development of acoustic microscopy. (NTIAC)

NTIAC-018377

Quate, Calvin R.; Atalar Abdullah; Wickramasinghe, H. K.
"Acoustic Microscopy with Mechanical Scanning—A Review"; IEEE Proceedings, Acoustic and Optical Micrographs, 67, 8, August 1979, 1092-1114; Institute of Electrical and Electronics Engineers, 345 E. 47th St., New York, NY 10017
This article establishes the characteristic properties of this new instrument. It reviews some of the simple properties of acoustic waves and shows how a single spherical surface formed at a solid liquid interface can serve as this ideal lens free from aberrations and capable of producing diffraction limited beams. When this is incorporated into a mechanical scanning system and excited with acoustic frequencies in the microwave range, images can be recorded with acoustic wavelength equal to the wavelength of visible light. We will present images that show the elastic properties of specimens selected from the fields of material science, integrated circuits, and cell biology. The information content in these images will often exceed that of the optical micrographs. (Author)

NTIAC-021834

Raymond, L.; Romano, T.
"Review of and Future Trends in Nondestructive Evaluation of Metal Matrix Composites"; Ceramic Engineering & Science Proceedings, 4th Annual Conference on Composites and Advanced Materials, 20-24 January 1980, Cocoa Beach, FL, 565-575; American Ceramic Society Inc., 65 Ceramic Dr., Columbus, OH 43214
Ultrasonics and x-ray radiographic techniques were evaluated and compared as a means of identifying a variety of defects found in graphite-reinforced metal matrix composite plates. Sections of various stages of manufacture were analyzed, and deficiencies in NDE techniques were identified. Standards and mechanical property correlations are evolving. The effort on defect-property sensitivity analysis is continuing, with more rigorous definition of test variables. (Author)

NTIAC-019050

Reason, R. E.
"Progress in the Appraisal of Surface Topography During the First Half-Century of Instrument Devel-

opment"; *Wear*, 57, 1, November 1979, 1-16

The principal developments in the stylus measurement of roughness texture are traced. The instrument problems which were encountered, particularly with regard to the requirements of transmission characteristics and reference lines, are outlined. The behavior of the skid is given further consideration, and a distinction is drawn between the systematic error resulting from its application to instrument calibration specimens and the random error to be expected from all kinds of workpieces. Brief consideration is then given to the development of roundness measurement and the requirements for avoiding excessive eccentricity distortion. Finally attention is drawn to some unfortunate anomalies that have arisen. (Author)

NTIAC-023838

Reinhart, Eugene R.

"In-Service NDE Methods for Turbine Motors and Blades"; VII Inter-American Conference on Materials Technology Proceedings, 19-23 October 1981, Mexico, 325-331

Operational failures of steam turbines are a major cause of fossil-fired steam plant outages, second only to boiler tubes. It has therefore become common practice in the utility industry to periodically inspect the steam turbine as part of routine plant maintenance. A major area of inspection concern is the large forged spindles and rotors. Steam turbine spindle and generator rotor retirement, as a result of ultrasonic inspection from the bore, remains a critical issue in utility plant availability due to high component replacement costs and lost plant operation. If the ultrasonic inspection method could be improved to provide better flaw information for lifetime prediction, the retirement rate of many of these components might be reduced. A review of present inspection methods and their limitations is presented. Suggestions for industry action to improve the present inspection process are also presented along with the results of recent independent field and laboratory studies of new bore inspection and data analysis methods. These methods are used to achieve rapid integration of inspection results with a stress analysis-fracture mechanics model. The overall result is an optimized NDE-fracture mechanics approach to achieving correct run/retire decisions. Turbine blade failure, although not as catastrophic as spindle failure, continues to be another cause of decreased turbine availability. Present field inspection methods, primarily magnetic particle (MT), have produced variable results in some cases. To study and alleviate this problem, complementary field inspection methods were evaluated. The initial results indicated that an optimum combined use of MT, eddy current, and ultrasonic test methods can be used to enhance the overall inspection process. (Author)

NTIAC-023150M

Reynolds, William N.

"Nondestructive Examination of Composite Materials—A Survey of European Literature"; Final report, October 1979-February 1980, May 1981, 88 pp, USAAVRADCOM TR-81-F-6, AMMRC TR-81-24, DAJA37-79-C-0553; Atomic Energy Research Establishment, Harwell NDT Centre (England), AD-A100454

The references corresponding to the nondestructive examination of fibre-reinforced composite materials have been retrieved from the Harwell NDT Centre information system and all those relating to European work have been examined. This has produced a comprehensive list of techniques used and of institutions and companies which have so far played an active part in the field. Apart from the relatively few industries which have met the need to develop testing procedures for composite materials in production or use, a much larger number of universities and research organizations have carried out fundamental studies of the problems involved which enable some conclusions to be drawn about the outstanding difficulties. These include some useful reviews of the subject. In addition, samples of composite materials have been included in some general testing programmes, and references to a number of these are included. (Author)

NTIAC-022255

Rice, J. R.

"Elastic Plastic Crack Mechanics"; DARPA/AFML Review of Progress in Quantitative NDE Proceedings, 8-13 July 1979, Scripps Institution of Oceanography, La Jolla, CA, 172; Rockwell International Science Center, 1049 Camino Dos Rios, Thousand Oaks, CA 91360

Recent developments in elastic plastic fracture mechanics are reviewed. These include the J-integral and its application, as well as recent work on predicting the crack surface opening profile and criterion for continuing quasi-stable crack growth for ductile solids. (Author)

NTIAC-020344

Richardson, M. H.

"Detection of Damage in Structures from Changes in their Dynamic (Modal) Properties—A Survey"; April 1980, 266 pp, NUREG/CR-1431, FIN NO. A0128; California University, Lawrence Livermore Laboratory, Livermore, CA

The stated object of this study was to survey the technical literature and interview selected experts in the fields of dynamic testing and analysis to determine the state-of-the-art of the relationship between physical damage to a structure and changes in its dynamic (modal) properties. (Author)

NTIAC-023537

Rippel, H. C.

"Failure-Cause Analysis: Turbine Bearing Systems — Phase I. Development of Data Collection Plan"; Summary report, April 1981, 26 pp, EPRI CS-1801-SY; Franklin Research Center, Philadelphia, PA

This report comprises the summary of the first of a three phase study intended to investigate rotor/bearing/lube system-related failures in large capacity (equal to or greater than 300 MW) turbine/generator units. The objectives of phase I were to: (1) identify and tentatively rank the proximate/root causes of generic problems that result in failures of the rotor/bearing/lube system, (2) determine the nature of the available data and select the appropriate methodologies for both data collection and analysis, and (3) develop the data collection plan to be implemented during phase II. These objectives were accomplished by: surveying existing data bases, relevant literature and technical personnel; implementing fault tree methodology to identify potential root causes; establishing an integrated analysis approach to maximize the value of the information available; and finally, structuring a data collection plan based on a mail survey of all utilities having unit capacities greater than 300 MW, on-site visits to selected utilities, and personal interviews with industry experts. The successful completion of phase I has established the foundation for the subsequent phases of this study, the goal of which is to formulate recommended, ranked research and development programs to minimize outages due to turbine/generator rotor/bearing/lube system-related failures. (Author)

NTIAC-018878

Robertson, E. R.; King. W.

"Holography in Nondestructive Testing"; Methods and Practice for Stress and Strain Measurement, Part 3 Optical Methods for Determining Strain and Displacement, Monograph, July 1978, 82-91; British Society for Strain Measurement

When holography came of age in the middle Sixties, everyone thought that the panacea for all that ails the stress analyst had arrived. It would only be a matter of time before all the techniques necssary for the whole field solution of in-plane strains had been worked out. In the meantime, wasn't it tremendous fun making magic in three dimensions? Well, the reality has been a little less wonderful than we had all hoped—for the stress analyst if not for the magician. That is not to say that holography has not turned out to be an immensely valuable addition to the experimental stress analyst's armoury, but it is as well to say right at the beginning that, except for certain cases, holography is not all that good at solving problems of plain strain. It can, however, do many other useful things very well indeed. This paper is designed to help the reader understand how to use holography and to suggest the best areas of application. It dwells entirely on practical matters and leaves the more erudite theory to be sought in the massive literature that has grown up with the subject. The only theory introduced is that thought to be essential for understanding what to do and then, that has been done. (Author)

NTIAC-021447

Ronca, Gilbert E.; Glenn, William E.

"Westinghouse's Boresonic System—A Status Report"; NDT for Engergy Progress, Paper Summaries, National Fall Conference ASNT, 6-9 October 1980, Houston, TX, 37-38; American Society for Nondestructive Testing, 4153 Arlingate Plaza, Caller No. 28518, Columbus, OH 43228

A comprehensive study was undertaken by Battelle Columbus under EPRI NP 923 Project 502 Task 2 to assess the Boresonic Examination Systems used to develop run/retire decisions. Two retired turbine rotors (Joppa 3 and Buck 6) were made available for boresonic examinations to the General Electric Company, Commercial Machine Works and Westinghouse Electric Corp., Commercial Machine Works. Westinghouse Electric Corp. conducted contemporaneously their unique boresonic examinations prior to the scheduled destructive examinations of these turbine rotors in order to establish the NDE capability available at the time to characterize turbine rotors for a lifetime prediction system that would use details of field NDE examination results as input to the calculations. The General Electric Co. did not conduct re-examinations specifically for the program. Consequently, the only General Electric Company data available were contained in reports previously submitted to the utilities prior to their retirements. (Author)

NTIAC-021725

Rubin, Lawrence

"Scatterplate Interferometry"; *Optical Engineering*, 19, 6, November/December 1980, 815-824

This paper presents a study of scatterplate interferometry from a 'user-oriented' standpoint. A review and clarification of past work as well as some of the author's own research on the subject are discussed. A wide range of areas concerning the scatterplate is covered including fabrication, basic principles of operation, advantages and limitations, and modification for its use in null testing. (Author)

NTIAC-023868

Ruud, Clayton O.

"A Review of Nondestructive Methods for Residual Stress Measurement"; *Journal of Metals*, 33, 7, July 1981, 35-40

This paper summarizes the findings of a study whose objective was to review the state of the art of nondestructive residual stress measurement methods, evaluate the practical applicability of each to metallic engineering components, place the methods in perspective with respect to each other, develop a prognosis for advancements, and determine the most prudent areas for research investment. Also, the study was to provide elementary descriptions of the important principles of the various techniques as well as the application and limitations of each. (Author)

NTIAC-022203

Saglio, R.; Destribats, M. T.; Pegeon, M.; Roule, M.; Touffait, A. M.

"French Developments and Experience in the Field of Inservice Inspection"; Periodic Inspection of Pressurized Components, Institution of Mechanical Engineers Conference, 8-10 May 1979, London, England, Paper C29/79, 61-71; Mechanical Engineering Publications Ltd., P. O. Box 24, Northgate Ave., Bury St., Edmunds, Suffolk IP32 6BW, England

The French PWR Nuclear Plant Program was at the origin of a large amount of R & D work in the field of inservice inspection. The actions which were undertaken may be split up into different levels: the regulatory level, the R & D level, the design level, the flaw evaluation level. The first results of pre- and inservice inspection are presented. The experience gained by French Atomic Enegry Commission with new techniques like focused ultrasonics transducers and multifrequencies eddy current apparatus are discussed. (Author)

NTIAC-022750

Sandor, L. W.

"Study of the Significance of Weld Discontinuities in Shipbuilding"; *Materials Evaluation*, 39, 6, May

1981, 533-536 & 639

This paper discusses the results of a comprehensive survey of the world literature on the significance of weld discontinuities assessed by relevant fracture mechanics principles. The fitness-for-purpose philosophy represents an important advancement over the present weld acceptance standards, which in general are too conservative and workmanship-based. Quality control data and information supplied by four major U.S. shipyards are analyzed statistically to determine the causes and costs of weld repair. Accordingly, this study shows that the large majority of weld repair activity involves removal of slag inclusions and porosity at costs ranging from $0.6 million to in excess of $1.0 million per ship. Weld repair should not be viewed as ipso facto improvement in weldment quality. The predominant failure mode in commercial ships is fatigue caused primarily by poor design details and joint misalignment. Weld discontinuities rank low as sole causes of ship failures. Since failures in ocean-going vessels are reportedly induced by a host of causes, the quality control systems loop' proposes to be the best overall solution to the present state of the U. S. shipbuilding industry. (Author)

NTIAC-021553

Schliekelmann, R. J.

"Nondestructive Testing of Adhesive Bonded Joints"; AGARD Lecture series No. 102 (Available from NTIS as ADA068806), April 1979, 37 pp; AGARD Lecture Series No. 102, Bonded Joints and Preparation for Bonding, 2-3, April 1979, Oslo, Norway & 5-6 April 1979, The Hague, 37 pp

With the increased interest in the use of adhesive bonded joints in structural applications, the importance of a reliable nondestructive evaluation is growing. In this lecture requirements for application of nondestructive testing of bonded joints are discussed. Available methods are presented with their capabilities and limitations. (Author)

NTIAC-019172

Schmitz, V.; Kiefer, R.; Wosnitza, M.; Grosser, H.

"Recent Developments in Ultrasonic Holography"; 9th World Conference on NDT Proceedings, 19-23 November 1979, Melbourne, Australia, 4F-1, 6 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia

The article describes the recent work to improve the applicability of ultrasonic holography in the field. Efforts have been made to improve the probes, probe-holding devices, to shorten the recording and reconstruction time. Typical examples are shown. (Author)

NTIAC-019051

Schneider, Eric J.

"Recent American and International Developments in the Assessment of Surface Quality and Their Effect on the Future"; *Wear*, 57, 1, November 1979, 17-32

Surface geometry measurement, especially surface roughness measurement, has taken significantly different, although sometimes overlapping, directions in the United States on the one hand and in Europe and the rest of the industrial nations on the other. Developments of shop instruments, research instruments, new parameters, standards and sensors will call for new approaches to instrumentation and use with truly inexpensive simple devices, flexible quality control instruments, automated surface inspection and the 'ultimate' surface quality analysis center benefitting from microprocessors and advances in computer technology and electro-optics. (Author)

NTIAC-019322

Sharpe, R. S.

"Current Limitations of Nondestructive Testing in Engineering"; Philosophical Transactions of the Royal Society of London, A.292, 1390, August 1979, 163-174

This paper gives an introductory review of the current status of nondestructive testing techniques as used in engineering practice, and the various ways in which they are employed to improve quality and reliability.

All structural materials are inherently 'defective' if one inspects at sufficient sensitivity and many of the limitations of present-day testing techniques center around the difficulty of characterizing defects in a sufficiently quantitative way so that thresholds can be realistically set. Many techniques rely on interrogation with a sensing probe and as a consequence of this approach, there are many limitations associated with ambiguity in interpretation. Improved means of signal processing and data presentation are being evaluated to minimize this ambiguity although it must be realized that the conditions under which engineering inspection has to be carried out in practice often preclude the use of optimum solutions. The paper identifies areas where scientific attention might be directed so that the techniques are more acceptable to present requirements. (Author)

NTIAC-023139

Shaw, G. R. O.
"Pipe Dreaming or A Quality for Life?"; Second International Conference on Pipewelding, Vol. 1-Papers, 20-22 November 1979, London, England, 333-342; Welding Institute, Abington Hall, Abington, Cambridge CB1 6AL, England

NDT methods are examined critically and some of their limitations noted, and a review is made of some of the commonly used quality standards for acceptance of flaws in an attempt to show how well (or badly) they are served. Suggestions are made for stages where consideration could be given to the improvement and harmonisation of quality requirements with technique capability. Additionally, there is a brief review of training and qualifications of NDT personnel. (Author/NTIAC)

NTIAC-020827

Simons, J. S.
"Diagnostic Testing of High-Voltage Machine Insulation (A Review of Ten Years' Experience in the Field)"; IEE Proc.-B, Electric Power Applications, Vol. 127, Part B, No. 3, May 1980, 139-154; The Institution of Electrical Engineers, P. O. Box 8, Southgate House, Stevenage, Herts, SG1 1HQ, England

Following a review of the basic philosophy of preventive maintenance testing and the theory of degradation mechanisms leading to failure, available test methods used for assessing the state of high-voltage machine insulation are discussed. Preferred test methods introduced ten years ago for field measurements between the winding and the grounded core are detailed, together with the reasons for their selection and their significance. Test data obtained from measurements on nearly five hundred machines are presented in terms of eight criteria and four groupings based on rated voltage, namely 3-4.9 kV, 5-7.9 kV, 8-12.9 kV, and 13 kV and above. To illustrate the practical application of the diagnostic data, a number of case histories are briefly outlined. It is concluded that a standardized program of nondestructive measurements carried out periodically on high-voltage stator windings can identify trends in generalized degradation, reduce unplanned outages and allow refurbishment to be carried out at an early stage. Of the several criteria used, the measurements of integrated discharge energy and associated charge voltage loop trace displays have been particularly helpful in indicating changes in structural integrity associated with cumulative degradation. They have also been of value in detecting anomalous discharging. The need is recognized for additional diagnostic tests to be developed to detect localized defects. (Author)

NTIAC-020835

Singh, Jag J.
"Measurement Techniques for Trace Metals in Coal-Plant Effluents—A Brief Review"; 1979, 34 pp, NASA RP-1047; National Aeronautics and Space Administration, Langley Research Center, Hampton, VA

X-ray spectroscopic techniques include x-ray fluorescence and charged particle induced x-ray emission methods. A discussion of these last two methods constitutes the main subject of this review. Besides providing simultaneous, sensitive multi-element analyses, these techniques lend themselves more readily to depth profiling, which has become increasingly important in aerosol studies. The gas/liquid chromatographic and gas-chromatographic/mass-spectrometric methods are rather slow (although quite sensitive), destructive of the sample, and inappropriate for airborne particulate analysis. (NTIAC)

NTIAC-021184

Singh, Ram Prakash

"Acoustic Investigation of Polymers—Electrical Methods"; *Journal of Scientific and Industrial Research*, 38, 6, June 1979, 308-315

The scope of this review is restricted to the application of the fast low amplitude acoustic waves to the investigation of polymers. The main features are various techniques for measuring the viscoelastic and ultrasonic parameters and these are summarized in two tables. A brief description of each technique is given, along with a few examples illustrating the applications of these techniques in understanding polymers and other high viscous liquids. (NTIAC)

NTIAC-019296

Stanton, K. N.

"The NDT Industry in Australia"; *Nondestructive Testing—Australia*, 16, 8, August 1979, 17-22

Australia's NDT industry is a problem industry with limited public confidence in its work and inadequate profitability. The paper reviews the services provided to the industry by the Standards Association of Australia (SAA), the National Association of Testing Authorities, Australia (NATA), and the Australian Institute for Nondestructive Testing (AINDT). It questions the attitude of the NDT industry to these service organizations. (Author)

NTIAC-017664

Stephen, R. W. B.

"Acoustic Surveillance in the Nuclear Industry—A Review"; Nondestructive Evaluations in the Nuclear Industry, Proceedings of an International Conference, 13-15 February 1978, Salt Lake City, UT, 191-205; American Society for Metals, Metals Park, OH 44073

Acoustics has become increasingly applied during recent years to the diagnosis and monitoring of both biological and inanimate media and in this contribution particular physical aspects of the problems will be discussed. Some suggestions are also made of possible lines of investigation which could merit attention. The urgent need for improved quantifying of NDT techniques is now more widely realized and the full answer to any method is not just where and when but what has taken place. A brief consideration is given to a quantitative approach to acoustic emission studies. The desirability of correlating two different properties of the same even as confirmatory evidence will also be considered with examples. (Author)

NTIAC-022475

Stonestrom, J. Peter; Alvarez, Robert E.; Macovski, Albert

"A Framework for Spectral Artifact Corrections in X-Ray CT"; Institute of Electrical and Electronics Engineers Transactions on Biomedical Engineering, BME-18, 2, February 1981, 128-141

The spectral artifact problem in x-ray computed tomography (CT) is well known. Many techniques have been suggested to correct for this problem, including linearization methods, iterative methods, and dual spectrum methods. In this paper two goals are addressed: (1) we review the various methods now being used to correct for spectral artifacts, and (2) we introduce a framework which provides useful insight as to the suitability of particular methods to various imaging problems. (Author)

NTIAC-022553M

Swanek, Richard A.; Rodd, James L.; Ford, Harry M.; Dinsenbacher, Alfred L.

"Modeling of Inelastic Behavior of Structures Using Plastic and Metal Laminates"; Final report, August 1980, 53 pp, DTNSRDC-80/073; David W. Taylor Naval Ship Research and Development Center, Bethesda, MD

A review of past research concerning the determination of structural ultimate strength and/or inelastic behavior in isotropic metallic structures revealed that (1) most investigations of this type are carried out on full-size or nearly full-size models requiring large test loads and facilities, (2) small-scale modelling of this structural behavior using the parent metal requires a degree of skill in the fabrication of the model and a subsequent high cost, and (3) no useful and cost effective method of extending small-scale structural modelling into the inelastic range currently exists. The basic criteria to be satisfied when modelling an isotropic metallic structure elastoplastically using another material are: duplication of stress/modulus versus strain behavior for both model and prototype materials and equality of Poisson's ratio for model and prototype material. Additionally, a structural model using another material must possess the same bending, axial, torsional, and buckling properties as the prototype structure using the parent material. A composite material made up on stainless steel and rigid vinyl was developed to model a mild steel parent material. This composite material was then shown to satisfy the basic criteria needed to elastoplastically model a structure through tests which defined the elastic and inelastic material properties in tension and bending. A deep plate girder structure, for which ultimate strength data exists, was modelled using the composite material and tested. Both the failure mode and ultimate strength of the mild steel girder were accurately reproduced using the composite material. (Author)

NTIAC-019479

Tarassov, V. J.
"Pattern Recognition for Inspection"; 1978 Joint Automatic Control Conference Proceedings, Pt. 1, Philadelphia, PA, 15-20 October 1978, 299-306; Instrumentation Society of America

Pattern recognition is a rapidly expanding field. Although there are no universal solutions, there are many practical inspection problems that exist in industry which can be solved with existing pattern recognition resources. This paper presents an overview of the pattern recognition field. It then examines the shape recognition problem and how it relates to inspection. (Author)

NTIAC-021817

Tessmann, R. K.
"Monitoring Wear in Hydraulic Systems"; Fundamentals of Tribology, International Conference on Fundamentals of Tribology Proceedings, June 1978, Cambridge, MA, 855-867; MIT Press, Cambridge, MA

Life and reliability have always been important considerations in the application of hydraulic systems. As component loading, system investments, and maintenance costs have risen, the need for highly reliable and long-lasting hydraulic systems has become very important. In order to accurately assess the probable life of such systems, it is necessary to measure the wear rate exhibited by the system under various conditions. The intent of this paper is to discuss the concepts and viewpoints of a review paper, entitled 'Monitoring of Wear' by Vernon C. Westcott, as those ideas apply to hydraulic systems. The important topics covered are: (1) the relationship between wear rate and debris concentration, (2) system sampling, (3) wear debris recovery, (4) wear debris measurement, and (5) interpretation of wear debris analysis. While there are many other aspects of wear monitoring which could be discussed, it is felt that these are very critical subjects. (Author)

NTIAC-020715

Thomas, T. R.; Walker, M.
"Roughness Measurement with a Microcomputer"; Engineering Software, 1st International Conference Proceedings, Southampton University, England, September 1979, 663-672; Pentech Press Ltd., Estover Rd., Plymouth, Devon, England

The history of the application of digital computers to the analysis of surface roughness measurements is reviewed. The progress from mainframe machines through minicomputers to microprocessors is noted. The practical disadvantages of early microprocessors are pointed out. The hardware realization is described on a new system using a stylus instrument on-line to a microcomputer user-programmable in a high-level language. Some of the problems of writing a suite of applications programs for profile characterization are outlined. Measurements are presented using the new system on a wide range of standard roughness specimens. Results include measurements of British and German standard roughness parameters and a selection of other parameters including average wavelength, mean slope, peak and valley curvature, high-spot count, skewness and kurtosis. Levels of noise and vibration are negligible. (Author)

NTIAC-019365M

Thompson, Donald O.
"Proceedings of the ARPA/AFML Review of Progress in Quantitative Nondestructive Evaluation Held 17-21 July 1978, La Jolla, California"; Report No. 4 (Annual) 1 July 1977-30 June 1978, January 1979, 545 pp, AFML TR-78-205, SC595,51AR, F33615-74-C-5180; Rockwell International Science Center, Thousand Oaks, CA, AD-A071047

The edited transcripts of the ARPA/AFML Review of Quantitative Nondestructive Evaluation (NDE) held on July 17-21, 1978, at Scripps Institution of Oceanography, La Jolla, California, are presented in this document. Several key topics form the core of these presentations and discussions. They include quantitative ultrasonics, adhesives and composites, emissions related to failure prediction, residual stress, and reliability of ceramics. It is believed that this document provides a reasonable summary of NDE research and development currently underway. (Author)

NTIAC-022229

Thompson, Donald O.; Thompson, R. Bruce
"Proceedings of the DARPA/AFML Review of Progress in Quantitative Nondestructive Evaluation, 8-13 July 1979, La Jolla, CA"; Annual report, No. 5, 1 July 1978-30 September 1979, July 1980, 752 pp, AFWAL TR-80-4078, SC595,70AR, F33615-74-C-5180; Rockwell International Science Center, Thousand Oaks, CA, AD-A094826

The edited transcripts of the DARPA/AF Review of Progress in Quantitative Nondestructive Evaluation (NDE) held on July 8-13, 1979, at Scripps Institution of Oceanography, La Jolla, California, are presented in this document. Several key topics form the core of these presentations and discussions. They include quantitative ultrasonics, eddy currents, emissions related to failure prediction, and reliability of metals and ceramics. It is believed that this document provides a reasonable summary of NDE research and development currently underway. (Author)

NTIAC-018303

Thompson, R. B.
"Overview of Quantitative NDE"; ARPA/AFML Review of Progress in Quantitative NDE Proceedings, January 1979, Scripps Institution of Oceanography, La Jolla, CA, 309-316; National Technical Information Service, Springfield, VA 22161, AD-A071047

This paper presents an overview of the ARPA/AFML program for quantitative ultrasonic flaw characterization which will serve as a framework to interrelate the papers which follow. Work supported by the ARPA/AFML Program will be primarily discussed. However, it should be noted that other work has also played an important role in the development of this body of knowledge and will be cited in a more comprehensive review paper to be published elsewhere. (Author)

NTIAC-022276

Thompson, R. B.
"Overview of Ultrasonic Developments"; DARPA/AFML Review of Progress in Quantitative NDE Proceedings, 8-13 July 1979, Scripps Institution of Oceanography, La Jolla, CA, 301-309; Rockwell International Science Center, 1049 Camino Dos Rios, Thousand Oaks, CA 91360

An overview of the ultrasonic developments which have occurred in the DARPA/AFML interdisciplinary program for quantitative NDE is presented. The paper is introduced by a discussion of the philosophy of the program and review of the progress made during the last five years toward the development of quantitative techniques and criteria for accepting or rejecting parts. This is followed by a summary of the relevant papers presented at this meeting and of the role which they play in the evolution of this new technology. The paper concludes with a discussion of the use of these technical building blocks in establishing on-line systems and stand alone spin-offs for DoD applications. (Author)

NTIAC-021284

Tietz, H. D.; Weigt, D.

"Measurement Procedure for Stresses and Self-Contained Stresses by Using Ultrasonics"; *Feingeraete-technik* (Germany), 28, 11, 1979, 501-503 (In German); English Abstract Published in *Physics Abstracts*, 83, 1138, 16 June 1980

Guided by a literature survey, the present nondestructive measuring procedures using ultrasonics are reported. For typical types of ultrasonic waves, the dependence of the velocity from external stresses was detected in calibration experiments. This was compared with values from the literature. The uncertainty of the stress measurement is 50 MPA for steel and 15 MPA for aluminum alloys.

NTIAC-023400

Tittmann, B. R.

"Imaging in NDE"; Acoustical Imaging, Vol. 9, 9th International Symposium on Acoustical Holography Proceedings, 3-6 December 1979, Houston, TX, 315-340; Plenum Press, New York, 227 West 17th Street, New York, NY 10011

The ultimate objective of most nondestructive evaluation (NDE) studies is to develop a capability for predetermining the inservice failure probabilities of a structural component with the best possible confidence. The role that ultrasonic imaging can be expected to play in the failure prediction process is reviewed. Included are discussions of the basic concepts of imaging in NDE, a survey of types of NDE imaging systems, and some key problem areas which need to be addressed in the future. (Author)

NTIAC-017927M

Tobiasson, Wayne; Korhonen, Charles

"Summary of Corps of Engineers Research on Roof Moisture Detection and the Thermal Resistance of Wet Insulation"; Special report, December 1978, 10 pp, CRREL-SR-78-29; Cold Regions Research and Engineering Lab, Hanover, NH, AD-A063144

Nuclear, infrared, capacitance, microwave and impulse radar methods for nondestructively detecting moisture in roofs were evaluated. No system was reliable enough by itself or by cross-checking with another system to eliminate the need for a few core samples of membrane and insulation to verify findings. Airborne infrared surveys are a cost-effective way of reconnoitering numerous roofs at a major installation. However, the follow-up on-the-roof surveys are necessary. Of the several grid techniques examined, nuclear surveys were the most reliable. Hand-held infrared surveys are the most accurate on-the-roof method studied. Although an infrared camera costs significantly more than a nuclear meter ($27,000 vs $3,000), infrared surveys can be conducted more rapidly. Where numerous roofs are to be surveyed, infrared surveys appear to be the most cost-effective method. In-situ measurements have been made of the thermal resistance of wet and dry portions of roofs. A laboratory apparatus has been built to subject 12 in. x 12 in. specimens of roof insulation to combined thermal and moisture gradients. Thermal resistance and moisture content are periodically determined and characteristic curves are being developed for various roof insulations. (Author)

NTIAC-022503

Vary, A.

"Ultrasonic Measurement of Material Properties"; Research Techniques in Nondestructive Testing, Vol. IV, 1980, 159-204

Progress in the use of ultrasonics for direct, nondestructive evaluation of mechanical strength properties of structural materials is reviewed. Accordingly, this chapter focuses on research techniques for measuring properties such as elastic moduli, hardness, fracture toughness, tensile, shear and yield strength, and microstructural states of solids ranging from metals and ceramics to fiber composites. The purpose of this chapter is to highlight the potential uses of ultrasonics not only in nondestructive testing but also in materials research. This overview of ultrasonic methods indicates the essential 'state of art' which currently stands at the threshold of broad practical use in industry. More laboratory work and technology transfer are needed, however, before ultrasonic methods become universally accepted and added to conventional destructive or statistically based (sampling) tests for verification and control of mechanical strength and material condition. Thus, much of the technology to be cited involves recent efforts that demonstrate feasibility with laboratory samples rather than current practice on actual structural parts. (Author)

NTIAC-020318

Vary, Alex

"A Review of Issues and Strategies in Nondestructive Evaluation of Fiber Reinforced Structural Composites"; New Horizons-Materials and Processes for the Eighties, 11th National SAMPE Technical Conference, 13-15 November 1979, Boston, MA, 166-177; Society for the Advancement of Material and Process Engineering, P. O. Box 613, Azusa, CA 91702

This paper emphasizes the need for advanced nondestructive evaluation (NDE) techniques for quantitative assessment of the mechanical strength and integrity of fiber composites during manufacture and service and following repair operations. Problems and approaches are discussed relative to acceptance criteria, calibration standards, and methods for NDE of composites in strength-critical applications. It is indicated that acousto-ultrasonic techniques provide the 'method of choice' in this area. (Author)

NTIAC-019326

Wait, James R.

"Review of Electromagnetic Methods in Nondestructive Testing of Wire Ropes"; IEEE Proceedings, 67, 6, June 1979, 892-903; Institute of Electrical and Electronics Engineers, 345 E. 47th Street, New York, NY 10017

Wire ropes are used extensively in many life sustaining situations. Elevator and mine-hoist cables are two notable examples, but the support cable for aerial tramways, ski chairlifts and gondolas, helicopter and suspension cables we might also mention. In this review, we will deal mainly with wire ropes used in mine hoists, but the results are also relevant for testing support cables for ski lifts. There is an obvious need to perform tests of the integrity of such ropes without in any way impairing their function. Apart from careful visual examination and measurements of the external diameter, the nondestructive test methods available utilize electromagnetic fields, x-rays, or mechanical waves. Here, we will review progress in the electromagnetic methods. The early history of the subject will be described briefly, since this provides a remarkably good introduction to the working principles. We will then progress quickly to the current techniques and operating procedures. Next, we will summarize some of the basic papers that deal with the basic concepts and techniques for testing of cylindrical conductors for both electric and magnetic methods. At this juncture, we call our attention to the extensive related work on electromagnetic probing of geophysical targets such as ore bodies and other subsurface conductors. Finally, we turn to the various recent investigations, primarily of theoretical nature, that have been carried out; we include here onty the most recent works. (Author)

NTIAC-022508

Walther, H.; Pizzi, P.

"Small Angle Neutron Scattering for Nondestructive Testing"; Research Techniques in Nondestructive Testing, Vol. IV, 1980, 341-391

Topics discussed in this chapter include experimental devices with emphasis on general aspects, the propane cold neutron source, the neutron guide tube, the wavelength selector, and the detection system. Another section discusses theoretical fundamentals including the scattering cross-section, characteristic parameters, polydispersion of particles, scattering from dislocations, and multiple refraction. Practical applications are given consideration including nickel superalloys, steels, non-ferrous metals, and non-metallic materials. (NTIAC)

NTIAC-019533

Wehrenber, Robert H.

"Thermal Analysis: The Hot New Technique for Testing Plastics"; *Materials Engineering*, September 1979, 78-83; Penton/IPC Inc., 1111 Chester Ave., Cleveland, OH 44114

This is a general survey and descriptive article on the technique of thermal analysis. (NTIAC)

NTIAC-022167

Weymueller, Carl R.

"Ultrasonic NDT—Is It Good Enough?"; *Welding Design & Fabrication*, May 1980, 84-87; Penton/ IPC Inc., 1111 Chester Ave., Cleveland, OH 44114

This is a survey article discussing the general qualifications of UT inspectors, and the quality of UT equipment. It is concluded that UT instruments satisfy the conditions necessary for welding specifications, but lack true precision. (NTIAC)

NTIAC-023950

Whitaker, J. S.; Jessop, T. J.

"Ultrasonic Detection and Measurement of Defects in Stainless Steel—A Literature Survey"; *British Journal of Non-Destructive Testing*, 23-6, November 1981, 293-303; British Institute of Non-Destructive Testing, 1 Spencer Parade, Northampton NN1 5AA, England

This report gives a detailed account of a literature survey on the ultrasonic testing of austenitic stainless steel material, including both as-wrought plate and weldments. The importance of these materials, the type of defects which can be encountered, the nature of the problems and the attempted approaches to a solution are covered. Particular reference is made to nuclear applications. Recommendations are made regarding future avenues of investigation. (Author)

NTIAC-023523

White, C.

"Corrosion Monitoring Using X-Radiography"; Corrosion Prevention and Control, 27, 5, October 1980, 16-17

Applications of x-radiography for the monitoring of corrosion in aircraft structures and nuclear power stations are discussed. (NTIAC)

NTIAC-017223

Williams, James H.; Lee, Samson S.

"Acoustic Emission Monitoring of Fiber Composite Materials and Structures"; *Journal of Composite Materials*, Vol. 12, October 1978, 348-370; Technomic Publishing Co., 265 Post Road West, Westport, CT 06880

A review of the current acoustic emission literature relating to fiber reinforced composite materials is presented. Summary tables which assist in the prompt delineation of the achievements in this research area are developed. Because of the qualitative character of much of the current literature, suggestions to develop quantitative AE standards are strongly recommended. (Author)

NTIAC-020533

Wilson, T.

"Imaging Properties and Applications of Scanning Optical Microscopes"; *Applied Physics*, 22, 2, June 1980, 119-128; Springer-Verlag New York Inc., 175 Fifth Ave., New York, NY 10010

This review paper is concerned with the imaging properties and major uses of scanning optical microscopes. It is shown that the confocal scanning microscope exhibits a form of super-resolution and that the instrument in general has great application in nonlinear microscopy and the inspection of electronic devices. (Author)

NTIAC-017582

Wright, E. S.; Darcy, G. A.

"A Survey of Future Army Needs in Automated Inspection"; 4th International Conference Automated Inspection and Product Control Proceedings, 7-9 November 1978, Chicago, IL, 319-326

The Army is converting a substantial fraction of its labor-intensive inspection procedures and practices toward a highly automated computer-controlled posture. While the main driving forces for this change include improved quality, reliability, and readiness, there are also the secondary forces of testing materials costs, test operator salaries, test operator subjectivity, and very high rate production, among the reasons for the conversion to automation. Examples of inspection modernization and automation are given for radiography, ultrasonics and bearing inspection as well as some projections for potential improvements in other areas. (Author)

NTIAC-023562

Yeh, L.

"High Intensity Acoustic Testing to Determine Structural Fatigue Life and to Improve Reliability in Nuclear Reactor and Aerospace Structures"; *Materials Science and Engineering*, 48, 2, May 1981, 167-179; Elsevier Sequoia S.A., P. O. Box 851, 1001 Lausanne 1, Switzerland

In this paper we review some of the techniques in which high intensity acoustic testing is used in engineering practice. These are as follows: (A) In the nuclear engineering field we describe the simulation of reactor noise due to the CO_2 circulator and the use of strain gauges to obtain a response spectrum in order to predict the fatigue life of a gas-cooled nuclear reactor structure where a 30 year lifespan is of paramount importance. It will be realized that, once the reactor becomes critical, the radiation hazard in the vessel will prevent any repairs from being carried out inside the reactor. Therefore it is important to ascertain the structural life before introducing the structure into a reactor. The method described here is generally used for advanced gas-cooled nuclear reactors in Britain. (B) In the satellite field, we discuss the simulation of the high intensity noise due to the launching rocket motors and the testing of the integrity of the satellite structure and the behavior of the electronic control system when affected by high intensity acoustic excitation. The use of acoustic testing to improve the reliability before the launching of the satellite is also considered. (C) In the aircraft and rocket field, the generation of high intensity noise to simulate boundary layer pressure fluctuation or turbulence of a flying object or aircraft at various speeds is considered. This is to improve the reliability before manned flight is carried out and to eliminate premature malfunction and failures. (Author)

NTIAC-022945

Youshaw, Robert A.

"Summary of Nondestructive Inspection Standards for Heavy Section Castings, Forgings, and Weldments"; Final report, December 1980, 35 pp, SSC-300; Ship Structure Committee, Washington, DC, AD-A099119

Code bodies, notably ASTM, have produced procedural guides, standard methods, and recommended practices which can be used to assure proper inspection for the various methods of nondestructive testing. These guides and practices in private industry have been reviewed for their applicability to quality control of heavy steel castings, forgings, and weldments. Acceptance criteria are not set forth, and recommendations are not suggested. They do, however, define levels of quality and describe the parameters generally agreed to be of significance which should be a part of the contractural agreement. The user must quantify these parameters according to service requirements and other considerations. (Author)

NTIAC-021082

Zimmer, T. J. M.

"Sound Propagation Analysis—Application Possibilities and Limits of Distortion Free Testing Methods"; *Messen und Prufen*, No. 5, May 1979, 400-402; English Abstract published in *Physics Abstracts*, 83, 1127, 2 January 1980

A review is given of a symposium organized by the German Institute for Substance Testing and Chemistry in Cologne dealing with sound effects of vibration and shock testing of various industrially produced substances (e.g. metals, plastics, glass, etc.).

2.3 State-of-Art Reviews

NTIAC-019252

Aman, John K.

"Improving Radiographic NDT in the U.S.A."; 9th World Conference on NDT Proceedings, 19-23 November 1979, Melbourne, Australia, 4C-9, 14 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia

'To improve' must first be defined. In the sense of this effort, it means moving our radiographic NDT toward set objectives. In order to set objectives, we must first apply an analytical process to examine our present techniques. (Author)

NTIAC-017748

Alwang, W. Gilbert

"Applications of Electro-Optical Instrumentation in Turbine Engine Development"; Instrumentation in the Aerospace Industry, Vol. 24 (Advances in Test Measurement, Vol. 15) Part 1, Proceedings 24th International Symposium, Albuquerque, NM, 1-5 May 1978, 305-313; Instrumentation Society of America, 400 Stanwix St., Pittsburgh, PA 15222

The importance of electro-optical instrumentation in turbine engine development has been increasing rapidly over the past several years. Many difficult measurement problems have been solved using electro-optical technology and it is likely that this trend will continue. This paper will review the various applications of electo-optics to date, including all the most successful devices and some not so successful. Among the topics which will be included in the review are: holography, laser velocimetry, pyrometry, Raman spectroscopy, optical proximity sensors, image analysis devices, fiber optics and speckle photography. The current state-of-the-art in these areas will be briefly assessed along with probable future trends. A short bibliography will be provided as a guide to more detailed information on the various specific applications. (Author)

NTIAC-023595

"Trends in Testing and Inspection Technology"; *Metal Progress*, 119, 1, January 1981, 79-81; American Society for Metals, Metals Park, OH 44073

This is a short review article and technology forecast for 1981 in the field of testing and inspection technology. Some new testing equipment is described, predictions and trends discussed, along with needs that will shape future developments. (NTIAC)

NTIAC-020008

Beissner, R. E.; Matzkanin, G. A.; Teller, C. M.

NDE Applications of Magnetic Leakage Field Methods. A State-of-the-Art Survey, January 1980, 55 pp, NTIAC-80-1, DLA900-79-C-1266; Nondestructive Testing Information Analysis Center, P.O. Box 28510, San Antonio, TX 78284, AD-A083618

Magnetic methods of nondestructive evaluation (NDE) are among the oldest and most pervasive in the industrialized countries of the world because of the dominant production and use of steel and related ferrous metals. Economically, it is difficult to imagine a more important industrial commodity than steel. Without doubt more steel tonnage is produced per year than any other metal. There is a growing interest, too, in the quality and reliability of parts fabricated from high-strength alloy steels for critical aerospace as well as energy production applications. As replacement costs continue to soar, it is vital to get the maximum safe life from structures and components as diverse as jet engine bearings and gas pipelines.

NTIAC-020976

Berger, Harold

"Nondestructive Testing in the 80's"; *Metal Progress*, 118, 3, August 1980, 33-38; American Society for

Metals, Metals Park, OH 44073

The author discusses the possible variations or new methods which may be utilized in the 1980's. Trends discussed include computers, stress data, and traceability. Specific NDT advances include real time x-rays, tomography, sound studies, new transducer concepts, microwave methods, and signal processing. (NTIAC)

NTIAC-022318

Birks, A. S.; Posakony, G. J.

"Development of Advanced NDE Ultrasonic Equipment"; DARPA/AFML Review of Progress in Quantitative NDE Proceedings, 8-13 July 1979, Scripps Intitution of Oceanography, La Jolla, CA, 605-611; Rockwell International Science Center, 1049 Camino Dos Rios, Thousand Oaks, CA 91360

Recent studies to determine the probability of detection of nondestructive examination methods by the Air Force indicate that these capabilities are severely limited. One of the factors contributing to the insufficiency of ultrasonic testing is related to a general lack of versatility and capability of commercial ultrasonic equipment. Inadequate instrument reliability, inconsistent components including transducers, and uncertain calibration standards further compromise the potential utility of this method. Battelle Pacific Northwest Laboratories, under the sponsorship of the Manufacturing Technology Division of the Air Force Materials Laboratory, is developing an advanced ultrasonic nondestructive testing system directed at resolving these deficiencies. As a result, this program will establish a modular ultrasonic system specification that will prevent near term obsolescence by permitting the addition of new technology such as ARPA developments in the form of additional or replacement modules. This paper will describe the Phase I and II tasks and objectives which are planned to establish an equipment specification, demonstrate initial prototype systems, and provide a procurement specification and technical manuals. Progress to date will be summarized. (Author)

NTIAC-023291

Bittence, John C.

"Exotic Metals: From Glassy to Superplastic", *Materials Engineering*, 93, 2, February 1981, 41-45; Penton/IPC, 1111 Chester Ave., Cleveland, OH 44114

A portion of this article is given to recent NDE techniques which may be used for newer materials. Small angle neutron scattering, holography, ultrasonic beam cat-scan and double crystal x-ray defractometry are among the techniques discussed briefly. (NTIAC)

NTIAC-023929

Booth, R. C.; Cressman, R. N.

"Nondestructive Testing Needs in the Steel Industry"; *Materials Evaluation*, 39, 12, November 1981, 1130-1137; American Society for Nondestructive Testing, 4153 Arlingate Plaza, Caller 28518, Columbus, OH 43228

This paper identifies several areas of nondestructive testing instrumentation that should be developed for reducing steel processing costs and assuring the quality of steel products. Steel processing and the related product testing needs from bloom or slab through finished product are described. Testing needs covered in greater detail include: (1) accurate detection of the extent of shrinkage cavities (pipe) in blooms or slabs, (2) assessment of surface quality of hot cast material to facilitate direct rolling without cooling, (3) verification of grade, (4) reliable methods for in-line surface quality evaluation in bar and rod, and (5) nondestructive verification of mechanical properties. (Author)

NTIAC-022119

Bortz, S. A.; Larsen, D. C.

"Properties of Structural Ceramics"; *SAMPE Journal*, 17, 1, January/February 1981, 16-31; Society for the Advancement of Material and Process Engineering, 668 South Azusa Ave., P. O. Box 613, Azusa, CA 91702

An overview is presented of the pertinent thermal and mechanical properties of structural ceramics that are candidates for advanced heat engine applications. Data are presented for flexure strength, strength degradation at long time due to subcritical crack growth, long term oxidation effects, burner rig exposure, creep resistance. Emphasis is placed on predominant behavioral trends as related to material microstructure. Also contained in this paper are discussions of design methodology, materials development, and quality assurance which summarize the current state-of-the-art. (Author)

NTIAC-019001

Brook, Richard A.

"Development of Techniques for Automated Industrial Inspection in the United Kingdom in the Age of Microprocessors"; Society of Photo-Optical Instrumentation Engineers Proceedings, Imaging Applications for Automated Inspection and Assembly, Vol. 182, 19-20 April 1979, Washington, DC, 79-82; Society of Photo-Optical Instrumentation Engineers, 405 Fieldston Rd., Bellingham, WA 98225

This paper reviews some of the activity in the UK directed towards realization and exploitation of practical shop-floor automatic inspection systems. There are still considerable barriers to widespread applications because of the generally specialized nature of each situation, and the complexity and cost associated with achieving satisfactory solutions to image analysis problems. However, rugged solid-state imagers and microprocessor-based signal processing systems are beginning to advance the state-of-the-art to the point at which autonomous and robust equipment of moderate sophistication can be built at reasonable cost. The impact of microelectronics on performance and cost of equipment for inspection applications, and the problems of justifying and maintaining this equipment are examined. Projects in which SIRA Institute has been involved are referred to briefly to illustrate some of the points made. (Author)

NTIAC-023798

Buck, Otto; Wolf, Stanley M.

"Nondestructive Evaluation: Microstructural Characterization and Reliability Strategies"; TMS Fall Meeting Proceedings, 5-9 October 1980, Pittsburgh, PA; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., 345 East 47th St., New York, NY 10017

Papers of this volume include new techniques for quantitative NDE, reduction of unscheduled utility outages through component NDE, engine component retirement-for-cause; NDE and fracture mechanics based maintenance concept, reliability strategies in flaw evaluation, NDE failure prediction for brittle solids, ten papers on the NDE characterization of microstructure, and five papers on the NDE characterization of deformation and fracture processes. (NTIAC)

NTIAC-022928

Bucklow, I. A.

"Possible Methods for the Nondestructive Testing of Sprayed Coatings"; *Materials in Engineering*, 2, 3, March 1981, 141-148; Scientific and Technical Press, Chilberton House, Doods Rd., Reigate, Surrey, England

The increasing demand for the nondestructive testing of sprayed coatings has prompted a general examination of some of the basic physical properties of solids, and ways of measuring them, in the hope that pointers would emerge to indicate at least an alleviation of, if not a solution to, this problem. The viewpoint adopted was firstly to identify properties of coatings that could be reliably measured, and then to choose those properties that could be related to features of a coating of engineering interest. A further restriction imposed was the existing availability of instruments and techniques for the measurements. The resultant suggestions are therefore largely speculative and embrace thermal, acoustic, and magnetic properties amongst others. The purpose of the paper is to encourage exploration along possible unconventional lines; thus no firm conclusions are drawn but a list of coating flaws etc. is given with some suggestions for the techniques that might be suitable for their assessment. It is emphasized that all tests must be regarded as comparative. (Author)

NTIAC-020029

Busby, R. Frank

"Underwater Inspection/Testing/Monitoring"; *Ocean Engineering*, 65, 1979, 355-491; Pergamon Press

Ltd., Headington Hill Hall, Oxford, OX30BW, England

This study identifies and describes actual and potential underwater inspection requirements for fixed concrete and steel structures. It identifies and assesses the state of the art in underwater nondestructive testing, and evaluates the capability of servicing and hardware producers to meet the inspection requirements identified. It describes and establishes priorities for specific tasks for technology development that should be undertaken to satisfy current and future requirements. (NTIAC)

NTIAC-021028M

Bryant, L. B.

"Status of Radiographic Study, Development, and New Applications in the LASL Nondestructive Testing Group"; October 1979, 15 pp; Los Alamos Scientific Lab, NM

Efforts presently underway include study; replacement of betatron with racetrack microtron; development; tomography, cineradiography, and flash x-ray; new applications: flash x-ray. (NTIAC)

NTIAC-020280

Byrne, J. G.

"The Utility of Positrons for Studies of Metals and Alloys"; *Scripta Metallurgica*, 14, 1, January 1980, 307; Pergamon Press

Four distinct processes have been described in which positron measurements can provide clear nondestructive indications of changes in the state of materials. Many other examples may be found in the literature, however, this article should give the reader an indication of the utility of positrons for studies of metals and alloys. (Author)

NTIAC-016932M

Cahall, R.

"Nondestructive Evaluation Systems for the Naval Aviation Maintenance Environment Technology Assessment"; Final report, August 1971-September 1977, 5 July 1978, 128 pp, NAEC-GSED-120; Naval Air Engineering Center, Ground Support Equipment Dept., Lakehurst, NJ. AD-A058146

Under NAVAIRSYSCOM direction, NAEC-GSED conducted an investigation and analysis of the field of nondestructive evaluation as it relates to the Naval aviation community. This report finalizes that task. Areas of discussion include general description of what NDE is and why it is practiced, how inspection requirements are established and suggested methods for improvements, assessment of the positive impact expanded utilization of NDE could provide, discussion of present and future field inspection requirements, technology base assessment/projection, and recommended research program options. (Author)

NTIAC-022307

Cannon, T. M.; Fenimore, E. E.

"Coded Aperture Imaging in NDE"; DARPA/AFML Review of Progress in Quantitative NDE Proceedings, 8-13 July 1979, Scripps Institution of Oceanography, La Jolla, CA, 558; Rockwell International Science Center, 1049 Camino Dos Rios, Thousand Oaks, CA 91360

It is sometimes the case in nondestructive evaluation that the position and intensity of a faint radioactive source must be determined. A simple pinhole camera may suffice in many instances, however its small collection efficiency may result in unreasonable exposure times. To correct for the low collection efficiency, a multiple-pinhole (coded) aperture can be substituted for the single pinhole. The result is that many more photons are collected by the camera, however the resulting picture is scrambled beyond recognition and must be decoded somehow. Various coded apertures have been used in the past, including Fresnel zone plates and random arrays. Recent work at Los Alamos has produced a state-of-the-art advance in coded aperture imaging. The sensitivity of the coded aperture system can be greatly increased by the use of a newly developed uniformly redundant array (URA) as the camera aperture. When coupled with recent advances in computer decoding methods, the URA coded aperture camera can produce images that are totally free of the artifacts that hinder other approaches. (Author)

NTIAC-017462

Chin, R. T.; Harlow, C. A.; Dwyer, S. J.
"Automatic Visual Inspection of Printed Circuit Boards"; Society of Photo-optical Instrumentation Engineers Proceedings, Vol. 155, Image Understanding Systems and Industrial Applications, August 30-31, 1978, San Diego, CA, 199-213; SPIE Proceedings, Vol. 155, Image Understanding Systems and Industrial Applications, August 30-31, 1978, San Diego, CA, 199-213; Society of Photo-Optical Instrumentation Engineers, 405 Fieldston Road, Bellingham, WA 98225

A description of research work on the automatic visual inspection of printed circuit boards is presented as an example of a practical industrial automation problem. The major goal of this research is to develop a programmable visual inspection system applicable to printed circuit boards and other electronic assemblies. Described methods are the dimensional verification technique and the pattern matching technique. In dimensional verification, the inspection is accomplished by verifying the dimensional accuracy of certain features of the board. In pattern matching, standard features of the board are extracted interactively. The inspection is accomplished by matching these standard features with patterns of the unit under test. (Author)

NTIAC-021035

Cook, N. H.
"Tool Wear Sensors"; *Wear*, 62, 1, July 1980, 49-57; Elsevier Sequoia, P. O. Box 851, 1001 Lausanne 1, Switzerland

A state of the art review of tool wear sensing is presented. A recently developed technique is described and the need for further research effort in tool wear sensing is emphasized. (Author)

NTIAC-018460M

"State of the Art Reviews"; Supersedes report no. DDC-TAS-74-41, dated February 1975, AD-A005 375., Report bibliography, December 1965-July 1978, March 1979, 261 pp, DDC/BIB-79/01; Defense Technical Information Center, Alexandria, VA, AD-A066401

This bibliography contains 335 citations pertinent to the evaluation and results of surveys, studies, and literature searches in the state of the art reviews of selected subjects. (Author)

NTIAC-016755

Deutsch, V.; Becker, E. A.; Vogt, M.
"Important Aspects of Magnetic Particle Crack Testing"; *Materialprufung*, 10, 4, April 1978, 160-164; VDI-Verlag GMBH, Dusseldorf (In German, Abstract translated by NTIAC)

This article reports the state-of-the-art of the combined methods of magnetic powder/crack testing where current circulation and field circulation are supplied by alternating currents of differing phase relationships. This method is useful for practical applications and is superior to earlier techniques such as a combination of AC circulation and DC yoke magnetization. (Author/NTIAC)

NTIAC-022456

Donato, V.; Bannister, R. L.; DeMartini, J. F.
"Measuring Blade Vibration of Large Low Pressure Steam Turbines"; *Power Engineering*, 85, 3, March 1981, 58-71; Technical Publishing, 1301 S. Grove Ave., Barrington, IL 60010

Measurement systems have come a long way from listening rods and mirrors to minature telemetry transmitters and strain gauges feeding data to sophisticated analyzing equipment, but further advances may still be expected in continuing efforts to improve designs and reliability of large steam turbines. (Author)

NTIAC-022722M

Ellingson, William A.
"Advances in Nondestructive Evaluation Methods for Inspection of Refractory Concretes"; March

1980, 27 pp; Argonne National Lab, IL

Refractory concrete linings are essential to protect steel pressure boundaries from high-temperature aggressive erosive/corrosive environments. Castable refractory concretes have been gaining more acceptance as information about their performance increases. Economic factors, however, have begun to impose high demands on the reliability of refractory materials. Accordingly, nondestructive evaluation methods are being developed to assist the refractory user. Radiographic techniques, thermography, acoustic-emission detection, and interferometry have been shown to yield information on the structural status of refractory concrete. Methods using ^{60}Co radiation sources are capable of yielding measurements of refractory wear rate as well as images of cracks and/or voids in pre- and post-fired refractory linings up to 60 cm thick. Thermographic (infrared) images serve as a qualitative indicator of refractory spalling but quantitative measurements are difficult to obtain from surface-temperature mapping. Acoustic emission has been shown to be a qualitative indicator of thermomechanical degradation of thick panels of 50 and 95% AL_2O_3 during initial heating and cooling at rates of 100 to 220 deg C/H. Laser interferometry methods have been shown to be capable of complete mappings of refractory lining thicknesses. This paper will present results obtained from laboratory and field applications of these methods in petrochemical, steel and coal-conversion plants. (Author)

NTIAC-016198

Ermolov, I. N.

"Current Trends in the Development of Acoustical Testing Methods"; *Soviet Journal of Nondestructive Testing*, 13, 4, July-August 1977, 371-380 (English translation, May 1978)

Papers and exhibits presented at the Eighth World Conference on Nondestructive Testing are reviewed; the main trends are discussed in the development of acoustical testing methods and equipment. (Author)

NTIAC-019015

Ermolov, I. N.; Pilin, B. P.

"Present State and Future Outlook in Ultrasonic Inspection of Metals with Coarse-Grained Structure (Review)"; *Industrial Laboratory*, 45, 1, January 1979, 57-65; Plenum Publishing Corp.

The problem of ultrasonic inspection of materials with anisotropic coarsely crystalline structure is very topical to this day. Attention centers in particular on problems of inspecting welding seams of austenitic steels, very thick electroslag welding seams that were not normalized after welding, coarse-grained forgings and castings that were not hot worked, a number of products with a particularly coarse-grained structure, and also welded joints with a distinct boundary between the base metal and a built-up material. The main obstacle in inspection of these materials is the interfering effect of structural reverberation. (Author)

NTIAC-023647

Epstein, Max

"Fiber Optics"; *International Advances in Nondestructive Testing*, Vol. 7, 1981, 241-277; Gordon and Breach Science Publishers, Inc., One Park Ave., New York, NY 10016

The transmission of light through optical fibers and the fabrication of specially aligned fiber-optic imaging structures form the basis of a variety of instruments for visualization of inaccessible and hazardous sites. It is finding wide use in industrial and military applications and it has contributed significantly to the growth of the field of medical endoscopy. Multicolor laser illuminators increase the effectiveness of fiber-optic devices and further the utilization of polymeric optical fibers. Other applications of lasers and the design of miscellaneous transducers indicate many diverse applications of optical fibers. The expanding field of optical communications stimulates the development of sophisticated techniques in nondestructive testing and monitoring of fiber fabrication. (Author)

NTIAC-017553M

Evans, A. G.

"Nondestructive Failure Prediction in Ceramics"; Final report, 1 March 1976-28 February 1978; September 1978, 43 pp, SC5064-3FR, N00014-76-C-0624; Rockwell International Science Center, Thousand

Oaks, CA, AD-A060785

Techniques for nondestructive failure prediction in ceramics are examined in the context of a probabilistic framework for obtaining failure and rejection probabilities. The ultrasonic method appears to have the greatest short-term potential for achieving acceptable failure probabilities, without the excessive rejection of satisfactory components. (Author)

NTIAC-020337M

Ewing, Donald D.

"Evaluation of Advanced Nondestructive Inspection Methods for Aircraft Tires"; Final report, February 1978-August 1979, February 1980, 154 pp, FAA-RD-80-10, 3AT04G3, DOT-FA78WA-4103; Goodrich (B.F.) Research and Development Center, Brecksville, OH, AD-A082523

Advanced Nondestructive (NDT) Aircraft Tire Inspection Systems were evaluated and compared with the air needle inspection technique normally used to qualify air carrier aircraft tires for repair, retread, and return to service. The advanced NDT inspection systems considered were: the air needle buffing, holographic, pulse-echo ultrasound, and x-ray types. A description of the equipment, inspection procedure, typical visual displays, and analysis technique is included for each inspection system. A discussion of equipment state-of-art, tradeoffs, operator skills, required manning, and inspection rates is provided. Basic equipment, installation, and maintenance costs are provided. The effectiveness of the inspection systems in detecting, identifying type and size, and locating the position of defects is reported for a group of four old defective tires and four new tires with built-in defects which were inspected by all evaluated systems. Some recent or potential advances in state-of-art are discussed. (Author)

NTIAC-024019

Fitting, Dale W.; Adler, Laszlo

"Ultrasonic Spectral Analysis for Nondestructive Evaluation"; *1981*, 363 pp; Plenum Press, New York, 233 Spring St., New York, NY 10013

This is a state of the art survey including ultrasonic spectroscopic systems, and applications to materials evaluation. A comprehensive abstracted bibliography is included. (NTIAC)

NTIAC-016730

Gardner, C. G.

Automated Radiography—A State-of-the-Art Survey; June 1978, 36 pp, NTIAC-78-1; Nondestructive Testing Information Analysis Center, San Antonio, TX

Radiography employing x-rays and gamma rays is the oldest of the sophisticated methods of nondestructive evaluation. As conventionally practiced, the method involves the use of photographic film or paper, specially prepared for radiography, with the attendent steps of exposure, processing, and finally, visual examination by a skilled 'reader' for indications of flaws in the test piece. While film radiography has certain inherent advantages, such as sensitivity, resolution, and a permanent graphic record of the test, there are many instances where the elimination of film or human interpretation of the image or both would be highly desirable. This publication surveys briefly the current status of those technologies which are crucial to automated radiography, as well as progress to date in the realization of automated radiography. Two major impediments to fully automated radiography have prevented implementation on an appreciable scale. First, filmless image receptors of sensitivity, resolution, and equivalent image size to radiographic film have yet to emerge. Second, until quite recently, the technical means for automatic image interpretation have not been available. It now appears that both these impediments are like to be overcome, and that cost-effective fully automated inspection for certain applications, such as artillery shells or components thereof, will become a reality in the next few years. (NTIAC)

NTIAC-016661M

Gladden, James W.

"Review of Photosensitive Materials for Holographic Recordings"; Technical report, (Errata sheet inserted) April 1978, 87 pp, ETL-0128; Army Engineer Topographic Labs, Fort Belvoir, VA, AD-A055013

There is a program objective to systematically evaluate photosensitive recording materials that can be used in holographic and other coherent optical systems. In association with this, a detailed literature search was undertaken in which considerable information was obtained and compiled in this report. An objective of this report is to describe aspects of the recording materials in a way that will aid in their future development and use in holography. Over 100 references were reviewed that treat electrostatic imaging materials, photoresists, hardened dichromated gelatin, photopolymers, photochromic materials, and bleached silver halide materials. Subcategories include Scott Graphics TEP film; photoplastic film; diazos, diazo-oxides and azides; Shipley's AZ 1350 positive photoresists; Hughes-NCR, DuPont and Bell Laboratories photopolymers; photochromic lithium niobate; and different halide bleaches for silver halide bleached holograms. The report compares a number of the characteristics of the different classes of holographic recording materials.

NTIAC-018381

Green, Allen T.

"Acoustic Emission Technology 1979"; *Metals Progress*, 116, 3, August 1979, 41-45, 48-49; American Society for Metals, Metals Park, OH 44073

This is a brief survey article of the applications of acoustic emission. Included is a discussion of work concerned with the acoustic emission signals generated in ferromagnetic materials when the level of an applied field is varied. (NTIAC)

NTIAC-023806

Green, Robert E.

"Effect of Metallic Microstructure on Ultrasonic Attenuation"; *Nondestructive Evaluation*, Microstructural Characterization and Reliability Strategies, TMS Fall Meeting Proceedings, 5-9 October 1980, Pittsburgh, PA, 115-132; Metallurgical Society of American Institute of Mining, Metallurgical, and Petroleum Engineers, AIME, 410 Commonwealth Dr., Warrendale, PA 15086

Ultrasonic techniques offer very useful and versatile nondestructive methods for investigating the microstructure and associated mechanical properties of materfals. There are various mechanisms by which energy can be lost from ultrasonic waves propagating through real materials, and measurement of this ultrasonic attenuation can complement ultrasonic velocity measurements in yielding valuable information about the mechanical properties of the material. Among the inhomogeneities which can cause ultrasonic attenuation either by absorption or scattering are precipitates, inclusions, voids, cracks, grain boundaries, interphase boundaries, twin boundaries, magnetic domain walls, dislocations, substitutional impurities, vacancies, and interstitial impurities. The present paper will present a condensed overview of the current state-of-the-art of the use of ultrasonic attenuation to determine metallic microstructure. (Author)

NTIAC-018181

Gramberg, U.

"Brittle Behavior of Structural Parts Made from Steels—Causes of this Behavior and Avoidance of this Behavior—Report on the Meeting of the VDT Society for Material Technology, November 16-17, 1978, Augsburg"; *Materialprufung*, 21, 2, February 1979, 45-49; VDI, Verlag, Dusseldorf, Germany

The meeting, attended by 250 participants, included 18 lectures which are reprinted verbatim in the VDI Report 318, and in the article here we report on the state of the art in this field. (NTIAC)

NTIAC-023329

Goebbels, K.; Romer, M.

"On the State-of-the-Art and Advanced Techniques to Improve the Signal-to-Noise Ratio for the Ultrasonic Testing of Coarse Grained Materials"; Nondestructive Evaluation in the Nuclear Industry-1980, 3rd International Conference Proceedings, 11-13 February 1980, Salt Lake City, UT, 75-99; American Society for Metals, Metals Park, OH 44073

The ultrasonic inspection of coarse grained materials (like austenitic welds, castings) and multiphase systems (like composites, materials with porosity) creates difficulties because of the occurrence of coherent noise ('grass', scattering). The object of the paper is to discuss methods improving the detectability of defects, especially to describe the signal-to-noise ratio and the signal enhancement quantitatively: The application of narrow band and broadband pulses, longitudinal waves instead of shear waves, the polarization of shear waves, focusing probes including the use of separate transmitter/receiver probes and signal-averaging methods. The possibilities to combine the different methods with each other and the limits of practical realization will be discussed. (Author)

NTIAC-018144

Hagemaier, D. J.; Fassbender, R. H.
"Nondestructive Testing of Advanced Composites"; *Materials Evaluation*, 37, 7, June 1979, 43-49; American Society for Nondestructive Testing, 4153 Arlingate Plaza, Caller No. 28518, Columbus, OH 43228

This paper presents the state of the art for nondestructive inspection (NDI) for graphite-epoxy composite structures for commercial aircraft. Usually, several NDT methods are used because different conditions or defects are revealed by each. The dielectric test has proven useful in monitoring the cure of composites. Ultrasonic attenuation measurements can be used to measure void content. The eddy current conductivity measurements exhibited good correlation with resin content. Ultrasonic C-scan inspection is primarily used to record such conditions as porosity, delaminations, foreign objects, voids, and cracks. The ultrasonic digital thickness gauge has been found useful for inspecting laminates for the same conditions indicated for C-scan inspection. X-ray radiography is especially useful for detecting porosity, foreign objects, and cracks in laminates. It is always used to inspect composite honeycomb assemblies for core defects. Dye penetrant inspection is useful for detecting cracks, porosity, and edge delaminations in laminates or to evaluate adhesive bonded joints. It addition, various discontinuity conditions revealed by NDT methods are shown. (Author)

NTIAC-022883

Harrison, J. D.
"The State-of-the-Art in Crack Tip Opening Displacement (CTOD) Testing and Analysis, Part 1. Background and Testing Methods"; *Metal Construction*, 12, 9, September 1980, 415-422; Welding Institute, Abington Hall, Abington, Cambridge CB1 6 AL, England

This is a major three part review of this most important technique for evaluating toughness and assessing the significance of defects in low and medium strength engineering materials. The first two parts summarize the background development leading to the current test procedure and describe practical problems encountered in carrying out the test and interpreting the test records obtained. Part 3 will deal with the application of the CTOD approach, and will include the bibliography for all parts. (Author)

NTIAC-022889

Harrison, J. D.
"The 'State-of-the-Art' in Crack Tip Opening Displacement (CTOD) Testing and Analysis — Part 3. Application of the CTOD Approach"; *Metal Construction*, 12, 11, November 1980, 600-605; The Welding Institute, Abington Hall, Abington, Cambridge CB1 6AL, England

A major three part review of this most important technique for evaluating toughness and assessing the significance of defects in low and medium strength engineering materials. The first two parts summarize the background development leading to the current test procedure and describe practical problems encountered in carrying out the test and interpreting the test records obtained. Part 3 will deal with he application of the CTOD approach, and will include the bibliography for all parts. (Author)

NTIAC-020345

Healey, J. J.; Wu, S. T.; Murga, M.
"Structural Building Response Review"; May 1980, 169 pp, NUREG/CR-1423, FIN NO. A0130; Cali-

fornia University, Lawrence Livermore Laboratory, Livermore, CA

The body of this report is organized in six chapters: Chapter 2 treats the subject of structural modeling including methods of discretization, basic modeling approaches, decoupling and other important modeling topics; Chapter 3 covers the various methods of linear and nonlinear structural dynamic analysis, numerical methods, damping, etc.; Chapter 4 contains a discussion of the nonlinearity as it relates to nuclear plant structures and presents a discussion of basic analytical considerations and computational algorithms for treating nonlinearity; Chapter 5 treats the subject of combining seismic and nonseismic load effects with particular reference to the state-of-the-art in this area as related to the probabilistic methodology. This material was not fully elaborated on in this report since the SSMRP has a special project to address this topic; Chapter 6 presents a summary of the various sources of uncertainty in seismic dynamic analysis together with a discussion of the sources of data available to quantitatively define these uncertainties; Chapter 7 provides a summary of the principal observations and recommendations of the study. (Author)

NTIAC-016750

Herberg, G.; Laufer, W.

"Status Report on Ultrasonic Testing of Austenitic Welds"; *Materialprufung*, 20, 3, March 1978, 190-124; VDI-Verlag GMBH, Dusseldorf

Experience in the use of austenitic structures shows that surface testing and irradiation testing alone are not adequate for judging a welding joint. Particularly in view of the development of sodium-cooled breeder reactors, it appears necessary to demand the same effort at fabrication and repeat tests as with ferritic components of light water reactors (LWR). As the primary and secondary cycle components of the sodium breeder are manufactured from austenitic materials, the ultrasonic testing must be adapted to the coarse grained and normally solidified structure of austenitic welding seams. Developmental work is going on. Worldwide procedures, however, are not uniform. (Author/NTIAC)

NTIAC-017249

Hildebrand, B. P.; Harrington, T. P.

"Residual Stress Mapping by Ultrasonic Tomography"; ASNT National Fall Conference Paper Summaries, Denver, CO, October 2-5, 1978, 51-58; American Society for Nondestructive Testing, 4153 Arlingate Plaza, Caller No. 28518, Columbus, OH 43228

The purpose of this paper is to discuss efforts to develop a method for mapping stress anomalies utilizing velocity information and an image reconstruction method known as the Algebraic Reconstruction Technique. The simulations and experiments described have demnstrated that velocity anomalies of 2% can be quite easily resolved. In work not reported in this paper, the authors also experimentally mapped velocity anomalies as low as 0.2% and feel that 0.05 is technically feasible. These velocities translate to a sensitivity of 1000 PSI in a 1-inch thick region. (Author)

NTIAC-023510

Hunt, B. R.

"Digital Image Processing"; *Optical Engineering*, 20, 5, September/October 1981, 677-680; Society of Photo-Optical Instrumentation Engineers, 405 Fieldston Rd., Bellingham, WA 98225

Digital image processing has been one of the more active fields at the interface between optics and computing. In particular, image displays have begun to assume many of the characteristics of general purpose computers, but with the full computational power of the system devoted to image manipulation. Where can the trends established in the past ten years be expected to take us in the coming years? We try to answer this question, after first reviewing and summarizing the current state of digital image processing. (Author)

NTIAC-023826

Hoffman, Mario Sergio

"Mechanistic Interpretation of Nondestructive Pavement Testing"; Ph.D. Thesis, 1980, 240 pp; Illinois

University at Urbana

This work is an indepth study concerned with the development and analysis of flexible pavement nondestructive testing methods. Both theoretical and experimental considerations are presented and pavement deflection and characteristics of material data from an extensive NDT testing program are analyzed. The principle objectives of the study are (1) to examine the state-of-the-art in the subjects of: nondestructive testing methods and procedures, pavement evaluation methods based on the interpretation of NDT data, and mechanistic models for pavement evaluation; (2) to investigate the effect of rate of loading (or loading mode) on flexible pavement deflections; (3) to characterize the measured deflection basin and define deflection basin parameters for structural flexible pavement evaluation; (4) to develop (based on the background and information derived from objectives 1-3) a flexible pavement evaluation method based on the interpretation of measured deflection basins; and (5) to verify the method and develop recommendations for future research needs relating to the successful application of the method. (NTIAC)

NTIAC-019283

Imoto, K.

"Recent Developments of Thickness Measurements—in Japan"; 9th World Conference on NDT Proceedings, 19-23 November 1979, Melbourne, Australia, 4A-22, 3 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia

Recent aspects of Japan on the thickness measurements are reviewed. More than 5,000 thickness meters have been widely used in Japan, and our institute had made two standards. Several research works on the automatic methods have been started. (Author)

NTIAC-017930M

Kaiserlik, Joseph H.

"Nondestructive Testing Methods to Predict Effect on Degradation of Wood: A Critical Assessment"; Final report, 1978, 56 pp, FSGTR-FPL-19, MIPR-N68305-77, MIPR-7-06; Forest Products Laboratory, Madison, Wisconsin, AD-A063209

Results are reported for an assessment of methods for predicting strength of wood, wood-based, or related material. Research directly applicable to nondestructive strength prediction was very limited. In wood, strength prediction research is limited to vibration decay, wave attenuation, and multiparameter 'degradation models'. Nonwood methods with potential application to wood include spectral response and techniques based on the ratio of energy dissipated per bending cycle and bending elastic energy at maximum amplitude. Conclusions drawn summarize the current status of nondestructive strength prediction research in various materials. Several research options are discussed for nondestructively predicting strength loss in treated piling. (Author)

NTIAC-018281

Kane, James S.

"The Importance of Nondestructive Evaluation to Future Energy Systems"; ARPA/AFML Review of Progress In NDE Proceedings, Scripps Institution of Oceanography, La Jolla, CA, July 17-21, 1978, 145-148; National Technical Information Service, Springfield, VA 22161

The Department of Energy conducts both applied and basic research on nondestructive evaluation. The importance of NDE is discussed with emphasis on future energy systems. Organization, needs, barriers and new developments are described. (Author)

NTIAC-020114

Karitonov, A. V.

"Development of and Problems in the Theory of Normal Waves in Ultrasonic Defectoscopy"; *Soviet Journal of Nondestructive Testing*, 15, 7, July 1979, 595-600 (English translation, March 1980); Consultants Bureau, 227W. 17th St., New York, NY 10011

The state-of-the-art and recent achievements in the theory of normal waves propagating through plates are briefly surveyed, on the basis of material published during the last 12-15 years in the Soviet Union and abroad. (Author)

NTIAC-021798

Kino, G. S.
"Zinc Oxide on Silicon Acoustoelectric Devices"; 1979 Ultrasonics Symposium Proceedings, 26-28 September 1979, New Orleans, LA, 900-910; Institute of Electrical and Electronics Engineers, 345 East 47th St., New York, NY 10017

The ultimate importance of ZnO on Si technology to the development of ASW devices on silicon is described. Developments on magnetron discharge sputtering techniques are discussed. Important results on new types of adaptive filters, which use storage correlators operating in an iterative mode to deconvolve distorted signals, are given. (Author)

NTIAC-019267

Kljuev, V. V.
"Problems of Physical Quality Control Methods"; 9th World Conference on NDT Proceedings, 19-23 November 1979, Melbourne, Australia, 4A-20, 7 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia

Methods for testing and diagnostics of articles are considered. New techniques giving the information about a test object are discussed. (Author)

NTIAC-021869

Lautzenheiser, C. E.; Whiting, A. R.; Flach, W. T.
"Problems Associated with Repetitive Inspection of Reactor Pressure Vessels and Research Toward Solutions"; Non-Destructive Examination in Relation to Structural Integrity, 1st International Seminar Proceedings, 22 August 1979, Berlin, West Germany, 107-111; Applied Science Publishers Ltd., Ripple Rd., Barking, Essex, England

Over the past ten years, technology has successfully developed equipment and ultrasonic techniques for the inspection of reactor pressure vessels (RPVS), and the detection of flaws and reproducibility of data have been satisfactorily demonstrated. However, accurate sizing, location, and analysis of the flaws remain a principal problem. Intensive research is underway to improve the techniques and the hardware for flaw analysis. Examples of the reproducibility of data taken during the inspection of RPVS and advanced computer-assisted, ultrasonic inspection techniques for precise flaw analysis are discussed. (Author)

NTIAC-018276

Law, K. J.
"State of the Art in Single Frequency Eddy Current Testing"; ARPA/AFML Review of Progress in Quantitative NDE Proceedings, Scripps Institution of Oceanography, La Jolla, CA, July 17-21, 1978, 107-108; National Technical Information Service, Springfield, VA 22161

NDE in the mass production automotive industry uses single frequency eddy current test systems for component parts integrity testing. Typical measures accomplished are: surface hardness (RC), depth of hardened layer (case depth), core hardness, and soft spots on the surface caused by incorrect quench. Additionally, gross crack and seam defects are detected in production processes by this type equipment, on the order of 0.005-inch deep and 0.2-inch long. Some special results occur, such as: fillet combined hardness and case depth tests result in a direct correlation to fatigure life for the crankshafts of diesel engines. Material sorting for alloy differences is another important inspection performed on incoming stock. Many low to high carbon steel alloys may be sorted; however, there are combinations which cannot be separated. However, multiple frequency testing is now improving this situtation considerably. The equipment used must be highly reliable with MTBF's of 10,000 hours and long-term stability of months for successful high speed production testing at rates of 3600 to 72,000 parts per hour. (Author)

NTIAC-019268

Leonov, I. G.; Nikiforova, Z. S.

"Metrological Support of Nondestructive Testing"; 9th World Conference on NDT Proceedings, 19-23 November 1979, Melbourne, Australia, 4A-21, 3 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia

The evolvement of technique, means and standard base for metrological certification of the nondestructive testing facilities and the practice of state supervision guarantee credibility and comparability of the product quality testing results. (Author)

NTIAC-019323

Lewcock, A. I.

"Neutron Radiography: Status Report"; *Physics in Technology*, 10, 2, March 1979, 74-76; Institute of Physics, 47 Belgrave Square, London SW1X 8QX, England

Moving pictures of running aero-engines, similar to x-ray images, have already been obtained using neutron techniques. Much wider application is confidently expected as industry begins to recognize the advantages. Rolls-Royce already has operating experience with neutron radiography and we asked for a status report. (Author)

NTIAC-023750

Light, G. M.

"Feedwater Nozzle Inspection Evaluation"; Summary report, September 1981, 96 pp, EPRI NP-2025-SY; Southwest Research Institute, P.O. Box 28510, San Antonio, TX 78284

This report presents a summary of a series of investigations into ultrasonic testing (UT) of reactor pressure vessel feedwater nozzles for detection of thermal fatigue cracks. The report includes an assessment of the reliability of contemporary field UT techniques and describes the development and usage of a mock-up nozzle that is available to utilities for verification of proposed techniques. The status of ongoing development and the relationship between inspection capability and fitness-for-service determinations are also briefly described. (Author)

NTIAC-019022

Matzkanin, George A.; Beissner, Robert E.; Teller, Cecil M.

"The Barkhausen Effect and its Application to Nondestructive Evaluation"; October 1979, 50 pp, NTIAC-79-2, DLA900-79-C-1266; Nondestructive Testing Information Analysis Center, P.O. Box 28510, San Antonio, TX 78284, AD-A076595

Measurement of the Barkhausen effect has been developed into a useful approach for the nondestructive evaluation of magnetic materials. Most of the effort has been directed toward applications involving residual stress measurement, however, research in recent years has also demonstrated the applicability of the method for the nondestructive measurement of a variety of material properties, such as grain size and orientation, defect structure and metallurgical composition. Instrumentation systems have been developed for practical application of the Barkhausen method, and in a few cases, the method is in use for routine inspection, e.g., the inspection of helicopter rotor blades and bearing races for residual stress. A number of other specific NDE applications have been suggested such as measurement of grain size, evaluation of anisotropy, determination of carbide precipitation, measurement of pearlite morphology, determination of iron loss, analysis of ferrite content, inservice inspection of pipelines to determine overheating, creep strength and fatigue damage, and supervision of irradiation damage in nuclear reactor pressure vessels.

NTIAC-018663

Matzkanin, George A.; Burkhardt, Gary L.; Teller, Cecil M.

"Nondestructive Evaluation of Fiber Reinforced Epoxy Composites: A State-of-the-Art Survey"; Final report, 28 September 1978-30 April 1979, April 1979, 198 pp, USAAVRADCOM TR-79-24, SwRI-15-

4823-510, DLA900-77-C-3733; Southwest Research Institute, P.O. Bo '0, San Antonio, TX 78284, AD-A071973

This report contains the essential findings of a comprehensive survey of the state-of-the-art in nondestructive evaluation (NDE) of fiber reinforced epoxy composites with emphasis on the types presently used or planned for use in Army helicopter components. Primary consideration is given to the NDE of glass fiber composites because of its extensive use in the fabrication of advanced helicopter rotor blades with secondary consideration given to the NDE of Kevlar, graphite, and boron reinforced epoxy. A computer search of the literature was performed to compile an extensive bibliography of source documents. Pertinent documents were reviewed and NDE results categorized according to NDE methodology and type of composite. For each composite type, tables were developed listing defects and property variations detected by various NDE methods. These tables along with literature references are included in the report. The status of NDE of fiber reinforced epoxy composites with respect to available techniques, ongoing research, and projected future needs is reviewed and summarized.

NTIAC-018509M

McDonald, Bruce J.; Mohri, Eunice

"ONR Tokyo Scientific Bulletin, 3, 1, January-March 1978"; *1978*, 86 pp; Office of Naval Research, Scientific Liaison Group, APO San Francisco 96503, AD-A058481

This is a quarterly publication presenting articles covering recent developments in Far Eastern (particularly Japanese) scientific research. The articles are written primarily by members of the staff of ONR Tokyo, with certain reports also being contributed by visiting stateside scientists. Occasionally a regional scientist will be invited to submit an article, covering his own work, considered to be of special interest.

NTIAC-021076

McKee, Keith E.; Tobin, Henry G.

"Automated Inspection and Product Control"; November 1978, 360 pp; American Defense Preparedness Association, Union First Bank Bldg., 15th & 8th Sts., NW, Washington, DC 20005, 4th International Conference, 7-9 November 1978, Chicago, IL, 360 pp

This conference covered: the quality scene in the UK; problems connected with design manufacturing and inspection of the largest measuring machine; SUSIE, a prototyping system for automatic visual inspection; automatic measuring centre for quality assurance in flexible production systems; inspection of M-16 cartidge cases using eddy currents; present state of the art in applications of solid-state image scanners; proximity switches; economics of manufacturing process control; quantifying manufacturing and inspection risks for helicopter critical parts; automated materials analysis via chemical characterization; real time process solution monitoring of plating; welding the new light weights; feedback control for resistance welding; nondestructive quality control of tar-bonded basic brick; annular array search units and their potential application in conventional ultrasonic testing systems; nondestructive evaluation of composite materials; why optical noncontact gauging and inspection; modern instrumentation for nondestructive measurement of coating and plating thickness for quality control and inspection of electronic and industrial components; a survey of future Army needs in automated inspection; and incorporation of nondestructive testing techniques for automatic inspection of cracks in artillery projectiles. (NTIAC)

NTIAC-022936

Missiroli, G. F.; Pozzi, G.; Valdre, U.

"Electron Interferometry and Interference Electron Microscopy"; *Journal of Physics E: Scientific Instruments*, 14, 6, June 1981, 649-671; Institute of Physics, 47 Belgrave Square, London SW1X 8QX, England

A state-of-the-art review of electron interferometry and interference electron microscopy is given. The various types of interferometry device, interferometers and interference microscopes, which have been proposed and/or constructed are reviewed and commented upon. The electron biprism, by far the most successful interferometry device, is treated in some detail from both the experimental and theoretical (geometric and wave optics) points of view. The applications of electron interferometry are presented with particular reference to off-axis electron holography. Finally the future perspectives are indicated. (Author)

NTIAC-021027M

Morris, R. A.; Bryant, L. E.
"Interim Report of the LASL Nondestructive Testing Group"; *1979*, 8 pp; National Technical Information Service, Springfield, VA 22161 (LA-UR-79-3071); Los Alamos Scientific Laboratory, NM
Development activities include the work of looking at crystal structure of various materials in the megabar range. A quantitative analysis capability in the x-ray fluorescence analysis technique is being developed. An image analyzer has been set up to provide spatial data, optical density, and optical density gradient pertinent to the target parameters required by the laser fusion target group. Finally, a new model 1400 American Metals research microscope has been ordered. (NTIAC)

NTIAC-020432

Mueller, R. K.
"Diffraction Tomography"; Program & Abstracts, 5th International Symposium on Ultrasonic Imaging and Tissue Characterization and 2nd International Symposium on Ultrasonic Materials Characterization, 1-6 June 1980, National Bureau of Standards, Gaithersburg, MD, p. 36
The status of diffraction tomography is briefly reviewed and experimental results presented. Some newer theoretical developments are discussed including fan-beam rather than plane wave insonification, and the treatment of attenuation in the test objects. (Author)

NTIAC-019938

Neff, John A.
"Optical Signal and Image Processing Research in the Air Force"; *Optical Engineering*, 19, 2, March/April 1980, 205-210; Society of Photo-Optical Instrumentation Engineers, 405 Fieldston Rd., Bellingham, WA 98225
The Air Force is actively supporting scientific research in optical processing through the award of contracts and grants to university and industrial research laboratories. The overall objective of this Air Force research program is to increase the flexibility of optical processors to the point of being able to perform any operation that is suitable for parallel processing. This paper will describe the currently active efforts in this program. (Author)

NTIAC-023323

Nichols, R. W.
"The State-of-the-Art of NDE as a Reliable Flaw Detector"; Nondestructive Evaluation in the Nuclear Industry-1980, 3rd International Conference Proceedings, 11-13 February 1980, Salt Lake City, UT, 3-11; American Society for Metals, Metals Park, OH 44073
This paper discusses the possible sources of unreliability in flaw detection, some numerical values for UT flaw detection reliability, the effect of defect size on detection reliability, ways to improve reliability, and conclusions. The ten golden rules of reliability are standardize equipment; automate and/or train/certify operators; use many angles, traverses and different techniques; use relevant reference standards; prepare surface and control couplant; choose geometry, material, fabrication procedures for easy NDE; search thoroughly only the important volumes; adjust the sensitivity of the search to the criticality of the region; use recordings and supervisory checks to provide repeat analysis; and finally, use repeated inspections by different people and different methods. (NTIAC)

NTIAC-022216

O'Neil, R.
"The PISC Programme—A Status Report"; Periodic Inspection of Pressurized Components, Institution of Mechanical Engineers Conference, 8-10 May 1979, London, England, Paper C46/79, 183-190; Mechanical Engineering Publications Ltd., P. O. Box 24, Northgate Ave., Bury St., Edmunds, Suffolk IP32 6BW, England

The reliability and efficiency of ultrasonic NDE of thick steel sections is one of the remaining uncertainties in underwriting the integrity of nuclear reactor pressure vessels. A number of thick section test plates containing implanted defects have been manufactured for test purposes. Three plates have been made available to European organizations, two with seam welds and one with a nozzle. The European inspection program has now been completed and the plates are being destructively examined to establish the precise position of the implanted defects. The first analysis of these results should be complete this year and this paper provides a state of the art position as of December 1978. (Author)

NTIAC-018681M

Phelps, M. L.
"Assessment of State-of-the-Art of Inservice Inspection Methods for Graphite Epoxy Composite Structures on Commercial Transport Aircraft"; Interim report, January 1979, 56 pp, NASA CR-158969, NAS 1-15304; National Technical Information Service, Springfield, VA 22161 (N79-17252); Boeing Commercial Airplane Co., Seattle, WA

A survey was conducted to determine current inservice inspection practices for all types of aircraft structure and specifically for advanced composite structures. The survey consisted of written questionnaires to commercial airlines, visits to airlines, aircraft manufacturers, and government agencies, and a literature search. Existing inspection methods and equipment for inservice inspection of aircraft structures are documented in this report. A reference inservice inspection baseline and preliminary inservice inspection program for advanced composite structures on commercial transport aircraft have been documented and are appendices to this report. With the data obtained in Phase I, a Phase II plan has been prepared for development and improvement of inservice inspection methods for graphite-epoxy composite aircraft structures and presented to NASA-LRC for approval. (Author)

NTIAC-020068

Pipes, R. B.
"Nondestructive Evaluation and Flaw Criticality for Composite Materials"; October 1978, 368 pp, ASTM STP 696; American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103 (ASTM STP 696)

Sections covered in the proceedings are nondestructive evaluation methodology, flaw criticality, and flaw characterization. Techniques include ultrasonics, holographics, neutron radiography, liquid crystals, and vibro-thermography. (NTIAC)

NTIAC-017569

Purll, D. J.
"Present State of the Art in Applications of Solid-State Image Scanners"; 4th International Conference Automated Inspection and Product Control Proceedings, 7-9 November 1978, Chicago, IL, 107-120

The use of solid-state image sensors, such as photodiode arrays and CCD, in optical inspection and dimension measurement is explained, and the advantages and disadvantages of the different types of sensor are discussed. A brief review of applications is given, together with references to papers in which many of these applications are described in more detail. (Author)

NTIAC-017200

Purll, D. J.
"Survey of the Present State of the Art in Applications of Solid-State Image Scanners"; SPIE V. 145, Industrial Applications of Solid State Image Scanners, Proceedings of Symposium, 14 March 1978, London, England, 9-12; Society of Photo-Optical Instrumentation Engineers, 405 Fieldston Road, Bellingham, WA 98225

The industrial uses of solid-state image sensors, such as photodiode, CCD and CID arrays, are reviewed. The case studies to be presented in these proceedings are supplemented by examples of and reference to further significant applications in the areas to be covered. Brief descriptions are also given of applications in other major areas. Some general techniques of optics and signal processing which are used when building arrays into instrumentation systems are also described. (Author)

NTIAC-921185

Quate, C. F.
"Ultrasonic Imaging"; 1979 Electronic Imaging, Conference Proceedings, 11-13 September 1978, London, England, 365-393; Academic Press, London, England
This paper gives an overview of the technique of ultrasonic imaging, including the equipment used, the performances and the advantages over other forms of imaging, especially for the medical field. Future trends are also mentioned. (NTIAC)

NTIAC-023502

Raguzova, A. S.; Pichugin, G. N.; Mikhailov, E. A.; Vashchekina, A. P.
"Basic Directions in the Composite Interindustry Program of Metrological Provisions for Methods and Means of Nondestructive Testing"; *Soviet Journal of Nondestructive Testing*, 17, 1, January 1981, 30-39(English translation, September 1981); Consultants Bureau, 227 West 17th Street, New York, NY 10011
The current state and level of metrological provisions for means of nondestructive testing in the country are shown. The basic assumptions of the composite program of metrological provisions are presented. (Author)

NTIAC-020344

Richardson, M. H.
"Detection of Damage in Structures from Changes in Their Dynamic (Modal) Properties—A Survey"; April 1980, 266 pp, NUREG/CR-1431, FIN NO. A-128; National Technical Information Service, Springfield, VA 22161 (NUREG/CR-1431); California University, Lawrence Livermore Lab, Livermore, CA
The stated object of this study was to survey the technical literature and interview selected experts in the fields of dynamic testing and analysis to determine the state-of-the-art of the relationship between physical damage to a structure and changes in its dynamic (modal) properties. (Author)

NTIAC-018382

Robinson, Arthur L.
"Making Nondestructive Evaluation a Science"; *Science*, 205, 4405, August 3, 1979, 477-479; American Association for the Advancement of Science, 1515 Massachusetts Ave., NW, Washington, DC 20005
This paper is a general discussion of the goal of NDE to make accept/reject decisions quantitatively. The relationship between fracture mechanics and NDE is discussed. A survey of work in progress in included. (NTIAC)

NTIAC-018754

Rose, J. L.; Rogovsky, A. J.
"Computer-Assisted Ultrasonic Nondestructive Evaluation"; Fracture Mechanics, 10th Symposium on Naval Structural Mechanics, Washington, DC, 1978, 455-469; University Press of Virginia, Charlottesville, VA
This chapter includes the goals and advantages of NDE computerization, examples of computer-assisted systems, computer application in online automated systems for scan control and data processing, signal interpretation and processing (including data acquisition, recording, and storage, signal processing, flaw classification and pattern recognition, and transducer compensation), application for acoustical holography and multielement transducers, development of smart flaw detectors, and a list of references. (NTIAC)

NTIAC-023868

Ruud, Clayton O.
"A Review of Nondestructive Methods for Residual Stress Measurement"; *Journal of Metals*, 33, 7, July 1981, 35-40; Metallurgical Society of American Institute of Mining, Metallurgical, and Petroleum Engineers, P. O. Box 430, 420 Commonwealth Dr., Warrendale, PA 15086

This paper summarizes the findings of a study whose objective was to review the state of the art of nondestructive residual stress measurement methods, evaluate the practical applicability of each to metallic engineering components, place the methods in perspective with respect to each other, develop a prognosis for advancements, and determine the most prudent areas for research investment. Also, the study was to provide elementary descriptions of the important principles of the various techniques as well as the application and limitations of each. (Author)

NTIAC-022203

Saglio, R.; Destribats, M. T.; Pigeon, M.; Roule, M.; Touffait, A. M.
"French Developments and Experience in the Field of Inservice Inspection"; Periodic Inspection of Pressurized Components, Institution of Mechanical Engineers Conference, 8-10 May 1979, London, England, Paper C29/79, 61-71; Mechanical Engineering Publications Ltd., P. O. Box 24, Northgate Ave., Bury St., Edmunds, Suffolk IP32 6BW, England

The French PWR Nuclear Plant Program was at the origin of a large amount of R&D work in the field of inservice inspection. The actions which were undertaken may be split up into different levels: the regulatory level, the R&D level, the design level, the flaw evaluation level. The first results of pre- and inservice inspections are presented. The experience gained by French Atomic Energy Commission with new techniques like focused ultrasonics transducers and multifrequencies eddy current apparatus are discussed. (Author)

NTIAC-021553

Schliekelmann, R. J.
Nondestructive Testing of Adhesive Bonded Joints; AGARD Lecture Series No. 102, April 1979, 37 pp, AGARD Lecture Series No. 102, Bonded Joints and Preparation for Bonding, 2-3 April 1979, Oslo, Norway & 5-6 April 1979, The Hague, 37 pp

With the increased interest in the use of adhesive bonded joints in structural applications, the importance of a reliable nondestructive evaluation is growing. In this lecture, requirements for application of nondestructive testing of bonded joints are discussed. Available methods are presented with their capabilities and limitations. (Author)

NTIAC-019172

Schmitz, V.; Kiefer, R.; Wosnitza, M.; Grosser, H.
"Recent Developments in Ultrasonic Holography"; 9th World Conference on NDT Proceedings, 19-23 November 1979, Melbourne, Australia, 4F-1, 6 pp; Austalian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia

The article describes the recent work to improve the applicability of ultrasonic holography in the field. Efforts have been made to improve the probes, probe holding devices, to shorten the recording and reconstruction time. Typical examples are shown. (Author)

NTIAC-023914M

Schraft, Rolf-Dieter; Melchior, Klaus; Ahlers, Rolf-Juergen
"Automatic Systems for Inspection and Control of Complex Production Systems (State-of-the-Art and Trends of Development in the USA and in the Federal Republic of Germany)"; Feasibility study 30 April 1981, 53 pp, EOARD TR-81-6; Institut Fuer Produktionstechnik Und Automatisierung, Stuttgart, Germany, F.R., AD-A104220

This report is a summary of the state-of-the-art and of trends in development in the field of quality control in complex, highly automated production systems. Special emphasis is given to the development and use of modern optical sensor systems and components in industrial metrology. The report compares and contrasts accomplishments in the field in both the USA and the Federal Republic of Germany. (Author)

NTIAC-018982

Segal, Emanuel; Thomas, Graham; Rose, Joseph
"Hope for Solving the Adhesive Bond Nightmare"; 12th Symposium on Nondestructive Evaluation Proceedings, 24-26 April 1979, San Antonio, TX, 269-281; Nondestructive Testing Information Analysis Center, P.O. Box 28510, San Antonio, TX 78284

The problem of inspecting nondestructively adhesive bond integrity will be separated into four parts. First, there exists the problem of detecting unbonds or places in the bonded area where there is a gap between adherents. Then, predicting the cohesive strength of a bond will be considered. The third part deals with the detectability of adhesive failure where the adherents are very close to each other (1-2 angstrom units) but with a zero bond strength. And finally, the prediction of a combined cohesive/adhesive strength of a joint. These problems will be considered for various laminates; metal to metal and metal (or composite) to honeycomb structures. The first part of the bond problem is solvable by several NDT methods. The other three parts have been only partially solved. Different approaches to these problems will be discussed. Special attention will be given to ultrasonics, neutron radiography, and optical holographic methods. Thus, a complete, state-of-the-art review of the field of nondestructive testing of adhesive bonds will be presented. (Author)

NTIAC-020379

Singh, A. K.; Isu, T. I.; Khatua, T. P.
"Structural Building Response Review"; May 1980, 180 pp. NUREG/CR-1423, FIN No. A1030; National Technical Information Service, Springfield, VA 22161 (NUREG/CR-1423); California University, Lawrence Livermore Lab, Livermore, CA

This report describes the structural response analysis method, including the structural model, soil-structure-interaction as it relates to structural models, methods for seismic structural analysis, numerical integration methods, methods for nonseismic response analysis approaches to combine various responses, structural damping values, nonlinear response, uncertainties in structural properties, and structural response analysis using random properties. The report presents the state-of-the-art in these areas for nuclear power plants. It also details the past studies made at Sargent & Lundy to evaluate different alternatives and the conclusions reached for the specific purposes that those studies were intended. (Author)

NTIAC-17967

Somoano, R. B.
"Photoacoustic Spectroscopy of Condensed Matter"; *Angewandte Chemie*, 17, 4, April 1978, 238-245 (English translation); Verlag Chemie, D-6940 Weinheim, Germany

Photoacoustic spectroscopy is a new analytical tool that provides a simple nondestructive technique for obtaining information about the electronic absorption spectrum of samples such as powders, semisolids, gels, and liquids. It can also be applied to samples which cannot be examined by conventional optical methods. Numerous applications of this technique in the field of inorganic and organic semiconductors, biology, and catalysis have been described. Among the advantages of photoacoustic spectroscopy, the signal is almost insensitive to light scattering by the sample and information can be obtained about nonradiative deactivation processes. Signal saturation, which can modify the intensity of individual absorption bands in special cases, is a drawback of the method. (Author)

NTIAC-023797

Stillwell, P. F. T. C.
"Thermal Imaging"; *Journal of Physics E: Scientific Instruments*, 14, 10, October 1981, 1113-1118; Institute of Physics, 47 Belgrave Square, London SW1X 8QX, England

This is a review article on thermal imaging covering specific topics of the thermal signal, optical materials, detection in the thermal bands, image conversion, pyroelectric vidicon, cooled quantum detectors, performance of scanners using cooled detectors, mechanical scanning systems, use of thermal imagers, and future developments. (NTIAC)

NTIAC-022475

Stonestrom, J. Peter; Alvarez, Rober E.; Macovski, Albert

"A Framework for Spectral Artifact Corrections in X-Ray CT"; IEEE Transaction on Biomedical Engineering, BME-28, 2, February 1981, 128-141; Institute of Electrical and Electronics Engineers, 345 East 47th St., New York, NY 10017

The spectral artifact problem in x-ray computed tomography (CT) is well known. Many techniques have been suggested to correct for this problem, including linearization methods, iterative methods, and dual spectrum methods. In this paper, two goals are addressed: (1) we review the various methods now being used to correct for spectral artifacts, and (2) we introduce a framework which provides useful insight as to the suitability of particular methods to various imaging problems. (Author)

NTIAC-019479

Tarassov, V. J.

"Pattern Recognition for Inspection"; 1978 Joint Automatic Control Conference Proceedings, Pt. 1, Philadelphia, PA, 15-20 October 1978, 299-306; Instrumentation Society of America

Pattern recognition is a rapidly expanding field. Although there are no universal solutions, there are many practical inspection problems that exist in industry which can be solved with existing pattern recognition resources. This paper presents an overview of the pattern recognition field. It then examines the shape recognition problem and how it relates to inspection. (Author)

NTIAC-020164

Vanderbrug, Gordon J.; Nagel, Roger N.

"Vision Systems for Manufacturing"; Automation in Manufacturing, 1979 Joint Automatic Control Conference Proceedings, 17-21 June 1979, Denver, CO, 760-770; American Institute of Chemical Engineers, 345 E. 47th St., New York, NY 10017

This short survey illustrates the application of image analysis and pattern recognition techniques to problems of visual inspection. (NTIAC)

NTIAC-022503

Vary, A.

"Ultrasonic Measurement of Material Properties"; *Research Techniques in Nondestructive Testing*, Vol. IV, 1980, 159-204; Academic Press Inc., 111 Fifth Ave., New York, NY 10003

Progress in the use of ultrasonics for direct, nondestructive evaluation of mechanical strength properties of structural materials is reviewed. Accordingly, this chapter focuses on research techniques for measuring properties such as elastic moduli, hardness, fracture toughness, tensile, shear and yield strengths, and microstructural states of solids ranging from metals and ceramics to fiber composites. The purpose of this chapter is to highlight the potential uses of ultrasonics not only in nondestructive testing but also in materials research. This overview of ultrasonic methods indicates the essential 'state of art' which currently stands at the threshold of broad practical use in industry. More laboratory work and technology transfer are needed, however, before ultrasonic methods become universally accepted and added to conventional destructive or statistically based (sampling) tests for verification and control of mechanical strength and material condition. Thus, much of the technology to be cited involves recent efforts that demonstrate feasibility with laboratory samples rather than current practice on actual structural parts. (Author)

NTIAC-022306

Vasile, C. F.; Houston, R. B.; Pongracz-Bartha, E.; Lee, R. E.

"Portable Instrument for Detection of Surface Flaws using EMATS", DARPA/AFML Review of Progress in Quantitative NDE Proceedings, 8-13 July 1979, Scripps Institution of Oceanography, La Jolla, CA, 555-557; Rockwell International Science Center, 1049 Camino Dos Rios, Thousand Oaks, CA 91360

The work reported here is the development of a first prototype portable ultrasonic inspection instrument based on EMAT (electromagnetic acoustic transducer) technology. The goal was to demonstrate EMAT inspection capabilities for small-size flaws in metal parts and to build a self-contained NDE unit that had a high degree of signal processing on-board so that human interpretation was minimized. The unit also served as a test bed, so that a number of new concepts could be evaluated. This instrument is viewed as an important step in the development of future NDE equipment. (Author)

NTIAC-020095

Votava, E.; Jax, P.

"Inspection of Nuclear Reactors by Means of Acoustic Emission during Hydrostatic Test"; Acoustic Emission Monitoring of Pressurized Systems (ASTM STP 697), ASTM Symposium, 25-26 January 1979, Ft. Lauderdale, FL, 149-164; American Society for Testing and Material, 1916 Race St., Philadelphia, PA 19103

The paper presents the state of the art for the surveillance of nuclear reactor components by acoustic emission (AE) during hydrostatic tests, as obtained during several inspections made by the Kraftwerk Union (KWU) and Battelle. The necessary preconditions, wave propagation, calibration method, location accuracy, attenuation of AE signals due to geometrical configurations (nozzles), and the correlation between AE sources and defects as detected by other nondestructive testing methods (NDT) are presented and discussed. The present results indicate the following: AE has a high sensitivity for detecting small leakages; AE signals from inside and outside of a thick reactor component can be located with approximately the same degree of sensitivity and accuracy; AE is a very sensitive NDT method, able to detect even very small flaws; and AE indications lie preferentially in areas of seam welds, nozzles, welded-on attachments (auxiliary welds), closure studs, or other prominent areas. (Author)

NTIAC-022691

Wholahan, J. D.; King, D. G.

"The State-of-the-Art in Medical Computed Tomography"; IEEE Transactions on Nuclear Science, NS-28, 2, April 1981, 1726-1731; Institute of Electrical and Electronics Engineers, 345 East 47th St., New York, NY 10017

A new development in computed tomography display systems permits dynamic review of image data along arbitrary planes. This has been shown to be a major step towards the goal of true three-dimensional presentation of clinical information. With the advent of three-dimensional viewing capability, it is necessary to expand the concept of spatial resolution to include the slice thickness parameter. The spatial resolution specification will now have three orthogonal components, and the goal will be to make the longitudinal component more nearly equal to the components in the scan plane. (Author)

NTIAC-019717

Youshaw, R.; Dyer, C.

"Underwater Nondestructive Testing of Ship Hull Welds"; Final report, September 1979, 32 pp, SSC0293; Ship Structure Committee, Washington, DC, AD-A079445

Techniques are presented whereby nondestructive testing of hull butt welds can be accomplished underwater. Radiography, ultrasonic inspection, and magnetic particle testing are discussed including the modifications necessary for underwater applications. In all cases, trained divers are required. (Author)

3. NDT-NDE TECHNIQUES AND SELECTED REFERENCES

3.1 Introduction

NDE techniques are rapidly evolving. Future trends in NDE are such that many sophisticated laboratory techniques of today may become effective and useful NDE techniques of tomorrow. The NDE community is making strong efforts to develop procedures which will be applicable to areas which heretofore were never considered candidates for NDE applications. Consequently, this section presents a comprehensive listing of NDE techniques, old and new, each accompanied by selected references. These references should aid the user in obtaining further information about that technique. The references were selected on the basis that they are in some way either directly or indirectly associated with their respective technique under which they are cited.

There has been a departure from the 1979 Handbook where each technique was briefly described and a technique selection chart was presented.

3.2 Index of Techniques Cited

3.3 Techniques with References Cited

ACOUSTIC EMISSION

NTIAC-017736

Achenback, J. D.; Harris, J. G.
"Acoustic Emission from a Brief Crack Propagation Event"; *Journal of Applied Mechanics,* Vol. 46, March 1979, 107-112; American Society of Mechanical Engineers, 345 E. 47th Street, New York, NY 10017

NTIAC-018521M

Advisory Group for Aerospace Research and Development
"Non-Destructive Inspection Methods for Propulsion Systems and Components", lecture series; April 79, 156 pp; AGARD-LS-103, Advisory Group for Aerospace Research and Development, Neuilly-sur-Seine, France; AD-A069901

NTIAC-022990

American Institute of Mining, Metallurgical and Petroleum Engineers, Inc.
"Proceedings of the 1978 International Conference on Composite Materials"; American Institute of Mining, Metallurgical and Petroleum Engineers, Inc., 345 East 47th St., New York, NY 10017

NTIAC-023322

American Society for Metals
"Nondestructive Evaluation in the Nuclear Industry—1980"; 3rd International Conference Proceedings; 11-13 February 1980, Salt Lake City, UT; American Society for Metals, Metals Park, OH 44073

NTIAC-023799

Armor, A. F.; Poole, D. N.; Lapides, M. E.
"Reduction of Unscheduled Utility Outages through Component Non-Destructive Evaluation"; Nondestructive Evaluation: Microstructural Characterization and Reliability Strategies; Symposium Proceedings, TMS Fall meeting, 5-9 October 1980, Pittsburgh, PA, 3-16; The Metallurgical Society of American Institute of Mining, Metallurgical and Petroleum Engineers, Inc., 410 Commonwealth Dr., Warrendale, PA 15086

NTIAC-024056

Armor, A. F.; Graham, L. J.; Frank, R. L.
"Acoustic Emission Monitoring of Steam Turbines"; Presented at Joint American Society of Mechanical Engineers/Institute of Electrical and Electronic Engineers Power Generation Conference, 4-8 October 1981, St. Louis, MO; American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017

NTIAC-017146

Arrington, M.
"Some Industrial Applications of Acoustic Emission Monitoring"; *NDT International,* 11, 3, June 1978, 117-120; IPC Business Press Ltd., Oakfield House, Perrymount Rd., Haywards Heath, Sussex RH16 3DH, UK

NTIAC-020521

Association of Iron and Steel Engineers

"Minicomputer Locates Structural Flaws in Real-Time"; *Iron & Steel Engineer*, 56, 9, September 1979, p. 59; Association of Iron and Steel Engineers, Suite 2350, Three Gateway Center, Pittsburgh, PA 15222

NTIAC-023791

Bailey, C. D.; Pless, W. M.
"Acoustic Emission: An Emerging Technology for Assessing Fatigue Damage in Aircraft Structure"; *Materials Evaluation*, 39, 11, October 1981, 1045-1050; American Society for Nondestructive Testing, 4153 Arlingate Plaza, Caller No. 28518, Columbus, OH 43228

NTIAC-022446

Baranov, V. M.; Kudryavtsev, E. M.
"Noise Immunity of Acoustic-Emission Monitoring Systems"; *Soviet Journal of Nondestructive Testing*, 16, 6, June 1980, 446-450 (English Translation, February 1981); Consultants Bureau, 227 West 17th St., New York, NY 10011

NTIAC-020736

Bardenheier, Reinhard
"Acoustic Emission Monitoring of Polymeric Composite Materials—Part II: Experimental Results"; *Zeitschrift Fur Werkstofftechnik*, Vol. 11, March 1980, 101-110; Verlag Chemie, GMBH, (In German, abstract in English)

NTIAC-023598

Bartle, P. M.; Stockham, N. R.
"Acoustic Emission Studies in Offshore Engineering"; Final report, 1980, 263 pp; EUR 6906, 7210-GA/803; Request from Commission of the European Communities, Luxemburg (EUR 6906)

NTIAC-020997

Baum, Michael
"The Sounds of Failure—Developments in Acoustic Emission Research"; *Dimensions*, 64, 4, May/June 1980, 12-18; National Bureau of Standards, U. S. Department of Commerce, Washington, DC 20234

NTIAC-024074

Bentley, P. G.
"A Review of Acoustic Emission for Pressurized Water Reactor Applications"; *NDT International*, 14, 6; December 1981, 329-335; IPC Business Press Ltd., Oakfield House, Perrymount Rd., Haywards Heath, Sussex RH16 3DH, UK

NTIAC-017652

Birchak, J. R.; Chagnon, C. W.
"Acoustic Emission Kaiser Effect in Zircaloy 4 Fuel Rods"; Nondestructive Evaluation in the Nuclear Industry; Proceedings of an International Conference, 13-15 February 1978, Salt Lake City, UT, 249-260; American Society for Metals, Metals Park, OH 44073

NTIAC-015695

Bloch, H. P.
"Acoustic Incipient-Failure Detection"; *Oil and Gas Journal*, February 6, 1978, 62-66, 71-72

NTIAC-022393

Boyd, Donald M.

"Holographic and Acoustic Emission Evaluation of Pressure Vessels"; March 1980, 6 pp; UCRL-84046; Prepared for Proceedings of American Society of Mechanical Engineers, Centennial Pressure Vessels and Piping Conference, 12-15 August 1980, San Francisco, CA; National Technical Information Service, Springfield, VA 22161 (UCRL-84046); California University, Lawrence Livermore National Laboratory, Livermore, CA

NTIAC-024050

Brackett, R. L.

"Underwater Inspection of Waterfront Facilities"; Presented at American Society of Mechanical Engineers Winter Annual Meeting, 15-20 November 1981, Washington, DC; American Society of Mechanical Engineers, 345 East 47th St., New York, NY 10017 (Paper 81-WA/OCE-5)

NTIAC-018957

Bradshaw, W. W.

"Proceedings of the Symposium on Nondestructive Evaluation" (12th); April 24-26, 1979, San Antonio, Texas; Nondestructive Testing Information Analysis Center, San Antonio, TX 78284; AD-A083617

NTIAC-020473

Burchey, W. J.; Fick, S. E.; Green, R. E.; Palmer, C. H.

"Analysis of Acoustic Emission During Plastic Deformation of Micro-Tensile Specimens by Optical Probing"; Program and abstracts, 5th International Symposium on Ultrasonic Imaging and Tissue Characterization and 2nd International Symposium on Ultrasonic Materials Characterization, 1-6 June 1980; National Bureau Standards, Gaithersburg, MD; 93-94

NTIAC-020539

Buck, O.; Alers, G. A.

"New Techniques for Detection and Monitoring of Fatigue Damage"; Fatigue and Microstructure; Papers presented at the 1978 American Society for Metals Materials Science Seminar, 14-15 October 1978, St. Louis, MO, 101-147; American Society for Metals, Metals Park, OH 44073

NTIAC-019923

Buxbaum, Sanford R.; Friant, Carl L.; Fick, Steven E.; Djordjevic, B. Boro; Green, Robert, E.

"Acquisition and Reduction of Acoustic Emission Data from Fatigue Tests"; Paper summaries, National Spring Conference, American Society for Nondestructive Testing, 24-27 March 1980, Philadelphia, PA, 162-163; American Society for Nondestructive Testing, 4153 Arlingate Plaza, Caller No. 28518, Columbus, OH 43228

NTIAC-021898M

Buxbaum, Sanford R., Friant, Carl Lee; Fick, Steven E.; Green, Robert E., Jr.

"Ultrasonic and Acoustic Emission Detection of Fatigue Damage"; Final report, 1 March 1976—31 May 1980; July 1980, 120 pp; AFOSR TR-80-1069; F44620-76-C-0081; John Hopkins University, Baltimore, MD, Department of Materials Science and Engineering, AD-A090799

NTIAC-018675

Carlyle, John M.

"Imminent Fracture Detection in Graphite/Epoxy Using Acoustic Emission"; *Experimental Mechanics*, May 1978, 191-195; Society for Experimental Stress Analysis, P.O. Box 277, Saugatuck Sta., Westport, CT 06880

NTIAC-023226

Chan, W. Y.; Hay, D. R.; Suen, C. Y.; Schwelb, O.
"Application of Pattern Recognition Techniques in the Identification of Acoustic Emission Signals"; 5th International Conference on Pattern Recognition Proceedings, Vol. 1, 1-4 December 1980; Miami Beach, FL, 108-111; Institute of Electrical and Electronic Engineers, 445 Hoes Lane, Piscataway, NJ, 08854

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"Tomographical Properties of Uniformly Redundant Arrays"; SPIE Proceedings, Vol. 155, Image Understanding Systems and Industrial Applications, August 30-31, 1978, San Diego, CA, 228-231; Society of Photo-optical Instrumentation Engineers, 405 Fieldston Rd., Bellingham, WA 98225

NTIAC-020785

Crane, R. L.; Moran, T. J.; Patterson, T. M.
"Computed X-ray Tomography of Carbon/Carbon Composites"; Paper Summaries—National Fall Conference ASNT, 15-18 October 1979, St. Louis, MO, 128-132; American Society for Nondestructive Testing, 4153 Arlingate Plaza, Caller No. 28518, Columbus, OH 43228

NTIAC-019008

Ellinger, H.; Morgan, I. L.; Klinksiek, R.; Hopkins, F. H.; Thompson, J. Neils
"Tomographic Analysis of Structural Materials"; SPIE Proceedings, Imaging Applications for Automated Industrial Inspection and Assembly, Vol. 182, 19-20 April 1979, Washington, DC, 179-186; Society of Photo-optical Instrumentation Engineers, 405 Fieldston Rd., Bellingham, WA 98225

NTIAC-022499

Ellingson, W. A.; Berger, H.
"Three-dimensional Radiographic Imaging"; *Research Techniques in Nondestructive Testing*, Vol. IV, 1980, 1-38; Academic Press Inc., 111 Fifth Ave., New York, NY 10003

NTIAC-023285

Garrett, D. A.; Bracher, D. A.
"Real-time Radiologic Imaging: Medical and Industrial Applications"; Committee E-7 on Nondestructive Testing Symposium, 3-10 May 1978, Gaithersburg, MD; American Society for Testing and Materials, 1916 Race St., Philadelphia, PA, 19103 (ASTM STP-716)

NTIAC-022074

Grievenkamp, J. E.; Swindell, W.; Gmitro, A. F.; Barrett, H. H.
"Incoherent Optical Processor for X-ray Transaxial Tomography"; *Applied Optics*, 20, 2, 15 January 1981, 264-273; Optical Society of America, 335 East 45th St., New York, NY 10017

NTIAC-022476

Gullberg, Grant T.; Budinger, Thomas F.
"The Use of Filtering Methods to Compensate for Constant Attenuation in Single-Photon Emission Computed Tomography"; IEEE Transactions on Biomedical Engineering, BME-28, 2, February 1981, 142-157; Institute of Electrical and Electronics Engineers, 345 East 47th St., New York, NY 10017

NTIAC-018912

Hounsfield, G. N.
"Computer Reconstructed X-ray Imaging"; *Philosophical Transactions of the Royal Society of London*, 292, 1390, 31 August 1979, 223-232; The Royal Society, 6 Carlton House Terrace, London SW1Y 5AG, England

NTIAC-022630

Johnson, Steven A.; Berggren, Michael J.; Gustafson, David E.; Arave, Alvin F.; Robb, Richard A.
"X-ray Tomographic Imaging of Boiling from Heated Rod Bundles"; Instrumentation in the Aerospace Industry, Vol. 26, Advances in Test Measurement, Vol. 17, Part 2, Proceedings 25th International Instrumentation Symposium, 1980, Seattle, WA, 693-699; Instrument Society of America, Research Triangle Park, NC

NTIAC-018720

Kak, Avinash C.
"Computerized Tomography with X-ray, Emission, and Ultrasound Sources"; Proceedings of the IEEE, 67, 9, Semptember 1979, 1245-1272; Institute of Electrical and Electronics Engineers, Inc., 345 East 47th St., New York, NY 10017

NTIAC-020670

Kruger, Richard; Morris, Roger
"Finding Flaws with Tomography"; *Industrial Research/Development*, January 1980, 130-133; Technical Publishing, 1301 S. Grove Ave., Barrington, IL 60010

NTIAC-019002

Mays, Joe
"Precision Image Isocon TV Camera"; Society of Photo-optical Instrumentation Engineers Proceedings, Imaging Applications for Automated Inspection and Assembly, Vol. 182, 19-20 April 1979, Washington, D.C., 83-93; Society of Photo-optical Instrumentation Engineers, 405 Fieldston Rd., Bellingham, WA 98225

NTIAC-022023

Miura, S.; Mabuchi, H.; Honma, T.
"Survey of a Sculpture of Buddha Using X-ray Computed Tomography"; *Transactions of the Society of Instrumentation & Control Engineers* (Japan), 16, 2, April 1980, 239-244; *Physics Abstracts*, 83, 1149, 1 December 1980

NTIAC-022275

Morris, R. A.; Kruger, R. P.; Wecksung, G. W.
"Applications of Tomography to the Nuclear Industry"; DARPA/AFML Review of Progress in Quantitative NDE Proceedings, 8-13 July 1979, Scripps Institution of Oceanography, La Jolla, CA, 295-300; Rockwell International Science Center, 1049 Camino Dos Rios, Thousand Oaks, CA 91360

NTIAC-019984

Naruse, Y.; Sugita, T.; Kobayashi, T.; Jimbo, M.; Fujii, M.
"Multichannel Semiconductors for X-ray Transmission Computer Tomography"; IEEE Transactions on Nuclear Science, 1979 Nuclear Science Symposium, 1979 Symposium on Nuclear Power Systems, 17-19 October 1979, San Francisco, CA, NS-27, 1, February 1980, 252-257; Institute of Electrical and Electronics Engineers, Inc., 345 E. 47th St., New York, NY 10017

NTIAC-024157

Ong, P. S.; Huang, H. T.
"A Novel Detector Array for Industrial X-ray Tomography"; DARPA/AFWAL Review of Progress in Quantitative NDE Proceedings, AFWAL-TR-81-4080, 14-18 July 1980, Scripps Institute of Oceanography, La Jolla, CA, 526-527; Rockwell International Science Center, 1049 Camino Dos Rios, Thousand Oaks, CA 91360

NTIAC-024277

Polichar, Raulf M.
"X-ray Computed Tomography of Thick Steel Castings and Forgings"; November 1981, 10 pp; Nondestructive Evaluation Program, Progress in 1981, EPRI NP-2088-SR, T 101-3, Section 8, 8-1—8-10; Electric Power Research Institute, 3412 Hillview Ave., Palo Alto, CA 94304

NTIAC-023279

Ritman, E. L.; Robb, R. A.; Harris, L. D.; Kinsey, J. H.; Gilbert, B. K.
"Cylindrical-scanning Transaxial Roentgen Tomography of High Temporal Resolution"; Real-time Radiologic Imaging: Medical and Industrial Applications, ASTM STP-716, Symposium on Nondestructive Testing, 8-10 May 1978, Gaithersburg, MD, 277-293; American Society for Testing and Material, 1916 Race St., Philadelphia, PA 19103

NTIAC-023903

Sato, Takuso; Ikeda, Osamu; Yamakoshi, Yoshiki; Tsubouchi, Mototaka
"X-ray Tomography for Microstructural Objects"; *Applied Optics*, 20, 22, 15 November 1981, 3880-3883; Optical Society of America, 335 East 45th St., New York, NY 10017

NTIAC-020398

Shibata, Tsutomu; Frei, Werner; Akutagawa, Wesley M.
"Multispectral X-ray Computed Tomography and its Evaluation by Principal Component Analysis";

6th Conference on Computer Applications in Radiology & Computer-aided Analysis of Radiological Images Proceedings, 18-21 June 1979, Newport Beach, CA, 328-333; The Institute of Electrical and Electronics Engineers, 345 E. 47th St., New York, NY 10017

NTIAC-022475

Stonestrom, J. Peter; Alvarez, Robert E.; Macovski, Albert
"A Framework for Spectral Artifact Corrections in X-ray CT"; IEEE Transactions on Biomedical Engineering, BME-28, 2, February 1981, 128-141; Institute of Electrical and Electronics Engineers, 345 East 47th St., New York, NY 10017

NTIAC-022833

Vainberg, E. I.; Kazak, I. A.; Kurozaev, V. P.
"Accuracy of the Reproduction of the Spatial Structure of the Inspected Object in Computerized X-ray Tomography"; *Soviet Journal of Nondestructive Testing*, 16, 10, October 1980, 691-699 (English translation, June 1981); Consultants Bureau, 227 W. 17th St., New York, NY 10011

NTIAC-022834

Vainberg, E. I.; Goncharov, V. I.; Kazak, I, A.; Kurozaev, V. P.
"Sensitivity of Computerized X-ray Tomography in Inspection of Industrial Products with Local Flaws"; *Soviet Journal of Nondestructive Testing*, 16, 10, October 1980, 699-703 (English translation, June 1981); Consultants Bureau, 227 W. 17th St., New York, NY 10011

4. BIBLIOGRAPHIES, HANDBOOKS, AND TEXTBOOKS

4.1 Introduction

This is a list of bibliographies, handbooks and textbooks with abstracts entered into the NTIAC Data Base since January 1, 1978.

4.2 BIBLIOGRAPHIES

NTIAC-023219

Caulfield, H. J.; Friday, William

"MM&T: Bibliography on Optical Testing"; August 1980, 278 pp, RH-CR-81-5; Army Missile Command, Redstone Arsenal, AL

This is a major expansion of "Bibliography on Various Optical Testing Methods" by Daniel Malacara, Alejandro Cornejo, and M. V. R. K. Murty which appeared in *Applied Optics*, Vol. 14, pp 1065-1080 (1975). It is computerized to allow for easy update and correction. The last update was in September 1979. For availability information, please contact either of the authors. The present bibliography occupies 300 pages. (Author)

NTIAC-0!8819

Drouillard, Thomas F.

"Acoustic Emission: A Bibliography with Abstracts"; 1979, 802 pp; IFI/Plenum Data Co., 227 West 17th St., New York, NY 10011

This bibliography includes nearly 1000 references. For almost all entries, an abstract or annotation is provided. Wherever possible, the original abstract by the author has been reprinted with minor editing to establish consistency. The volume consists of four parts: bibliography, list of journals, author index and subject index. (NTIAC)

NTIAC-017718M

George, Nicholas

"Optical Data Processing and Statistical Optics (A Bibliography)"; Final scientific report, 1 July 1976-30 June 1978, October 1878, 41 pp, AFOSR TR-78-1506, F49610-76-C-0021, AFOSR-72-2234; California Institute of Technology, Pasadena, CA, AD-A061959

This final scientific report contains a summary of research at Caltech on the wavelength sensitivity of speckle. Included in this bibliography are research publications by N. George, A. Jain, A. Livanos, R. D. S. Melville, C. H. Papas, and J. Roth. Topics in speckle supported under the subject contract are described: (1) diffraction by a serrated aperture and (2) propagation in an experimental test chamber containing a turbulent gaseous mixture. Research on the fabrication of grating structures for use in integrated optics is also described. Chirped or variable period gratings have been successfully made by a holographic process. Briefly, a waveguiding layer of Corning 7059 glass is sputtered onto a substrate glass using the Technics MIM Model 5.5 ion-beam etching machine. Photoresist is coated onto the waveguiding layer, exposed holographically in an argon or helium-cadmium laser beam, developed and then ion-milled. Extensive theory and technique are reported in the bibliography of publications listed in this report. (Author)

NTIAC-010846

Huang, T. C.

"Bibliography on Residual Stress"; 196 pp; Society of Automotive Engineers, Inc., 485 Lexington Ave., New York, NY 10017; SP-125; 196 pp

1545 abstracts through 1953. Subject indexes by areas: (1) measurement; (2) occurrence; (3) origin, control, and removal; (4) effects; (5) miscellaneous. Author index. (NTIAC)

NTIAC-017704

Johnson, Dorothea M.

"Bibliography on Fibers and Composite"; October 1978, 275 pp, MCIC-78-38, DLA900-78-C-1715; National Technical Information Service, Springfield, VA 22161; Battelle Columbus Labs, Ohio Metals and Ceramics Information Center, AD-A061903

This bibliography continues and updates previously issued reports by Battelle's Columbus Laboratories, particulate, and eutectic composite materials. No organic matrix composites or fibers are included. This edition includes 2367 literature references published between January 1972 and September 1978. The references are arranged alphabetically according to author's last name or the name of the organization concerned and chronologically by year of publication. The subject categorization of this edition is similar to that used in the earlier bibliographies. References pertaining only to fibers are indexed as (1) general reviews; (2) growth, forming, or surface treatments; and/or (3) test methods and structural properties. Entries relating to composites are broadly indexed according to matrix materials and specifically by fiber materials. Composites are also indexed (at least once) in the following areas: (1) compatibility studies; (2) theory, analysis, micromechanics, and design; (3) testing and evaluation; (4) application; (5) general review articles; (6) fabrication; and (7) coating. The report includes both an authors' index and a subject index. (Author)

NTIAC-021629

Mordfin, Leonard

"NDE Publications: 1978 (A Bibliography)"; December 1979, 19 pp, NBS IR 80-2080; National Technical Information Service, Springfield, VA 22161, (NBS IR 80-2080); National Bureau of Standards, Washington, DC

This report is a supplement to NBS IR 78-1557, "NDE Publications: 1972-1977." It is a bibliography, with selected abstracts, of 72 National Bureau of Standards (NBS) publications on nondestructive evaluation (NDE) and related technologies, primarily for the calendar year 1978. A detailed subject index is included, as well as information on how copies of many of the publications may be obtained. (Author)

NTIAC-018810

Ollick, E.

"Bibliography Series 1979 Eddy Current Testing"; January 1979, 48 pp; American Society for Metals, Metals Park, OH 44073

This is a list of 523 bibliographies on eddy current testing. Copies of the abstracts for each of these citations can be found in the monthly or annual issues of Review of Metal Literature. Copies of the original articles are available through ASM Photocopy Service. (NTIAC)

4.3 HANDBOOKS

NTIAC-018336

Engelhardt, Robert E.

NTIAC Handbook, March 1979, 217 pp, NTIAC-79-1, DLA900-77-C-3733; Nondestructive Testing Information Analysis Center, P.O. Box 28510, San Antonio, TX 78284, AD-A069969

This handbook has been prepared for the purpose of supplying a major source of references for the many aspects of nondestructive testing. In addition, it contains fundamental descriptions of testing techniques, applications of these techniques, and references to standard handbooks and textbooks containing sources of additional information. The final section of the handbook contains an index and a description of organizations active in NDT. Entries in this section are compiled from the responses to a questionnaire mailed out by the NTIAC staff. Material in the handbook, except as noted, has been generated from the NTIAC information files. It is believed that these files are the most comprehensive source of NDT references in the United States. It would be appreciated if any major omissions or errors were brought to the attention of the NTIAC staff. It is intended that periodic additions will be made to the handbook in order to provide the most current information to the user.

NTIAC-016919

Hayward, Gordon P.

"Introduction to Nondestructive Testing", 1978, 123 pp; American Society for Quality Control, 161 W. Wisconsin Ave., Milwaukee, WI 53203

This short handbook contains a brief overview of NDT describing visual, magnetic, radiographic, ultrasonic, and eddy current testing, followed by appendices containing a glossary of terms frequently used in nondestructing testing and excerpts from the Nondestructive Evaluation Technique Guide, prepared by Mr. Alex Vary of NASA Lewis Research Center. (NTIAC)

NTIAC-008776

Rimbach Publications, Div. of Chilton Co.

Pressure Handbook; 95 pp; Rimbach Publications, Div. of Chilton Co., 845 Ridge Ave., Pittsburgh, PA 15212

A short handbook comprising chapters by various authors on the principles, practices, and instrumentation of pressure measurement. (NTIAC)

NTIAC-021700

Smith, Dallas, G.; Schaeffel, John A. Jr.

"Quantitative Nondestructive Evaluation"; October 79, 174 pp, MCIC-111089, AD-A085945

This manual has been prepared primarily for the non-NDE specialist. Its aim is to increase understanding of NDE capabilities among those involved in structural design and fracture mechanics calculations, and to provide physical details pertaining to most of the important NDE techniques. Since NDE has been so actively applied in the aerospace industry, most of the application examples discussed are related to aerospace structures; however, the basic ideas apply to any structure containing fracture critical components. The introduction discusses the relationship of fracture mechanics and quantitative NDE. The present practice of NDE, including military specifications, airplane inspection manuals, and inspector training are discussed next. The 'Big Five' methods of NDE — liquid penetrant, magnetic particle, ultrasonic inspection, eddy current, and radiography — are introduced as well as certain advanced inspection methods — methods still undergoing development. (Author)

NTIAC-011195

Technical Operations Inc., Radiation Products Div.

"Isotope Radiography—Radiation Safety Handbook"; 64 pp; Technical Operations Inc., Radiation Products Div., Burlington, MA 01803

This handbook provides a general discussion of the physics involved in radiation. Radiation measurement and also criteria are discussed. Descriptions of instruments are provided and emergency procedures concerning safety incidents and operational environments are detailed. Formulas for calculating values such as half life, absorption distances, etc., are provided. (NTIAC)

NTIAC-019674M

Wood, Howard A.; Engle, Rober M. Jr.

"USAF Damage Tolerant Design Handbook: Guidelines for the Analysis and Design of Damage Tolerant Aircraft Structures"; Revision A to report dated 1 July 1979, Interim report, January 1977-November 1978, March 1979, 447 pp, AFFDL-TR-79-3021-REV-A; Air Force Flight Dynamics Lab, Wright-Patterson AFB, OH, AD-A078216

This is the first edition of a handbook to support the USAF Airplane Damage Tolerance Requirements contained in MIL-A-83444. It provides specific background data and justification for the detailed requirements of MIL-A-83444 and provides guidelines and state-of-the-art analysis methods to assist contractor and USAF personnel in complying with the intent of the specification and in solving cracking problems, in general, for metallic aircraft structures. The material in this document is general enough to be useful in the evaluation of the damage tolerance of in-service aircraft designed and qualified prior to the issuance of MIL-A-83444. The handbook was structured to provide a clear and concise summary of the specification, MIL-A-83444, as well as supporting analysis methods, test techniques, and nondestructive inspection (NDI) methods are provided as state-of-the-art along with suggested and/or recommended practices, limitations, etc. Copies of appropriate USAF structural specifications are contained as an appendix.

4.4 TEXTBOOKS

NTIAC-017962

Gurvich, A. K.
Flaw Detection in Rails; December 1978, 585 pp, DOT/FRA; Office of Rail Safety Research RRD-32, Washington, DC 20590

The physical principles and techniques of magnetic and ultrasonic flaw detection in rails are given. The intended use, working principles and layout of various rail flaw detector systems and the procedure for working with them are described. The methodology of rail inspection, both in the field and at trailwelding facilities is also described. The repair of flaw detection equipment on the railroads is examined. The book has been approved by the Chief Administration of Education Institutions of the MPS (Ministry of Railroads) as a textbook for rail transportation.

NTIAC-023398

Kessler, Lawrence W.; Yuhas, Donald E.
"Acoustic Microscopy—A Tutorial Review"; December 1979, 25 pp; Acoustical Imaging, Vol. 9, 9th International Symposium on Acoustical Holography Proceedings, 3-6 December 1979, Houston, TX, 275-299; Plenum Press, New York, 227 West 17th St., New York, NY 10011

Acoustic microscopy is emerging as an important analytical technique serving the needs of both biomedical and materials technology. By means of very high frequency elastic waves, acoustic microscopes reveal structural-mechanical properties of specimens at high magnification. A review of the techniques and applications is presented in this reprinted article entitled "Acoustic Microscopy-1979". (Author)

NTIAC-023407

Sutton, Jerry L.
"A Tutorial on Underwater Acoustic Imaging"; December 1979, 32 pp; Acoustical Imaging, Vol. 9, 9th International Symposium on Acoustical Holography Proceedings, 3-6 December 1979, Houston, TX, 599-630; Plenum Press, New York, 227 West 17th Street, New York, NY 10011

The purpose of underwater acoustic imaging is to produce two dimensional images of underwater objects that are somehow recognizable, or at least useful. Underwater acoustic imaging systems are generally useful for either classifying objects or observing the details of objects, usually from some form of underwater vehicle. For example, acoustic imaging systems are useful in differentiating mines from rocks, coral heads, and garbage on the ocean bottom, and in general, differentiating between objects that warrant further investigation and the many uninteresting objects that are in the ocean. Acoustic imaging systems are also useful for inspecting or examining objects when water turbidity precludes the use of closed circuit television or other optical means of viewing. (Author)

NTIAC-022789

United States Air Force

"Nondestructive Inspection Methods"; Technical order, March 1979, 1 pp, T.O. 33B-1-1; AFO Kelly AFB, San Antonio ALC/MMEDTD, Kelly AFB, TX 78241 (T.O. 33B-1-1)

This is a loose-leaf text covering the basic theory and general applications of the following NDE methods: liquid penetrant, magnetic particle, electromagnetic, ultrasonic, and penetrating radiation. (NTIAC)

5. STANDARDS, SPECIFICATIONS, AND RECOMMENDED PRACTICES

5.1 Introduction

This is a listing of documents concerned with the many aspects associated with the philosophy and establishment of standards and related items. The 1979 Handbook was a listing of specific standards with, in most cases, a brief description of each standard. This supplement focuses on those documents concerned with establishing standards. While many of these documents cite existing standards, they generally are concerned with the nature, philosophy and criteria for establishing standards, procedures, and recommended practices. This material interfaces with, and complements, the specific standards cited in the 1979 Handbook. References concerned with certification procedures and requirements are also included.

5.2 Index

5.3 Bibliography of Standards, Specifications and Recommended Practices

NTIAC-015988

Cuthill, John R.

"ASTM Committee E-42 on Surface Analysis: Its History, Scope, Activities, and Objectives"; *Standardization News*, 6, 2, February 1978, 8-11, 59-60

American Society of Testing and Materials Committee E-42 on surface analysis was formally established at a meeting in Chicago, 30 September 1976, evolving from subcommittee E02.02 on surface analysis of committee E-2 on emission spectroscopy. E02.02 was established March 1974 to provide standards for surface analysis techniques - Auger electron spectroscopy (AES), electron spectroscopy for chemical analysis (ESCA), ion scattering spectroscopy (ISS), and secondary ion mass spectrometry (SIMS). These are currently recognized analytical techniques, emerging from the research laboratories to become a part of the regular arsenal of analytical techniques. These techniques are related in that, in each case, the specimen is bombarded by energetic electrons, ions, etc. According to E-42, the surface is that material which might be expected to differ from the bulk, in terms of chemical composition, binding energy, atomic spacing, etc. The depth of this surface zone varies from a few angstroms to several micrometers according to the material. (NTIAC)

NTIAC-016173

Yatsun, M. A.; Kardash, Y. I.; Chernov, A. S.

"An Analysis of Method Errors in Inspecting Pipe Differing in Wall Thickness"; *Soviet Journal of Nondestructive Testing*, 13, 3, May-June 1977, 295-300 (English Translation March 1978)

A harmonic method of analyzing method errors in measuring the average and minimum wall thickness of metal pipe is described. The values of the errors are determined and recommendations are given for choosing the inspection zone and the number of transducers. (Author)

NTIAC-016348

Alburger, J. R.

"Notes on the History of Testing Panels for Inspection Penetrants"; ASNT National Spring Conference Paper Summaries, April 3-6, 1978; New Orleans, LA; 257-270; American Society for Nondestructive Testing; 4153 Arlingate Plaza, Caller #28518, Columbus, OH 43228-0518

The author reviews efforts which have been made in the direction of developing test panels leading up to the most recent and versatile panels, the Y-404 fractured-glass test panels. The author discusses intrinsic brightness, flaw detection sensitivity, contrast, time-temperature response, leach-loss of removers, and residual background noise. A summary is given of procedures for using the panels. (NTIAC)

NTIAC-016701

Smith, V. Devon; Teller, Cecil M.; Swanson, Robert K.

"Engineering Services to Determine Acceptance Limits of Ultrasonic Transducers for Nondestructive Inspection"; Final engineering report, June 1978, 65 pp, TIDEP E105 2512, F41608-77 C 1381; Southwest Research Institute, P.O. Drawer 28510, San Antonio, TX 78284, AD-A056648

Electrical, ultrasonic, and flaw response performance was characterized for 23 ultrasonic transducers used by the Air Force to inspect aircraft components. Wide variation was noted in the response of these transducers to sample flaws, including a flat-bottom hole, an Elox notch, and two laboratory generated fatigue cracks. Seventeen parameters descriptive of the characteristics of these transducers were defined and correlations between these parameters and the flaw detection performance analyzed. Good correlation between loop sensitivity and ability to detect the sample flaws was shown for each transducer in the set. Other parameters of significance appear to be transducer center frequency, beamwidth spectrum inflection, and beam inflection. Definitions of these parameters are presented. A performance rating based on the significant parameters was developed, and, on the basis of this rating, only two of the 23 transducers were judged to be good and eleven fair. In the case of fatigue cracks the response of individual transducers ranged from signals several times the noise background permitting easy crack detection and a transducer rating of good to no signal which means the crack would not be detected and a transducer rating of poor.

NTIAC-016758

Rackwitz, R.

"On the Comparability of Acceptance Tests for Concrete by Operation Characteristics" (In German, Abstract translated by NTIAC); *Materialprufung*, 20, 6, June 1978, 230-232

The mere statistical side of test regulations can be judged with the help of their operational characteristics. Their location and scope determine which probability produced data are accepted or rejected. At the quality control of conc~~e~~te and in the case of a negative decision at normal quality control, a following secondary test is the rule. The operational characteristics with secondary tests are presented for DIN 1045, DIN 1084, and DIN 10[illegible] respectively. Full comparison of various test regulations based on operational characteristics can be achieved only if the various sampling rates for specimens and the number of decisions are included in the considerations. Proposals for improving quality control regulations of concrete are presented. (Author/NTIAC)

NTIAC-016906

Berger, Harold; Mordfin, Leonard

"Calibrations and Standards for Nondestructive Testing"; *Materials Evaluation*, 36, 11, October 1978, 36-39

Improved nondestructive testing (NDT) standards and calibrations are needed to provide greater reproducibility of NDT measurements and to provide improvements in the quantitative characterization of defects. Different calibration and standards concepts may be required to meet these two needs. This theme is developed and illustrated by radiographic measurements of trans-Alaska oil pipeline girth welds. (Author)

NTIAC-016907

Landolt, J. F.; Stump, W. D.; Summers, J. L.

"A Visual Comparative Method for Radiographic Determination of Defect Thickness"; *Materials Evaluation*, 36, 11, October 1978, 33-35

A comparative procedure has been developed to determine the thickness of defects in welds and other materials. This determination may be made from existing and/or single view radiographs where additional radiography is not practical. (Author)

NTIAC-016932M

Cahall, R.

"Nondestructive Evaluation Systems For the Naval Aviation Maintenance Environment Technology Assessment"; Final report, August 1972-September 1977, 05 July 1978, 128 pp, NAFC-GSED 120; Naval Air Engineering Center, Lakehorst, NJ, AD-A058146

Under NAVAIRSYSCOM direction, NAEC-GSED conducted an investigation and analysis of the field of nondestructive evaluation as it relates to the Naval aviation community. This report finalizes that task. Areas of discussion include: general description of what NDE is and why it is practiced, how inspection requirements are established and suggested methods for improvement, assessment of the positive impact expanded utilization of NDE could provide, discussion of present and future field inspection requirements, technology base assessment/projection, and recommended research program options. (Author)

NTIAC-016964

Glazkov, Yu. A.

"Definition of New Professional Qualifications in Nondestructive Testing"; *Soviet Journal of Nondestructive Testing*, 14, 2, February 1978, 165-168 (English Translation November 1978)

The major deficiencies of the existing qualification scales for flaw-detecting workers are discussed and major lines of improvement are suggested. (Author)

NTIAC-017012M

Judak, S. J., Jr.; Saxena, A.; Bucci, R. J.; Malcolm, R. C.

"Development of Standard Methods of Testing and Analyzing Fatigue Crack Growth Rate Data"; Final report, May 1978, 268 pp, AFML TR-78-40, GIDEP E143 2433, 77 9D3-AFCGR-R1, F33615-75-C-5064; Westinghouse Research and Development Center, Pittsburgh, PA, AD-A058320

Results are presented which provide the basis for the development of an ASTM standard for generating, analyzing and presenting fatigue crack growth rate data. Comprehensive data were also obtained on the individual and combined effects of load ratio, cyclic frequency, test temperature and environment on fatigue crack growth rates in a 10Ni steel and a 2219-T851 alluminum alloy. These data are used to demonstrate the utility of the proposed test methods. A new mathematical representation of wide-range fatigue crack growth rate data is also proposed which has advantages over existing representations. (Author)

NTIAC-017180

Hall, A. J.; Fleming, J. E. E.

"A Method of Calibrating Contact B-Scanners"; *Ultrasonics*, 16, 6, November 1978, 277-281

The test method described enables the registration of contact B-scanners to be calibrated without using water-immersed targets. It is simple to implement and analytical in nature, allowing several variables to be checked and set. (Author)

NTIAC-017288

Smallman, H.; Whittle, M. J.

"The Assessment and Specification of Ultrasonic Probes"; *British Journal of Non-Destructive Testing*, 20, 6, November 1978, 296-302

A comprehensive range of equipment for assessing ultrasonic probes has been assembled at the NDT Applications Centre of the C.E.G.B., and large numbers of commercial transducers have been examined. About one third of these proved to be defective, pointing to the need for improved quality control by manufacturers. Accordingly, we are drafting a number of standards for probes which define the performance required by the C.E.G.B. In contrast with previous probe standards, these define acceptable ranges for the various probe parameters. The first standard, which applies to single and twin crystal miniature angle probes, has been circulated for comment within the U.K., and will be issued very shortly. (Author)

NTIAC-017364

Birnbaum, George

"New Candidates for Ultrasonic NDE Standards and Calibrations"; ARPA/AFML Review of Progress in Quantitative NDE, May 1978, 289-293; Rockwell International Science Center, 1049 Camino Dos Rios, Thousand Oaks, CA 91360; May 1978, 5 p

This paper discusses the NBS program in acoustic-ultrasonic standards and calibrations. Certain elements of this program were initiated with medical applications in mind while others address some current standards and calibrations problems in NDE. Since ultrasonice NDE depends so vitally on transducer performance, much effort has been devoted to its characterization, and a formal calibration service is planned in the near future. Transducer characterization includes determination of the entire radiation pattern from near field measurements, and measurements of the total radiated power by calorimetry and an electrical method. Work on acoustic emission transducers is directed at the determination of sensitivity and spectral response by the use of a reproducible stress impulse. The reliability of flat-bottom hole aluminum reference blocks has been improved to the point where a calibration service has been established. (Author/NTIAC)

NTIAC-017407

Tittmann, B. R.; Paton, N. E.

"New Ultrasonic Standards"; ARPA/AFML Review of Progress in Quantitative NDE Proceedings, May 1978, 331-335; Rockwell International, Science International, 1049 Camino Dos Rios, Thousand Oaks, CA 91360

Standard samples containing defects of known size, shape, and location are requirements for the evaluation and calibration of NDE test equipment. Here we review the methods developed for producing such samples from selected metallic alloys and ceramics. In the work with metallic alloys, the method of diffusion bonding TI-6AL-4V is presented in some detail and is illustrated for a large number of samples containing a variety of defects ranging from spherical cavities and inclusions, to prolate and oblate spheroids, to thin discs and simulated cracks. In the work with ceramics, the method of hot pressing of glasses with cavities and inclusions is illustrated for a variety of defects. The presentation demonstrates how these samples may be applied in a procedure for calibrating ultrasonic systems by employing a recently proposed characteristic equation for the system and a figure-of-merit for the transducers in analogy to the gain of a radar antenna. (Author)

NTIAC-017480

Schmidt, J.T.

"Quality Control of Inspection Materials—What Does it Take Today"; *Materials Evaluation*, 37, 3, February 1979, 43-50

Nondestructive testing is not a fail-safe process. Absence of an indication may mean either a good part or a failure of the inspection process. This paper describes the tests necessary to assure reasonable quality and uniformity of the expendable materials used, thus minimizing the probability of a process failure due to faulty materials. For this discussion the tests are divided into categories related to the purpose to be served by each test. Included are tests which measure discontinuity detection ability (performance), tests related to product hazards for the operator, the equipment used and the parts tested, tests related to the overall cost of the inspection, and tests which determine product uniformity or composition. Each test is briefly described, as is its purpose and importance. (Author)

NTIAC-017555M

Wulf, Walter F.; Phytila, Melvin V.; Catalano, Salvatore B.; Matichuk, Don

"Development of Quality Assurance Training Manual to Assist in Establishing Soundness Requirements for Aluminum and Steel Castings"; Technical report, August 78, 66 pp, TARADCOM-TR-12256, Army Tank-Automotive Research and Development Command, Warren, MI, AD-A061248

Samples of aluminum and steel casting flaws most commonly experienced in production were selected to be radiographed in order to develop quantitative and descriptive picture images of various radiographic reference standards. Graphic illustrations of flaw size and flaw distribution for various radiographic reference standards were depicted by using radiographs and associated cross-sectional photo-macrographs. These graphic illustrations of radiographic levels of acceptance will provide meaningful design criteria for establishing realistic standards of acceptance for new material applications. This report also furnishes operational guidance to quality assurance and radiographic personnel in their normal on-the-job duties. (Author)

NTIAC-017564

Treywin, E. T.

"The Quality Scene in the UK"; 4th International Conference Automated Inspection and Product Control Proceedings, 7-9 November 1978, Chicago, IL, 1-11; American Defense Preparedness Association, Washington, DC 20005

The paper reviews the quality scene in the UK and highlights the problem areas. The influence of government, industry and trade unions is discussed in the overall concept of quality and reliability. Finally how automated production will align itself with quality. (Author)

NTIAC-017698

Shives, T. Robert; Willard, William A.

"Product Durability and Life"; 27th Meeting MFPG, National Bureau of Standards Proceedings, Gaithersburg, MD, 1-3 November 1977, May 78, 188 pp; National Bureau of Standards, Washington, DC, For Sale by U. S. GPO, Washington, DC 20402

These proceedings consist of a group of nineteen submitted papers from the 27th meeting of the Mechanical Failures Prevention Group which was held at the National Bureau of Standards in Gaithersburg, Maryland, on November 1-3, 1977. The central theme of the proceedings pertains to the durability of consumer products. Special emphasis is on durability technology, product testing, product performance, the economics of extending product life, and labeling products for durability. (Author)

NTIAC-017713M

Herr, E. Louis; Grabarek, Chester

"Standardizing the Evaluation of Candidate Materials for High L/D Penetrators"; Final report, September 1978, 31 pp, ARBRL-MR-02860; Army Armament Research and Development Command, Ballistics Research Lab, Aberdeen Providng Ground, MD, AD-A062101

A procedure using penetration performance criteria for characterizing and evaluating the potential of candidate materials for use as kinetic energy penetrators has been developed. A preliminary quick method for screening candidate penetrator materials, the up-down V_{50} ballistic limit test and a more complete method of evaluation, the x-ray diagnostic procedure, are described. (Author)

NTIAC-017754

Lewis, W. H.; Sproat, W. H.; Pless, W. M.

"Reliability of Nondestructive Inspections"; Government/Industry Workshop Proceedings; 2-4 August 1978, Houston, TX, December 1978, 304 pp, SA-ALC/MME 76-6-38-2, F41608-76-C-A005; Lockheed-Georgia Co., Marietta, GA

The NDI reliability workshop was held in Houston, Texas on August 2-4, 1978, to present the results of the Air Force Logistics Command Program, "Determination of NDI Reliability," and to provide a forum for evaluating the results and discussing approaches for NDI reliability improvement. Attendance at the workshop was limited to government and industry personnel whose primary interest was in nondestructive inspection, fracture mechanics, NDE equipment and quality assurance. The workshop consisted of formal presentation, working task groups involving all attendees, and a general discussion forum. These workshop proceedings contain a transcript of the general discussion forum which presented the task group's conclusions and recommendations for nondestructive inspection improvement. (Author)

NTIAC-017976M

Chwirut, Daniel J.; Boswell, Gary D.

"The Evaluation of Search Units used for Ultrasonic Reference Block Calibrations"; February 1978, 30 pp, NBS IR-78-1454; National Technical Information Service, Springfield, VA 22161 (PB-280311), National Bureau of Standards, Washington, DC

The effects of using different (nominally identical) quartz search units in the evaluation of ASTM-type standard reference blocks are determined. Various characteristics of the search units are measured and correlated with the amplitude of the ultrasonic response from reference blocks to determine which characteristics must be specified if reproducible results are to be obtained. It is shown by a series of experiments that the exact shape of the distance-amplitude curve in water (axial profile) is a primary characteristic that must be considered. When operational corrections for differences in axial profiles are made, the variability in ultrasonic responses from reference blocks, measured with different search units, is reduced from about 25 percent to 4 percent. (Author)

NTIAC-017984M

Blakeman, E. D.; Allen, E. J.; Jenkins, J. D.

"An Evaluation of NDA Techniques and Instruments for Assay of Nuclear Waste at a Waste Terminal Storage Facility"; May 1978, 84 pp, ORNL/TM-6163; Oak Ridge National Lab, Tennessee; National Technical Information Service, Springfield, VA 22161 (ORNL/TM-6163)

The use of nondestructive assay (NDA) instrumentation at a nuclear waste terminal storage facility for purposes of special nuclear material (SNM) accountability is evaluated. Background information is given concerning general NDA techniques and the relative advantages and disadvantages of active and passive NDA methods are discussed. The projected characteristics and amounts of nuclear wastes that will be delivered to a waste terminal storage facility are presented. Wastes are divided into four categories: high level waste, cladding waste, intermediate level waste, and low level waste. Applications of NDA methods to the assay of these waste types is discussed. Several existing active and passive NDA instruments are described and, where applicable, results of assays performed on wastes in large containers (e.g. 55-gal. drums) are given. It is concluded that it will be difficult to routinely achieve accuracies better than approximately 10-30% with "simple" NDA devices or 5-20% with more sophisticated NDA instruments for compacted wastes. It is recommended that NDA instruments not be used for safeguards accountability at a waste storage facility. It is concluded that item accountability methods be implemented. These conclusions and recommendations are detailed in a concurrent report entitled "Recommendations on the Safeguards Requirements Related to the Accountability of Special Nuclear Material at Waste Terminal Storage Facilities" by J. D. Jenkins, E. J. Allen and E. D. Blakeman. (Author)

NTIAC-018180

Masing, W.
"From Inspection to Quality Assurance" (In German, Abstract in English); *Materialprufung*, 21, 2, February 1979, 43-45

The distinction introduced by F. W. Taylor (1856-1915) between plans and their implementation in industrial operations required the institution of the 'Inspector,' who is still with us. The inspector must decide whether the actual values for the quality features of a product correspond to the specifications. If not, the inspector must reject the goods. Reasonable and successful inspection requires for every feature under consideration that a quantitative specification be formulated and that such features may be measured. Often vague specifications permit considerable subjectivity—'without burrs,' 'light gray,' 'acceptable seating.' Excessive demands are thus made of the inspection function, if we require the classification of products into those which are acceptable and those which are not. Concepts have been revised during the past 20 years—by defining quality as the suitability of a product for meeting certain requirements relative to the intended use. (NTIAC)

NTIAC-018191

Christianus, Dieter; Fischer, Karl-Heinz
"Ultrasonic Testing and Inspection of Steel Castings for Use at Elevated Temperatures According to DIN 17245—Correlation between Radiographic Examination in Accordance with ASTM" (In German, Abstract in English); *Materialprufung*, 20, 8, August 1978, 295-298

Nondestructive testing has hardly been described thus far in German steel standards and delivery terms for steel castings. DIN 17245 for heat-resistance ferritic steel castings (July 1967 version) was an exception; it contained the first data about the maximum permissible defects in radiographic testing. The US (ultrasonic) method for finding interior defects was mentioned along wtih radiographic examination, but for the former method also, the defect limits indicated are those according to the ASTM (American Society for Testing and Materials) Reference Image Series. It is clear to every practitioner that it is just in the case of steel castings that it is not always possible to determine the true defect type on the basis of the reflection behavior of an inhomogeneity, because the number of possible defects is so great and their orientation cannot be predicted accurately. In any case, two physically different methods cannot be compared directly. If we analyze foreign standards for steel castings, then we find somewhat more material about nondestructive testing. Generally, the criteria established, however, go back to the guidelines of radiographic testing according to ASTM. A Westinghouse specification, the ASTM norm A-609 and the ASME (American Society of Mechanical Engineers) specifications for components of nuclear reactors are exceptions. In general, there is a tendency to give increased attention to ultrasonic testing. The time has come to use this method less subjectively and to work out testing and acceptance specifications which would be uniform for the manufacturer and purchaser. This led to the Steel/Iron Test Pamphlet (SIP, 1922, Second Edition, June, 1977) and the DIN 17245 (October, 1977). (NTIAC)

NTIAC-018196

Dodd, C. V.; Scott, G. W.; McClung, R. W.; Deeds, W. E.

"Eddy Current Inpsection for Steam Generator Tubing Program Annual Progress Report for Period Ending December 31, 1978, May 1979, 17 pp, NUREG/CRO764; Oak Ridge National Lab, TN; National Technical Information Service, Springfield, VA 22161

Eddy current methods provide the best in-service inspection of steam generator tubing, but present techniques can produce ambiguity because of the many independent variables that affect the signals. The current development program will use existing mathematical models and develop or modify computer programs to design optimum probes, instrumentation, and techniques for multifrequency, multiproperty examination. Interactive calculations and experimental measurements are made with the use of modular eddy current instrumentation and a minicomputer. These establish the coefficients for the complicated equations that define the values of the desired properties (and the attainable accuracy) despite changes in other significant variables. The final eddy current instruments will contain on-board microcomputers for realtime data processing and interpretation. Progress has been made in establishing the necessary computer codes, constructing some of the basic modules for the instrumentation, and acquiring selected tubing reference standards. To date, our results show that eddy current inspection does work and can make far better measurements than are possible with existing commercial instruments. (Author)

NTIAC-018451M

Dance, W. D.

"N-Ray Inspection of Aircraft Structures using Mobile Sources: A Compendium of Radiographic Results"; Final report, 18 May 1977-22 December 1978, 16 April 1979, NAEC 92 116, ATC-B-92200/8CR-137, N68335-77-C-0555; Vought Corp., Advanced Technology Center, Inc., Dallas, TX, AD-A068316

This report presents a compendium of typical results of neutron radiographic inspections performed on aircraft structures and laboratory structural specimens. The radiographs are representative of the capability of isotope or small accelerator (nonreactor) neutron sources for imaging defects in aircraft and missile structures. The results show that: (1) the resolution and sensitivity of transportable sources are adequate for effective inspection of structures for many commonly occurring defects (the validity of the technique is established), and (2) the systems utilized to obtain these results prove the feasibility of making N-Ray systems sufficiently portable for field inspection of aircraft. Recommendations are made for implementing the transition from exploratory work to a routine field inspection capability. (Author)

NTIAC-018524M

Anderson, C. W.

"Eddy Current Testing and Ultrasonic Reference Standards for Depleted Uranium Barstock"; Final report, March 1979, 27 pp, NSWC/TR-79-86; Naval Surface Weapons Center, Dahlgren Lab, VA, AD-A070295

The design and testing of ultrasonic test standards for one-half inch (12.7 mm) diameter depleted uranium barstock is discussed. This report also explores the feasibility of testing the barstock for near surface flaws using an eddy current technique. It is shown that eddy current testing is the most efficient means available for detecting surface and near surface flaws in the barstock material. (Author)

NTIAC-018620

Weglein, R. D.

"An Acoustic Gray Scale for Scanning Acoustic Microscopy and Diagnostic Ultrasound"; *Ultrasonic Imaging*, 1, 1, January 1979, 89-100

The principle of a true acoustic gray scale standard is presented and experimentally applied to the scanning acoustic microscope (SAM). The implementation is based on the impedance matching property of a quarter wave impedance transformer through which precise changes in reflection coefficient may be produced in a single material. The performance of the first implementation designed for 375 MHZ operation is described and the implications of its use are discussed in detail. The application of the principle to diagnostic ultrasound is also treated. (Author)

NTIAC-018625

Muir, G.

"Certification for In-Water Survey and Inspection"; *British Journal of Non-Destructive Testing*, 21, 5, September 1979, 256-266

This paper reviews the training and certification of nondestructive testing personnel for in-service maintenance and inspection of off-shore structures. Consideration is also given to current schemes already in vogue onshore. (Author)

NTIAC-018690

Heimerdinger, M. W.

"Quality Control of Adhesive Bonding"; Presented at Business Aircraft Meeting Exposition Century II, 3-6 April, 1979, Wichita, KS; Available only from Author, 1979, 8 pp; Society of Automotive Engineers, Inc., Warrendale, PA 15096

The quality control of adhesive bonded panels begins with the arrival of the adhesive system at the fabricating facility. Whether an adhesive must be kept refrigerated or stored at room temperature, its quality must be verified and maintained until it is cured in a bonded assembly. Panel detail prefit, surface preparation, curing temperature, and pressure must all be maintained within prescribed parameters to obtain quality. The utilization of process verification coupons adds assurance of correct processing and verifies the strength of the bond assembly. Nondestructive inspection (NDI) is a valuable tool used to provide final assurance of correct processing. NDI comes in many shapes, and selection of the method to be employed must be given careful consideration. Underinspection can make the assemblies cost prohibitive. A few of the methods available will be discussed from visual inspection to ultrasonic through transmission with 'C' scan recordings. (Author)

NTIAC-018790

Troitskii, V. A.; Adamenko, A. A.; Grom, V. S.; Valevich, M. I.; Demidko, V. G.

"Standardization of the Radiographic Flaw Detection of Welded Joints"; *Soviet Journal of Nondestructive Testing*, 14, 10, October 1978, 944-945 (English translation, June 1979)

The authors discuss the difference between absolute and relative sensitivity and give examples of the determination of these two sensitivities. (NTIAC)

NTIAC-018791

Goncharov, E. N.

"Problem of Planning Statistical Acceptance Monitoring When Using Flaw Detection Methods"; *Soviet Journal of Nondestructive Testing*, 14, 10, October 1978, 946-948 (English translation, June 1979)

The author develops an analytical technique for statistical acceptance monitoring when using various flaw detection methods. (NTIAC)

NTIAC-018792

Dorf, V. A.; Kashkarov, K. P.; Leshchinskii, M. Yu.; Sidorenco, M. V.; Sizov, G. V.

"Standardization of Nondestructive Methods of Determining the Strength of Concrete with Mechanical Action Samples"; *Soviet Journal of Nondestructive Testing*, 14, 10, October 1978, 951-952 (English translation, June 1979)

This is a brief listing of several Russian standards for NDE methods of determining the strength of concrete. (NTIAC)

NTIAC-018874

Fischer, Robert E.

"Society of Photo-optical Instrumentation Engineers Contemporary Optical Systems and Components

Specifications — Volume 181—Proceedings"; 1979, 180 pp; Society of Photo-optical Instrumentation Engineers, 405 Fieldston Road, Bellingham, WA 98225

One of the most difficult yet crucial tasks in optical systems engineering is the meaningful assignment of specifications, the purpose of which is to assure that the system meets its original performance goal in actual use. There exists, however, a lack of standardization and understanding in optical systems and component specifications; yet the proper generation of specifications can yield more cost-effective systems which meet performance goals and can be fabricated by any qualified vendor. The purpose of this seminar was to evaluate critically the present methods of assigning specifications and to propose, if appropriate, more useful and meaningful forms of specifications. (Author)

NTIAC-018947

Chwirut, Daniel J.

"Recent Improvements to the ASTM-Type Ultrasonic Reference Block System"; Final report, 1 January 1976-31 January 1979; July 1979, 57 pp; AFML TR-79-4080, F33615-76-F-6751; National Bureau of Standards, Washington, DC, AD-A074724

Recent activities aimed toward improving the ASTM-type ultrasonic reference block system are described. On the aluminum block system (ASTM E 127 and NBS TN 924), efforts were focused on better definition of the measurement equipment (transducer and instrument), the implementation of a Measurement Assurance Program and Loaner Block Service, and modeling of the distance-amplitude relationship. It is shown that a large increase in the precision of reference block readings is easily achievable by implementing simple changes and controls in the measurement procedure. On steel and titanium block (e.g. ASTM E-428), efforts were directed toward quantifying the extent of reproducibility possible among blocks fabricated by both conventional drilling and by diffusion bonding. Reasonable reproducibility is achievable by both, with the diffusion-bonding process offering both advantages and disadvantages. (Author)

NTIAC-018986

Meyer, Hans J.

"Problematics of Inspection and Evaluation of Welded Joints with Regard to Inspection Procedure, Quality Requirements and the Various National Codes and Standards"; 12th Symposium on Nondestructive Evaluation Proceedings, 24-26 April 1979, San Antonio, TX; Nondestructive Testing Information Analysis Center, P.O. Drawer 28510, San Antonio, TX 78284

General survey and review of welding inspection and codes in Germany. (Author)

NTIAC-019014

Ross, D. S.

"Mass Spectrometer Calibration Standard"; NASA Tech Brief, Vol. 3, No. 1, Item 57, October 1978, 2 p; Jet Propulsion Lab, Pasadena, CA

Use of a fluorochemical liquid as an inert calibration standard material in the described technique makes it possible for the first time to have unambiguous identification of mass peaks as produced by the inert liquid, and therefore assures precision calibration of the mass spectrometer over a broad range of mass numbers. This in turn provides a much-improved residual gas analyzer for vacuum chambers. (Author)

NTIAC-019051

Schneider, Eric J.

"Recent American and International Developments in the Assessment of Surface Quality and Their Effect on the Future"; *Wear*, 57, 1, November 1979, 17-32

Surface geometry measurement, especially surface roughness measurement, has taken significantly different, although sometimes overlapping, directions in the United States on the one hand and in Europe and the rest of the industrial nations on the other. Developments of shop instruments, research instruments, new parameters, standards and sensors will call for new approaches to instrumentation and use with truly inexpensive simple devices, flexible quality control instruments, automated surface inspection and the 'ultimate' surface quality analysis center benefitting from microprocessors and advances in computer technology and electro-optics. (Author)

NTIAC-019081

Berger, H.
"National and International Standards for NDT: To Achieve Improved Repeatability and Measures Related to Performance"; 9th World Conference on Nondestructive Testing Proceedings, 19-23 November 1979, Melbourne, Australia; Vol. Plenary Lectures, 11 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia
Nondestructive testing (NDT) standards provide a practical procedure to bring some measure of reproducibility to NDT measurements. Nevertheless, better standards are needed both to improve reproducibility and to provide quantitative data for performance-related analyses. (Author)

NTIAC-019084

Hollamby, D. C.
"Ultrasonic Flaw Detection and Characterization — An Australian View"; 9th World Conference on Nondestructive Testing Proceedings, 19-23 November 1979, Melbourne, Australia; Vol. Plenary Lectures, 11 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia
A large variability of test results was found to result from differing probe and instrument characteristics. The need for standards and specifications to better reflect the capabilities of NDT methods is emphasized. (Author)

NTIAC-019085

VanValkenburg, H. E.
"Calibration and Standards Programs for Ultrasonic NDT in the United States"; 9th World Conference on Nondestructive Testing Proceedings, 19-23 November 1979, Melbourne, Australia, 6-1, 9 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia
Sources of NDT standards documents in U.S.A. Review of current philosophy and procedures. Need for consistent terminology. Widespread use of test blocks for calibration, qualification and acceptance criteria. Status of electronic standardization techniques. (Author)

NTIAC-019086

Virgo, A. G.
"An Australian Approach to Standardizing Ultrasonic Weld Testing Methods"; 9th World Conference on Nondestructive Testing Proceedings, 19-23 November 1979, Melbourne, Australia, 6-2, 8 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia
Codes for ultrasonic examination tend to be either too detailed and restrictive or alternatively too flexible. Australian standard 2207-1979 attempts to lay down standard methods and at the same time leave flexibility to cater for the varied requirements of weld testing. (Author) (Also published in *Nondestructive Testing—Australia*, 17,3, March 1980, 9-11, 13, 16)

NTIAC-019087

Koukhar, V. A.; Maksimov, A. A.; Berger, H.
"A Comparison of NDT Standards in the U.S. and U.S.S.R."; 9th World Conference on Nondestructive Testing Proceedings, 19-23 November 1979, Melbourne, Australia, 6-3, 9 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parville 3052, Victoria, Australia
An initial comparison and analysis is given for several radiographic and ultrasonic standards of the U.S. (ASTM) and the U.S.S.R. (GOST). This study is part of a joint U.S./U.S.S.R. project on automated information systems in standardization. Differences between standards are pointed out. (Author)

NTIAC-019131

Schnitger, Heidt H.

"Actual Situation of Standardization in the Field of Radiation Methods and Radiation Protection in the Federal Republic of Germany"; 9th World Conference on Nondestructive Testing Proceedings, 19-23 November 1979, Melbourne, Australia, 6-4, 8 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia

This paper gives a general view on the West German state of standardization in the field of radiography. Detailed discussion is given concerning two tasks: testing metallic welds by x-rays or gamma rays, and viewing conditions for film. (NTIAC)

NTIAC-019135

Hall, J. M.

"Quality Assurance Planning in the SEGV"; 9th World Conference on Nondestructive Testing Proceedings, 19-23 November 1979, Melbourne, Australia, 2A-12, 8 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia

The basic concepts of quality assurance planning adopted by the state electricity commision of Victoria in the manufacture of power plants are explained. In the climate of extremely costly plant outages quality assurance planning is an economical necessity. (Author)

NTIAC-019150

Isshiki, S; Niwa, N.

"New Certification Scheme for NDT Personnel in Japan"; 9th World Conference on Nondestructive Testing Proceedings, 19-23 November 1979, Melbourne, Australia, 7-3, 4 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia

Three grades certification scheme had been in force since 1968 by the administration of the Japanese Society for NDI. New four grades system had started in 1978. About 14,500 certificates are effective in March 1979. (Author)

NTIAC-019151

Schaper, H.; Kopineck, H. J.

"International Qualification of NDT Personnel"; 9th World Conference on Nondestructive Testing Proceedings, 19-23 November 1979, Melbourne, Australia, 7-4, 6 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia

Outline of the German Society for Nondestructive Testing (DGZFP) system and for gradual international harmonization of training and qualifications for various levels of NDT personnel. Differences on administrative level depend on conditions in different countries, impact should therefore be on preferably a three-level system of technical qualifications as used in many countries. (Author)

NTIAC-019152

Bobbin, J.; Hellier, C.

"An Approach to International Personnel Certification"; 9th World Conference on Nondestructive Testing Proceedings, 19-23 November 1979, Melbourne, Australia, 7-5, 6 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia

Universal agreement to a single personnel qualification and certification plan, based on the many national schemes, seems impossible. However, by separating the technical aspects, where much agreement already lies, from the diverse administration requirements, could possibly lead to a prompt, if limited, acceptance providing wide economic benefits. (Author)

NTIAC-019154

Guerassimov, V. G.; Sukhorukov, V. V.; Tseplyaeva, M. S.
"Training of Specialists on Nondestructive Testing in the U.S.S.R."; 9th World Conference on Nondestructive Testing Proceedings, 19-23 November 1979, Melbourne, Australia, 7-7, 5 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia

Some extracts from the curricula of some basic institutions preparing engineers with the specialities in the field of nondestrucitve testing. (Author)

NTIAC-029255

Young, J. G.
"Certification of NDT Personnel"; 9th World Conference on Nondestructive Testing Proceedings, 19-23 November 1979, Melbourne, Australia, 7-8, 9 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia

The author has been closely associated with NDT certification for the past eleven years, principally through being secretary to SCWIP since its inception in 1969 but also as a member of various committees and panels on certification, including the international working group on the subject. The paper is a distillation of the author's experiences in establishing and operating the world's first major independent certification scheme for NDT personnel. Amongst the subjects discussed are the applications to be covered by a scheme (SCWIP is mainly but not exclusively concerned with welding), levels and job responsibilities, the content and conduct of examinations, marking systems, entry requirements for candidates, training for certification, administrative procedures and recognition of certificates. A personal view of the way to international collaboration is expressed. (Author)

NTIAC-019156

Chapman, H.
"Certification of Canadian Firms and Individuals in Welding Inspection"; 9th World Conference on Nondestructive Testing Proceedings, 19-23 November 1979, Melbourne, Australia, 7-10, 9 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia

The Canadian Welding Bureau certifies welding inspectors under CSA Standard W178, qualification code for welding inspection organizations. The thrust of the standard is to accredit the inspection firm, and individuals are certified as members of their firm or department. Approval of the firm's welding inspection procedures is also encompassed. (Author)

NTIAC-019157

Kemp, R. W.
"Welding Inspection — Education, Training and Certification"; 9th World Conference on Nondestructive Testing Proceedings, 19-23 November 1979, Melbourne, Australia, 7DD-1, 11 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia

An outline of the education and training programs for welding inspectors and the Australian Welding Institute's welding inspector's certification scheme. Comparisons are made with other welding inspectors certification schemes.

NTIAC-019164

Perdijon, J.
"Calibration and Specifications for Nondestructive Testing of Thin-Wall Tubing"; 9th World Conference on Nondestructive Testing Proceedings, 19-23 November 1979, Melbourne, Australia, 1A-7, 6 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia

In order to compare the results obtained with two test benches, the qualities of a bench must first be characterized. Once this is done, it is possible to establish specifications guaranteeing a quality level for the tubes and avoiding conflicting results of tests performed by the producer and the consumer. (Author)

NTIAC-019176

LaPorte, A.; Bouloumie, J. P.
"Standard Procedures for Nondestructive Testing by Neutron Radiography"; 9th World Conference on Nondestructive Testing Proceedings, 19-23 November 1979, Melbourne, Australia, 4K-1, 12 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia

The inspection of industrial parts by neutron radiography requires the setting up of standard test procedures. A critical study of existing standards was carried out, especially for testing pyrotechnic components associated with the European Ariane Space Program. (Author)

NTIAC-019210

Isono, E.; Fujimori, T.
"Standardization of Automatic Ultrasonic Testing of Steel Welds in Japan"; 9th World Conference on Nondestructive Testing Proceedings, 19-23 November 1979, Melbourne, Australia, 1C-4, 8 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia

It is desirable to standardize the minimum requirements, definitions and related matters before the automatic testing is used widely. In Japan, the Task Group on Automatic Ultrasonic Testing for Welds had been organized in 1976 and has specified NDIS 2407-76. (Author)

NTIAC-019268

Leonov, I. G.; Nikiforova, Z. S.
"Metrological Support of Nondestructive Testing"; 9th World Conference on Nondestructive Testing Proceedings, 19-23 November 1979, Melbourne, Australia, 4A-21, 3 pp; Australian Institute for Nondestructive Testing, 191 Royal Parade, Parkville 3052, Victoria, Australia

The evolvement of technique, means, and standard base for metrological certification of the nondestructive testing facilities and the practice of state supervision guarantee credibility and comparability of the product quality testing results. (Author)

NTIAC-019341

Leonov, I. G.
"Metrological Provisions for Nondestructive Testing Equipment"; Measurement Techniques, No. 3, March 1978, 317-319

A general discussion of the desirable characteristics for all measuring instruments used in NDE. (NTIAC)

NTIAC-019346

Margolis, R. D.
"Quality Assurance of Manufactured Components"; Advanced Composites: Design and Applications, 29th Meeting of the Mechanical Failures Prevention Group Proceedings, 23-25 May 1979, Gaithersburg, MD, 174; Superintendent of Documents, U. S. GPO, Washington, DC 10401, NBS SP-563

This paper describes progress to date on a joint effort of Rockwell Plastics and Ford Motor Company to apply nondestructive testing techniques in the quality control testing of adhesive bonded plastic truck hood assemblies. The program involves selection of a suitable sonic testing device to measure adhesive bond integrity along with laboratory trials to establish procedures and measure the instrument's flaw detection capabilities in testing the instrument's viability in an industrial environment and provide a data base for establishing quality control specificaitons. (Author)

NTIAC-019390M

Sheeter, Dwight S.
"Comparative Evaluation of Container Leak Test Procedures of Federal Test Method Standard 101B

Method 5009"; July 1979, 5 pp, PTPT 79-13; Air Force Packaging Evaluation Agency, Wright-Patterson AFB, OH, AD-A073749

This report presents an evaluation in Container Leak tests, i.e., the squeeze technique, (para 6.4), versus the vacuum chamber technique (para 6.2), prescribed in method 5009-1 of Federal Test Method Standard 101-B. The squeeze test was found to be a suitable alternative to the vacuum chamber test for determining leaks in flexible self-supporting containers sealed in atmospheric conditions. (Author)

NTIAC-019412

Cecco, V. S.

"Design and Specifications of a High Saturation Absolute Eddy Current Probe with Internal Reference"; *Material Evaluation*, 37, 13, December 1979, 51-58

This report describes the design and specifications of an eddy current probe developed for the inspection of Monel 400 steam generator tubes. This probe has four new features: absolute coil with internal reference, high saturation multi-magnet bobbin, flexibility for traversing small U-Bend radius tubes, and interchangeability through a 4-pin connector. Computer and experimental saturation plots were used to maximize the complex permanent magnet saturation arrangement. A toroidal reference coil was designed and built to track the impedance with frequency of the test coil. This probe has a high signal/noise ratio, a low temperature drift and can be used at frequencies between 20 and 200 kHz with a 30 M multi-conductor cable. (Author)

NTIAC-019707M

Carver, James G.

"Improved Specifications for Composite Propellant Binders for Army Weapon Systems"; Technical report, 27 July 1979, 24 pp, DRSMI-T-79-76; Army Missile Command Redstone Arsenal, Technology Lab, AL, AD-A078026

This project has been accomplished as part of the U.S. Army Materials Testing Technology Program, which has for its objective the timely establishment of testing techniques, procedures, or prototype equipment (in mechanical, chemical or nondestructive testing) to insure efficient inspection methods for materiel/material procured or maintained by DARCOM. (Author)

NTIAC-019747

1980 Annual Book of ASTM Standards Part 11 Metallography: Nondestructive Testing; American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103

This book contains all currently formally approved ASTM standard specifications, test methods, classifications, definitions, and practices, and related material such as proposals. The book is replaced annually. (NTIAC)

NTIAC-019755

Eitzen, Donald G.

"Measurement Services for Ultrasonic Nondestructive Evaluation"; *Dimensions*, 63, 3, March 1979, 14-16

This brief paper describes measurement services available from NBS, including ultrasonic transducer power output vs. frequency, ultrasonic transducer and system power output by calorimetry, aluminum ultrasonic reference block calibration, loaner services for transducers and reference blocks. (NTIAC)

NTIAC-019825

"Factors Exercising a Technical Influence to be Taken into Consideration in the Establishment and Execution of a Quality Assurance Programme for Pressure Vessels"; *Welding in the World*, 17, 5/6, 1979, 131-150

This document gives a comprehensive list of controls, checks, and tests available for quality control and assurance of welds of pressure vessels, broken down into stages before welding, during welding, and after welding. (NTIAC)

NTIAC-019906

De La Pintiere, Louis; Knuter, Norman J.

"An Analysis of Variables that Influence Multifrequency Eddy Current Tubing Inspection"; National Spring Conference, ASNT Paper Summaries, 24-27 March 1980, Philadelphia, PA, 93-95

Applying multifrequency eddy current techniques in order to satisfy steam generator or heat exchanger tubing NDT testing inspection requirements is straightforward, assuming one uses some logic in selecting the appropriate operating frequencies and mixing methods to suppress the unwanted signals; i.e., support plate, ID noise, dent, etc. Based on five years of multifrequency field experience on various steam generator and heat exchanger PSI and ISI in Europe and USA, this paper addresses parameters that should be given consideration in order to establish viable multifrequency field inspection procedures and presents recommendations toward obtaining satisfactory frequency mixing results. (Author)

NTIAC-019907

Gunther, Karl M.

"Holiday Detection — A Potentially Valuable Method of Nondestructive Testing", National Spring Conference ASNT, Paper Summaries, 24-27 March 1980, Philadelphia, PA, 96-97

After years of field usage, Holiday detectors are being utilized in the laboratory. They can be used to test the integrity of any nonconductive coating on a metal substrate, coating dielectric strength, and verify coating thickness. However, until recently, there has been no standard by which to operate these machines. Therefore, the instruments were used by many people under widely varying conditions. A new standard governing use of Holiday detectors has just been released as ASTM G-62-79, "Standard Test Methods for Holiday Detection in Pipeline Coatings". Usage of this standard will allow interlaboratory results to be more meaningful. (Author)

NTIAC-020033

Drost, Cornelis J.; Milanowski, G. Jan

"Self-Reciprocity Calibration of Arbitrarily Terminated Ultrasonic Transducers"; IEEE Transactions on Sonics and Ultrasonics, SU-27, 2, March 1980, 65-71

Conventional electroacoustic reciprocity techniques, which constitute excellent primary standards for the calibration of sonar transducers, have found little acceptance in the megahertz frequency range. Extensions of these techniques are derived which can easily be applied at such higher frequencies. The conventional reciprocity formulation is generalized to include transducers with arbitrary electrical termination. This extension allows one to define a calibration standard for high-frequency transducers with prescribed termination, e.g., 50 ohms. A novel reciprocity calibration method is presented which establishes the power transfer in a transmit-receive chain under actual operating conditions. Transducer performance is measured as the ratio of received voltage produced across the transducer terminating resistance and the ideal driving source voltage. This ratio directly yields the transducer gain of the electroacoustic chain. An electronic implementation of this method is described, and sample measurements are shown where the performance of a transducer is characterized as a function of frequency, source resistance, and acoustic field angle. (Author)

NTIAC-020182

Nichols, R. W.

Developments in Pressure Vessel Technology-2 — Inspection and Testing, Applied Science Publishers Ltd., Ripple Road, Barking, Essex, England

This book contains seven chapters devoted to radiography, developments in the industrial application of ultrasonic testing, current practices for ultrasonic and radiographic examination of tubes, tube plates and tube-plate welds, acoustic emission techniques, developments in various countries in operator certification for nondestructive testing, and quality control and quality assurance. (NTIAC)

NTIAC-020188

Drury, J.
"Developments in Various Countries in Operator Certification for Nondestructive Testing"; *Developments in Pressure Vessel Technology-2,* 1979, 199-221; Applied Science Publishers Ltd., Ripple Road, Barking, Essex, England

This chapter describes the various types of operator certification schemes currently in use. It begins by defining a number of levels of certification in terms of operator performance criteria. The different approaches to certification, such as schemes devised and controlled by inspection authorities, insurance companies and organizations using inspection services, schemes controlled by employers of nondestructive testing personnel, and schemes devised and controlled by independent organizations, are discussed. Finally, current and proposed schemes from the USA, UK, Germany, Japan, France and Scandinavia, including the Unicert Scheme, are described in some detail so that comparisons can be made. (Author)

NTIAC-020189

Burgess, N. T.
"Quality Control and Quality Assurance"; *Developments in Pressure Vessel Technology-2,* 1979, 215-235; Applied Science Publishers Ltd., Ripple Road, Barking, Essex, England

This chapter highlights some of the trends that have taken place in recent years that affect the application of inpsection and testing practices and procedures. The economics of the design and manufacture of pressure vessels as well as the increased importance of safety and reliability and changed legislantion have focused attention on the fundamentals of quality and in its achievement. The philosophy of quality control and the practices of quality assurance are dealt with, with particular reference to pressure vessels, and this should complement the information included in earlier chapters. (Author)

NTIAC-020298

Naumov, N. M.; Miklyaev, P. G.
"Standard Models for Measuring Electrical Conductivity"; *Soviet Journal of Nondestructive Testing,* 15, 8, August 1979, 664-667 (English translation, April 1980)

The article suggests a method of measuring electrical conductivity with the aid of standard models (S.M.). It describes a method of producing and measuring standard conductivity models. A comparison is made of the bridge and eddy current methods. (Author)

NTIAC-020319

Collins, R. M.
"NDI Policy and Techniques for Advanced Composites"; New Horizons — Materials and Processes for the Eighties, 11th National SAMPE Tech. Conference, 13-15 November 1979, Boston, MA, 178-191; Society for the Advancement of Material and Process Engineering, P. O. Box 613, Azusa, CA 91702

An NDI policy that has provided the guidance necessary to assure the quality of primary structure is described. Critical defect types for NDI are defined. Designs for NDI standards, applicable to variable attenuative structures are described. The effect of longitudinal ultrasonic waves propagating through the laminate thickness is discussed. The utility of NDI techniques for defect depth determination, per ply thickness measurement, detection of radii or edge defects, and the prediction of ultimate or residual strength of a structure are presented. (Author)

NTIAC-020522

Lautzenheiser, Clarence E.; Trigilio, Richard F.; Meredith, William R.
"NDE Personnel Needs in Nuclear Industry"; American Nuclear Society Transactions, Vol. 32, 1979 Annual Meeting, 3-7 June 1979, Atlanta, GA, 98; American Nuclear Society

This is a short review of the resources and the needs for NDE personnel within the nuclear industry. (NTIAC)

NTIAC-020743

Kusenberger, Felix N.; Barton, John R.

"Special Engineering Services to Establish Inpsection Criteria for Bearings to Improve Life Prediction"; Final report, December 1979, 168 pp, F09603-74-C-5158; Southwest Research Institute, P.O. Drawer 28510, San Antonio, TX 78284, AD-A088765

The CIBLE (Critical Inspection of Bearings for Life Extension) program concept for quantitative nondestructive evaluation of bearing components is briefly reviewed and the automatic inspection equipment used to acquire the data presented in this report is described. Many examples of significant crack networks detected in the races of vendor reworked bearings as well as subsurface flaw indications in a new bearing are illustrated. The savings realized by elimination of the potential for inclusion nucleated failure from the group of CIBLE inspected bearings is estimated, and the future economic benefits of removing potential failures from the J57-2 and J57-4 engine bearings currently in the fleet are also projected. The results of endurance testing bearings with service-induced cracks at low stress levels and flaw indications at higher levels are presented and discussed. The results of metallurgical examination of service-induced cracked regions as well as other flaw regions are illustrated, and the results from 1000 balls inspected at the Oklahoma City Air Logistics Center (OCALC) are summarized. A preliminary serviceability criteria for races is outlined and implementation of the criteria is discussed. (Author)

NTIAC-020774

Graber, H. C.

"Overview of ASTM — Radiographic Standards Activities"; National Fall Conference ASNT, Paper Summaries, 15-18 October 1979, St. Louis, MO, 75-80; American Society for Nondestructive Testing, 4153 Arlingate Plaza, Caller No. 28518, Columbus, OH 43228-0518

This paper discusses program activity highlights including penetrameters, realtime imaging, radiographic practices, and film classification. (NTIAC)

NTIAC-020775

Kuriyama, M.; Boettinger, W. J.; Burdette, H. E.

"Real-Time Radiographic System Performance Standards"; National Fall Conference ASNT, Paper Summaries, 15-18 October 1979, St. Louis, MO, 81-85; American Society for Nondestructive Testing, 4153 Arlingate Plaza, Caller No. 28518, Columbus, OH 43228-0518

The paper discusses the need for standards and proposes a possible unified method to describe the fundamental characteristics of any realtime radiographic system. The feasibility of the method is demonstrated using an actual x-ray source for a radiographic system. (NTIAC)

NTIAC-020864

Burdekin, F. M.

"The British Standard Committee WEE/37 Draft and IIW Approaches"; *Developments in Pressure Vessel Technology-1 Flaw Analysis*, 1979, 63-95; Applied Science Publishers Ltd., Ripple Road, Barking, Essex, England

For some years there have been discussions in the UK as to whether there should be a formal British standard on the acceptability of flaws in welded construction. There is still no clear agreement as to whether rules for the acceptance of flaws in welded construction should be given in the form of a standard or code and at the present time it seems likely that information on this subject will be issued in the form of a guidance document rather than a mandatory standard. At the same time, discussions have been held within the commissions of the International Institute of Welding and a guidance document prepared by a working group of Commission X dealing with assessment of the significance of weld defects in respect to brittle fracture failure. This chapter sets out the background and detailed requirements to the British Standard WEE/37 discussions and the IIW approach, giving the basic information necessary for assessment of the acceptability of flaws as detailed in these approaches. (Author)

NTIAC-020879

Chwirut, Daniel J.; Eitzen, Donald G.

"Toward the Development of Improved Reference Fatigue Cracks for use in Ultrasonic Nondestructive Evaluation"; International Advances in Nondestructive Testing, Vol. 6, 1979, 179-197; Gordon and Breach Science Publishers Inc., One Park Ave., New York, NY 10016

A rationale for the development of well-characterized fatigue cracks for use as standards for advanced ultrasonic flaw evaluation systems is presented. The primary parameters affecting the ultrasonic response from fatigue cracks are reviewed. A loading program to generate controlled cracks and to minimize the effects of some of these parameters is described. Complementary nondestructive techniques for determining crack geometry, including ultrasonic, radiographic, and mechanical techniques, were developed. As determined by these techniques, measured crack lengths are accurate within a few percent. These specimens are being used as test objects in the development of new techniques for flaw evaluation by ultrasonics, radiography, and penetrants. (Author)

NTIAC-020916

NBS Standard Reference Materials Catalog 1979-1980 Edition

April 79, 106 pp, NBX SP 260; Superintendent of Documents, U. S. GPO, Washington, DC; National Bureau of Standards, Washinton, DC

This catalog lists those standard reference materials (SRM's), research materials (RM's), and special reference materials (GM's) that are available from the National Bureau of Standards (NBS), and those that are soon to be available. The catalog describes these materials as to their certified characterization, unit size, and type, as well as providing ordering information. Prices for these materials are listed separately in annual supplements to this catalog. (Author)

NTIAC-020917

Belanger, B. C.

"Calibration and Related Measurement Services of the National Bureau of Standards"; April 1978, 107 pp, NBS SP 250; Superintendent of Documents, U. S. GPO, Washington, DC 20402; National Bureau of Standards, Washington, DC

This publication provides detailed descriptions of the currently available NBS calibration services, measurement assurance programs, and other measurement services. In addition, each section describing specific services contains references to additional publications giving even more detail about the measurement techniques and procedures used. This revised edition reflects the services available as of the fourth quarter of 1977. NBS Special Publication 250 was last issued in 1970. The appendix to SP 250 is reviewed every six months (June and December). It lists current prices for the services described in this publication and the NBS points of contact (addresses and phone numbers) from whom additional information can be obtained. (Author)

NTIAC-020971M

Golan, Sam

"A Comparison of American and European Ultrasonic Testing Standards"; August 1979, 74 pp; National Technical Information Service, Springfield, VA 22161 (PB 298809); National Bureau of Standards, Washington, DC

In this report, 27 general ultrasonic testing standards from eleven countries and international organizations are reviewed and evaluated. Also, 37 ultrasonic testing standards for specific products, from five countries, are examined in order to evaluate their utilization of the general ultrasonic testing standards, i.e., the extent to which the procedures outlined in the general standards are applied by the product standards. Finally, the 'universal' concept of ultrasonic testing standards versus the 'specific' product-oriented concept is discussed. (Author)

NTIAC-021005

Stipura, A. P.; Zagorulko, V. S.; Shchipanov, V. A.; Vyunichenco, V. N.
"Standardization of Sensitivity in Automatic Ultrasonic Inspection of Pipe Weld Joints"; *Soviet Journal of Nondestructive Testing*, 15, 11, November 1979, 952-955 (English translation, July 1980)
Methods have been developed for preparing standards and adjusting the sensitivity of ultrasonic inspection units for inspectings the quality of the weld joints in large-diameter gas and oil pipe. (Author)

NTIAC-021025M

Russel, R. J.
"Plating Thickness Standards"; Final report, January 1970, 1 p; National Technical Information Service, Springfield, VA 22161 (BDX-613-2032-REV.); Bendix Corp., Kansas City, MO
A variety of standards that have been developed and fabricated for the nondestructive measurement of plating thickness are listed. The development and fabrication of TIB2-ON-steel thickness standards are described. Pure-copper-foil reference units were provided for use in the four-point resistance measurement of copper-on-epoxy-board plating thickness. (Author)

NTIAC-021108M

Olley, D. A.
"Development of a Tubular Comparator for Radiographic Evaluation of Steel Tube Structures"; *Technical Memo*, March 1980, 17 pp, ARL/MAT-TM-374; Aeronautical Research Labs, Melbourne, Australia, AD-A086596
A description is given of the development of a tubular comparator, containing internal blind holes, for application in the radiographic inspection of tubular components suspected of being corroded on their inner surfaces. (Author)

NTIAC-021149

Hellier, Charles J.
"The Myth of Certification"; *Materials Evaluation*, 38, 9, September 1980, 37-40; American Society for Nondestructive Testing, 4153 Arlingate Plaza, Caller No. 28518, Columbus, OH 43228-0518
This is an 'opinion' paper delineating the need for the development of a fair, high quality system for personnel certification through the American Society for Nondestructive Testing. The author proposes 13 items which should be considered in developing such a program. He recommends that the entire program be administered and controlled by full time employees of ASNT and that immediate action be taken to develop the program. (NTIAC)

NTIAC-021477

Landolt, J. F.; Stump, W. D.; Summers, J. L.

"A Visual Comparative Method for Radiographic Determination of Defect Thickness"; NDT for Energy Progress, National Fall Confence ASNT, Paper Summaries, 6-9 October 1980, Houston, TX, 193-194; American Society for Nondestructive Testing, 4153 Arlingate Plaza, Caller No. 28518, Columbus, OH 43228-0518
The Rock Flats Nondestructive Testing Department has been requested, at various times, to determine the thickness of defects in welds and other materials. Thickness of the defect is the third dimension perpendicular to the plane of the film. These defects are located in welds and other materials in locations that make additional testing impractical, and the determinations have to be made from existing radiographs. These defects are mostly irregular in shape, vary in thickness and are located at random depths. (Author)

NTIAC-021502

Kosovskii, D. I.; Shkarlet, Yu. M.

"Ways of Making Standard-Conductivity Specimens for Eddy Current Instruments"; *Soviet Journal of Nondestructive Testing*, 16, 2, February 1980, 71-75 (English translation, October 1980)

It is shown that standard eddy current instruments should be supplemented with simulators for standard conductivity specimens, and a criterion is derived for the performance of such a simulator in terms of the agreement between the hodograph and the basic hodograph of the monitored object (in the case of devices for use with massive bodies, with the hodograph for response to a conducting half space). It is shown that these eddy current simulators are best made stratified. (Author)

NTIAC-021611

Tietz, H. D.

"Material Testing — An Integral Part of Quality Assurance"; *Feingeraetetechnik* (Germany), 28, 12, 1979, 540-543; Electrical & Electronics Abstracts, 83, 994, October 1980 (English Abstract)

The development of nondestructive testing has been notable and, in particular, applications of radiographic, ultrasonic, magnetic, and magnetoinductive methods have been widely propagated. Quantitative methods are treated as a new concept in this area under the heading 'defectometry'. Test requirements must be shaped wiht a full knowledge of the manufacturing processes and subsequent service conditions. The setting-up of test specification for components is based conveniently on prototype tests. For one type of aircraft, 536 nondestructive tests were called for: 59% visual, 14% ultrasonic, 16% radiographic, 7% eddy current, and the balance magnetic, etc. (Author)

NTIAC-021842

Moiseeva, N. N.; Shchukin, V. A.; Yablonik, L. M.

"Basic Positions of the New Industry Standard on Ultrasonic Inspection of Weld Joints and Surfacing"; *Soviet Journal of Nondestructive Testing*, 16, 3, March 1980, 171-174 (English translation, November 1980)

Basic method positions in ultrasonic inspection of butt, tee, angle, and cross-shaped weld joints of low-carbon, low-alloy, and medium-alloy steels made with low-alloy, austenitic-ferritic, and austenitic welding materials with a joint thickness of 6-400 mm and a facing thickness from 3 to 25 mm are presented. It is shown how the industry standard takes into consideration features of ultrasonic inspection of circular and longitudinal joints in cylindrical parts with a diameter of 300 mm and more and of joints in pipe with a diameter of 25-300 mm. (Author)

NTIAC-021910

Hsu, N. N.; Breckenridge, F. R.

"Characterization and Calibration of Acoustic Emission Sensors"; *Materials Evaluation*, 39, 1, January 1981, 60-68

It is generally agreed that AE sensor calibration is necessary to the quantification of AE techonology. However, how a sensor should be calibrated remains a question subject to argument. In this paper, we first discuss conceptually how a sensor can be characterized, and what assumptions must be made to facilitate the actual calibration. The selection of a specific calibration technique depends on the particular application. A critierion for the selection is also discussed. Then various suggested calibration techniques are compared in terms of underlying principles and assumptions, specific methods and procedures, and limitations and advantages. The helium gas jet technique and the reciprocity technique are reviewed. The step-force calibration technique is described in detail. Sample calibration results of a commercial sensor are shown. (Author)

NTIAC-021983

Conn, Don L.

"New and Improved ASTM-Type Ultrasonic Standard Reference Blocks"; Ultrasonic Materials Characterization, 1st International Symposium Proceedings, 7-9 June 1978, Gaithersburg, MD, NBS SP 596, 587-594; National Bureau of Standards, Washington, DC 20234

This paper describes the development of diffusion bonded ultrasonic reference standards (blocks) of the ASTM type which offer many advantages over standards containing conventional drilled flat bottom holes. These advantages include: (1) diffusion bonded blocks contain perfectly flat and dimensionally accurate sonically reflected areas, (2) the reflecting areas are truly perpendicular to the sound beam, (3) diffusion bonded blocks can be fabricated from many materials, (4) such blocks can be interrogated from either end resulting in two sound travel distances per block, and (5) diffusion bonded reference standards can be fabricated containing either naturally occurring or simulated defects. (Author)

NTIAC-021995

Guthrie, G. L.; McElroy, W. N.

"LWR Pressure Vessel Irradiation Surveillance Dosimetry"; Quarterly progress report, January 1980, December 1980, 70 pp, NUREG CR-1241, HEDL TME 80-4, B5988-7; National Technical Information Service, Springfield, VA 22161 (NUREG/CR-1241, Vol. 1); Hanford Engineering Development Lab, Richland, WA

This report describes progress made in the Light Water Reactor Pressure Vessel Irradiation Surveillance Oosimetry Program during the reportfng period. The primary objective of the multilaboratory program is to prepare an updated and improved set of dosimetry, damage correlation, and associated reactor analysis ASTM standards for LWR-PB irradiation surveillance programs. Supporting this objective are a series of analytical and experimental validation and calibration studies in 'standard, reference, and controlled environment benchmark fields', reactor 'test regions', and operating power reactor 'surveillance positions'. (Author)

NTIAC-022159

Hollamby, D. C.

"Ultrasonic Flaw Detection and Characterization—An Australian View"; *Non-Destructive Testing—Australia*, 17, 10, October 1980, 9-13, 15

A large variability of test results was found to result from differing probe and instrument characteristics. The need for standards and specification to better reflect the capabilities of NDT methods is emphasized. (Author)

NTIAC-022167

Weymueller, Carl R.

"Ultrasonic NDT — Is it Good Enough?"; *Welding Design & Fabrication*, May 1980, 84-87

This is a survey article discussing the general qualifications of UT inspectors, and the quality of UT equipment. It is concluded that UT instruments satisfy the conditions necessary for welding specification, but lack true precision. (NTIAC)

NTIAC-022175

Kosovskii, D. I.; Shkarlet, Yu. M.

"Eddy-Current Multilayer Standard Specimens of Electrical Conductivity"; *Soviet Journal of Nondestructive Testing*, 16, 5, May 1980, 343-348 (English translation, January 1981)

The possibility of reproducing the electrical conductivity of large articles of thickness greater than the penetration depth of eddy currents using multilayer articles is analyzed. By comparing hodographs of articles with a different number of layers, thickness, and electrical conductivity, the construction of a simulator is found which enables the properties of a uniform conducting half space to be reproduced most accurately. (Author)

NTIAC-022197

Anderson, W. F.; Chockie, L. J.; Parker, W. O.

"Revisions to the ASME Section XI Inservice Inspection Code to Accommodate Enforcement on Old and New Nuclear Power Plants"; Periodic Inspection of Pressurized Components; Institution of Mechanical Engineers Conference, B-10, May 1979, London, England, Paper C22/79, 13-16; Mechanical Engineering Publications Ltd., P. O. Box 24, Northgate Ave., Bury St., Edmunds, Suffolk IP32 6BW, England

The codes effecting the program of inservice inspections in the United States are published by the American Society of Mechanical Engineers and adopted as a mandatory requirement by regulations of the U. S. Nuclear Regulatory Commission, as well as adoption by most of the jurisdictions in which the nuclear power plants are located. Initially, the code was written to cover only the primary portion of the plant. During the ten years since the first edition was published, the coverage was broadened to include more of the pressure boundary of the plant, as well as the functional operational requirements of the pumps and valves in the system. Following this, refinements were made to reduce the amount of effort required where experience and studies dictated that a commensurate benefit was not being realized; and also at the same time examinational requirements were increased where ft was determined that coverage was not adequate. The modification to the rules contained in Section XI is shown in the Summer 1978 Addenda in recognition of the problems encountered when recent revisions of the code were attempted to be implemented in the older plants as well as implemented in the plants currently undergoing construciton. The modifications were necessary to accommodate the enforcement of the rules as mandatory requirements on both old and new plants. (Author)

NTIAC-022199

Cereceda, M.; Alsonso, A.

"Spanish Experiences on ISI Codes and Standards"; Periodic Inspection of Pressurized Components, Institution of Mechanical Engineers Conference, 8-10 May 1979, London, England, Paper C24/79, 21-27; Mechanical Engineering Publications Ltd., P. O. Box 24, Northgate Ave., Bury St., Edmunds, Suffolk IP32 6BW, England

Implementation of inservice inspection programs in Spain is being performed applying codes and standards used in the country that provides the nuclear steam supplier system. Code edition applied for each preservice or inservice inspection is carefully selected to satisfy the requirements of nuclear regulations, updating, in come cases, this edition to later ones, in order to provide a more realistic inservice inspection program within the established safety limits. (Author)

NTIAC-022213

Silk, M. G.

"Accurate Techniques for Defect Sizing in Pressurized Components"; Periodic Inspection of Pressurized Components, Institution of Mechanical Engineers Conference, 8-10 May 1979, London, England, Paper C43/79, 155-162; Mechanical Engineering Publications Ltd., P. O. Box 24, Northgate Ave., Bury St., Edmunds, Suffolk IP32 6BW, England

The general comment which could be made about all forms of nondestructive examination, until quite recently, was that techniques were available which allow defects to be located but that there was little precision in defect sizing. Thus, while the safety of components can be assured by rigorous inspection procedures, this often results in expensive repairs or replacement where pessimistic assumptions have to be made regarding defect size. On the other hand, where less rigorous inspection is carried out, the size of defects may be significantly underestimated. This unsatisfactory situation has prompted considerable development of improved NDT techniques, particularly in the field of ultrasonics. A number of these techniques are described in detail and conclusions drawn regarding their accuracy, which in many cases is better than plus or minus 1 mm, and their potential in the wide range of material thickness from which pressurized components are constructed. It is important, of course, that we do not set too precise a target for the accuracy of these techniques, since it may be equally uneconomic to inspect to too high a standard. For this reason, some thought is also given to the level of precision the newer generation of techniques should be capable of achieving. It is shown that the required error is much smaller than is often assumed. (Author)

NTIAC-022314

Smith, J. M.

"Strong Need for Improved Ultrasonic Standards for Inspection of Artillery Shell Metal Bodies"; DAR-

PA/AFML Review of Progress in Quantitative NDE Proceedings, 8-13 July 1979, Scripps Institution of Oceanography, La Jolla, CA, 583-585; Rockwell International Science Center, 1049 Camino Dos Rios, Thousand Oaks, CA 91360

Ultrasonic standards for artillery shells are made by machining grooves into inert projectile bodies. Current standards are difficult to design and build and do not realistically simulate manufacturing defects. This poster paper will discuss the design process and use of ultrasonic standards and will describe some of their current limitations. (Author)

NTIAC-022315

Eitzen, D. G.; Berger, H.; Birnbaum, G.

"A Basis for Traceable NDE Standards"; DARPA/AFML Review of Progress in Quantitative NDE Proceedings, 8-13 July 1979, Scripps Institution of Oceanography, La Jolla, CA, 586-578; Rockwell International Science Center, 1049 Camino Dos Rios, Thousand Oaks, CA 91360

The National Bureau of Standards (NBS) is beginning to provide a mechanism for traceability for a number of NDE measurement procedures, an activity that is expected to have a significant, positive impact on the reproducibility and accuracy of NDE measurements. Much of the NDE standards activity has been in ultrasonics and acoustic emission, this effort leading to calibration services for ultrasonic reference blocks and ultrasonic and acoustic emission transducers. Additional NDE standards are also available or are being developed in radiography, eddy currents, magnetic particles, liquid penetrants, and visual testing. (Author)

NTIAC-022318

Birks, A. S.; Posakony, G. J.

"Development of Advanced NDE Ultrasonic Equipment"; DARPA/AFML Review of Progress in Quantitative NDE Proceedings, 8-13 July 1979, Scripps Institution of Oceanography, La Jolla, CA, 605-611; Rockwell International Science Center, 1049 Camino Dos Rios, Thousand Oaks, CA 91360

Recent studies to determine the probability of detection of nondestructive examination methods by the Air Force indicate that these capabilities are severely limited. One of the factors contributing to the insufficiency of ultrasonic testing is realted to a general lack of versatility and capability of commercial ultrasonic equipment. Inadequate instrument reliability, inconsistent components including transducers, and uncertain calibration standards further compromise the potential utility of this method. Battelle Pacific Northwest Laboratories, under the sponsorship of the Manufacturing Technology Division of the Air Force Materials Laboratory, is developing an advanced ultrasonic nondestructive testing system directed at resolving these deficiencies. As a result, this program will establish a modular ultrasonic system specification that will prevent near term obsolescence by permitting the addition of new technology such as ARPA developments in the form of additional or replacement modules. This paper will describe the Phase I and II tasks and objectives which are planned to establish an equipment specification, demonstrate initial specification, demonstrate initial prototype systems, and provide a procurement specification and technical manual. Progress to date will be summarized. (Author)

NTIAC-022353

Sergeeva, A. I.

"Criteria for Evaluating the Precision in Measuring the Thickness of Films and Coatings"; *Measurement Techniques*, 22, 11, November 1979, 1316-1318 (English translation, April 1980)

This paper is a short discussion of the mathematic definitions of average thickness of films and coatings. (NTIAC)

NTIAC-022459

Hitchman, M. L.; Gale, M. T.; Sandercock, J. R.

"Calibration Standards for Surface Profile Monitors"; *Journal of Physics E: Scientific Instruments*, 13, 1, January 1980, 19-20

Thickness measurements of thin films are often made with surface profile monitors. The preparation and optical measurement of a set of standards that will allow the calibration of a surface profile monitor to an accuracy of plus or minus 1% are described. With these standards, it has been found that the use of calibration standards provided by the manufacturers of such monitors can lead to errors in thickness measurements of over 5%. (Author)

NTIAC-022544

Thomas, Graham H.; Rose, Joseph L.

"An Ultrasonic Evaluation and Quality Control Tool for Adhesive Bonds"; *The Journal of Adhesion*, 10, 4, May 1980, 293-316

The problem of predicting adhesive bond performance for both surface praparation and under-cure defects has been studied using an ultrasonic, experimental test bed system. This experimental test bed incorporates the ultrasonic and computer equipment necessary to acquire and process data from various types of adhesively bonded test specimens. The computer hardware and software has been developed to allow the design of reliable pattern recognition algorithms for the evaluation of surface preparation and bond cure. The specific problem studied is the inspection of the adhesive bond in an aluminum to aluminum step-lap joint whose strength could be affected by improper surface preparation or undercure. A set of 154 bond specimens was used to design an algorithm that is 91% reliable for separating the specimens into a good class, those bonds with no defects, or a weak class, bonds with poor surface preparation or undercured adhesive layer. A Fisher linear discriminant function was selected by the test bed as the best patterern recognition routine for this classification problem. (Author)

NTIAC-022559

Heard, L. S.

"NDT Quality Management"; *Metals Australasia*, 11, 7, August 1979, 7-9

If Australian manufacturing industry is to be competitive in overseas and home markets, all means available must be used to ensure products of high quality and reliability. Ways in which nondestructive testing can be used and improved to help achieve this are discussed. (Author)

NTIAC-022591

Pope, C. W.

"Selection, Specification and Design of Tests"; *Metals Australasia*, 11, 7, August 1979, 10-12, 15

Much of the current NDT carried out in industry is not appropriate to the application or sufficiently cost effective. Factors influencing the selection of testing procedures such as cost, safety, speed, test capability, convenience and the existence of suitable codes are discussed. Mention is made of and specifications to aid in specifying tests. The importance of prior consultation is stressed. Although considerable time, effort and cost is committed annually to NDT, much of it is not really cost effective, and regrettably often generates more heat than light. Before applying NDT to any situation, it is necessary to answer the following basic questions: (A) why is the test to be carried out?, (B) what defect or defect types do we wish to detect?, (C) how much testing is required?, and (O) when is the test to be carried out? These questions will be examined in more detail. (Author)

NTIAC-022647

Taylor, T. T.; Selby, G. P.

"Evaluation of ASME Section XI Reference Level Sensitivity for Initiation of Ultrasonic Inspection Examination"; April 1981, 59 pp; National Technical Information Service, Springfield, VA 22161 (NUREG/CR-1957); Battelle Memorial Institute, Pacific Northwest Labs, Richland, WA

This report evaluates the change in inspection sensitivity resulting in major changes of ASME Boiler and Pressure Vessel Code Section XI between 1974 and 1977 editions. It was found that the inspection sensitivity resulting from requirements of the 1977 edition of Section XI were not adequate to detect minimum flaws referenced by same code. (Author)

NTIAC-022711

Stern, Irving L.; Alia, Bruno L.

"Materials, Fabrication and Inspection Requirements for Offshore Fixed Structures"; 1980 Offshore Technology Conference Proceedings, Vol. II, 5-8 May 1980, Houston, TX, 71-82

At the time of preparation of this paper, the final drafts of American Bureau of Shipping (ABS) rules for offshore fixed installation, American Petroleum Institute (API) recommended practice (RP-2A) and U. S. Geological Survey (USGS) regulations discussed herein were being processed through the governing bodies of the respective organizations. The above reflects the dynamic status of the subject. The information presented herein is intended to convey an understanding of the ABS rules for fixed offshore installations relative to materials, welding, and nondestructive testing and to indicate their relationship to related documents of other technical organizations, classification societies and regulatory bodies. While substantial changes in the ABS, API, and USGS specifications presented are unlikely, details presented herein should be checked with the latest edition of the specifications which are expected to be available from the organizations in early 1980. (NTIAC)

NTIAC-022725M

Franck, David E.; Barrar, Robert

"The Air Force Nondestructive Inspection Management Information System Development Program. Phase II—Preliminary Design and Approval. Task 2—On-Site Data Collection"; Interim report, March 1981, 40 pp, 8AALC MM-006862, 2214-22-TR-2410, F41608-79-D-A014; ARINC Research Corp., Annapolis, MD, AD-A097670

This report summarizes the Task 2 activities of ARINC Research Corporation in support of Phase II of the Air Force Nondestructive Inspection (NDI) Program Office (MMEI) at the San Antonio Air Logistics Center (SAALC), Kelly Air Force Base, TX. These activities, performed as part of Contract F41608-79-D-A014-0004, included field collection of NDI maintenance data to assess their applicability to a proposed NDI Management Information System. The objective of this task was to monitor NDI maintenance at three selected air bases and document the NDI activities by use of both the current Air Force NDI documentation procedures and NDI maintenance codes proposed in ARINC Research publication 1555-11-1-2068. (Author)

NTIAC-022798

Katsulai, Hiroshi; Arimizu, Noboru

"Evaluation of Image Fidelity by Means of the Fidelogram and Level Mean-Square Error"; IEEE Transactions on Pattern Analysis and Machine Intelligence, PAMI-3, No. 3, May 1981, 337-347; IEEE, 345 East 47th St., New York, NY 10017

In the present correspondence a method for the representation of image fidelity is proposed and demonstrated by experimental examples. A fidelity measure is also proposed, which is a formal extension of the commonly utilized mean-square error. The characteristics of these fidelity representations are discussed. As a result, it is shown that the representations proposed here are effective, in the sense that they can display clearly the level variance and average levels of the processed image for the standard one, or make it possible to evaluate image fidelity from definite aspects, as compared to existing fidelity representations. (Author)

NTIAC-022880

Sproat, W. H.

"New Ultrasonic Standard Design Criteria"; Final report, January 1981, 63 pp; AFWAL TR-80-4198, LG81ER0125, F33615-79-C-5022; Lockheed-Georgia Co., Marietta, GA, AD-A100321

The purpose of the effort was to identify, on solid theoretical grounds, an alternative approach, to the standardization and calibration of ultrasonic nondestructive evaluation (NDE) systems, which would overcome the limitations of the commonly employed flat bottom hole standards, and to design and fabricate a laboratory prototype device to demonstrate the alternative approach to NDI standards. After establishment of the performance criteria to be met by the alternative standard, an approach based on a software programmable electronic standard simulator was selected for the design and construction of the prototype demonstration device. The resulting device has the capability of assisting the user in: equipment checkout and calibration, set-up on reference standards and diagnosis of equipment malfunctions. The ultrasonic standard simulator may be used in either an automatic mode, to perform preprogrammed tests, or in a manual mode to evaluate and/or calibrate either the ultrasonic electronic equipment on the entire inspection system including both electronics and transducers. (Author)

NTIAC-022895

Bouche, Raymond R.
"Calibration of Shock and Vibration Measuring Transducers"; 1979, 177 pp, SVM-11; The Shock and Vibration Information Center, Naval Research Laboratory, Code 8404, Washington, DC 20375

This book has chapters devoted to fundamentals for calibration, theory of seismic transducers, transducers and auxiliary instruments (primarily accelerometers), calibration shakers, primary shock and vibration standards, sinusoidal comparison calibrations, shock motion calibrations, force gauges and impedance heads, and an extensive bibliography. (NTIAC)

NTIAC-022945

Youshaw, Robert A.
"Summary of Nondestructive Inspection Standards for Heavy Section Castings, Forgings, and Weldments"; Final report, December 1980, 35 pp, SSC-300; Ship Structure Committee, Washington, DC, AD-A099119

Code bodies, notably ASTM, have produced procedural guides, standard methods, and recommended practices which can be used to assure proper inspection for the various methods of nondestructive testing. These guides and practices in private industry have been reviewed for the applicability to quality control of heavy steel castings, forgings, and weldments. Acceptance criteria are not set forth, and recommendations are not suggested. They do, however, define levels of quality and describe the parameters generally agreed to be of significance which should be a part of the contractual agreement. The user must quantify these parameters according to service requirements and other considerations. (Author)

NTIAC-022977

Horikawa, Kohsuke; Kawai, Kiyokazu; Okamoto, Takashi
"Quality Assurance in Welding of High Strength Steel in Penstock Construction"; Transactions of Japan Welding Research Institute, 9, 1, 1980, 125-135

A huge penstock has been constructed with heavy sectional high strength steel. On this construction, quality assurance through quality control was intended for not only welding in itself, but also preparation and other related works. However this report emphasizes welding procedures. (Author)

NTIAC-023064

Witting, G.; Beller, M.; Leider, A.; Stumm, W.; Weber, H. P.
"Application of Reference Standards for Control of Eddy Current Test Equipment"; Eddy Current Characterization of Materials and Structures, ASTM STP-722, Symposium on Nondestructive Testing, 5-7 September 1979, Gaithersburg, MD, 79-85; American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103

Within the German Standard Organization, a working group was engaged with the task of investigating and specifying methods for testing the essential properties of eddy current test equipment for application to the inspection of tubes with feed-through coil systems. For this purpose several reference standards are required. These contain artificial defects such as holes, longitudinal and transverse notches, and milled-off segments. Several materials are recommended for use in the usual frequency ranges. (Author)

NTIAC-023066

Jones, A. R.
"Secondary Conductivity Standards Stability"; Eddy Current Characterization of Materials and Struc-

tures, ASTM STP-722, Symposium on Nondestructive Testing, 5-7 September 1979, Gaithersburg, MD, 94-118; American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103

Calibration values of secondary conductivity standards obtained on a periodic basis, both for the Boeing Company and for commercial customers, have shown various drift patterns. Presently, a 100-KHZ bridge used with an H-P 9825 computer compares unknown secondary standards against carefully built, National Bureau of Standards (NBS) traceable, primary bars fn an oil-bath environment. Factors affecting the stability of secondary standard values of conductivity include primary conductivity bar value changes, uneven surface wear, environmental contamination, lift-off due to the presence of foreign material on the surface, and aging of the metal crystalline structure. Some secondary standards, which were large physically, exhibited significant conductivity changes across their surface due to the nonhomogeneity of the metal. Original calibration of secondary standards was accomplished by assigning the same value to a section cut from the primary bar that was given to the primary bar itself. When new alloy metals were obtained, as older metal primary bar material was exhausted for secondary use, an H-P 65 program was developed to utilize a curve-fitting method for replacement secondary-standard material calibration. Some changes in older secondary values resulted from this method. An H-P 9825 computer program was later developed, which resulted in other secondary-value bars, which further altered the program and the calibration results. New primary bars have been also added from time to time to smooth out the curve-fitting program, which has some effect on the calibration values of the secondary standards. (Author)

NTIAC-023176

Leonov, I. G.; Palees, E. E.

"Certification of Electrical Conductance Standards for Calibrating and Checking Nondestructive Inspection Facilities"; *Soviet Journal of Nondestructive Testing*, 16, 11, November 1980, 802-804 (English translation, July 1981)

A solution is given for the problem of finding the potential within a conducting rod when a current is fed into it through parts of a side surface. The solution obtained allows one of the systematic error components to be excluded when measuring electrical conductance by the two-probe method. (Author)

NTIAC-023189

Babadzhanov, L. S.

"Set of Means for Checking Coating Thickness Gauges"; *Soviet Journal of Nondestructive Testing*, 16, 11, November 1980, 860-862 (English translation, July 1981)

The principles of the development of nomenclature, composition, and main characteristics of a set of means for checking coating thickness gauges, consisting of standard measure of coating thickness, checking equipment, and means for testing and verifying measures of coating thickness are described. The principles proposed enable one to optimize the nomenclature of checking means in the area of coating-thickness measurements. (Author)

NTIAC-023265

Polansky, D.

"Radiation Sources and Detectors"; Real-time Radiologic Imaging: Medical and Industrial Applications, ASTM STP-716, Symposium on Nondestructive Testing, 8-10 May 1978, Gaithersburg, MD, 22-30; American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103

Some characteristics of radiation sources, such as x-rays, electrons, protons, and neutrons used in the nondestructive testing of material are presented. Detailed information on the quality of inspection possible with x-rays is also presented. The different types of detectors such as ionization chambers and solid-state detectors are briefly reviewed, while a detailed presentation is made of the characteristics of film. The capability of the radiographic system as described in specifications is presented as the measuring base for competitive methods of image analysis in nondestructive test systems. (Author)

NTIAC-023324

Trumpfheller, R.

"Reliability and Standards"; Nondestructive Evaluation in the Nuclear Industry—1980, 3rd International Conference Proceedings, 11-13 February 1980, Salt Lake City, UT, 13-21; American Society for Metals, Metals Park, OH 44073

This paper discusses the human factors, the choice of the NDE method, the sensitivity of ultrasonic techniques, and the size and nature of flaws. (NTIAC)

NTIAC-023328

Dau, Gary J.; Lapides, Melvin E.

"Considerations for an Optimized System for an Ultrasonic Inspection of Stainless Pipe"; Nondestructive Evaluation in the Nuclear Industry—1980, 3rd International Conference Proceedings, 11-13 February 1980, Salt Lake City, UT, 61-74; American Society for Metals, Metals Park, OH 44073

Since 1975, considerable emphasis has been placed on improving ultrasonic inspection of welded joints in austenitic stainless steel pipe. Detection of intergranular stress corrosion cracks (IGSCC) in the weld heat affected zones has been a major issue. However, inspection of cast stainless materials is receiving increased attention. If the work underway in many laboratories throughout the world has one common feature, it is that each group tends to concentrate efforts on one part of the overall inspection system. The high competence of these groups has resulted in major improvements in many components of an overall inspection system. However, such progress appears to have been achieved at the expense of insufficient attention to developing an optimized system. The purpose of this paper is to indicate the necessity for an overall systems approach to development of an optimized inspection system. The aim is to illustrate why optimization must involve the entire system as opposed to indivfdual components. Trade-off studies and examples evaluated to date are included. The discussion that follows defines basic problems in inspection of stainless steel pipe, and identifies the different inspection system components that must be considered. (Author)

NTIAC-023340

Baschek, H.

"Requirements for Inservice Inspection in Switzerland and Their Comparison with the Requirements in Other Countries under Particular Consideration of ASME Code Section XI"; Nondestructive Evaluation in the Nuclear Industry—1980, 3rd International Conference Proceedings, 11-13 February 1980, Salt Lake City, UT, 271-280; American Society for Metals, Metals Park, OH 44073

The authors discuss layout and component design, obligatory inspections and inspectability, inspection program and test specifications, inspection intervals and periods for Class I and Class II components, detection of corrosive attack, hydro tests, and class 2 and class 3 components. (NTIAC)

NTIAC-023341

Holland, Norman

"Interdependence of 10 CFR 50 with ASME Section XI, NRC Regulatory Guides and ANSI Standards"; Nondestructive Evaluation in the Nuclear Industry—1980, 3rd International Conference Proceedings, 11-13 February 1980, Salt Lake City, UT, 281-289; American Society for Metals, Metals Park, OH 44073

At the present time, the design, operation, testing and inspection of nuclear power plants is governed by a large number of codes, standards, practices and regulatory requirements. These include the regulatory requirements of the U.S. Government, codes and standards of various technical societies such as the American Society of Mechanical Engineers (ASME) in its Boiler and Pressure Vessel Code. Since the utility must have ultimate responsibility to construct and operate the safest possible facility; understanding application and interrelationships of governing documents is imperative. This paper explores some of the problems inherent in the application of governing documents. (Author)

NTIAC-023342

Engl, G. O.; Elsner, H. J.

"Comparison of Requirements for Inservice Inspection in Germany with Section XI, ASME, BAPV Code"; Nondestructive Evaluation in the Nuclear Industry—1980, 3rd International Conference Proceedings, 11-13 February 1980, Salt Lake City, UT, 291-302; American Society for Metals, Metals Park, OH 44073

The authors discuss the scope of inspections including the reactor pressure vessel, and the primary circuit. Inspection intervals, inspection techniques, calibratfon, and the evaluation of the indications are discussed. They discuss the differences in the German Inspection Service Requirements and the ASME Code. (NTIAC)

NTIAC-023343

Mordfin, Leonard

"NDE Standards for Nuclear Power Systems: An NBS Perspective"; Nondestructive Evaluation in the Nuclear Industry—1980, 3rd International Conference Proceedings, 11-13 February 1980, Salt Lake City, UT, 303-318; American Society for Metals, Metals Park, OH 44073

The most effective approach toward achieving standardization in new NDE measurement methods, in order to enhance their reliability and reproducibility, is basically different from efforts to standardize well-established NDE measurement methods. This difference is described and illustrated by examples of recent and on-going NDE standardization activities at NBS. Several needs for better NDE measurement capabilities in the nuclear industry are identified. These include needs for new or improved methods for measuring residual stresses and for assuring the operability of pumps and valves. Exploratory research at NBS on nuclear and high-energy x-ray diffraction and on wear debris analysis, plus development work on polymer transducers and ONB leak testing standards, suggest approaches toward fulfilling these needs. The advantages of addressing the standardization requirements of a new NDE method as an integral part of the development of the measurement methodology are described. Other NDE-related standardization needs in the nuclear industry, of a non-method-specific nature, are also identified. These pertain to the procedures by which defect-detection capabilities are assessed, and to the reporting of inservice inspection data. The development of meaningful NDE standards in all of these areas requires cooperation between the nuclear industry, the regulatory agencies, and the codes and standards organizations. NBS is prepared to participate in these efforts. (Author)

NTIAC-023472M

Kwun, Hegeon; Burkhardt, Garry L.; Teller, Cecil M.

"Ultrasonic Transducer Performance Requirements"; Final engineering report Phase 2, June 1981, 130 pp, F41609-78-C-1823; Southwest Research Institute, P.O. Box 28510, San Antonio, TX, AD-A101169

Characteristic ultrasonic transducer parameters were measured for over 160 contact type ultrasonic transducers (of equivalent sizes) used by depot and field NDI shops in the Air Force. For each transducer, a maximum of 24 parameters was obtained which included electrical impedance, rf-echo and frequency spectru, beam characteristics, sensitivity, and signal-to-noiserratio parameters. Transducers were categorized into six groups according to their nominal frequency and beam angle (i.e., 5 MHz and 10 MHz; 0 deg, 45 deg, and 60 deg). Except for 10 MHz-60 deg transducers, 32 transducers were evaluated for each category. For measurement of the beam characteristic parameters of the contact transducers, a side-drilled hole block and an automated data acquisition system were developed. Three small fatigue cracks of different sizes were used for the measurement of flaw signal-to-noise ratios (which determine the flaw detectability of a transducer). Wide variations were observed in the characteristic parameters for individual ultrasonic transducers having the same name-plate size, frequency and angle. However, the average performance for all transducers evaluated in each category of transducers was found consistent with theory. In order to find the characteristic parameters which primarily determine the flaw detectability of a transducer, a linear correlation analysis between pairs of parameters was conducted for each transducer category. (Author)

NTIAC-023491

Belenkii, R. R.; Gukasyan, G. A.

"Standardization of Sealing Testbeds for Repaired Agricultural Equipment"; *Soviet Journal of Nondestructive Testing*, 16, 12, December 1980, 906-909 (English translation, August 1981)

Standardization of sealing equipment for agricultural purposes is considered; a range of testbeds is defined, together with the components, and rules are drawn up for interchangeability of testbeds, while results are given on optimization of the series for two types of testbed. (Author)

NTIAC-023641

Brodsky, Allen,; McGuire, Stephen

"Risks of Radiation Exposure and Radiation Protection Standards"; International Advances in Nondestructive Testing, Vol. 7, 1981, 13-30; Gordon and Breach Science Publishers Inc., One Park Avenue, New York, NY 10016

This paper compares the occupational radiation exposures received by industrial radiographers with radiation exposures from other natural and manmade sources. The risks from these exposures are discussed and found to be reasonably acceptable in comparison to other risks which we all face. Recent public claims by a few scientists that the risks are higher than has been generally believed are rejected. Some current NRC activities in the areaoof radiation protection standards for industrial radiography are mentioned. (Author)

NTIAC-023841

Clifton, James R.; Anderson, Erik D.

"Nondestructive Evaluation Methods for Quality Acceptance of Hardened Concrete"; January 1981, 52 pp; NBS IR 80-2163; National Technical Information Service, Springfield, VA 22161 (PB81-159618)

Nondestructive test methods which can be used in quality acceptance programs for hardened concrete have been critically reviewed and are described in this report. Methods have been identified which provide information on the strength, quality and uniformity, thickness, air content, stiffness, finish, density of concrete as well as the location and condition of steel reinforcement. Both commonly used methods and possible test methods are covered. In addition, the feasibility of combining two or more test methods for improving the prediction of the strength or quality of concrete is explored. (Author)

NTIAC-024323

Birnbaum, G.; Berger, H.; Eitzen, D. G.

"Traceable NDE Standards"; 13th Symposium on Nondestructive Evaluation Proceedings, 21-23 April 1981, San Antonio, TX, 266-272; Nondestructive Testing Information Analysis Center, Southwest Research Institute, P. O. Drawer 28510, San Antonio, TX 78284

Recent work at the National Bureau of Standards, which led to NDE standards and calibrations, as well as work in progress is reviewed. The NDE areas discussed include acoustic emission, x-ray and neutron radiography, eddy current, magnetic particles, liquid penetrants, visual acuity testing and leak rate measurements. (Author)

NTIAC-024340

Birks, Albert S.

"Quantitative Characterization of Ultrasonic NDE Transducers"; 13th Symposium on Nondestructive Evaluation Proceedings, 21-23 April 1981, San Antonio, Texas, 486-496; Nondestructive Testing Information Analysis Center, Southwest Research Institute, P. O. Drawer 28510, San Antonio, TX 78284

Techniques for characterizing the performance of ultrasonic transducers to obtain improved reliability of nondestructive evaluation (NDE) of materials have been established as part of an Air Force Wright Aeronautical Laboratory manufacturing technology program on advanced ultrasonic NDE equipment. The performance characteristics selected will be presented and the equipment and techniques necessary to obtain measurements traceable to national standard will be described. Electrical parameters currently measured by these techniques include complex impedance, relative pulse echo response (S_{RPE}), center frequency and bandwidth. Permanent records of transducer tests for convenience in evaluating baseline performance and for subsequent comparison of response are afforded by photographs of the oscilloscope response or by computerized graphics. The presence of tuning networks and a determination of their functional accuracy can be made by evaluating the voltage and current peaks and nulls over the test frequency range. Acoustic parameters including the determination of classical points along the sound beam axis, such as the first null (Y_0-) point approaching the transducer from the far field, several critical measurements, such as beam symmetry and accuracy of the angle of refraction are made to verify nameplate data. A determination of the skew or misalignment of the crystal element on the wedge is made as a final verificatfon of performance. Test data resulting from the evaluation of various transducers and their performance with current commercial NDE instrumentation will be discussed. (Author)

6. DIRECTORY OF NDT ORGANIZATIONS

6.1 Introduction

The primary instrument for updating this section of the Handbook was a questionnaire mailed by NTIAC. This contains the organizations listed in the 1979 Handbook, their specified changes (if any), plus many new organizations. Undoubtedly, there are organizations involved in NDT which are not represented. Nevertheless, those listed and described in Section 6.5 furnish an excellent cross-section of those organizations offering NDT equipment, information, supplies, and services.

Sections 6.2 and 6.3 are subject indexes of organizations in terms of specific test capabilities and services. Listed with each key subject area is the NTIAC accession number which is used to identify the respective organization; the index identifying the NTIAC accession number with its respective organization is presented in Table I below.

Section 6.4 is a trade name index listing names with the NTIAC accession number.

Section 6.5 is a catalog of all the organizations, giving the NTIAC accession number of each organization, along with the name, address, and brief description of each, including, when possible, the products and services offered.

Table I - Index of Organizations with Respective NT Accession Numbers in Numerical Order

NT-15718	AMF Tuboscope, Inc.
NT-15719	Acco Industries Inc., Measurement Systems Division
NT-15720	Acoustic Emission Technology Corp., Division of KrautKramer-Branson International
NT-15721	AGFA-GEVAERT, Inc., Industrial X-Ray Dept.
NT-15722	Allegheny Ludlum Steel Corp., Research Center
NT-15723	Allis-Chalmers Corp., Advanced Technology Center
NT-15724	Allis-Chalmers Corp., Nuclear Components Division
NT-15725	Alloy Stainless Products Co.
NT-15726	American Gas & Chemical Co., Ltd.
NT-15727	American Optical Corp., Scientific Instrument-Fiber Optics Division
NT-15728	American Society of Mechanical Engineers
NT-15729	American Society for Quality Control, Society Headquarters
NT-15730	American Society for Testing and Materials
NT-15731	American Welding Society Headquarters
NT-15732	Amersham Corporation
NT-15733	Ametek, Inc., Schutte & Koerting Division
NT-15734	Annis, R. B., Company
NT-15735	Apollo Lasers, Inc.
NT-15736	ANCO Engineers, Inc.
NT-15737	Argonne National Laboratory, Materials Science Division
NT-15738	ARi Industries, Inc.
NT-15739	ARMCO Steel Corp., National Supply Co., NDE Dept.
NT-15740	Atomergic Chemetals Corp.
NT-15742	Babcock & Wilcox Co., Belfab, Bailey Meter Co.
NT-15743	Babcock & Wilcox - Lynchburg Research Center
NT-15744	Bailey Instruments, Inc., Dianagraph Division
NT-15745	Balteau Electric Corp.
NT-15746	Barnes Engineering Company
NT-15747	Battelle Memorial Institute, Columbus Laboratories, Fabrication & Quality Assurance Section
NT-15748	Battelle, Pacific Northwest Laboratories, Nondestructive Testing Section
NT-15749	Bearing Inspection, Inc.
NT-15750	Bell Helicopter Textron, Methods and Materials Lab - NDT Lab
NT-15751	Bell & Howell, CEC Division

NT-15752	Bendix Corporation (The), Automation & Measurement Divison
NT-15753	Bendix Corporation (The), Electric/Fluid Power Division
NT-15754	Benthos, Inc.
NT-15755	Bently Nevada Corporation
NT-15756	Boeing Technology Services, Boeing Commercial Airplane Company
NT-15757	Biddle Instruments
NT-15758	Big Three Industries, Inc., Tempil Division
NT-15759	Biochemical & Nuclear Corporation
NT-15760	Boride Products, Inc.
NT-15761	Braun, D. B., and Company
NT-15762	Brewer Engineering Laboratories, Inc.
NT-15763	Filterite/Brunswick
NT-15764	Burns & Roe, Inc., Quality Assurance Divison
NT-15765	Pace Transducer Company, Division of C. J. Enterprises
NT-15766	CBL Industries, Inc.
NT-15767	CSP Incorporated
NT-15768	Cambridge Instruments Company, Inc., Cambridge/IMANCO
NT-15769	Canberra Industries, Nuclear Systems Divison
NT-15770	Catalytic, Inc., Operations Division - Power Projects
NT-15771	Circle Chemical Company, Inc.
NT-15772	Cleveland Technical Center, Inc.
NT-15773	Cober Electronics, Inc., Industrial Microwave Heating Equipment
NT-15774	Coherent, Inc., Tropel Division
NT-15775	Coleman, W. B. Company
NT-15776	Col-X Corporation
NT-15777	Continental Testing Labs, Inc., Magnetics & Electronics Division
NT-15778	Control Data Corporation, Computer Development Divison
NT-15779	Custom Machine, Inc.
NT-15780	Custom Scientific Instruments, Inc.
NT-15781	Applied Engineering Co., Inc. of Daniel International, Inc.
NT-15782	Datametrics, Inc.
NT-15783	Dayton X-Ray Company, Inc.
NT-15784	Defelsko Corporation
NT-15785	Del Electronics Corporation
NT-15786	Denver, University of, Physics Department
NT-15787	Detoronics Corporation
NT-15788	Dosimeter Corp. of America, Nuclear Accessories Division
NT-15789	Dunegan/Endevco
NT-15790	Dynamold, Inc.
NT-15791	EMI Therapy Systems, Inc., EMI Technology, Inc.
NT-15792	Eastman Kodak Company, Health Sciences Markets Division
NT-15793	Ebasco Services, Inc., Materials Engineering Laboratory
NT-15794	Echo Laboratories, Inc.
NT-15795	Econospect Corporation
NT-15796	Electrical Testing Laboratories, Inc. (ETL)
NT-15797	Electromatic Equipment Company, Inc., Check-Line Instruments Division
NT-15798	Emerson and Cuming, Inc., Flotation Products Division
NT-15799	Eocom Corporation
NT-15800	Explosive Technology, Inc., Aerotest Operations, Inc.
NT-15801	Failure Analysis Associates
NT-15802	Fife Corporation, Instrument Systems Division
NT-15803	Flow Technology, Inc.
NT-15804	Fluor Power Services, Inc., Welding and Metallurgy Division
NT-15805	Forney, Inc.
NT-15806	Industrial Inspection Industries, Inc.

NT-15807	Froehling and Robertson, Inc., Metals and Nondestructive Testing Dept.
NT-15808	GAF Corporation, Photo and Repro Group, X-Ray Products
NT-15809	GCA Corporation, Vacuum Industries Division
NT-15810	Gaertner Scientific Company
NT-15811	Gates, George W., and Company, Inc.
NT-15812	GARD, Inc., a Subsidiary of GATX Corporation
NT-15813	General Activation Analysis, Inc.
NT-15814	General Dynamics Convair Division, Convair School for NDT (M/Z 41-1414)
NT-15815	General Eastern Instruments Corporation
NT-15816	General Electric Company, Advanced Reactor Systems Department
NT-15817	Geoscience Ltd., Thermal Testing Division
NT-15818	Geotest Instrument Corporation
NT-15819	Dravo Utility Constructors, Inc., Division of Gibbs & Hill, Inc.
NT-15820	Gilbert/Commonwealth, Quality Assurance Division
NT-15821	Gollob Analytical Service
NT-15822	Gould, Inc., Measurement Systems Division
NT-15823	Greene, Arnold, Testing Laboratories, Inc.
NT-15824	Hacker Instruments, Inc.
NT-15825	Haile, Edward L., and Associates
NT-15826	Hamill Manufacturing Company
NT-15827	Harisonic Laboratories, Inc.
NT-15828	Harshaw Chemical Company (The), Crystal and Electronic Product Dept.
NT-15829	Health Physics Associates, Ltd.
NT-15830	Hewlett-Packard Co., McMinnville Division
NT-15831	High Voltage Engineering Corporation, Burlington Division
NT-15832	Hobart Brothers Company, Technical Center
NT-15834	Hydro Products, Inc.
NT-15835	IIT Research Institute
NT-15836	IRT Corporation, Nuclear Systems Division
NT-15837	ITT Grinnell Industrial Piping, Inc., Industrial Piping Division
NT-15838	Industrial NDT Company, Inc.
NT-15839	Infrared Survey, Inc.
NT-15840	Instrument Technology, Inc.
NT-15841	International Thermal Instrument Company
NT-15842	Ithaco, Inc.
NT-15843	James Instruments
NT-15844	JEM Penetrameter Mfg. Corp.
NT-15845	Jodon, Inc., Laser Products Division
NT-15846	Jordan Nuclear Company
NT-15B47	Kaman Sciences Corporation, Products Division
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NT-15849	Konigsberg Instruments, Inc.
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NT-15852	Krautkramer-Branson, Inc., KB-Aerotech
NT-15853	LND, Inc.
NT-15854	Lambrecht, Karl, Corporation
NT-15855	Law, K. J., Engineers, Inc.
NT-15856	Lion Precision Corporation
NT-15857	Litton Industries, Fitchburg Coated Products
NT-15858	Lockwood and McLorie, Inc., Sales Division
NT-15859	Maxwell Laboratories, Inc.
NT-15860	McWilliams Forge Co., Inc.
NT-15861	MET Electrical Testing Company, Inc.
NT-15862	Metals Testing Co., Inc.

NT-15863	Metcut Research Associates, Inc.
NT-15864	MET-L-CHECK Company
NT-15865	Mikron Instrument Co., Inc.
NT-15866	Mine Safety Appliances Company, Advanced Systems Division
NT-15867	Monitor Labs, Inc.
NT-15868	Monroe Electronics, Inc.
NT-15869	Monsanto, Fisher Controls Co.
NT-15870	Monsanto Research Corp.
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NT-15872	Comtel Corp.
NT-15873	National Nuclear Corporation
NT-15874	Net Systems, Inc.
NT-15875	New England Nuclear Corporation, Nuclides and Sources Division
NT-15876	Newport News Industrial Corporation, Technical Services Division
NT-15877	Nicolet Scientific Corporation
NT-15878	Nondestructive Testing Management Association, Inc.
NT-15879	Nortec Corporation
NT-15880	Nuclear Assurance Corp., Engineering and Transportation Services
NT-15881	Nuclear Components, Inc.
NT-15882	Nuclear Consulting Services, Inc.
NT-15883	Nuclear Diagnostic Labs, Inc.
NT-15884	Nuclear Energy Services, Inc., Conam Inspection Division
NT-15885	Nuclear Energy Services, Inc., NES Division
NT-15887	Nuclear Services Corporation, Construction and Operations
NT-15888	Nuclear Sources and Services
NT-15889	Nuclear Systems, Inc., Gamma Industries
NT-15890	Nucleometrics, Inc.
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NT-15892	Nucor Corporation, Research Chemicals Division
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NT-15911	Texas Nuclear, a Subsidiary of Ramsey Engineering Co.
NT-15912	Ranger Engineering Corporation
NT-15913	Reactor Experiments, Inc.
NT-15914	Ridge Instruments Co., Inc.
NT-15915	Rockwell International Corp., Los Angeles Division
NT-15916	Roentgen Industrial Corp.
NT-15917	Rohrback Corporation, Rohrback Instruments Division
NT-15918	St. John X-Ray Laboratory

NT-15919	Sandpower, Inc., Fuel Technology Division
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NT-15921	Schumacher and Associates, Inc.
NT-15922	Science Applications, Inc., Radiation Applications Division
NT-15923	Science Applications, Inc., Nuclear Environmental Services
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NT-15934	Southern Research Institute, Mechanical Engineering Research Division
NT-15935	Southwest Research Institute
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NT-15949	Tektran-NDT Products, Aircair Company Division
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NT-15966	Unitron Instruments, Inc.
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NT-15968	Universal Technical Testing Labs, Inc.
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NT-15983	X-Ray Products Corporation
NT-15984	X-Ray Products Corporation, NDT Apparatus and Supply Sales Division
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NT-15986	Zeiss, Carl, Inc.
NT-23672	AGA Corporation
NT-23673	Acoustic Instruments International
NT-23674	Allen Associates
NT-23675	American Volpi Corporation
NT-23676	Atlas Electric Devices Co.
NT-23677	Automatic Switch Co.
NT-23678	Baird Corporation, Government Systems Division
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NT-23687	Foxboro Company (The), *Analytical Division*
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NT-23693	Inframetrics, Inc.
NT-23694	Intercontrole, Inc., Division of Intercontrole, S.A. - France
NT-23695	J. B. Engineering & Sales Co., Inc.
NT-23696	Keyan Industries, Inc.
NT-23697	Leasametric
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NT-23699	Link Systems
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NT-23709	Novex, Inc.
NT-23710	Nuclear Associates, Division of Victoreen, Inc.
NT-23711	Pacific Scientific, Belfab Division
NT-23712	Parker Research Corp.
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Consultants
NT-15719, NT-15720, NT-15721, NT-15722, NT-15724, NT-15726, NT-15728, NT-15729, NT-15730, NT-15736, NT-15757, NT-15759, NT-15761, NT-15762, NT-15766, NT-15770, NT-15771, NT-15773, NT-15776, NT-15777, NT-15778, NT-15781, NT-15783, NT-15786, NT-15787, NT-15790, NT-15801, NT-15804, NT-15819, NT-15820, NT-15821, NT-15825, NT-15827, NT-15829, NT-15831, NT-15832, NT-15836, NT-15851, NT-15852, NT-15859, NT-15862, NT-15863, NT-15866, NT-15874, NT-15876, NT-15878, NT-15881, NT-15882, NT-15883, NT-15884, NT-15885, NT-15887, NT-15889, NT-15893, NT-15904, NT-15910, NT-15915, NT-15918, NT-15920, NT-15921, NT-15922, NT-15924, NT-15924, NT-15930, NT-15933, NT-15934, NT-15935, NT-15938, NT-15940, NT-15943, NT-15945, NT-15949, NT-15951, NT-15954, NT-15961, NT-15968, NT-15973, NT-15812, NT-23682, NT-23692, NT-23696, NT-23702, NT-23722, NT-23724

Design
NT-15720, NT-15748, NT-15762, NT-15764, NT-15774, NT-15781, NT-15804, NT-15807, NT-15812, NT-15816, NT-15819, NT-15840, NT-15843, NT-15841, NT-15921, NT-15922, NT-15945, NT-15951, NT-15953, NT-15974, NT-23674, NT-23678, NT-23679, NT-23723, NT-23727, NT-23735

Failure analysis
NT-15718, NT-15737, NT-15762, NT-15776, NT-15777, NT-15801, NT-15835, NT-15861, NT-15863, NT-15874, NT-15876, NT-15882, NT-15884, NT-15885, NT-15887, NT-18915, NT-15921, NT-15928, NT-15934, NT-15935, NT-15935, NT-15943, NT-15948, NT-15951, NT-15964, NT-15973, NT-15755, NT-15906, NT-23714

Field test
NT-15718, NT-15720, NT-15721, NT-15724, NT-15764, NT-15807, NT-15837, NT-15839, NT-15872, NT-15873, NT-15876, NT-15878, NT-15880, NT-15882, NT-15883, NT-15885, NT-15887, NT-15888, NT-15893, NT-15904, NT-15915, NT-15921, NT-15922, NT-15934, NT-15935, NT-15938, NT-15943, NT-15946, NT-15959, NT-15964, NT-15973, NT-15980, NT-15983, NT-15762, NT-15796, NT-15910, NT-14940, NT-14960, NT-23725, NT-24757

Inspection
NT-15718, NT-15736, NT-15739, NT-15740, NT-15747, NT-15749, NT-15753, NT-15764, NT-15775, NT-15778, NT-15790, NT-15801, NT-15802, NT-15812, NT-15834, NT-15845, NT-15862, NT-15883, NT-15885, NT-15893, NT-15896, NT-15910, NT-15914, NT-15936, NT-15983, NT-15985, NT-15719, NT-15722, NT-15726, NT-15727, NT-15738, NT-15743, NT-15748, NT-15763, NT-15796, NT-15804, NT-15806, NT-15819, NT-15820, NT-15823, NT-15824, NT-15825, NT-15829, NT-15835, NT-15838, NT-15884, NT-15904, NT-15945, NT-15946, NT-15948, NT-15951, NT-15968, NT-23683, NT-34684, NT-23694, NT-23695, NT-23696, NT-23719, NT-23725, NT-23732

6.4 Trade Name Index

Record-A-Strain—NT-15907
Red Hat—NT-23677
Ridge-X—NT-15914
Ring Brinell—NT-23707
Rolling R Meter—NT-15843
Rota-Sonic—NT-15933
Scalometer—NT-15917
Scanray—NT-15969
Scan-A-Matic—NT-15779
Scan-Ray—NT-15982
Scherr-Tumico—NT-23713
Scintaflex—NT-15985
Scintrex—NT-23688
Scopemaster—NT-15984
Sectorr—NT-15891
SediGraph 5000D—NT-23705
Selspot—NT-23717
Selspot II—NT-23717
Sensitip—NT-15822
Sermetal—NT-15952
Sherlock—NT-15979
Sigmascan—NT-23716
Sinco—NT-23688
SirChem—NT-15771
SMAC—NT-15889
Smart Monitor—NT-15755
Snap-II—NT-15767
Soiltest—NT-23688
Soltec—NT-15932
Sonic 200—NT-15726
Sonirail—NT-23724
Sonodur—NT-15851
Sonogage-rt—NT-23716
Sonomicroscope—NT-23735
Sonoray—NT-15851
Sonoscope—NT-15718
Sonosort—NT-23726
Sonostate—NT-15794
Sonotem—NT-15794
Sonotrace—NT-15794
Soot-set—NT-24508
Space Jr—NT-15953
Spectra-Check—NT-15772
Speed—NT-15735
SPI—NT-23721
Spotcheck—NT-15904 and NT-23701
Starlighter—NT-23718
Statham—NT-15822
Statiflux—NT-23701
Stereoscan—NT-15768
Sterilaire—NT-24508
Strata Scout—NT-15931
Strata-Meter—NT-15931
Stresscoat—NT-23701
Super DAD—NT-15788
Super-Flux—NT-15914
Surfscan—NT-23726
Sweet-pea—NT-24508
Synchropower—NT-23677
Syncro Drive—NT-15972
System 8000—NT-15848
Syten—NT-15952
Taptone—NT-15754
TEAM—NT-23723
Telebrineller—NT-23724
Temp-Alarm paint—NT-15758
Tempgard—NT-15953
Tempil Pellets—NT-15758
Tempilabel—NT-15758
Tempilaq—NT-15758
Tempilstik—NT-15758
Tenney Jr—NT-15953
Tenneyten—NT-15953
Tentype—NT-23726
Tevra Scout—NT-15931
The Locator—NT-15720
Thermasonic 450—NT-15794
Thermatrace—NT-15746
Thermovision—NT-23672
Thetaplus + —NT-23681
Tinsley Magnetic Thickness—NT-15824
TK—NT-15718
TMI Lock Eddytester—NT-15955
Torrex 120—NT-15957
Torrex 150—NT-15947
Tracer-Tech—NT-15926 and NT-15969
Tripoint—NT-23677
Tru-Mite—NT-15782
Tru-Rota—NT-15782
Tru-tac—NT-15782
Tube-Kote—NT-15718
Tubogage—NT-15718
Tuboscope—NT-15718
Tukon—NT-15719
Turbo-Probe—NT-15803
Tween Screen—NT-15916
UDATS—NT-15834
Ultimate Cleaner—NT-24508
Ultragel—NT-15794
Ultrascan—NT-15943
Uniprobe—NT-15803
UniSeal—NT-15763
Unitron—NT-15966
Untouchable—NT-23716
Uvcon—NT-23676
V Meter—NT-15843
Vacusealed—NT-15754
Vac-K-Set—NT-15892

6.5 Catalog of NDT-NDE Organizations

NTIAC-015719

Acco Industries, Inc.
Measurement Systems Division
P. O. Box 9021, Bridgeport, CT 06602; 203/335-2511
Branches: Los Angeles; Dallas; Plymouth, MI; and Des Plains, IL

The Measurement Systems Division of Acco is a supplier of testing equipment for Rockwell hardness. It manufactures and markets Wilson standard testers for Rockwell hardness, including microhardness, microficial and mobile testers; Brinell hardness testers; automated testing systems incorporating Rockwell hardness, Brinell hardness and eddy current tests. A wide range of models and accessories is available for testing materials of virtually any size, shape or thickness. Engineered testing systems can be developed for automatically feeding, testing, classifying, and sorting parts at up to 3,600 pieces per hour and recording the results. Principal industries served are transportation equipment (including automotive, aircraft, and marine), ordnance, oil field equipment, primary metals, heat treating, farm equipment, and metal fabrication. The Measurement Systems Division has a nationwide network of service representatives and has operations in Canada, England, and Germany.

NTIAC-015720

Acoustic Emission Technology Corp.
Division of Krautkramer-Branson International
1812J Tribute Road, Sacramento, CA 95815; 916/927-3861

The Acoustic Emission Technology Corporation designs, manufactures, sells, and services acoustic emission instruments, systems, and accessories. Contractual studies, research and development programs, field service testing and inspections are also performed. Special instrumentation systems for structural testing, nondestructive inspection and testing and for destructive testing are supplied. Worldwide representation for sales, service and inspection is provided.

NTIAC-123673

Acoustic Instruments International
650 Vaqueros Avenue, Sunnyvale, CA 94086; 408/733-0233

Acoustic Instruments International manufactures sound measurement instruments. Pulsar Instruments and Castle Associates are both divisions of Acoustic Instruments.

NTIAC-023672

AGA Corporation
P. O. Box 721, 60 Chapin Road, Pine Brook, NJ 07058; 201/227-8260
AGA Corporation manufactures and markets the Thermovision Infrared Imaging System. Various models are available, namely Thermovision 780, 782, 720, 110. These units will provide an instantaneous detection and presentation of the infrared energy emitted from any object. Display is made on a TV-like monitor. Temperature resolution is 1/10 degree C with real-time scan rate at 25 feet per second.

NTIAC-015721

AGFA-GEVAERT, Inc.
Industrial X-Ray Dept.
275 North Street, Teterboro, NJ 07608; 201/288-4100
Branches: Atlanta, Boston, Chicago, Dallas, Los Angeles, and San Francisco
The Industrial X-Ray Department of AGFA-GEVAERT, Inc., offers a line of X-Ray films, plates, screens, and film processors. Holographic films and plates are also offered.

NTIAC-015722

Allegheny Ludlum Steel Corp. Research Center
Brackenridge, PA 15014; 412/226-2000
The Allegheny Ludlum Steel Corporation Research Center is equipped to conduct research and development programs in most major nondestructive examination methods, including ultrasonic, penetrant, eddy current and magnetic particle. Limited radiographic facilities are available. Special emphasis is on specialty alloys. In-depth and broad studies are possible. Support facilities exist that are well-experienced in preparing reference standards, including EDM machining and artificial discontinuity replication, constructing test apparatus, and performing complementary tests to substantiate or augment NDE results. Considerable experience and background exists in the development, establishment, and administration of personnel qualification and certification programs, including training; preparation and evaluation of reference standards; checking performance of NDE equipment, including ultrasonic search unit characteristics; and receiving, as well as preparing, specifications and procedures. Activities include innovating production nondestructive examination of a broad spectrum of products, as well as monitoring production processing parameters. Consultation services by a recognized NDE authority are available.

NTIAC-023674

Allen Associates
248-25 Cambria Avenue, Little Neck, NY 11362; 212/631-7886
Allen Associates is a supplier of nondestructive holographic test systems and services. The company designs and manufactures custom equipment; stock holographic test systems are available.

NTIAC-015723

Allis-Chalmers Corp.
Advanced Technology Center
P.O. Box M-101, 500 Lincoln Street, York, PA 17405; 414/475-2805
Branches: Worldwide
Allis-Chalmers Corporation is a highly diversified, multinational manufacturer of capital and consumer goods that are aimed at basic markets: mining, agriculture, industrial, electrical, consumer, and government.

NTIAC-015724

Allis-Chalmers Corp.
Nuclear Components Division
P.O. Box 712, York, PA 17405; 717/484-1126

Nondestructive testing personnel qualified to ASME and military specification are available to perform all standard methods of testing to Level III, and engineering personnel are on hand to provide consulting services in the various NDE methods. Field services also provide training for customer's personnel at the customer's site in the various NDE methods. Welder training and qualification are among the many services offered by the Weld Engineering Section. A complete metallurgical laboratory is also available for weld and metals analysis. Other services offered by the field services group include vendor surveillance, in-house and vendor procedure audits, procedure writing, and test development. The field services group can, in most cases, be at a customer's site providing the required service in less than 24 hours.

NTIAC-015725

Alloy Stainless Products Company
611 Union Blvd., Totwa, NJ 07512; 201/256-1616
ASP, the trade-mark that means Alloy Stainless Products Company, was founded in 1944 and remains an owner-operated company to this day. ASP is a major, independent manufacturer of stainless steel pipe fittings, with a wide range of products, sizes, and ratings. All ASP pipe fittings are produced from selected domestic raw materials. Major suppliers are carefully surveyed for their capabilities and methods and must meet quality standards. Forgings, the priority products for nuclear power piping, are produced to ASP tooling specifications by one of America's leading forgers. Castings and bar-stock are drawn from reputable firms. All raw materials are received with complete chemical and physical histories. Identity is permanently marked, logged, and maintained throughout ASP manufacturing processes. When the finished product is ready for shipment, each fitting goes out fully and permanently identified with the ASP trade-mark and all other important information for assured traceability. All ASP pipe fittings are machined on modern production equipment under qualified supervision. Rigorous inspections assure quality and uniformity of threads, sockets, angles, and concentricity. When required, penetrant and ultrasonic nondestructive testing examinations are performed to detect discontinuities on or below surfaces, such as cracks, seams, laps, laminations, and particular discontinuities.

NTIAC-015726

American Gas & Chemical Co., Ltd.
110 Pegasus Avenue, Northvale, NJ 07646; 201/767-7300
Branches: London and Toronto
The American Gas and Chemical Company offers a complete line of chemical leak detectors. These detectors range from Leak Tec, a thin-film bubbly fluid, to immersion testing liquids and colormetric developers. To complement this product area, Testing Systems, Inc., an AMGAS affiliate company, offers a line of fluorescent and dye penetrants and associated production line equipment. In keeping with modern technology, AMGAS has entered into the electronic leak-detection equipment market. Included are systems that operate on the principles of electron capture, thermal conductivity, heated anode halogen detectors, and resistivity. A production line leak-testing system that can monitor pressure change, flow measurement, or a freon tracer gas has been recently introduced. AMGAS also conducts courses in leak testing which comply with ASNT training requirements. Personnel from AGMAS sit on leak-testing committees of ASNT and ASTM.

NTIAC-015727

American Optical Corp.
Scientific Instrument-Fiber Optics Division
14 Mechanic Street, Southbridge, MA 01550; 617/765-9711
Branches: Buffalo, NY and Keene, NH
American Optical manufactures a line of rigid and flexible fiber-optic devices for the inspection of internal or remote areas. Both portable and 110-volt fiberscopes are available in flexible fiber-optic lengths, ranging from 2 feet to over 15 feet. American Optical fiberscopes have integral fiber-optic illumination and can be easily converted from front viewing to right-angle operation. Special, flexible fiber-optic devices are also available for use with photographic and CCTV equipment. American optical has fiber-optic dealers in most major cities and throughout the world.

NTIAC-015729

American Society for Quality Control
Society Headquarters
161 W. Wisconsin Avenue, Milwaukee, WI 53203; 414/272-8575
171 Local Sections throughout USA, Mexico, Canada, and Japan
The American Society for Quality Control (ASQC), a non-profit technical society of about 28,000 individuals, was founded in 1946. It describes itself as "The society of professionals engaged in the management, engineering, and scientific aspects of quality and reliability." The Society's technical activities are conducted by 26 divisions and technical committees whose chairmen comprise the General Technical Council. The Council is structured in five groups: Process and Fabrication; Energy, Transportation and Construction; Food and Health; Communication and Management Sciences; and Technologies.

NTIAC-015730

American Society for Testing and Materials
1916 Race Street, Philadelphia, PA 19103; 215/299-5400
The American Society for Testing and Materials (ASTM) is a non-profit corporation formed in 1898 for the development of standards on characteristics and performance of materials, products, systems, services, and the promotion of related knowledge. In ASTM terminology, standards include test methods, definitions, practices, classifications, and specifications. ASTM is a primary management system for standards development, with more than 6500 standards under copyright.

NTIAC-015728

American Society of Mechanical Engineers
345 E. 47th Street, New York, NY 10017; 212/644-7785
Branches: San Francisco; Washington, D.C.; Chicago and Dallas
The American Society of Mechanical Engineers is a technical society engaged in dissemination of technical information via meetings and publications, including codes and standards. Several technical divisions have a direct interest in NDT, i.e., Applied Mechanics, Pressure Vessels, and Piping and Materials.

NTIAC-023675

American Volpi Corporation
26 Aurelius Avenue, Auburn, NY 13021; 315/255-1105
American Volpi is a manufacturing firm of fiber-optic light transmitting bundles and illumination systems, fiber-optic components, and opto-electronic systems. For nondestructive inspection of visually inaccessible areas, Volpi offers the combination of oriented cold light and optical image transfer, either by means of flexible coherent fiber-optic bundles or a relay lens system. Their standard borescope program consists of intrascopes from 2.5 mm to 38 mm diameter and from 40 mm to 33 meters long; super wide-angle intrascope, 140 degrees; UV intrascopes; and flexible, coherent fiberscope, with working length up to 3430 mm. Applications include nondestructive inspection of blind cavities and hollow objects; engine block and gearbox inspection; maintenance and repair for gas turbines, power generators, nuclear reactors, diesel engines, etc.; and AQL inspection of mass produced parts.

NTIAC-015731

American Welding Society Headquarters
2501 Northwest 7th Street, Miami, FL 33125; 312/642-7090
The American Welding Society, founded in 1919, is the national organization for advancing the art and science of welding and its allied processes. Among other programs designed to serve that aim, the society offers a qualification and certification service to personnel in the quality assurance community, a course specifically designed for welding inspectors, welding and NDT technicians, foremen, and engineers, who have

found certification an attractive and beneficial credential. Certification requirements are given in the standard for qualification and certification of welding inspectors, AWS QC1-77. Details are explained in the Guide to AWS Welding Inspector Qualification and Certification, which also includes Standard QC1-77 and is available from the society's headquarters upon request.

NTIAC-015732

Amersham Corporation
2636 S. Clearbrook Drive, Arlington Heights, IL 60005; 800/323-6695
Amersham Corporation is part of a large international organization, with additional facilities in Europe, supplying radioactive products on a worldwide basis. Production facilities are located in Chicago, England, and Germany. Their products are used in a wide range of applications in inudstry, medicine, and research. One large business area, particularly for radiation sources, is in nondestructive testing.

NTIAC-015733

Ametek, Inc.
Schutte & Koerting Division
2249 State Road, Cornwells Heights, PA 19020; 215/639-0900
Branch: Bethayres, PA
Ametek, Inc., Schutte and Koerting Division, manufactures valves, strainers, desuperheaters, variable area flow meters, orifice flanges, eductors, steam-jet syphons, steam-jet vacuum systems, mechanical vacuum pumps, and heat exchangers. Users of the equipment are the power, process, chemical and food industries. Complete engineering and manufacturing facilities are available for the listed products.

NTIAC-015718

AMF Tuboscope, Inc.
P. O. Box 808, Houston, TX 77001; 713/749-5100
AMF Tuboscope, Inc., serves the petroleum industry with advanced nondestructive inspection of tubular goods and protective plastic coatings designed to withstand severe, corrosive environments. Tuboscope employs its analog, sonoscope, linascan, linalog, tuboscan and vertilog equipment, all developed by the company, in nondestructive inspection of drill pipe, casing, tubing, sucker rods and line pipe. Tuboscope's development of new resins, coatings, and applications techniques has contributed to a rapid growth in the coatings industry. The company applies a wide range of specialized coatings, including polyesters, vinyls, fluorocarbon resins, epoxies, polyurethanes, and phenolics, using both liquid and powder technologies. Tuboscope's inspection and coating services are available all over the world.

NTIAC-015736

ANCO Engineers, Inc.
9937 Jefferson Blvd.
Culver City, CA 90230; 213/204-5050
Applied Nucleonics Company, Inc.'s (ANCO) nondestructive testing activities include in-situ dynamic tests of structures, electrical and underground equipment and piping systems; dynamic qualification of equipment on in-house shake tables; and use of such nuclear techniques as activation analyses, radio-tracer applications, and mechanical testing of components. ANCO was founded in 1971 and since that time has had major responsibilities on over 300 projects in the United States and Europe. A major activity area is meeting the testing and analysis needs associated with nuclear power facilities. ANCO's power experience includes more than a dozen nuclear stations sited in the U.S. and abroad; ANCO has performed dynamic excitation tests on more nuclear facilities than any other world organization.

NTIAC-015734

Annis, R. B., Company
1101 N. Delaware Street
Indianapolis, IN 46202; 317/637-9282
The R. B. Annis Company is a manufacturer of balancing machines, split-core current transformers, pocket magnetometers, demagnetizing equipment, high-flux magnetic units, magnetic comparitors, and other special magnetic equipment.

NTIAC-015735

Apollo Lasers, Inc.
6357 Arizona Circle
Los Angeles, CA 90045; 213/776-3343
Apollo Lasers, Inc., is one of the oldest dedicated laser-manufacturing firms. Solid-state lasers, with ruby, ND glass, and YAG rods, are designed and built for research, education, government and industry. Also, CO_2 lasers (tunable and fixed) are built for research and light industrial applications. The company recently introduced a tunable for infrared, pumped by a CO_2 laser. Since its inception, the company has built laser systems for high-speed and dynamic holographic applications. These applications include nondestructive testing, acoustic propagation testing, and aerosol particle studies.

NTIAC-015781

Applied Engineering Co., Inc., Division of Daniel International, Inc.
P. O. Box 1327, Orangeburg, SC 29115; 803/534-2424
Brances: Charlotte, NC; Atlanta, GA; Greensboro, NC; and Greenville, SC
The Applied Engineering Company, Inc., is a designer and manufacturer of custom equipment for industry, such as industrial and commercial standby gas plant and LP-gas vaporizers; LPG storage, handling and processing equipment; turnkey liquid natural gas (LNG) plants and systems; heat exchangers and waste heat recovery systems; modular chemical process plants for the general chemical, petro-chemical, and textile industries; hydrocarbon fume abatement systems; and nuclear power plant components, parts, and appurtenances. The company also performs consulting services in NDT, welding engineering, source inspection, and expediting disciplines. Contract NDE services are performed at customer plants or job sites in UT, MT, PT, and RT inspection techniques.

NTIAC-015737

Argonne National Laboratory
Materials Science Division
9700 Cass Avenue, Argonne, IL 60439; 312/739-7711
Argonne National Laboratory (ANL) is a multidisciplinary institute operated by the University of Chicago for the U. S. Department of Energy for the purpose of providing technical leadership in the development of advanced energy systems. The general objectives of the Materials Science Division programs are to develop materials for advanced energy systems and to determine properties and behavior of materials in extreme environments. The scope of the NDT program is concerned with the development and application of various test techniques to measure changes in mechanical properties and dimensions of materials and to assess and monitor the integrity of components and systems. The task requires the implementation of various methods and equipment, such as ultrasonics, pulsed and continuous eddy current, infrared, X-Ray and neutron radiography, holography, dye penetrants, acoustic emission, and computer data handling. Materials for which tests are devised include metals, ceramics and metal-ceramic composites. Failure analysis capability increases the group's effectiveness in solving problems. As a national laboratory, ANL must observe certain restrictions in performing tasks for others.

NTIAC-015738

ARi Industries, Inc.
9000 King Street, Franklin Park, Il 60131
312/671-0511; Branch: ARi England
Complete test facilities exist to meet the requirements of RDT-F2-2T, RDT-F2-4T, MIL-C-45662, CMC-49, CFR-50, ASTM 3-235, and ASTM 3-230, as applied to thermocouple and RTD temperature sensors. The facilities include temperature calibration, radiography, mechanical inspection, liquid penetrant, helium leak detection, electrical inspection, time response, spurious EMF, and metallurgical structure.

NTIAC-015739

ARMCO Steel Corp.
National Supply Company, NDE Department
1524 Border Avenue, Torrance, CA 90509; 213/328-4111
The Torrance, California, plant of the National Supply Company, Division of ARMCO Steel Corporation, is the largest completely integrated machinery manufacturing plant in the west. There are facilities for steel-making, casting, forging, machining, heat-treating, plating, welding, and assembly. Inspection facilities include chemical, metallurgical, and nondestructive testing. In the area of nondestructive testing, there are facilities for radiography, ultrasonics, magnetic particle, and liquid penetrant. These facilities are available to industry for commercial services.

NTIAC-023676

Atlas Electric Devices Company
4114 N. Ravenswood Avenue, Chicago, IL 60613 312/327-4520
Branch: South Florida Test Service, Inc., Miami, FL 33178
Atlas Electric Devices Company is a manufacturer of environmental and material testing equipment serving textile, paint, and plastics industries.

NTIAC-024757

Atlas Oilfield Services Group
Division of Dresser Industries
P. O. Box 1407 (DC-Bldg. 12)
10201 Westheimer, Houston, TX 77001 ; 713/972-4060
Atlas Oilfield Services Group of Dresser Industries, Inc., provides well-logging services to the oil and gas industry. Included in these services is the nondestructive testing of tubular goods in wells for detecting corrosion or flows therein.

NTIAC-015740

Atomergic Chemetals Corp.
100 Fairchild Avenue, Plainview, NY 11803; 516/349-8800
The Atomergic Chemetals Corporation is a supplier of piezoelectric transducers for ultrasonic testing, chemical spot test kits for alloy determination, and portable 80 KVP X-Ray machines.

NTIAC-023677

Automatic Switch Company
Hanover Road, Florham Park, NJ 07932; 201/966-2000
Branches: Worldwide
Automatic Switch Company is a major international manufacturer of an extensive line of control equipment used for the automation of machinery, and industrial processes, and the control of electric power. Major ASCO products are for the control of fluids: solenoid-operated valves; electromagnetically operated

controls used to deliver or interrupt the flow of liquids and gases to operate all kinds of tools, equipment, machinery and processes; air-operated valves, activated by air pressure instead of electricity, to perform functions similar to solenoid valves; and pressure and temperature switches, devices to control high- and low-pressure limits or temperatures of liquids and gases. Products for the control of electric power are electromagnetic/solid-state electronic controls for the control of emergency power and the conservation of energy. Packaged systems are of standard or custom design and include all of the components necessary to control on-site engine generators and emergency distribution systems.

NTIAC-024757

Babcock & Wilcox
Lynchburg Research Center
P. O. Box 1260, Lynchburg, VA 24505; 804/384-5111, Ext. 5133
The Lynchburg Research Division of Babcock and Wilcox pursues R&D in nondestructive examination (NDE) and the design and fabrication of special measuring and monitoring systems. Primary NDE activities are with the ultrasonic, acoustical holography, acoustic emission, and eddy current methods. Special instruments are generally computer-based, field-worthy, and customized to special applications for which commercially available systems do not apply.

NTIAC-015744

Bailey Instruments, Inc.
Dianagraph Division
515 Victor Street, Saddle Brook, NJ 07662; 201/845-7252
Bailey Instruments is mainly involved with temperature-related items. The main product lines are (1) digital thermometers with a complete temperature range of -200 to 1400 degrees C — complete line of interchangeable thermocouple probes for all applications, including high-temperature, skin surface and microprobe; (2) freezing stages for use with microtomes and temperature stress testing — temperature range from -40 to 100 degrees C.; and (3) recorders and recorder accessories. The Dianagraph is a combined analog chart recorder and digital data logger with signal processing facility.

NTIAC-023678

Baird Corporation
Government Systems Division
125 Middlesex Turnpike, Bedford, MA 01730; 617/276-6134
Baird Corporation designs, develops, and manufactures instruments that detect and quantify natural constituents, contaminants, and pollutants in liquids and solids. Typical "off-the-shelf" instrumentation includes optical emission spectrometers for the analysis of wear metals in lubricants, contaminants in turbine fuel and intake air, oil-in-water, and basic elemental determinations on solids. Custom instrumentation for unique applications is also designed to order.

NTIAC-015745

Balteau Electric Corporation
Box 385, 63 Jefferson Street
Stamford, CT 06902; 203/324-6118
Branch: Barrington, IL
Balteau Electric is solely involved in nondestructive testing equipment sales and service. The products encompass X-ray, ultrasonic, eddy current, acoustic emission, magnetic particle and crack depth measuring. Training courses are also available in ultrasonic inspection. Territories include Canada, Central America, United States, and certain outlying islands, such as Puerto Rico.

NTIAC-015746

Barnes Engineering Company
30 Commerce Road, Stamford, CT 06904; 203/348-5381
Barnes Engineering Company designs, develops, and manufactures infrared and electro-optical components, instruments, and systems for industry, science, space exploration, and defense. Products produced range from infrared detectors to research and industrial noncontact thermometers and from temperature controls to infrared sensors for near-earth and deep space environmental sensing and navigation. For use in nondestructive testing, the company produces two lines of noncontact infrared thermometers and temperature controllers—a pocket-size, portable infrared thermometer and a single-line thermal scanner. Aids for spectral analysis include sample cells and ATR equipment. Also produced are two infrared microscopes and an infrared microimager. Distribution is national and international through engineering representatives.

NTIAC-015747

Battelle Memorial Institute, Columbus Laboratories
Fabrication & Quality Assurance Section
505 King Avenue, Columbus, OH 43201; 614/424-7371
The Fabrication and Quality Assurance Section of Battelle Columbus Laboratories has a group of 15 to 20 people engaged in contract research and development in broad areas of nondestructive testing. Well-qualified personnel and appropriate equipment and facilities are available to conduct programs in the major NDT areas of radiography, ultrasonic, eddy current, penetrant and magnetic testing, as well as less common areas, such as optical, acoustic emission, and microwave. Program objectives, using standard NDT techniques, are, through development of improved techniques, to design and fabricate prototype NDT systems to solve production and field inspection problems.

NTIAC-015748

Battelle, Pacific Northwest Laboratories
Nondestructive Testing Section
P. O. Box 999, Richland, WA 99352; 505/375-2138
Battelle, Pacific Northwest Laboratories (NW), Nondestructive Testing Section, is engaged in the research and development of advanced nondestructive test systems, instrumentation procedures, and application. Research is concentrated in fields of ultrasonics, eddy currents, acoustic emission, and high-speed electro-optical inspection. Capabilities include both the theoretical and engineering aspects associated with design, development, acoustic emission instrumentation, pattern recognition, computer-aided analysis, and automatic electro-optical inspection. Full laboratory facilities exist for instrument and system design and development.

NTIAC-015749

Bearing Inspection, Inc.
10041 Shoemaker Avenue
Santa Fe Springs, CA 90670; 213/944-6251
Bearing Inspection, Inc., reconditions used ball and roller bearings by refinishing working surfaces and replacing worn components as necessary to make used bearings like new. This work has produced a capability to nondestructively inspect and evaluate ball and roller bearing dimensions, running accuracy, failures, and types and degrees of wear. In addition, specialized gages and inspection equipment for ball and roller bearings are produced, along with the bearing analyzer, an instrument for the evaluation of noise produced by ball and roller bearings.

NTIAC-015750

Bell Helicopter Textron
Methods and Materials Laboratory
NDT Laboratory
Fort Worth, TX 76101; 817/280-2510

The NDT Lab is part of the Methods and Materials Laboratory in the Engineering Laboratories Department. Activities are strictly "in-house"; no development, testing, or inspection services are offered to the outside community. BHT's NDT lab's primary functions are (1) planning and conducting independent research and development programs to establish more reliable and cost-effective nondestructive inspection of helicopter components and to establish nondestructive testing procedures for new materials and components; (2) developing inspection techniques and preparing written procedures for use in production inspection of components; (3) performing special nondestructive examinations of production and engineering components and providing support for the product assurance department; (4) specifying NDT equipment, systems, and supplies; (5) coordinating with BHT customers, suppliers, and subcontractors; and (6) providing information and assistance to engineering design, metallurgical, field investigation, and bonding groups upon request. The principle NDT method utilized is ultrasonic inpsection. Radiography and eddy current techniques are also being used. Other NDT activities will include evaluations of acoustic emission techniques and optical holography to accomplish various inspection tasks.

NTIAC-015751

Bell & Howell, CEC Division
360 Sierra Madre Villa, Pasadena, CA 91109; 213/796-9381
Branches: Huntsville, AL; Los Angeles; San Francisco; Orlando; Chicago; Boston; Detroit; St. Louis; Cherry Hill, NJ; Albuquerque; Dayton; Dallas; Houston; Salt Lake City; Norfolk; and Seattle
The CEC Division of Bell & Howell is a major manufacturer of primary pressure standards, pressure and vibration transducers and associated monitoring equipment, signal conditioning amplifiers, recording oscillographs, and galvanometers.

NTIAC-015752

Bendix Corporation (The)
Automation & Measurement Division
P. O. Box 1127, Dayton, OH 45401; 513/254-5377
Branches: Detroit, Chicago, Indianapolis, and Cleveland
The Automation and Measurement Division of the Bendix Corporation offers standard systems and special or automated equipment for measurement of part feature thickness dimension, location, roundness, and geometry relationsips. Instruments are also available for surface roughness and X-ray thickness measurement of steel, glass, aluminum, strips, etc.

NTIAC-015753

Bendix Corporation (The)
Electric/Fluid Power Division
211 Seward Avenue, Utica, NY 13503; 315/797-2500
The Electric/Fluid Power Division of the Bendix Corporation is a custom manufacturer of ground support equipment and automatic test equipment of all types, usually combining fluid power technology with electrical/electronic controls and instrumentation.

NTIAC-015754

Benthos, Inc.
Edgerton Drive, North Falmouth, MA 02556; 617/563-5917
Benthos manufactures and sells taptone quality inspection systems for food and beverage packers. These are nondestructive machines that automatically test and reject improperly packed containers (low vacuum or pressure, leaks, cracked jars, etc.). This work involves testing of the customer's products in the Benthos laboratory to determine machine set-up, etc., as well as R&D into system advancements. Benthos also maintains deep-sea pressure-testing facilities and underwater pool facilities to check operation of instruments such as acoustic devices, camera systems, bottom grabs, flotation equipment, underwater flash and lighting equipment, and other electrical-mechanical devices and instruments.

NTIAC-015755

Bently Nevada Corporation
P. O. Box 157, Minden, NE 89423; 701/782-3611
Branches: USA, Canada, Italy, France, Japan, The Netherlands, Venezuela, England, and West Germany
The Bently Nevada Corporation manufactures a broad line of electronic equipment—proximity probes, proximitors, transducers, accelerometers, seismoprobes, optical pickups, monitors, tachometers, and calibrating and diagnostic testing equipment. This equipment is used to measure out-of-limit vibration, thrust position, speed, velocity, thermal growth, temperature, and many other rotating machine characteristics. Products include standard and custom-built total protection and information systems for rotating machines. Customer training, mechanical engineering services, and custom products divisions are part of the worldwide supply. Training and consulting services are available to customers. These products are used in the petrochemical, power generation, energy transmission, pulp and paper, steelmaking, marine, and other industries around the world.

NTIAC-015757

Biddle Instruments
510 Township Line Road
Blue Bell, PA 19422; 215/646-9200
The James G. Biddle Company manufactures instruments that are used for nondestructive testing by electrostatic, electric current, and magnetic methods. Typical uses of these instruments are testing of various types of electrical insulating systems.

NTIAC-015758

Big Three Industries, Inc., Tempil Division
2901 Hamilton Blvd., South Plainfield, NJ 07080; 201/757-8300
Tempil Division is a manufacturer of temperature-indicating crayons, liquids, paints and labels. These products are used in determining pre- and post-heat temperatures in welding applications and the calibration of laboratory and commercial ovens and equipment.

NTIAC-015759

Biochemical & Nuclear Corporation
749 West Burbank Blvd.
Burbank, CA 91503; 213/849-1788
Biochemical & Nuclear Corporation manufactures radiochemicals and biochemicals for research and industry for tracer studies and testing. The isotopes used are tritium, carbon-14 and iodine-125. It has a standard line catalog. The company is also involved in sample analysis, consulting services, research and development of labeled compounds, and training of personnel in radiochemical laboratory technology.

NTIAC-015756

Boeing Technology Services
Boeing Commercial Airplane Company
P.O. Box 3707, M/S 73-43, Seattle, WA 98124
Branches: Renton and Auburn, Washington
Boeing Technology Services is marketing the full range of nondestructive testing. Complete laboratories in the following disciplines are available: chemical, metallurgical, polymer, rubber, structural, environmental, quality assurance, materials, fluids & liquids, plastics, finishes, physical testing, and calibration. Nondestructive testing of plating porosity is offered for hydrogen detection using the Boeing plating porosity meter, which the company markets.

NTIAC-015760

Boride Products, Inc.
2879 Aeropark Drive, Traverse City, MI 49684; 616/946-2100
Boride Products, Inc., manufactures ceramic and powdered metals parts, as well as abrasive and polishing compounds. The company also performs laboratory analysis services on boron.

NTIAC-015761

Braun, C. F., and Company
1000 So. Fremont, Alhambra, CA 91802; 213/570-1000
C. F. Braun and Company has engineers and constructors associated principally with the petroleum, petrochemical, chemical and power industries. The operations are worldwide. The Company can and does provide visual, liquid penetrant, ultrasonic, magnetic particle, and radiographic testing, and qualification and certification of NDT personnel services in support of in-house engineering activities and on a consulting basis to others. Both laboratory and field services can be provided.

NTIAC-015762

Brewer Engineering Laboratories, Inc.
P.O. Box 288, 513 Miel St., Marion, MA 02739; 617/748-0103
Brewer Engineering Laboratories, Inc., (BEL) provides a specialized consulting and testing service to industrial and engineering organizations. BEL comprises engineers from a number of disciplines, including mechanical, aeronautical, civil, ocean engineering, and materials sciences. This group is supported by a trained group of electromechanical technicians and engineering secretaries. An extensive inventory of data acquisition and recording instruments also supports this group. Complete engineering studies include materials properties and product design testing, theoretical and experimental stress analysis, static and dynamic field laboratory testing, equipment or structure integrity, troubleshooting machinery or equipment malfunctions, laboratory model testing, special transducers and measurement systems design and development, design of laboratory test fixtures and loading mechanisms, and formal engineering report preparation.

NTIAC-023679

Bruel & Kjaer Instruments, Inc.
185 Forest Street, Marlborough, MA 01752; 617/481-7000
Branches: West Caldwell, NJ; Livonia, MI; Bensenville, IL; Gaithersburg, MD; and Anaheim, CA
Bruel & Kjaer Instruments, Inc., is the sales and service organization in the U.S. for the Danish parent company. Bruel & Kjaer makes electronic instruments for the measurement of sound and vibration. Bruel & Kjaer has been involved in the design and manufacture of precision measuring instruments for more than 35 years. Although principal involvement during this time has been acoustics and vibration, the scope of Bruel & Kjaer Instruments is being continuously broadened. Participation in international standardization work and congresses and the intensive research carried out in our labs keep the company continually abreast with latest developments and ensure instrument specifications fulfilling the latest international requirements.

NTIAC-015764

Burns & Roe, Inc.
Quality Assurance Division
800 Kinderkamack Road, Oradell, NJ 07649; 201/265-2000
Branches: Richland, WA; Jacksonville, FL; Washington, D.C.; Australia; Hong Kong; Puerto Rico; and London
Burns & Roe, Inc., is an engineering organization providing engineering and design, construction management, and quality assurance services to the power generation industries. Services provided in the field of nondestructive testing include personnel training in radiography, ultrasonics, liquid penetrant, magnetic particle, leak and eddy current testing; auditing of NDT programs and processes; verification inspection of NDT per-

formed by others; and evaluation of NDT methods and procedures for compliance with government and industry codes and standards. Burns & Roe personnel providing the above services are certified to government and industry standards.

NTIAC-015768

Cambridge Instrument Company, Inc.
Cambridge/IMANCO
40 Robert Pitt Drive, Monsey, NY 10950; 914/356-3331
Branches: Morton Grove, IL; Mountain View, CA; and Montreal and Toronto, Canada

Cambridge/IMANCO is essentially a sales and service organization for a British company. The U. S. company consists of approximately 70 people located throughout the United States and Canada. The company demonstrates and markets special-purpose, image-analyzing computers (Quantimet), scanning electron microscopes, and microprobes, plus related equipment used in the manufacture of semiconductor equipment (electron beam microfabrication equipment, crystal growth systems, cutting saws, polishing equipment, and vapor disposition equipment). The image analyzer is used in NDT. This system scans a sample and classifies the sample accurately to its size, area, perimeter, gray level or other parameters, depending on the operator's requirements. It is used in evaluating pin-holes on samples, dust on wafers, fibre configuration in textiles, biological cell anomalies, metallurgical grain size, and almost any other application where the sample can be visually observed and classified with/without magnification. The scanning electron microscope (Stereoscan) is used to visually examine almost any sample that requires magnification beyond the range of a light microscope. Additionally, other accessories are available to identify chemical composition, etc.

NTIAC-015769

Canberra Industries
Nuclear Systems Division
45 Gracey Avenue, Meriden, CT 06450; 203/238-2351

Canberra Industries manufactures a complete line of solid state detectors, multichannel analyzers (MCA), and nuclear instrument modules (NIM) for application in the nuclear physics research community, materials analysis, nuclear medicine, and the total nuclear fuel cycle. Canberra is a worldwide organization with manufacturing facilities in the United States and Europe. There are 14 sales offices in the United States and 52 in the rest of the world. Field service support is available on an international basis. Solid state detectors provided by Canberra are GE(LI), HPGE, SI(LI), and silicon surface barrier. In addition, a complete line of gas-filled detectors and NAL(TI) scintillation detectors are carried. MCA's include small portable types up to large stand-alone research-grade types, providing quantitative analysis and MCA's with mini computers. The NIM products include analog and digital modules for high resolution, high-count rate spectroscopy work and automation of X-ray diffractometers. Specialized applications include special nuclear material waste assay systems, whole body counting and liquid and gaseous effluent monitoring systems for the nuclear reactor facility, and low-level environmental counting systems.

NTIAC-015770

Catalytic, Inc.
Operations Division—Power Projects
Centre Square West, 1500 Market Street
Philadelphia, PA 19102; 215/864-8000
Branch: Charlotte, NC

Catalytic, Inc., Operations Division—Power Projects, offers worldwide services in architect-engineering, construction, and contract maintenance. Users of these services include the government and industries such as nuclear and industrial power, chemical processing, petrochemical processing, pharmaceutical, and plastics.

NTIAC-015766

CBL Industries, Inc.
13810 Enterprise Avenue, Cleveland, OH 44135; 216/267-4142
CBL Industries, Inc., provides nondestructive testing services for aircraft, aerospace, nuclear, automotive and other industries requiring sophisticated testing with ultrasonic (UT), radiographic (RT), magnetic particle (MT), penetrant (PT), and eddy current (ET). UT capabilities include multi-tank setups for immersion scanning of plate, bar, forging, and products such as honeycomb and bonded structures. Precision contact scanning with surface shear and other techniques is available. Multi-channel tubing and bar testing is available. High-resolution UT with B- and C-scanning is available. RT capabilities from 25KV BE window to 300KVCP radiography is available, as are X-ray-sensitive vidicon techniques for small components. Real-time imaging with image intensifiers and mirror optics or TV is available for production on investigative work. MT and PT are available in most sensitivity levels, from the fluorescent to the visible powder and dyes. ET testing can be done to customer's requirements. NDT consulting services are also available.

NTIAC-015771

Circle Chemical Company, Inc.
P.O. Box 1184, Hinckley, IL 60510; 815/286-3271
Circle Chemcial Company, Inc., produces and markets the following items for the nondestructive testing industry: fluorescent magnetic particles for wet applications, using either a water or an oil media; wetting agents for water media applications; a wide range of fluorescent and nonfluorescent magnetic dusting powders; underwater magnetic particles; and underwater permanent magnet probes. In addition to their proprietary product line, the company serves the nondestructive testing industry by developing unique products for specific applications in which special problems demand a variance from the established product line. The company maintains its plant, laboratory, and research facilities in Hinckley, Illinois. Its products are warehoused in various locations throughout the country. The company's products are marketed internationally.

NTIAC-015772

Cleveland Technical Center, Inc.
13600 Diese Avenue, Cleveland, OH 44110; 216/451-6455
The Cleveland Technical Center, Inc., offers an engine oil analysis service. The purpose of this analysis is to determine potential engine wear and malfunctions before an engine failure occurs.

NTIAC-015773

Cober Electronics, Inc.
Industrial Microwave Heating Equipment
102 Hamilton N.E., Stamford, CT 06902; 203/327-0003
The company is based on microwave power generation. It designs, engineers, manufactures, tests, and services microwave power supplies, transmission systems, devices, and ovens. Individual components are supplied, along with complete conveyors and batch ovens. Supplied also are RF test devices and systems, along with communication systems. Cober Electronics serves military, communication, medical, and diverse industrial markets, e.g., rubber, foundry, food, and plasma fusion markets.

NTIAC-015774

Coherent, Inc.
Tropel Division
60 O'Connor Road, Fairport, NY 14450; 716/377-3200
Tropel is in the field of optical nondestructive testing of materials (specifically, optical materials and components). Following is a list of major characteristics tested and the specific product or service: (1) Optical transfer function—Tropel's System 2000 measures the OTF of all optical components, i.e., lenses, mirrors, image intensifiers, filar, etc., in the U.V., visible or I.F. regions; (2) Optical surface figure—Tropel's Models

4000 and 2500 surface testing interferometers are used to determine the optical surface figure. System 70 allows the total automation of fringe analysis by using a digital computer to analyze wavefront; (3) Aspheric optical surface figure—Tropel's modified Model 4000 uses holographic interferometry and shearing interferometry to analyze aspheric surfaces. System 70 facilitates the automatic, objective analysis of aspheric wavefronts also; (4) Lens design—Tropel has computer lens design programs and designers; and (5) Products for optical spectroscopy—the Fabry Perot Plano and Confocal Cavity interferometers are used for the analysis of optical spectra.

NTIAC-015775

Coleman, W. B., Company
P. O. Box 4461, Philadelphia, PA 19140; RA5/7368
The W. B. Coleman Company is a testing laboratory specializing in metallurgical and chemical tests. Among the tests and inspections that are offered are the following: chemical analysis of ferrous and nonferrous metals, as well as other compounds, both organic and inorganic; optical spectroscopy; arc or spark spectroscopy; X-ray spectroscopy; metallurgical examination; welding qualification; and mechanical testing.

NTIAC-015776

Col-X Corporation
981 East Hudson Street, Columbus, OH 43211; 614/267-1201
The NDT services of the Col-X Corporation include PT, MT, contact UT, leak testing and visual inspection, along with welding engineering consulting. Welding engineering services include welding procedure preparation and testing, individual welder performance testing, QA manual preparation on a "tailor-made" basis, accident and failure investigation, and welder training and development of various testing procedures. The company maintains an extensive welding library with up-to-date code references, a machine shop, a clean room and versatile manual and semiautomatic welding equipment. Field equipment includes portable hardness, magnetic particle, liquid penetrant, black light, ultrasonic, and leak testing units. Services are provided throughout the United States and parts of Canada to industrial concerns, both nuclear and non-nuclear. Clients include utilities, steel mills, fabricators, erectors, designers, marine equipment owners, attorneys, and a wide variety of others.

NTIAC-015872

Comtel Corp.
2201 N. Hollywood Way, Burbank, CA 91505; 213/849-6701
Branches: San Diego, CA; and Irvine, CA
Comtel Corporation is a calibration laboratory for test and measurement instrumentation.

NTIAC-01577

Continental Testing Labs, Inc.
Magnetics & Electronics Division
763 U. S. Highway 17-92, Fern Park, FL 32730; 305/831-2700
CTL performs both environmental and electrical testing of electronic components, primarily semiconductor devices from diodes to microprocessors, but also resistors, capacitors, relays, connectors, transformers, etc. They perform screening, qualification, and characterization for military, aerospace, industrial and commercial customers. A parts management program is also offered under which are supplied screened products of the desired quantity, with supporting data. As an independent testing laboratory, services are performed as an extension of the customer's Q.C. and reliability organizations. Government source inspection is available on the premises.

NTIAC-015778

Control Data Corporation
Computer Development Division
4201 North Lexington Avenue, St. Paul, MN 55112; 612/482-2829
The Hardware Product Qualification Center (HPQC) of Control Data Corporation offers consulting and testing services for electronic equipment in the areas of acoustic emissions, electromagnetic compatibility (EMC) and temperature/humidity phenomena. The HPQC provides a centralized source for design guidance, product testing, and engineering analysis. The acoustic lab provides both ANSI S1.21-1972 and ISO STD 3742 testing capability. Compliance to MIL-STD 7408 and 1472B can also be checked. Laboratory facilities include a reverberation room (236M3) and a semi-anechoic room (200M3). The EMC laboratory provides testing capabilities for MIL-STD 461 testing as well as German VDE testing. A large selection of test instruments allows detection, analysis, measurement and recording of signals from 3 HZ to 10 GHZ, as well as the generation of high-level fields from 1HZ to 8GHZ. Laboratory facilities include two shielded enclosures and an open test area. The temperature/humidity laboratory is capable of testing electrical equipment to most commercial temperature/humidity requirements. The laboratory has a large T/H chamber (100M3) that can develop -10 degrees C to 70 degrees C and 10-90% relative humidity. The HPQC normally serves customers in the upper midwest region of the United States.

NTIAC-023680

Cox Instrument Division, Lynch Corp.
15300 Fullerton Avenue, Detroit, MI 48227; 313/838-5780
Branches: Worldwide
Cox Instrument Division, Lynch Corporation, manufactures mechanical and electronic flow instrumentation and calibration systems. Company offering includes complete design and fabrication of cataloged and custom systems for liquid, gas, and cryogenic service.

NTIAC-015767

CSP Incorporated
6177 Suburban Industrial Park
Billerica, MA 01821; 617/272-6020
CSP Incorporated is the manufacturer of signal processors, array processors, and FFT computers.

NTIAC-015779

Custom Machine, Inc.
9200 George Avenue, Cleveland, OH 44105; 216/341-3994
The Custom Machine Corporation performs approved contract machining for components and assemblies to nuclear and aerospace QC requirements. Special machinery is also designed and built for various industries. Transport mechanisms and systems have been designed and built for ultrasonic inspection of parts such as forgings, castings, plate, bar, billet, tubing, etc. Equipment ranges from simple manual operation to fully automated inspection lines, utilizing computer control.

NTIAC-015780

Custom Scientific Instruments, Inc.
P.O. Box A, Whippany, NJ 07981; 201/538-8500
Custom Scientific Instruments, Inc., (SCI) is a manufacturer of physical testing instruments for performing tests on plastic, paper, rubber, textiles, wood, concrete, etc. Also manufactured are nondestructive test instruments. The standard product line of instruments is made to ASTM, ISO, and federal specifications. CSI also designs and manufactures special equipment of customer designs or prototypes. This includes test jigs and fixtures that can be used with existing test equipment. The instruments are used in quality control and research laboratories. CSI's sales are worldwide.

NTIAC-023735

DAPCO Industries, Inc.
199 Ethan Allen Highway, Ridgefield, CT 06877; 203/438-9696
DAPCO Industries, Inc., is a Connecticut-based manufacturer of ultrasonic transducers and instrumentation, servicing the nondestructive testing requirements of the industrial and railroad industries. The DAPCO line of rail-inspection vehicles allows customers access to the highest level of technology currently available. Modular design permits the system to be tailored to the specific application requirements of customers. These systems are available as a complete "turnkey" package, or testing services may be contracted.

NTIAC-023681

Dapple Systems
P.O. Box 2160, Sunnyvale, CA 94087; 408/733-3283
Dapple Systems is a manufacturer of automation systems for X-ray diffractometers and X-ray fluorescence spectrometers. Complete software packages for data acquisition and data reduction are included with the systems. These systems utilize Apple II plus microcomputer, with all programs written in BASIC.

NTIAC-015782

Datametrics, Inc.
340 Fordham Road, Wilmington, MA 01887; 617/658-5410
Representatives throughout the United States and Canada
Datametrics is a prime manufacturer of precision/vacuum measurement and control systems, time code generators, shaft encoders, and velocity and mass flow measurement equipment (hot wire type for dry noncorrosive gases). Facilities include pressure and flow primary standards to 300 PSI and 250 SCFM, respectively.

NTIAC-015783

Dayton X-Ray Company, Inc.
1150 W. 2nd Street, Dayton, OH 45407; 228-4417
Dayton X-Ray Company provides commercial NDT services to the Dayton, Ohio area. Service area normally ranges from Richmond, Indiana, east to Columbus, Ohio, north to Lima, Ohio, and south to Cincinnati, Ohio. Inspection services include radiography, both X-ray and gamma ray; magnetic particle; penetrant; and ultrasonics. These services are provided both in laboratories and on site. The company has marketing agreements with two large NDT equipment suppliers and a very comprehensive stock of radiographic film, developing chemicals, and radiographic accessories and supplies. They train levels I and II personnel and provide examination services for general and specific written tests for these levels. Consulting services are also performed. Certified level III personnel in radiography, magnetic particle, penetrant, and ultrasonics are available.

NTIAC-015784

Defelsko Corporation
P.O. Box 676, Ogdensburg, NY 13669; 315/393-4450
Defelsko Corporation of Ogdensburg, NY, was incoporated in 1965. The main line is selling and servicing testing instruments, Mikrotest thickness gages, and Minitest thickness gages. A new Mikrotest II instrument is being introduced.

NTIAC-015785

Del Electronics Corporation
150 E. Sandford Blvd., Mt. Vernon, NY 10550; 914/699-2000
Del Electronics designs and manufactures high-voltage power supplies, transformers, precision and high-voltage capacitors.

NTIAC-015786

Denver, University of,
Physics Department
Denver, CO 80208; 303/753-2238

A complete, modern, acoustic emission laboratory has been developed over the past several years in the Physics Department of the University of Denver that allows for detection and presentation of data in a wide variety of ways, including RMS voltage, number of bursts, rate of bursts, amplitude distribution, time duration, frequency distribution, and energy distribution. A (high-frequency) video tape system is available that makes a permanent record of the acoustic emission. The playback of the tape can then be used to investigate the acoustic emission in many different representations. A unique feature of the system is the inclusion of a microprocessor that provides a digital output on paper tape of the acoustic emission and other test parameters. The arrangement currently allows a digital output of six variables during the actual testing operation. An integral part of the laboratory is a paper-tape reader and a Hewlett-Packard 9810 programmable calculator equipped with a plotter. This equipment provides a rapid and detailed analysis of the test data.

NTIAC-015787

Detoronics Corporation
P.O. Box 3805, South Elmonte, CA 91733; 213/579-7130

The Detoronics Corporation serves the continental U.S. and Canada with high-reliability glass-to-metal, hermetically sealed electrical connecting devices and products. The products are engineered, designed, and manufactured by the company. Also provided are services to the electronics industry in helium leak, electrical, pressure, and environmental testing.

NTIAC-015788

Dosimeter Corporation of America
Nuclear Accessories Division
P.O. Box 42377, 11286 Grooms Road, Cincinnati, OH 45242; 513/489-8100

The Dosimeter Corporation of America (DCA) provides the radiation-detection auxiliary equipment and supplies for measuring gamma, X-rays, and neutrons during X-, gamma, and neutron radiography. This includes radiation dosimeters and survey meters. It also includes ancillary equipment such as dosimeter chargers, calibrators, logbooks, racks and clips. The Dosimeter Corporation of America was previously known as the Bendix dosimeter product line and the Landsverk Electrometer Corporation and is the only United States manufacturer of multiple types of dosimeters to meet all NDT customer requirements.

NTIAC-015819

Dravo Utility Constructors, Inc.
Division of Gibbs & Hill, Inc.
2 Penn Plaza, New York, NY 10121; 212/760-4000
Branches: Dallas, Omaha, New Orleans, San Jose, Madrid, and Milan

Gibbs & Hill (G&H) provides management, engineering, design, consulting, analytical, and construction services for utilities, other industrial organizations, and government agencies. Through its own Dravo Utilities Constructors (DUCI) subsidiary, G&H provides nondestructive test services, vendor and on-site inspections, and QA audits. G&H and DUCI have the capability of providing varied nondestructive testing services, including consulting, providing technical information, performance of inspections and tests, interpretation of test results, preparation of inspection and test procedures, and personnel training on a worldwide basis. Performance of tests and inspection activities are limited to construction site locations. Nondestructive test methods utilized by G&H/DUCI encompass magnetic particle; ultrasonic (with emphasis on resonance and defect-echo analysis); X-radiography; gamma radiography; liquid penetrant; gaseous leak testing (utilizing the bubble method); and eddy current. These tests are applied to castings, forgings, piping, structural members, pressure vessels, other fabricated components and supports, concrete, coatings, and paint. These tests are performed to assess soundness of materials, conformance to specification for materials, components and structures, and product dimensions, and coating thickness.

NTIAC-015789

Dunegan/Endevco
Rancho Viejo Road, San Juan Capistrano, CA 92675; 714/831-9131
Branches: Houston; Atlanta; Chicago; East Brunswick, NJ; Palo Alto, CA; and Nashua, NH
Dunegan/Endevco manufactures acoustic emission instrumentation and provides testing services for flaw detection and location. Applications include detection and location of discontinuities, delaminations, voids, porosity, inclusions, fatigue cracks, stress corrosion cracks, corrosion, leaks, etc., in a wide variety of engineering materials and structures. Instrumentation manufactured ranges from low-cost, single-channel systems to complex, multichannel, computerized flaw-location systems. Testing services find primary application in the recertification of pressure vessels and piping in the petrochemical and nuclear power industries.

NTIAC-023682

du Pont de Nemours (E. I.) & Co., Inc.
Photo Products Division
Wilmington, DE 19898; 302/774-1000
Branches: Clifton, NJ; Atlanta, GA; Niles, IL; Irving, TX; and Burbank, CA
E. I. du Pont de Nemours is an international manufacturer of radiographic films, screens, chemicals, daylight film-handling equipment, processors and chemical mixers. There are over 200 thoroughly trained technical representatives throughout the U.S., backed by a sophisticated technical services laboratory located in Wilmington, Delaware. The technical services laboratory provides technique consultation, chemical analysis, a processing school, and evaluation of imaging techniques, as well as exposure adjusters, density strips, developer test strips, fixer-cleaning test strips, washing test solution, and a radiographers reference manual. Level I and II training courses are provided six times a year in various locations throughout the U.S. Products are sold through an extensive dealer network throughout the country. We offer the most complete line of NDT films for faster processability in a variety of put-ups, including cut-sheet and roll films available in daypack and lead screen daypack.

NTIAC-015790

Dynamold, Inc.
P.O. Box 9617, Fort Worth, TX 76107; 817/335-0862
Dynamold, Inc., is the sole licensee under U. S. patent number 3,862,047 for the manufacture and distribution of Magnetic Rubber Inspection (MRI). MRI is an innovative NDT technique for ferromagnetic metals that combines the principles of magnetic particle inspection with a novel replicating system. The outstanding capabilities of MRI include the inspection of (1) blind holes, (2) gear roots and thread roots, (3) coated inspection areas, and (4) areas of limited visual or mechanical access. MRI is employed internationally by the aerospace industry, power generation facilities, all branches of the military, and industrial NDT areas concerned with a need for a high degree of sensitivity and dependability. It is qualified to MIL-I-83387 (USAF), 21 August '72, and has a national stock number, NSN-7850-01-037-9015. Technical assistance with applications and parameters is readily available at no charge.

NTIAC-023683

Dyonics, Inc.
Industrial Division
160 Dascomb Road, Andover, MA 01810; 617/470-2800; 1-800/343-8386
Dyonics, Inc., provides inspection of inaccessible areas using fiber-optic-illuminated borescopes, visual inspection using fiber-optic devices, and quality control inspection.

NTIAC-015792

Eastman Kodak Company
Health Sciences Markets Division
343 State Street, Rochester, NY 14650; 716/724-4000

Branches: Chicago; Dallas; Atlanta; San Francisco; Whittier, CA; New York, NY; and Rochester, NY

Kodak Industrex products include X-ray films, X-ray paper, processing chemicals, film processors, and intensifying screens. Services offered by Kodak include technical sales representatives who assist with product application in all areas of NDT; a 2-week basic seminar on industrial radiography designed to help industrial radiographers prepare for qualification under the recommended practice of the American Society for Nondestructive Testing (SNT-TC-1A); and product literature describing product applications and performance.

NTIAC-015793

Ebasco Services, Inc.
Materials Engineering Laboratory
Bldg. 100 A, Port Kearny, South Kearny, NJ 07032; 201/344-8400
Branches: New York; Atlanta; Washington, D.C.; Jericho, L.I.; Houston; and Chicago

The scope of services performed by the Ebasco Materials Engineering Laboratory includes radiographic, ultrasonic, liquid penetrant, magnetic particle and visual examinations. These services may be performed both in-shop and in the field. Piping, pressure vessels, structural steel, weldments, castings, and forgings may be examined. The Ebasco Materials Engineering Laboratory has received a "Quality System Certificate (Materials) N-Stamp" from the ASME as a material supplier of carbon, alloy, and stainless steel castings and forgings.

NTIAC-015794

Echo Laboratories, Inc.
P. O. Box 552, R.D. No. 4, Box 76
Lewistown, PA 17044; 717/248-4993
Branch: Titusville, PA

Echo Laboratories is a manufacturer of ultrasonic couplants and ultrasonic transducers used in nondestructive testing. Ultrasonic couplants include Echogel II, an inexpensive production couplant that meets some (but not all) nuclear specifications; Ultragel II, a superior coupling agent with less than 50 PPM total halogens and sulphur, used extensively in the nuclear and aircraft/aerospace industries; Sonotrace, a modestly priced production couplant with less than 50 PPM halogens and sulphur and used in the nuclear, aerospace and metals industries; Pyrogel, a high-temperature, ultrasonic couplant useful to 1000 degrees F; Pyrodiscs, high-temperature coupling discs useful from 1000 to 2500 degrees F; Fluorescent ultrasonic couplants, unique high-transmission couplants with fluorescent tracers designed to ensure complete removal; immersion ultrasonic additives, additives for immersion systems for deairing, wetting, corrosion protection, and prevention of fungus or bacteria formation; ultrasonic couplants for shear wave coupling, i.e., permanent transducer bonding at elevated temperature; and medical ultrasonic couplants. Ultrasonic transducers are also supplied for industrial, medical, and specialized applications.

NTIAC-015795

Econospect Corporation
1757 Tanen Street, NAPA, CA 94559; 707/226-9833

Econospect manufactures magnetic particle testing equipment (18 models), ranging from 450 amperes to 6000 amperes, and manufactures magnetic particle testing accessories, including yokes, coils, and test meters. The Repair and Calibration Divisions provide complete repair and calibration service for all makes of magnetic particle testing equipment.

NTIAC-023685

Eikonix Corporation
23 Crosby Drive, Bedford, MA 01730; 617/275-5070

Eikonix Corporation manufactures high-precision, electro-optical image processing and image analysis equipment, including image scanners, image digitizers, viewing systems, and special purpose quality control systems. Our image digitizer serves as the input device for quality control and nondestructive testing systems.

It is capable of digitizing with higher resolution (2048 x 2048 samples) than other systems and can digitize from photographic imagery (film, prints, etc.) or directly from source materials such as PC boards. Once the digital image is acquired, it can be processed and/or analyzed by computer to determine a quality judgement. Eikonix Picture Processing Language (EPPL) is the company's image-processing language developed to be simple to use and interactive in nature. The company's approach to a QC or NDT problem is to provide the customer with a total solution that is cost-effective. This involves, in many cases, the adapting of available hardware and software, as well as the development of customized hardware and software.

NTIAC-015796

Electrical Testing Laboratories, Inc.
Industrial Park, Cortland, NY 13045; 607/753-6711
Branches: Atlanta and Los Angeles
Electrical Testing Laboratories, Inc., (ETL) is an independent testing laboratory. The organization is comprised of nine divisions that conduct performance and safety tests on a broad spectrum of industrial, commercial, and consumer products. The nine divisions are as follows: acoustical, air conditioning/refrigeration, carpet, chemical, design services, electrical/electronic, heating, mechanical, and photometric.

NTIAC-015797

Electromatic Equipment Company, Inc.
Check-Line Instruments Division
600 Oakland Avenue, Cedarhurst, NY 11516; 516/295-4300
Electromatic Equipment Company, Inc., supplies a series of coating thickness testers (analog and digital) to measure the thickness of coatings applied to ferrous and non-ferrous base materials (substrates). Employed are the electronic magnetostatic principle for magnetic base materials and the eddy current principle for ferrous and non-ferrous base materials. In addition, Electromatic supplies an ultrasonic thickness gage for measuring the overall thickness of plates, sheets, walls, tank sides and pipe walls—from 0.040 to 8 inches thick. The unit (Model TI-6) is handheld and battery-operated and provides a 3-1/2-digit LCD readout.

NTIAC-023686

Electro-Metrics Division of Penril Corporation
100 Church Street, Amsterdam, NY 12010; 518/843-2600
Electro-Metrics Division of Penril Corporation manufactures and sells instrumentation for measuring electromagnetic interference (EMI) emissions, from 10 Hz to 40 GHz. Products include instruments and accessories plus systems with all degrees of automation, including calculator/computer control. These are sold worldwide via independent sales representative organizations. Customer service activities are provided.

NTIAC-023684

EMCO, Division of Intertest, Inc.
P.O. Box 94, 95 Mary Jones Road, Swartswood, NJ 07877; 201/948-6838
EMCO, Division of Intertest, Inc., is a supplier of nondestructive testing equipment and services. Geographically, EMCO serves the northeast sector of the United States, including the Washington, DC area. Their product line includes ultrasonics, transducers, instrumentation, thickness gages, hardness testing, acoustic emission, borescopes/rigid, and fiberoptic/flexible; they also offer testing services.

NTIAC-015798

Emerson and Cuming, Inc.
Flotation Products Division
869 Washington Street, Canton, MA 02021; 617/828-3300
In connection with work in developing and manufacturing high-performance, deep-sea buoyancy materi-

als, Emerson & Cuming, Inc., maintains a high-pressure hydrostatic test laboratory. The laboratory is equipped with a variety of pressure vessels that enable material samples to be subjected to water at pressures up to 30,000 PSI. Sizes range from small vessels intended for standard 1-inch dia. by 2-inch dia. ASTM samples to a giant tank over 3 feet in diameter by 50 feet long. The services of the high-pressure laboratory are offered on a time-available basis.

NTIAC-015791

EMI Therapy Systems, Inc.
EMI Technology, Inc.
570 Del Rey, Sunnyvale, CA 94086; 408/245-3136
Branches: Chicago, Hayward, CA; Tampa, FL; Dallas; and Wayland, MA

NTIAC-015799

Eocom Corporation
15771 Redhill Avenue, Tustin, CA 95680; 714/730-5051
The Eocom Corporation performs infrared analysis using Fourier transform infrared. A complete facility exists for performing spectral analysis of liquids, solids, and gases on a measurement service basis. Products include an infrared monitoring system, FMS 7200, for toxic gas analysis; OSHA area monitoring; and quality control.

NTIAC-015800

Explosive Technology, Inc.
Aerotest Operations, Inc.
3455 Fostoria Way, San Ramon, CA 94583; 415/837-4248
Aerotest Operations, Inc., is a service organization providing the industrial community with neutron radiography and activation analysis.

NTIAC-015801

Failure Analysis Associates
750 Welch Road, No. 116, Palo Alto, CA 94304; 415/321-6350
Branches: Los Angeles, and Houston
Nondestructive inspection services are offered in laboratory, production, and in-service environments. Failure Analysis Associates has developed advanced methods for evaluating and optimizing inspection services. Specific capabilities include ultrasonic testing, dye-penetrant testing, eddy current testing, and acoustic emission testing.

NTIAC-015802

Fife Corporation
Instrument Systems Division
P.O. Box 26508, Oklahoma City, OK 73126; 405/755-1600
Branches: England and Germany
The Fife Corporation develops and manufactures beta-ray gauging and control systems for on-line process control of thickness or coating thickness.

NITAC-015763

Filterite/Brunswick
2033 Greenspring Drive, Timonium, MD 21093; 301/252-0800
Branches: Worldwide

Filterite/Brunswick is a manufacturing and service-oriented company. Products and services include disposable and cleanable filter cartridges, standard- and custom-designed pressure housings for liquid and gas applications, specifically in the fields of petrochemical, chemical, nuclear waste, pharmaceutical, and toxic chemicals, with stocking distributors worldwide.

NTIAC-015803

Flow Technology, Inc.
P.O. Box 21346, Phoenix, AZ 85036; 602/268-8776
Flow Technology, Inc., manufactures fluid flow measurement equipment and repairs and calibrates any type of turbine flowmeter. FTI's plant was specifically laid out for the design, development, and manufacture of fluid flow measurement equipment.

NTIAC-015804

Fluor Power Services, Inc.
Welding and Metallurgy Division
200 W. Monroe Street, Chicago, IL 60606; 312/368-6717
Fluor Power is engaged in the design and construction of both nuclear and fossil power plants. Nondestructive examination is the responsibility of the Welding and Metallurgy Division. The Welding and Metallurgy Division provides nondestructive examination consulting services that include code and standard interpretation, preparation of specifications and procedures, review of vendor procedures, supervision of field and laboratory nondestructive examinations, review of test reports, nondestructive examination personnel training, witnessing of nondestructive examination of components, welds and materials, and serving as level III examiner for utility in-house nondestructive examinations. Fluor Power maintains a complete facility for radiographic film interpretation and film storage at the corporate office in Chicago. The Welding and Metallurgy Division provides expertise in radiography, ultrasonics, magnetic particle, liquid penetrant, visual inspection, leak testing, and coatings.

NTIAC-015805

Forney, Inc.
RD No. 2, Route 28 South, Wampum, PA 16157; 412/535-4341

NTIAC-023687

Foxboro Company
Analytical Division
P.O. Box 435, 78 Blanchard Road, Burlington, MA 01803; 617/272-1000
The Foxboro Company, Analytical Division, offers a comprehensive range of instruments and systems for process control, environmental monitoring, and laboratory analysis. It also offers one of the widest ranges of analytical technologies available from any one company. These technologies include electrochemistry—conductivity/resistivity; PH/ORP; specific ion; ferrography; gas chromatography; infrared spectroscopy; and octane analysis. With this extensive technical capability, Foxboro Analytical can provide the precise analytical measurement and control systems for maximizing the quality of products and working environments to help achieve an unparalleled level of production efficiency. In addition, Foxboro Analytical provides in-depth engineering expertise and technical assistance to ensure that the performance of their instruments meets the customer's special needs. With the support of the Foxboro Company, recognized worldwide, they can furnish complete advanced control systems and provide pre-engineered sample-handling systems which are delivered, set up, and ready for simple connections. They can supervise installation of their instruments and systems and provide on-site training and worldwide service and maintenance.

NTIAC-015807

Froehling and Robertson, Inc.
Metals and Nondestructive Testing Department
P.O. Box 27524, 3015 Dumbarton Road, Richmond, VA 23261; 804/264-2701
Branches: Norfolk, VA; Roanoke, VA; Raleigh, NC; Charlotte, NC; Fayetteville, NC; Asheville, NC; Greenville, SC; and Baltimore, MD

Froehling and Robertson is a full-service, independently owned testing laboratory. The services offered include concrete and cements design, test and inspection; chemical and bacteriological testing; routine and special testing of asphalts and bituminous products; geophysical site investigation, field test, and laboratory testing and analysis; soils testing; structural steel inspection; and NDT, including radiographic, ultrasonic, magnetic particle, X-ray, and gamma ray liquid penetrant.

NTIAC-015810

Gaertner Scientific Company
1201 Wrightwood Avenue, Chicago, IL 60614; 312/281-5335

Gaertner Scientific Company manufactures a complete line of optical measuring and testing equipment for scientific and industrial applications. These include microscopes, positioning devices, micrometer slides, coordinate measuring microscopes, cathetometers, comparators, holographic systems, optical benches, interferometers, spectrometers, and ellipsometers for the precise measurement of film thickness. Gaertner Scientific has dealerships throughout the United States and abroad. In addition to the standard instrumentation mentioned above, Gaertner is prepared to offer special modifications to meet unusual requirements or to design new instrumentation where the nature of the application requires.

NTIAC-015808

GAF Corporation
Photo and Repro Group
X-ray Products
140 West 51 Street, New York, NY 10010; 212/582-7600

GAF offers the following products and services to the nondestructive testing market: industrial X-ray films; industrial X-ray processing chemicals (manual); industrial X-ray processing chemicals (automatic); illuminators; industrial intensifying screens; exposure holders; lead protective devices (aprons); darkroom accessories; safelights; process quality control systems and services; radiographic cassettes; and personnel training.

NTIAC-024506

Gamma High Voltage Research, Inc.
149 Wheeler Avenue, Pleasantville, NY 10570; 914/747-1744

Gamma High Voltage Research, Inc., specializes in the design and manufacture of high-voltage power supplies in voltage levels up to 100 kV, with output power levels in the milliwatt to 150-watt levels. Typical applications are gas lasers, X-ray equipment, capacitor charging, CRT displays, and electrostatic generators. The company is capable of providing custom design and manufacture of specialized equipment to meet specific needs of the scientific community.

NTIAC-015812

GARD, Inc.
A Subsidiary of GATX Corp.
7449 N. Natchez Avenue, Niles, IL 60648; 312/746-9000
Branch: Washington, DC

Gard, Inc., a subsidiary of the GATX Corporation, performs research and development under contract to both government and industry in the areas of NDT technique development and specialized inspection system design and fabrication. An NDT laboratory is available with acoustic emission, radiographic, eddy current, and ultrasonic equipment. Key areas of recent experience are system developments for acoustic emission weld monitoring and rubber product inspection.

NTIAC-023689

Gardner, Paul N., Company, Inc.
218 Commercial Blvd., Lauderdale by the Sea, FL 33308; 305/522-1679
Paul N. Gardner Company, Inc., manufactures and markets paint testing and laboratory instruments used in the coatings and other industries. Their 480-page catalog describing their complete line of instrumentation is available free of charge.

NTIAC-015811

Gates, George W., and Company, Inc.
P.O. Box 216, Franklin Square, NY 11010; 516/352-2904
The George W. Gates and Company, Inc., furnishes special light sources, such as sodium, mercury, zirconium, deuterium, xenon, spectral and filament lamps, and their operating auxiliaries. These sources can be used in conjunction with nondestructive test instruments or test procedures. Sales are nationwide to all types of laboratories and manufacturing facilities.

NTIAC-015809

GCA Corporation
Vacuum Industries Division
34 Linden Street, Somerville, MA 02143; 617/666-5450
GCA/Vacuum Industries manufactures a broad range of vacuum/thermal processing systems for laboratory and production use. Temperatures to 3000 degrees C and vacuum to .00000007 TORR are attainable. Certain laboratory vacuum furnaces are routinely adapted for various analytical test procedures by the users, but no specific test equipment is offered as standard catalog items.

NTIAC-015803

General Activation Analysis, Inc.
11575 Sorrento Valley Road, No. 214, San Diego, CA 92121; 714/755-5121
General Activation Analysis, Inc., performs neutron and photon activation analysis for the determination of trace elements.

NTIAC-015814

General Dynamics Convair Division
Convair School for NDT (M/Z 41-1414)
P.O. Box 80847, San Diego, CA 92138; 714/277-8900
The General Dynamics Convair Division serves the training needs of industry through its school for nondestructive testing in San Diego, California. In a concentrated, 3-week course, covering the material specified in SNT-TC-1A for category II qualification-certification, theory and practice are offered in the five most widely used NDT methods: radiographic, eddy current, ultrasonic, magnetic particle, and liquid penetrant testing. The 120-hour course combines programmed instruction, laboratory exercises, practical training, and interpretation of test results. Instructors are the specialists who created the 18-volume NDT training manual widely used throughout this country and 45 other nations for NDT training. In sessions the year round, the school offers classes with a student-instructor ratio of four to one. Laboratory equipment and NDT instruments worth more than a quarter of a million dollars are available for student use, as are Convair manufacturing facilities, where training is offered under actual production line conditions.

NTIAC-015815

General Eastern Instruments Corporation
50 Hunt Street, Watertown, MA 02172; 617/923-2386
The General Eastern Instruments Corporation manufactures a complete line of humidity instruments (dew point and relative humidity, parts-per-million, wet/dry bulb) for laboratory, industrial, and meteorological applications.

NTIAC-015816

General Electric Company
Advanced Reactor Systems Department
M/C 408 NDE Laboratory
175 Curtner Avenue, San Jose, CA 95125; 408/925-2641
Sales Dept.: 955 Arques Avenue, Sunnyvale, CA 94086
The Fast Breeder Department's NDE laboratory designs and builds specialized inspection equipment for application to breeder reactor or liquid metal systems. Inservice inspection equipment, as well as manufacturing equipment, has been built; pulse eddy current, computer ultrasonic, and steam generator ISI methods have been developed. The laboratory possesses tube and bar stock scanners, a computer controlled C-Scan system with turntable, a variety of metrology instruments and the usual assortment of conventional equipment. Electronics support is provided by an electronics laboratory that can fabricate instruments on request.

NTIAC-015904

GEO Construction Testing
7300 West Lawrence Avenue, Chicago, IL 60656; 312/867-8000
GEO Construction Testing offers on-site/on-call nondestructive and construction materials testing services to the heavy construction/power generation, refining, chemical/petrochemical, and commercial structure industries, as well as subsurface soils investigation and concrete design mix and pour evaluations. The company is involved in every phase of the construction process from the ground up. GEO also offers complete inspection. Using X-ray and gamma radiography, magnetic particle, penetrant and ultrasonic inspection techniques, its nondestructive testing division conducts highly critical examinations of welds for safety and reliability.

NTIAC-015817

Geoscience Ltd.
Thermal Testing Division
410 So. Cedros Avenue, Solana Beach, CA 92075; 755-9396
The laboratory operated by Geoscience's Thermal Testing Division specializes in the measurement of thermal conductivity of all materials. Specialized apparatus is available for measuring thermal conductivity of metals, ceramics, liquids, liquid metals, gases, building insulations, biological samples, and thermal radiation shielding. Standard ASTM apparatus is utilized for certified measurements of thermal conductivity, U factor, and R factor of commercial products, by either ASTM-177, -236, -518 or their variations. Insulations from a few thousandths of an inch thickness to 12-inch thickness can be measured. Also measured are specific heat, heat of reaction, thermal diffusivity, thermal expansion, saturation temperature/pressure characteristics, and thermal emissivity. The area served by the laboratory includes the West Coast and Southwest. In addition to the testing laboratory, Geoscience operates a research and development laboratory that specializes in applied investigations in heat transfer and fluid mechanics.

NTIAC-015818

Geotest Instrument Corporation
Box 551, Wheeling, IL 60090; 312/459-0710

The Geotest Instrument Corporation manufactures and distributes a line of equipment for testing physical properties of soil, concrete, asphalt, snow, ice, sand, and gravel. The business is solely involved in selling testing devices.

NTIAC-015820

Gilbert/Commonwealth
Quality Assurance Division
P.O. Box 1498, Reading, PA 19603; 215/775-2600
Branches: Jackson, MI; Seattle, WA; Paris; and London

The Quality Assurance Division of Gilbert/Commonwealth, Engineers and Consultants, is involved with laboratory testing, shop and field inspection and nondestructive testing, inservice inspection of nuclear power plants, maintenance inspections, program development and training, and consulting services. The Division's primary projects are nuclear and fossil power plant construction and operations inspections. Additionally, work is done on chemical, refinery, and water treatment plants, as well as inspections on structural steel, vessels, pipelines, trusses and beams, buildings and bridges, mining, transportation, and ultrasonic, magnetic particle, visual, liquid penetrant, leak testing and eddy current testing, including welding inspections.

NTIAC-023688

GISCO Geophysical Instruments & Supply Co., Inc.
Division of Soiltest Inc.
4665 Joliet Street, Denver, CO 80129; 303/371-1940

GISCO is a manufacturer and distributor of equipment and instruments for geophysical testing of the earth, (resistivity, self-potential, induced polarization, magnetics, hydralogical rock mechanics, and soil test equipment). GISCO is the geophysical division of Soiltest, Inc., and our service area is worldwide.

NTIAC-023690

Gogan Machine Corporation
1440 E. 55th Street, Cleveland, OH 44103; 216/431-3941
Branches: Worldwide

Gogan Machine Corporation designs and manufactures hardness testing equipment that uses the Brinell method for testing the hardness of all metals. This method is most effective for testing sections at least 5 mm thick. Gogan machines are available from the simplest, manual type to sophisticated machines with digital indication of hardness and computer language output for data logging, printing, or other computer operations. Gogan also designs and manufactures automatic systems for high-production testing. Gogan developed the hardness test currently used for testing brake linings for cars and trucks and manufactures equipment for the test. This test is known as SAE Recommended Practice J379, Gogan Hardness Test for Brake Lining. Specifications will be found in the Society for Automotive Engineers Handbook. Gogan machines are sold worldwide.

NTIAC-015821

Gollob Analytical Service
47 Industrial Road, Berkely Heights, NJ 07922; 201/464-3331

Gollob Analytical Service (GAS) is an independent analytical and consulting laboratory. Services include all types of gas analyses (including industrial hygiene, industrial gas mixtures analyses, environmental analyses, and stack emissions); analysis of organic compounds and contaminants; waste and drinking water analyses; and material testing. Facilities include GAS chromatographs, GAS mass spectrometers, an organic GC/MS system, a liquid chromatograph, internal gas proportional counters, chemical apparatus, and other instrumentation.

NTIAC-015822

Gould, Incorporated
Measurement Systems Division
2230 Statham Blvd., Oxnard, CA 93033; 805/487-8511
Branches: Martinez, CA; Houston, TX; Baton Rouge, LA; Pittsburg, PA; E. Boothbay, ME; Inglewood, CO; Palo Heights, IL; Orlando, FL; Perry, OH; and Yardley, PA

Gould, Inc., is a manufacturer of electrical/electronic instruments used in measurement and control systems. These include transducers/transmitters for measurement of pressures and temperature in aerospace and industrial applications, amplifying instruments, and display instruments. Products are sold worldwide through sales offices and representatives.

NTIAC-024509

Grandia Laboratories
1775 Whittier Avenue, Costa Mesa, CA 92627; 714/645-9080

Grandia Laboratories is engaged in the manufacture and servicing of nondestructive test instrumentation: ultrasonic instrumentation; ultrasonic transducers; and eddy current instrumentation probes. Also provided are consulting and custom applications, along with testing of metals in UT and EC methods.

NTIAC-015823

Greene, Arnold, Testing Laboratories, Inc.
6 Huron Drive, Natick, MA 01760; 617/235-7330
Branches: Everett, MA; Springfield, MA; Auburn, MA

The Arnold Greene Testing Laboratories, Inc., offers analytical testing as well as nondestructive testing. Analytical testing includes chemical, metallurgical, and physical. Nondestructive tests are conducted using radiography, magnetic particle, penetrant, ultrasonics, eddy current, and magnetic techniques. Welding upgrading, NDT training, and research and development are also offered.

NTIAC-015824

Hacker Instruments, Inc.
P.O. Box 657, Fairchild, NJ 07006; 201/226-8450

Hacker Instruments imports, subcontracts, and manufactures, in the USA, instruments for several applications, including NDT. The principal NDT applications for these instruments are portable hardness tester; compact, portable eddy current tester; surface finish by two-beam micro-interferometer; pocket-size magnetic paint/plating gauge; fiber optic ringlight for visual inspection with stereomicroscope, etc.; coordinate measuring microscope, and polarizing microscope.

NTIAC-015825

Haile, Edward L., and Associates
P.O. Box 38523, 9934 Sweetwater, Houston, TX 77088; 713/448-9725

E. L. Haile and Associates is an established consulting firm in the areas of metallurgy, chemistry, corrosion, and NDT. A completely equipped laboratory facility exists for failure analysis, physical, chemical and corrosion testing, and programs. Services are also offered to the petrochemical industry, including on-site NDT inspection, corrosion inspection, alloy analysis, metallography, radiography, and stress relieving. The company is the local representative for Pitchford Scientific's "Portaspec" portable X-ray spectrography, which is used as a laboratory system, as well as for field alloy analysis and verification.

NTIAC-015826

Hamill Manufacturing Company
RD No. 1, Box 295A, Pleasant Valley Road, Trafford, PA 15085; 412/744-2131

The Hamill Manufacturing Company (HMC) is a precision machining and fabrication company, with a diverse range of capabilities that include design engineering, manufacturing and fabrication, welding, nondestructive testing, and metallographic evaluation. HMC's principal products are nuclear equipment, both for the naval nuclear program and for commercial nuclear power plant installations. HMC's facility consists of a plant of approximately 25,000 square feet, which is comprised of shop areas, offices, NDT laboratories, metallographic laboratories, drafting, inspection, and cleaning facilities.

NTIAC-023691

Ham Industries, Inc.
Inspection Products Division
835 Highland Road, Macedonia, OH 44056; 216/467-4256

Ham Industries manufactures and markets visual inspection equipment for use in the electronics industry for visual checking of printed circuit board assemblies. The product, Video Circuit Board Comparators, is used for bare PCB inspection, component side inspection, and solder side inspection. Two closed-circuit TV cameras are used to compare a "known good" assembly against an "unknown assembly". Both images are superimposed on a single monitor that makes error locations immediately recognizable. This comparison technique lends itself to improved accuracy, as well as significant reductions in the amount of time that is normally required to perform this laborious task of visual inspection.

NTIAC-015827

Harisonic Laboratories, Inc.
7 Hyde Street, Stamford, CT 06907; 203/324-3301

Harisonic Laboratories, Inc., is an engineering and manufacturing organization engaged in the design, manufacture, and application of ultrasonic search units for nondestructive test problems. Facilities at Stamford include complete engineering, machine shop, assembly, and operations, as well as capabilities for special ultrasonic search units and electronic equipment development and manufacturing, consulting, engineering and performance of application studies. World markets served include basic metals production, fabrication operations, aerospace, oil, gas and chemical, and power generation, particularly nuclear.

NTIAC-015828

Harshaw Chemical Company (The)
Crystal and Electronic Product Department
6801 Cochran Road, Solon, OH 44139; 216/248-7400

Harshaw manufactures nuclear radiation detectors and systems and infrared transmitting materials and detectors. Components are furnished to original equipment manufacturers who in turn manufacture nondestructive testing systems. Harshaw also builds custom NDT systems on request.

NTIAC-015829

Health Physics Associates, Ltd.
3304 Commercial Avenue, Northbrook, IL 60062; 312/564-3330

Health Physics Associates, Ltd., are consultants in radiation safety, serving both industrial and medical clients with a variety of technical and advisory programs. Technical services include calibration, preventive maintenance and repair of radiation survey instruments, and providing leak/wipe test kits for sealed radioactive sources. Kits are mailed automatically when a test is due, and the wipes are returned for analysis. Advisory services cover specific needs, such as radiation hazard and shielding evaluation for legal, insurance and public relations purposes, feasibility studies, radiological safety training, and other consultation.

NTIAC-015830

Hewlett-Packard Company
McMinnville Division
1700 S. Baker Street, McMinnville, OR 97128; 503/472-5101

The McMinnville Division of Hewlett-Packard Company manufactures two types of specialized X-ray systems. The first category includes a family of shielded-cabinet X-ray systems used in typical nondestructive inspection applications and in the classroom for teaching radiographic fundamentals. The second category consists of pulsed (flash) X-ray systems ranging in output voltage from 150 kV to 1 mV. These provide single-pulse exposures in the submicrosecond range and are used primarily to record dynamic events that are difficult or impossible to photograph by normal techniques because of smoke, flame, debris, or intervening material. They are widely used in the radiography of ballistic, explosive, and crash injury events. Products are sold and serviced worldwide by Hewlett-Packard's network of local offices.

NTIAC-015831

High Voltage Engineering Corporation
Burlington Division
F.C. Box 416, South Bedford St., Burlington, MA 01803; 617/272-1313
Branch: Amersfoort, The Netherlands

High Voltage Engineering Corporation is a diversified manufacturer of flexible plastic insulating products, electrical connectors and switches, builder's instruments, electron processing systems, and scientific equipment. The majority of this product output, approximately 75%, is furnished to the electric and electronic industries, principally as components for products and equipment sold to end users. The balance of the products are provided to the medical, construction, laboratory, and capital equipment markets. Many products offered by High Voltage have unique physical properties resulting from the company's pioneering work in radiation technology and atomic particle acceleration.

NTIAC-015832

Hobart Brothers Company
Technical Center
Trade Square East, Troy, OH 45373; 513/339-6218

Testing is done primarily to certify properties of weldments made with company-produced welding electrodes. Training in testing is an additional function.

NTIAC-015834

Hydro Products, Inc.
P.O. Box 2528, San Diego, CA 92112; 714/453-2345

Hydro Products' complete engineering, manufacturing, and environmental testing facilities are located in San Diego, California. The complex houses all of the company's activities, which include a wide range of marine/offshore instruments and systems, and products for the nuclear industry. The company is a leading supplier of underwater equipment, including closed-circuit television systems; marine and oceanographic instruments; advanced RCV (remote controlled vehicle) systems; as well as radiation tolerant viewing systems and lighting for the nuclear power industry. The Systems Division of the company specializes in one-of-a-kind requirements, particularly where advanced technology is involved, supplying engineering and manufacturing services that complement the activities of the parent company. Hydro Products has been in this field more than 15 years and is committed to providing rugged, reliable equipment and responsive worldwide service.

NTIAC-015835

IIT Research Institute
10 W. 35th Street, Chicago, IL 60616; 312/567-4000
Branches: Rome, NY; Dayton, OH; Washington, D.C.; Annapolis, MD; and Huntsville, AL

Established in 1936, IIT Research Institute (IITRI) is an independent, non-profit organization that applies science and technology to solve problems for industrial and government clients. IITRI has 1500 employees and conducts over 500 programs annually. NDT is normally used as a contributor to these programs, and IITRI is only involved with NDT where requirements exist. In certain specific NDE efforts, IITRI has unique capabilities and/or personnel. Extensive laboratories are available with state-of-the-art equipment.

NTIAC-015806

Industrial Inspection Industries, Inc.
5250 Mayfair Road, North Canton, OH 44720; 216/494-9436
Nondestructive testing is performed to ensure product quality. Limited R&D is also performed to establish testing methods not yet available commercially. Testing is performed on metallic materials, structures, and weldments only.

NTIAC-015838

Industrial NDT Company, Inc.
3409 Ridgeway Street, Charleston, SC 29405; 803/744-7412
Branches: Savannah, GA; North Augusta, SC; Hopewell, VA; Mobile, AL; and Charleston, SC
Industrial NDT Company, Inc., is an independent testing laboratory. Specialties include ultrasonics, radiography, magnetic particle, dye penetrant, visual, fiberoptics, weld procedure qualification, welder certification, field weld inspection, preheat and post-weld heat treatment, hardness testing, concrete and soil inspection, chemical analysis, and microphotography. Industrial NDT Company is a quality oriented organization which has mechanical, civil, and chemical engineers employed as office managers and technicians.

NTIAC-023692

Industrial Quality, Inc.
P.O. Box 2397, Gaithersburg, MD 20879; 301/948-0332
Industrial Quality, Inc., (IQI) offers extensive nondestructive testing (NDT) experience to help industry and government improve the use of NDT in quality programs. The services of IQI include consulting, training, research/development, custom equipment, and testing. Examples are as follows: broad consulting services in NDT methodology, standards, and measurements, including assessment of present NDT capability and recommendations for improvement. NDT method coverage includes well-used techniques, such as X-rays, ultrasonics, liquid penetrants, magnetic particles, eddy currents, and visual-optical methods. IQI also has capability in acoustic emission, leak testing, microwaves, neutron radiography, thermal methods, and related areas, such as stress analysis and fracture mechanics. Training is provided in all aspects of NDT for inspector, engineering, and management personnel. NDT knowledge for management and people in technical areas that interact with NDT (design, manufacturing, maintenance) expands your quality program where it counts. Capabilities include research/development to address special testing problems—new materials, special shapes, new specifications, etc. IQI personnel can help your organization make practical use of new R&D results, along with design, procurement, installation of special NDT equipment—imaging systems, and real-time systems, automated systems. Special NDT services include e.g. neutron radiography. Referrals for other inspection services are also available.

NTIAC-023693

Inframetrics, Inc.
25 Wiggins Avenue, Bedford, MA 01730; 617/275-8990
Inframetrics manufactures a line of high-resolution imaging radiometers. These instruments are used in NDT for detection of voids, bonding flaws, fatigue points, etc. All of the Inframetrics instruments have a standard RS 330 TV output. This is of particular value for NDT because it permits thermal transient analysis using video cassette recorder stop action and slow motion.

NTIAC-015839

Infrared Survey, Inc.
3450 Evergreen, Houston, TX 77087; 713/643-8583
Branch: Rockport, TX
Infrared Surveys, Inc., provides an industrial service that gives early warning of breakdown, as well as programmed preventive maintenance and energy conservation programs, for all in-plant operations using electri-

cal power or fuel-fired energy systems. This is accomplished by locating faulty electrical connections before an outage occurs and by determining where refractory-lined vessels are breaking down or wearing.

NTIAC-023694

Intercontrole, Inc.
Division of Intercontrole, S.A. - France
4219 W. Clearwater Avenue, Suite 9, Kennewick, WA 99336; 509/735-4596
Intercontrole, Inc., is part of the international Intercontrole group that has its headquarters in Paris, France. This group has subsidiaries and divisions throughout the world. Their background is highly industrial and nuclear-oriented in the field of multifrequency eddy current and ultrasonics, both in equipment and application. Intercontrole personnel and equipment have been utilized at over 50 reactor sites throughout the world and have more engineering and manufacturing experience on power generating test devices than any other company in the world.

NTIAC-015840

Instrument Technology, Inc.
P.O. Box 381, Main Line Drive, Westfield, MA 01086; 413/562-5132
Instrument Technology, Inc., is an engineering company specializing in the design, development and manufacture of remote viewing systems. ITI products include periscopes, borescopes, telescopes, binoculars, and optical devices for inspection and general observation. ITI systems are used visually but are also available with photographic and TV cameras.

NTIAC-015841

International Thermal Instrument Company
P.O. Box 309, Del Mar, CA 92014; 714/755-4436
ITI Company possesses facilities for measuring the thermal conductivity, or thermal conductance, of any solid material. "K" factors of barriers may also be tested within ASTM specifications.

NTIAC-015836

IRT Corporation
Nuclear Systems Division
P.O. Box 80817, 7650 Convoy Court, San Diego, CA 92138
Branches: Placentia, CA and McLean, VA
IRT is an integrated engineering and scientific research company that provides contract services and hardware in broad areas of instrumentation research and technology. IRT's hardware and services include definition of the problem, evaluating technical and engineering approaches, prototyping and demonstrating the solution, and, finally, providing a complete service or a fully instrumented system. The Nuclear Systems Division specializes in the application of nuclear technology to nondestructive evaluation in three broad areas: nuclear materials and radiation measurement, ordnance inspection, and natural resources evaluation.

NTIAC-015842

Ithaco, Inc.
P.O. Box 818, Ithaca, NY 14850; 607/272-7640
Ithaco, Inc., is the manufacturer of electronic instruments, such as amplifiers, preamplifiers, lock-in instruments, variable electronic filter, and signal conditioning systems.

NTIAC-015837

ITT Grinnell Industrial Piping, Inc.
Industrial Piping Division
P.O. Box 566, Kernersville, NC 27284; 919/993-4831

ITT Grinnell Industrial Piping, Inc., is a piping fabricator and installer. This piping is for nuclear or fossil power plants, paper mills, or petrochemical plants. The scope of work can include both shop fabrication and field erection. Their North Carolina fabricating plant covers approximately 500,000 square feet, and plant employment is about 1000.

NTIAC-015843

James Instruments
4048 N. Rockwell Street, Chicago, IL 60618; 312/463-6500
James Instruments manufactures nondestructive test equipment for the industrial and concrete industries. The following list covers instruments manufactured, areas of usage, and a brief description of the instrument. The V-Meter: for low-frequency ultrasonic testing of coarse-grained material such as concrete, carbon, ceramics, rock, and wood. The C-Meter: an eddy current device for testing the resistivity of arc furnace electrodes. The R-Meter: for rebar location, depth measurement, and bar size determination in concrete. The M-Meter: maturity and early strength measurement of newly poured concrete. The M-System: for programmable microprocessor-based multipoint monitoring and recording of time/temperature/maturity/strength/tension load/stress in newly poured concrete. The T-Meter: for portable temperature measurement in concrete and asphalt. The Point-Riter: for six channel temperature measurement.

NTIAC-023695

J. B. Engineering & Sales Co., Inc.
207 Greenwich Avenue, Stamford, CT 06902; 203/348-6753
J. B. Engineering has grown in ten years to be a leading provider of complete ultrasonic immersion test systems. In 1974, the company recognized a need for immersion test systems that would provide greater accuracy, repeatability, and reliability. Based on testing, service experience, and regular consultations with customers, J. B. Engineering has evolved a series of ultrasonic flaw detectors and immersion test systems that are directed at real needs. Ultrasonic inspection procedures are developed on actual parts supplied by customers. Immersion test systems are built to meet specifications defined in such tests. Customer personnel are trained on customer parts at J. B. Engineering.

NTIAC-015844

JEM Penetrameter Mfg. Corp.
6 Huron Drive, Natick, MA 01760; 617/653-5950
JEM Penetrameter Manufacturing Corporation manufactures a job-site radiographic film-processing darkroom that is carried on a pickup truck, or as a trailer, and is capable of withstanding high- and low-temperature conditions; image quality indicators (IQI penetrameters), including the DIN, ISO, MIL, ASTM, ASME and other North American specifications, as well as foreign specifications; cobalt 60/iridium 192 gamma ray exposure calculators, which are a low-priced "tool" for the radiographer, used to calculate the exposure time for industrial radiographs; and an ultrasonic-depth/path flaw calculator that is an easy-to-operate, low-cost slide calculator that includes conversion to the metric system of all results.

NTIAC-015845

Jodon, Inc.
Laser Products Division
145 Enterprise Drive, Ann Arbor, MI 48103; 313/761-4044
Holographic NDT systems (HNDT) are furnished for performing utility and specialized continuous wave (CW) services, including real-time, time-average, and double exposure holography. These systems include complete turnkey setups, with on-site indoctrination by a qualified holographic engineer. Services are available at the Jodon Ann Arbor, Michigan, facility for performing a wide range of CW holographic experiments. Those experiments include vibration analysis of compressor and turbine components; honeycomb bond analysis; composite structure delamination or void analysis; special munitions testing (inert rounds); testing of lenses and mirrors; and optical testing of microelectronic assemblies.

NTIAC-015846

Jordan Nuclear Company
3244 Arroyo Seco Avenue, Los Angeles, CA 90065; 213/222-8141
The Jordan Nuclear Company manufactures radiation instrumentation and also repairs, services, and calibrates both commercial and military products. The instrumentation includes gamma and beta radiation survey meters, radiation monitors, ionization chambers, dosimeters, dosimeter charges, and remote area monitors.

NTIAC-015847

Kaman Sciences Corporation
Products Division
P.O. Box 7463, Colorado Springs, CO 80933; 303/599-1500
Kaman Sciences manufactures a complete line of 14-MEV neutron generators and transfer systems. They are useful in performing neutron radiography and neutron activation analysis.

NTIAC-015848

Kaye Instruments, Inc.
15 De Angelo Drive, Bedford, MA 01730; 617/275-0300
Kaye Instruments manufactures a broad line of data acquisition equipment. Many of these instruments are commonly used for recording voltage signals generated by strain transducers. Equipment supplied includes stand-alone data loggers, portable records, and remote multiplexing equipment for computer-based data acquisition systems. Many instruments include integral signal conditioning equipment.

NTIAC-023696

Keyan Industries, Inc.
P.O. Box 183, 196 Plain Street, Braintree, MA 02184; 617/848-7636
Keyan Industries, Inc., is a worldwide manufacturer and distributor of micrographic, graphic arts, and inspection equipment. Several film inspection units are available that are manufactured at the 196 Plain Street, Braintree, MA, head office and manufacturing plant. Several standard optical comparators, microscopes, and magnifiers are also available. Keyan Industries, Inc., also designs and manufactures special OEM items on a contract basis. Services offered are optical/mechanical consulting, research and development of optical mechanical devices and instruments, fabrication of prototypes from ideas, sketches and prints, and testing and inspection of products for improvements and safety features.

NTIAC-015849

Konigsberg Instruments, Inc.
2000 E. Foothill Blvd., Pasadena, CA 91107; 213/449-0016
Konigsberg Instruments, Inc., designs and manufactures standard and custom measurement instrumentation, including pressure, acceleration, force transducers, and telemetry electronics, to transmit transducer data. These products are used for biomedical and industrial applications. To support these activities, the company has a modern 10,000-square-foot facility incorporating clean room assembly areas, prototype and production hybrid circuit assembly equipment, and modern R&D laboratories and office areas.

NTIAC-015850

Koslow Scientific Company
75 Gorge Road, Edgewater, NJ 07020; 201/941-4484
Koslow Scientific Company manufactures a complete line of "do-it-yourself" chemical spot-test kits and an electronic hand-held file voltage instrument, the Electrosep 2001. These are complete, self-contained units for the identification or verification of the commonly used alloys. Kits are available for steels, nickel alloys,

brasses and bronzes, aluminums, plated metal coatings, titaniums, and zirconiums. The Electrosep 2001 identifies most metals by measuring a temperature rise caused by a file stroke across the metal. Both product lines are battery-operated.

NTIAC-015851

Krautkramer-Branson, Inc.
P.O. Box 408, Stratford, CT 06497; 203/377-3900
Branch: K-B Aerotech, Lewiston, PA
Krautkramer-Branson, Incorporated, a subsidiary of Smithkline Corporation, is a leading manufacturer of ultrasonic, nondestructive testing devices. The company's product line includes ultrasonic flaw detectors, thickness gages, hardness testers and velocity testers. Also manufactured is a variety of eddy current testing devices and large, computer-interfaceable ultrasonic and eddy current test systems. Generally speaking, these instruments are used to measure the dimensions of materials being tested and to check these specimens for internal and/or surface defects, as well as to determine certain other material characteristics of the specimens, such as acoustic velocity and hardness. Industries using these instruments include petrochemical, aerospace, basic metal, glass, plastic, structural, shipbuilding, automobile, nuclear and fossil-fuel power, and a wide variety of other manufacturing industries.

NTIAC-015852

Krautkramer-Branson, Inc.
KB-Aerotech
P.O. Box 350, Lewistown, PA 17044; 717/242-0327
KB-Aerotech designs and builds transducers for use in many different nondestructive testing applications. The product line includes transducers designed for contact testing work, shear wave inspection, immersion testing, applications involving dual element probes, delay, and thickness-gaging transducers. KB-Aerotech ultrasonic transducers are the result of extensive research aimed at providing performance, reliability, and reproducibility. As new and improved piezoelectric materials, dampings, epoxies, and techniques are developed, these innovations are incorporated into KB-Aerotech's standard transducer product line.

NTIAC-015854

Lambrecht, Karl, Corporation
4204 N. Lincoln, Chicago, IL 60618; 312/472-5442
The Karl Lambrecht Corporation is a designer and manufacturer of specialized optical components and systems. A wide range of optical test devices for both manufacturing and laboratory use is offered.

NTIAC-015855

Law, K. J., Engineers, Inc.
23660 Research Drive, Farmington Hills, MI 48024; 313/478-3150
K. J. Law Engineers manufacture and distribute Verimet, a complete line of eddy current nondestructive test instruments. The line includes production, portable, and laboratory instruments. Typical applications include hardness testing, heat-treat differentiation, alloy tests, conductivity measurement, and crack and seam detection. K. J. Law Engineers facilities include complete design and fabrication capabilities. The company is a single-source outlet for complete, automatic test systems. A worldwide organization of representatives assures prompt solutions to quality control problems. K. J. Law also manufactures a Rockwell-method digital hardness tester.

NTIAC-023697

Leasametric
1164 Triton Drive, Foster City, CA 94404; 415/574-4441

Leasametric has sales personnel to solve equipment needs anywhere in the nation. Since 1962, Leasametric has rented, leased, and sold data processing terminals; desktop computers; general purpose electronic test, microwave and telecommunications equipment; and microprocessor test and development systems from the top 500 manufacturers in the world. With an $80-million, 55,000-item inventory, Leasametric offers the broadest product inventory with the greatest depth in the rental industry. They also offer remote troubleshooting via multiple on-line diagnostic centers, which assures no downtime, and they deliver equipment anywhere in the country overnight.

NTIAC-023698

Lenox Instrument Company
111 E. Luray Street, Philadelphia, PA 19120; 215/324-4543
Branches: Houston; Atlanta; Chicago; New York; Portland; Los Angeles; and San Francisco
Lenox Instrument Company manufactures optical inspection devices for internal examination of large industrial machinery. Customers are the airline industry, petroleum industry, nuclear industry, power generating stations, steel mills, and large industrial machinery and equipment manufacturers.

NTIAC-023699

Link Systems
11735 Bowman Green Drive, Reston, VA 22090; 703/471-1905
Link Systems manufactures energy-dispersive X-ray analysis systems. Products include the 860 series of microanalysis systems for electron column instruments, Quicksort alloy sorting and materials identification systems, and the model XR-500 tube-excited X-ray fluorescence system. Link systems are used by industry, government, and educational institutes for characterization of the composition of materials.

NTIAC-015856

Lion Precision Corporation
60 Bridge Street, Newton, MA 92159; 617/969-4710
Lion Precision Corporation has been applying advanced electronics to dimensional gauging for many years. A broad array of sensors and circuitry is provided for contact and noncontact gauging and control. Lion is a manufacturer of spring gauges and measurement module gauging systems. The 10,000-square-foot facility comprises management offices, engineering and drafting departments, test area, assembly line, and machine shop production. Services are provided to all areas of the United States, Canada, and Europe.

NTIAC-015857

Litton Industries
Fitchburg Coated Products
P.O. Box 1106, Scranton, PA 18510; 717/347-2035
Fitchburg Coated Products manufactures electrosensitive recording paper for use in nondestructive testing equipment such as custom machines, automation industries, and others.

NTIAC-015853

LND, Inc.
3230 Lawson Blvd., Oceanside, NY 11572; 516/678-6141
LND, Inc., was conceived by physicists and engineers to serve the sophisticated and extremely specialized nuclear detector requirements of engineers, physicists, and scientists in every field of endeavor. From its inception in 1964, LND had developed, and is now manufacturing, a broad family of detectors of high quality and reliability. There has been a steady growth in the scope of its operations and the variety of its detector family. LND fully realizes the complex problems involved in the applications and use of nuclear detectors; therefore, services are available around the clock, when necessary, to aid in solving these problems. The people at LND are continually striving to overcome problems encountered with existing tube techniques and

to develop new techniques and tube types in this rapidly advancing field. The strong emphasis LND places on quality in all its products and activities is revealed in the scope of the quality assurance department. LND has a quality control organization set up under the general specifications of the NASA NPC 200-3, the SCAS MIL-Q9858 (Quality Control), and MIL-E-1 (tubes). LND is a Quality Products List (QPL) approved supplier of the following types: 5979, 5980, 7616, 7840, 8767, and 8204M.

NTIAC-015858

Lockwood and McLorie, Inc.
Sales Division
P.O. Box 113, Horsham Valley Industrial Center, Horsham, PA 19044; 215/675-8718
The Lockwood and McLorie Corporation manufactures proprietary analytical process instrumentation and related items and provides manufacturing services for the fabrication of special process instrumentation to customer specifications.

NTIAC-015937

Loge/Spatial Data Systems, Inc.
Division of Logetronics, Inc.
P.O. Box 978, 508 So. Fairview Avenue, Goleta, CA 93116; 805/967-2383
Loge/Spatial Data Systems manufactures image enhancement and analysis equipment. This equipment can be used to process images from real time X-ray systems, images from film, or images from microscopes. The images are processed to improve visualization by enhancing edge detail and overall contrast or to measure the optical density of the processed image. Spatial measurements can also be made using the cursor to define points of interest. The primary fields of interest in which the equipment is being used are (A) analysis of aircraft engine parts using X-radiography; (B) flaw detection or ordnance devices using X- and neutron-radiography; (C) automatic and semiautomatic classification of cells; (D) semiautomatic classification of earth resources for land use planning; (E) analysis of thermal imaging for power plant monitoring and heat loss in buildings; and (F) industrial inspection for defect detection.

NTIAC-023700

Macbeth, Division of Kollmorgen Corp.
Box 950, Newburgh, NY 12550; 914/561-7300
Macbeth, a Division of Kollmorgen Corporation, manufactures optical densitometers for the quality control of radiographic film processing. Recommended model, TD-502, meets ANSI standards.

NTIAC-023701

Magnaflux Corporation
7300 W. Lawrence, Chicago, IL 60656; 312/867-8000
Branches: New York, Atlanta, Cleveland, Detroit, Dallas, and Los Angeles
Magnaflux Corporation, a wholly owned subsidiary of GEO International Corporation, manufactures nondestructive testing equipment and materials of all major method types. These include magnetic particle, liquid penetrant, ultrasonic, eddy current, and X-ray.

NTIAC-024553

Magnaflux Quality Services
7300 W. Lawrence Avenue, Chicago, IL 60656; 312/867-8000
Magnaflux Quality Services is the on-call laboratory and field service arm of Magnaflux Corporation. All major nondestructive testing (NDT) methods are offered, including X-ray and gamma radiography, ultrasound, magnetic particle, dye and fluorescent penetrant, eddy current, visual, and acoustic emission techniques.

NTIAC-023702

Magnetoelastic Devices, Inc.
P.O. Box 625, 326 Springside Avenue., Pittsfield, MA 01202; 413/445-5608
Magnetoelastic Devices, Inc., is a scientifically oriented organization devoted to the study and exploitation of magnetoelastic phenomena. The scope of activities ranges from research into previously unexplored manifestations of magnetoelasticity to the manufacture and commercialization of devices in which these effects are utilized. Facilities are best described as a developmental laboratory. Products include both standard and custom lines of transducers (together with associated electronic packages) for the measurement and control of dimension, position, force, and pressure. They are competitive with strain gauge and LVDT devices. The laboratory is continually involved with a broad spectrum of magnetic measurements on materials under stress. An equipment line is being developed for the mapping and measurement of stress in ferromagnetic materials by means of surface probes utilizing proprietary sensing means. A specialized application of these devices is in the NDE of residual stress in weldments, castings, and heat-treated parts.

NTIAC-023703

MATEC, Inc.
60 Montebello Road, Warwick, RI 02886; 401/739-9030
MATEC, Inc., is a manufacturer and direct seller of high-power pulsed oscillators, low- and high-power R.F.-gated amplifiers, automatic attenuation recorders, and broadband receivers. This equipment has been primarily designed for ultrasonic attenuation and velocity measurements and pulsed nuclear resonance measurements. The instruments are also well suited for industrial applications where material inspection and/or flaw-detection techniques are being developed or applied.

NTIAC-024508

Mateson Chemical Corp.
Easton Division
1025 East Montgomery Avenue, Philadelphia, PA 19125; 215/423-3200
Mateson Chemical Corporation is an internationally represented firm (30 years old) specializing in the clean-air field—environmental, atmospheric, or specific areas such as manufacturing, processing, testing or work areas—living areas, research environments, etc. Facilities are located in Philadelphia, and the subsidiary distribution point (and manufacturing) is out of Grand Prairie, Texas. Products are primarily for decontamination or detoxification, or act as neutralizing agents for non-hazardous, semi-hazardous, or hazardous spills; gasification; seepage; etc. Service application for products (and equipment for air cleaning, washing, gas detection or monitoring, or particle size detection) is termed "disaster restoration," i.e., detection, identification and decontamination following fires, floods, explosions or sabotage. Products and equipment are used in clean-air field, institutional facilities (hospitals, nursing homes, etc.); insurance claims adjustment; air conditioning and heating; energy conservation (re-use of conditioned air); building operation management; transportation; manufacturing processing; medical applications (allergies, etc.); surface contamination; sewage and waste disposal; etc.

NTIAC-015859

Maxwell Laboratories, Inc.
8835 Balboa Ave., San Diego, CA 92123; 714/279-5100
Maxwell Laboratories, Inc., (MLI) designs and manufactures pulsed power systems for research, industrial, and government programs. The systems include high-power equipment which may be applied to laser systems, high-current electron-beam generators, Marx generators, trigger generators, energy storage banks, high-voltage power supplies, etc. In addition, Maxwell manufactures high-voltage components such as spark-gap switches and low-inductance capacitors. Maxwell also manufactures magneform machines that are used

for metalforming using electro-magnetic pressure. The Blackjack 3 and Pocobeam Flash X-ray and pulsed E-beam facilities are available to users on a non-interference basis with DNA (Defense Nuclear Agency) programs. Both Blackjack 3 and Pocobeam are DNA facilities built by Maxwell Laboratories and operated by MLI in San Diego, California.

NTIAC-015860

McWilliams Forge Co., Inc.
Franklin Avenue, Rockaway, NJ 07840; 201/627-0200
McWilliams supplies open- and closed-die forgings in ferrous and non-ferrous materials to the aerospace and nuclear industries. McWilliams forges almost every forgeable grade of materials and specializes in high-quality forgings. The company is comprised of 150 people and can forge closed-die forgings up to 500 lb and open-frame forgings up to 3,000 lb in certain configurations. Forgings are supplied to customers throughout the United States and Canada, and some are exported.

NTIAC-015974

Measurements Group, Inc.
P.O. Box 27777, Raleigh, NC 27611; 919/365-3800
Measurements Group, Inc., provides specialized instrumentation for measuring strain/stresses. Reflection and transmission polariscopes, photoelastic equipment materials and supplies are offered, as well as strain gauges, strain gauge accessories, and instrumentation.

NTIAC-015862
Metals Testing Co., Inc.
P.O. Box 213, South Windsor, CT 06074; 203/289-8225
The Metals Testing Company, Inc., performs nondestructive testing of metals such as magnetic particle inspection, fluorescent and dye penetrant inspection, radiography, ultrasonics, anodizing and etching inspection, and alloy testing. Training courses are offered in nondestructive testing, as well as on-site nondestructive testing.

NTIAC-015863

Metcut Research Associates, Inc.
3980 Rosslyn Drive, Cincinnati, OH 45209; 513/271-5100
Metcut Research Associates, Inc., is an independent organization offering technical services and laboratory facilities in the area of materials engineering and evaluation, including machinability testing and machinability data and information analysis. Materials engineering at Metcut is aimed primarily at the application and evaluation of both metallics and nonmetallics. Experimental work is carried out in three laboratories. One laboratory is concerned with the microscopic inspection and failure analysis of materials. The other two have responsibility for the mechanical evaluation of specimens, as well as testing of components and assemblies under a wide variety of conditions. Metcut's activities are supported by a fully equipped machine shop used for manufacture of special test equipment fixtures and test specimens. NDT support is provided by facilities to produce ultrasonic and eddy current test standards using custom-built electrical discharge machining units.

NTIAC-015861

MET Electrical Testing Company, Inc.
916 W. Patapsco Avenue, Baltimore, MD 21230; 301/354-2200
Branch: Pittsburgh, PA
Electrical testing and measurement is offered on electrical systems and components in power transmission, distribution, and generation equipment. Services include determining condition of equipment, insulation materials and conductive materials, system operation and functioning. Independent testing is performed for compliance to various specifications and evaluation of performance. Investigation of power system accidents, failures, and malfunctions is offered, including determinations of causes with recommendations for corrections. Services are performed in the field and in the laboratory, as required.

NTIAC-015864

Met-L-Chek Company
1639 Euclid Street, Santa Monica, CA 90404; 213/450-1111
Met-L-Chek Company manufactures a complete line of visible and fluorescent penetrants meeting MIL-I-25135 and other government and industrial specifications and codes.

NTIAC-023704

Metrotek, Inc.
80 Wellsian Way, Richland, WA 99352; 509/946-0684
Metrotek manufactures and supplies ultrasonic nondestructive testing equipment, including (1) modular, off-the-shelf, ultrasonic imaging systems; (2) ultrasonic instrumentation modules-pulsers, receiver amplifiers, and gates for laboratory research applications, on-line production testing, and large computer-operated systems; (3) immersion tanks, XY bridge assemblies and scan controllers; (4) custom built ultrasonic systems; (5) ultrasonic pulser and receiver modules for OEM users, and (6) a complete line of high-performance transducers. Additionally, NDE ultrasonic research and development projects are undertaken. The company has a network of national and international representatives to handle product sales and some product application work.

NTIAC-023705

Micromeritics Instrument Corporation
5680 Goshen Springs Road, Norcross, GA 30093; 404/448-8282
Branches: Arlington Heights, IL; Antioch, CA; Manasguon, NJ; Porter, TX; Elkridge, MD; Baltimore, MD; and Edison, NJ
Micromeritics is a manufacturer of scientific instruments and accessories utilized in particle technology and liquid chromatography disciplines. Micromeritics instruments and accessories are sold worldwide and supported by research and development, production engineering, service, marketing and applications laboratories located in Norcross, Georgia. In particle technology, Micromeritics manufactures particle technology instrumentation for complete characterization of physical properties of materials. Measurements include particle size distributions; specific surface area; pore structure (volume, size and shape); chemisorption (reaction properties); density; contact angle (between liquid and solid); electrophoretic mobility; and zeta potential. In liquid chromatography, Micromeritics manufactures a complete line of HPLC integrated systems and components designed for simplicity, sophistication and precision. HPLC components include a microcomputer-based control system with data reduction; microcomputer-based automatic sample injector; ternary solvent mixers for low-pressure blending of either two or three solvents; a complete line of detectors (refractive index, variable wavelength); a solvent delivery system; and a heated column compartment injector.

NTIAC-015865

Mikron Instrument Co., Inc.
P.O. Box 211, Ridgewood, NJ 07481; 201/891-7330
The Mikron Instrument Company, Inc., manufactures noncontact infrared temperature measuring instruments (both A.C. and battery-powered) between the limits of -100 degrees F to 4000 degrees F and surface emissivity limits of targets from 0.2 to 1.0. Many ranges, spectral responses, and physical configurations to accommodate an extremely wide variety of applications are available.

NTIAC-015866

Mine Safety Appliances Company
Advanced Systems Division
Evans City, PA 16033; 412/538-3510
The advanced systems division of Mine Safety Appliances Company (MSA) is an engineering organization that offers a range of design, development, fabrication and inspection capabilities to industry, institutions

and government. The facilities include approximately 100,000 square feet of chemical and engineering laboratories, development and pilot plant structures, clean areas, inspection and test areas, and manufacturing and assembly space. Services offered are worldwide and include the following: total integrated design and/or developmental engineering on a project basis; architectural and engineering service to augment your own A&E effort or organization; complete engineering consulting services; and various inspection services, including electrical testing and nondestructive examinations.

NTIAC-015867

Monitor Labs, Inc.
10180 Scripps-Ranch Blvd., San Diego, CA 92131; 714/576-5060
Branch: Silver Spring, MD
Monitor Labs, Inc., specializes in air quality instrumentation. The instrument line includes analyzers for ozone, nitrogen oxides, and sulfur. Accessories are offered, such as calibrators, signal averagers, sample dilutors, remote analyzers, telemetry links, and gas sample particulate filters. Data logger systems are also offered.

NTIAC-015868

Monroe Electronics, Inc.
100 Housel Avenue, Lyndonville, NY 14098; 716/765-2254
Monroe Electronics, Inc., is a manufacturer of specialized instruments for the measurement of electrostatic surface potential without physical contact to the surface measured. Standard instruments can be used for measurements of a few millivolts (contact potentials for example) up to tens of kilovolts. Applications include the testing of photoconductors as used in xerography and electrophotography, testing of the surface condition of aluminum for epoxy bonding, and general research and development on insulators. Additionally, Monroe Electronics manufactures a line of electrostatic fieldmeters that are most often used for monitoring the accumulation of static electricity during production processes.

NTIAC-015869

Monsanto, Fisher Controls Co.
Governor Road, Marshalltown, IO 50158; 515/754-3011
Branch: Worldwide
The Fisher Controls Company, Division of Monsanto, is a manufacturer of process control equipment, such as valves, regulators, and controllers. Also, a line of digital and analog computers for process control is offered. The valve line includes the manufacture of nuclear power plant components; thus, the company has an in-house NDT capability in PT, MT, RT, and UT.

NTIAC-015870

Monsanto Research Corp.
Station B, Box 8, 1515 Nicholas Road, Dayton, OH 45407; 513/268-3411
Monsanto Research Corporation (MRC), a wholly owned subsidiary of Monsanto Company, was established specifically to conduct research, development, and special manufacturing in areas of interest to government agencies. It is staffed, equipped, financed, and managed to facilitate work under contract. MRC operates two laboratories. The Dayton Laboratory at Dayton, Ohio, is available for contract research to all agencies. Mound Laboratory at Miamisburg, Ohio, has been operated under contract since it was built in 1948. The Dayton laboratory is a diversified facility, staffed and equipped for both fundamental and applications-oriented research, development, and engineering in polymer, organic, inorganic, physical, biological, analytical, and radiation chemistry. It also has specialized capabilities for development in instrumentation and test apparatus.

NTIAC-023706

Morgan, H. M., Company, Inc.
P.O. Box 132, 31 Clark Street, Norwood, MA 02062; 617/769-4152
The H. M. Morgan Co., Inc., manufactures the Dynamic Modulus Tester PPM-5R. The Dynamic Modulus Tester PPM-5R can test any material that can be prepared in filament or sheet form, such as textile yarns, plastic film, and paper products. By measuring the transit time of sonic pulses between two transducers contacting the sample, the PPM-5R determines the longitudinal sonic velocity in the sample. The Dynamic Modulus Tester PPM-5R is sold worldwide.

NTIAC-015873

National Nuclear Corporation
1904 Colony, Mountain View, CA 94043; 415/962-9220
Branch: Menlo Park, CA
The National Nuclear Corporation (NNC) has been in the commercial development and production of nuclear fuel assay, safeguards, and environmental protection equipment for over 10 years. During that time, many of these machines have been manufactured and placed into operation in the nuclear fuel manufacturing and processing industry or are utilized for NNC assay service in the United States and throughout the world. These systems include production machines for assaying fuel rods, pellets or powder, bulk fuel, liquid solutions, waste, etc. Also included are fixed and portable SNM and metal detectors. In addition to equipment, NNC supplies services.

NTIAC-015871

NDT Instruments, Inc.
15622 Graham Street, Huntington Beach, CA 91649; 714/893-2438
NDT Instruments, Inc., specializes in the design, manufacture and marketing (nationally and internationally) of ultrasonic, sonic and eddy current instrumentation. In the ultrasonic realm, are manufactured ultrasonic thickness gauges, bond testers, and an extensometer for gauging bolt tightness. In the eddy current realm, a coating thickness gauge, a metallic foil thickness gauge, a weld wire sorter, and a general-purpose eddy current tester are manufactured. NDT Instruments is currently involved with the development of additional new products in these two categories. NDT Instruments utilizes state-of-the-art electronic design concepts and, in that regard, has been incorporating the microprocessor into its product lines.

NTIAC-015874

Net Systems, Inc.
6405 Independence Avenue, Woodland Hills, CA 91367; 213/888-0724
Net Systems, using procedures in X-ray diffraction, ultrasonics, acoustic emission and eddy current, offers residual stress determinations and advanced flaw detection techniques. Net provides quantitative, as well as qualitative, results using computer hard-copy readouts and four-color chart plotting. In a 6,000-foot inspection/testing laboratory and office facility, Net provides residual stress determinations, failure analysis, fatigue- and fracture-critical criteria, damage tolerance information, and initial flaw size evaluation. Specifications and standards may be developed for product reliability, cost reductions, quality assurance, product design modification, engineering and consultation parameters, and educational criteria. The X-ray diffraction techniques allow a determination of residual stress in practically all grades, types and alloys of metals, including aluminum, inconel, titanium, magnesium, and high-temperature steel. Advanced ultrasonics technology is used to evaluate and detect residual stress, as well as flaw detection, in plastics, ceramics, advanced compounds and numerous other materials.

NTIAC-023707

Newage Industries
2300 Maryland Road, Willow Grove, PA 19090; 215/657-3151

Newage Industries manufactures a full range of hardness testing equipment from microhardness testing to automatic Brinell testing systems—all types of portable, bench, production, and customized systems for hardness testing most materials. Testing methods include Rockwell, superficial Rockwell, light load Rockwell, and Brinell. Testers are available that do not damage or affect performance of the work piece.

NTIAC-015875

New England Nuclear Corporation
Nuclides and Sources Division
Atomlight Place, N. Billerica, MA 01862; 800/225/1572
Radioactive materials are offered for research and industrial applications. Capabilities include manufacture of radionuclide alpha, beta, gamma, positron, and neutron sources for various applications, including X-ray fluorescence, gauging, well logging, Mossbauer spectroscopy, and instrument calibration. Only products are offered; NDT services are not available.

NTIAC-023736

Newport Corporation
18235 Mt. Baldy Circle, Fountain Valley, CA 91708; 714/963-9811
Newport offers a full range of holographic systems and components, as well as provides consulting services, performs feasibility studies, and teaches holography. The company has broad experiences in laser, coherent optics, optics, and holography. The most noteworthy holographic product is an instant holographic camera system that uses thermoplastic recording media to produce an image 10 seconds after exposure. For those interested in learning holography, the company offers a holographic manual titled "Projects in Holography" that is free for the asking.

NTIAC-015876

Newport News Industrial Corporation
Technical Services Division
660 39th Street, Newport News, VA 23607; 804/380-7821
Braanch: Gurnee, IL
Newport News Industrial Corporation is a subsidiary of Newport News Shipbuilding, a Tenneco Company. Newport News Industrial provides NDE inspection and services from its two locations at Gurnee, Illinois, and Newport News, Virginia. Newport News Industrial is a supplier of NDE, RT, MT, PT, and UT, health physics, codes and standards, and welding, and many specialized courses are offered on customer request. Services are provided dealing with materials testing, instrument calibration, gear and cargo certification (crane inspection), and craft maintenance. Prime customers are utility companies east of the Mississippi, i.e., Commonwealth Edison, Virginia Electric and Power Company, Carolina Power and Light, Duke Power, and many others.

NTIAC-023708

Niagara Scientific, Inc.
6716 Joy Road, East Syracuse, NY 13056; 315/437-0821
Optical testing is based on experience with video-based technology applied to identification and Q/C. This technology can be applied to a wide variety of materials and products, as all equipment is designed for specific tasks. Research and development is undertaken in the application of a wide variety of sensors and transducers to inspection, control, and monitoring—similarly, for "chemical properties". We can develop a simple one-time application or a new product.

NTIAC-015877

Nicolet Scientific Corporation
245 Livingston Street, Northvale, NJ 07647

NTIAC-015878

Nondestructive Testing Management Association, Inc.
P.O. Box 1214, Magnolia Park Station, Burbank, CA 91507; 213/842-4604
The Nondestructive Testing Management Association consists of membership by companies alone. The organization consists chiefly of companies involved in actual nondestructive testing, such as independent laboratories throughout the USA, Canada, and Mexico. Further information is available from Mr. Fred W. Rohde, Executive Secretary and Treasurer, at the address shown.

NTIAC-015879

Nortec Corporation
421 N. Quay, Kennewick, WA 99336; 509/735-7550
Branches: Lenexa, KS and Cincinnati, OH
Nortec Corporation manufactures ultrasonic and eddy current instruments and accessories for nondestructive testing. These instruments are used for flaw detection, crack detection, corrosion detection, thickness measurements, plotting thickness measurements, and conductivity measurements. Many industries are served, including aerospace, petrochemical, metalworking, military, transportation, nuclear, and test labs. Exclusive representatives are located in most major cities and foreign countries.

NTIAC-023709

Novex, Inc.
P.O. Box 3006, Gaithersburg, MD 20760; 301/840-8575
Novex is a young, innovative company engaged in the development, manufacture, and sales of electronic and computer instrumentation for the scientific, engineering, medical, and materials communities. The Novaspec Ultrasound System is an extraordinary series of powerful and compact electronic modules that provide research capabilities exceeding those available in most laboratories and, at the same time, is highly suitable for routine diagnostic applications. The Novex wideband transceiver is available from stock, and the other modules can be shipped within 60-90 days ARO. A high-frequency signal digitizer/averager module is scheduled for introduction in the first quarter of 1982. In addition to the ultrasound system described in the enclosed literature, their current product line includes high-resolution Fourier transform NMR, NMR imaging subsystems, and exorbuscompatible microprocessor boards and systems.

NTIAC-023710

Nuclear Associates
Division of Victoreen, Inc.
100 Voice Road, Carle Place, NY 11514; 516/741-6360
Branch: Ohio
Nuclear Associates provides instruments and accessories for radiology, nuclear medicine, ultrasound and radiation therapy, health physics monitoring and safety equipment. Products for NDT applications include survey meters, personal radiation protection products, warning signs, tapes and labels. Nuclear Associates sells nationwide directly and through a national dealer network.

NTIAC-015880

Nuclear Assurance Corp.
Engineering and Transportation Services
24 Executive Park West, Atlanta, GA 30329; 404/325-4200
Branch: Zurich, Switzerland
The Nuclear Assurance Corporation, Engineering and Transportation Services Division, offers the following inspections: visual and dimensional inspection of irradiated nuclear fuel assemblies and out-of-core shipping of irradiated fuel assemblies. Field inspections are performed for U.S. utilities, and equipment is manufactured for domestic and overseas customers.

NTIAC-015881

Nuclear Components, Inc.
P.O. Box 60, Stockbridge Road, Great Barrington, MA 01230; 413/428-2560
Nuclear Components Incorporated (NUCOM) is a modern plant that performs machining and welding, including electron beam, heat treating, prototype, production services, NDT testing, testing services, metallograph services, and consulting for technical information. For many years, NUCOM has been involved in the naval nuclear program to fabricate control rods, core structures, pressure vessels, and piping. This same type of work is also being done for power reactor operations for major utility companies. NUCOM is involved in manufacture of fuel transportation cask neutron absorber sleeves and fuel racks manufactured to ASME Boiler and Pressure Vessel Code, Section III, Quality Program. NUCOM currently holds an ASME 'N', 'NPT' and 'U' certificate, with complete facilities and experienced personnel for laboratory services and quality control, NDT level III, for the navy and ASME.

NTIAC-015882

Nuclear Consulting Services, Inc.
P.O. Box 29151, Columbus, OH 43229; 614/846-5710
Nuclear Consulting Services, Inc., is an independent engineering, consulting, and testing company providing service worldwide. About half their effort is nuclear related, split between field testing of gaseous systems per ANSI, ASME, ASTM, and company-developed procedures, and laboratory testing. Laboratory tests include I121, XE133, KR85, and H3 work in both gas and liquid phases. Analysis to determine nonradioactive contaminants is an important part of this work. In the non-nuclear area, a comprehensive general analytic laboratory provides backup for a number of specialized test areas. Detailed analysis is provided for process gas streams in stack and solvent recovery systems and detailed particulate analysis by particle size and number in both gas and liquid streams. Various other special field and laboratory services are offered to industry for process and effluent streams. A unique and valuable part of their service is the ability to provide consulting and engineering to help solve problems uncovered by NDT services. Participation in ASME, ASTM, and ANSI committees ensures their personnel are aware of the latest relevant standards.

NTIAC-015883

Nuclear Diagnostic Labs, Inc.
P.O. Box 791, Peekskill, NY 10566; 914/737-7330
Nuclear Diagnostic Labs, Inc., offers the following services: radioactive waste disposal, radiation detection meter calibrations, laboratory wipe testing, radioactive source leak testing, radiation safety consultants, and radioactive isotope laboratory inspections.

NTIAC-015884

Nuclear Energy Services, Inc.
Conam Inspection Division
Shelter Rock Road, Danbury, CT 06810; 203/748-3581
Branches: Chicago; Minneapolis; Houston; Richmond, CA; Philadelphia; Columbus, OH; Corpus Christi, TX; Baton Rouge; Longview, TX; and Midland, TX
Nuclear Energy Services, Inc., is a wholly owned subsidiary of Automation Industries, Inc. The company combines the nuclear power plant capabilities of the NES Division with the nationwide network of NDT laboratories of the Conam Inspection Division. The Conam laboratory testing facilities are located conveniently throughout the United States. Through these labs, the latest equipment is available for conducting laboratory or field tests using techniques such as ultrasonic contact and immersion with C-scan, polar and helical recording; eddy current testing; X-ray or isotope radiograph; magnetic particle inspection (wet or dry); visible dye or fluorescent penetrant; leak testing (helium mass-spectrometer method); acoustic emission; and visual inspection. In addition, welding procedure qualification and surveillance can be provided, and consulting services for NDT methods are available.

NTIAC-015885

Nuclear Energy Services, Inc.
NES Division
Shelter Rock Road, Danbury, CT 06810; 203/748-3581

Nuclear Energy Services, Inc., is a wholly owned subsidiary of Automation Industries, Inc. The company combines the nuclear power plant capabilities of the NES Division with the nationwide network of NDT laboratories of the Conam Inspection Division. The NES Division specializes in providing complete construction inspection and inservice inspection services to the nuclear power industry. Construction inspection capabilities include vendor surveillance, visual weld inspection, radiographic testing, eddy current testing, ultrasonic testing, magnetic particle testing, liquid penetrant testing, and leak testing. NES has been providing a full range of inservice inspection (ISI) services to the requirements of ASME Code Section XI since 1971. The scope of services include access engineering; preparation of the detailed inspection programs; design and manufacture of all specialized inspection equipment; and performance of both baseline and inservice examinations.

NTIAC-015887

Nuclear Services Corporation
Construction and Operations
1700 Dell Avenue, Campbell, CA 95008; 408/446-2500
Branch: Pittsburgh, PA

The Nuclear Services Corporation (NSC), Construction and Operations Division, performs engineering, laboratory, and field NDE for vibration testing of rotating machinery; trend monitoring and signal analysis; strain measurement; nuclear power machinery, trend monitoring and signal analysis; strain measurement; nuclear power plant PSI/ISI; tube eddy current; etc. Engineering services include equipment development and design program preparation, personnel training, audits, and reviews, etc. NSC generally serves the energy industry in a broad-based engineering and field consultant role.

NTIAC-015888

Nuclear Sources and Services
5711 Etheridge, Houston, TX 77087; 713/641-0391

Nuclear Sources and Services performs pipe inspection utilizing through-wall and backscatter gauging; activation analysis using a one-MW reactor; and tracer studies in refinery, industrial plants, subsurface items, and in medical applications. Construction of inspection equipment and sources is also offered.

NTIAC-015889

Nuclear Systems, Inc.
Gamma Industries
P.O. Box 2543, Baton Rouge, LA 70821; 504/383-7791

Gamma Industries serves its many customers through two locations, one in Baton Rouge, Louisiana, and one in Houston, Texas. Nuclear energy (radioisotopes) provides the technology base for its products and services. Sealed radioisotope sources are manufactured and shipped to industrial customers who use them for nondestructive testing (radiography), oil well logging, industrial gauging, research, and education. Health physics instruments (survey meters, area monitors, and instrument calibrators) are designed and manufactured by Gamma for customers using ionizing radiation sources. Gamma Industries also offers consulting services for developing and designing nuclear laboratories and nuclear equipment. Specialized training programs are periodically presented to professional and technical personnel who plan to use radiation and radioisotope techniques.

NTIAC-015890

Nucleometrics, Inc.
11522 W. Jefferson Blvd., Culver City, CA 90230; 213/390-1657
Nucleometrics, Inc., provides density gauging of agricultural products using low-energy, low-intensity X-ray sources. The company has developed an instrument that gauges lettuce for maturity.

NTIAC-015892

Nucor Corporation
Research Chemicals Division
P.O. Box 14588, Phoenix, AZ 85063; 602/936-1481
Research Chemicals produces equipment for neutron radiography. Included are gadolinium and dysprosium metal foils, gadolinium metal screens on aluminum support plates, antiscatter grids, vacuum cassettes, and metals and chemicals for absorbing radiation.

NTIAC-015893

Nutting, H. C., Company (The)
4120 Airport Road, Cincinnati, OH 45227; 513/321-5816
Branches: Newport, KY; and Charleston, WV
Geotechnical engineering services offered by The H. C. Nutting Company include test drilling, soil mechanics laboratory, and engineering recommendations. The construction inspection and services consist of quality assurance inspection of soil, concrete, steel and welding, roofing, bituminous paving, masonry, pipe, and castings. A full range of testing for construction materials is also offered. Nondestructive testing is offered in radiography (X-ray and gamma ray), ultrasonics, magnetic particle, and penetrants. Personnel are specialists in on-site testing — laboratory facilities are available, as well as tanks, pressure vessels, aircraft (FAA certificate), pipe lines, structural steel, welds, and welder certification. Analytical testing service is offered in water and pollution analysis spectrometric analysis, wet bench analysis, and lubricating oil analysis.

NTIAC-015894

Ohio Semitronics, Inc.
1205 Chesapeake Avenue, Columbus, OH 43212; 614/486-9561
Ohio Semitronics, Inc., manufactures a complete line of voltage, current, watt transducers, and meters. The research and development facilities include materials such as bismuth telluride, indium antimonide, indium arsenide, and associated materials. Ohio Semitronics, Inc., has the facilities and equipment to manufacture custom-built panels, special semiconductor materials, and power test panels. Transducers are supplied to government agencies, private industry, and testing laboratories for checking efficiencies of motors, heaters, and other electrical devices. Transducers are especially useful in monitoring, control, protection and regulation circuits. Their fast response results in accurate power measurements even when distorted or chopped wave forms are present.

NTIAC-015895

Oldelft Corporation of America
Commercial Department
2735 Dorr Avenue, Fairfax, VA 22030; 703/573-7020
Branch: San Jose, CA
Oldelft Corporation of America is a totally owned subsidiary of N.V. Optische Industrie, Delft, Holland. Oldelft manufactures X-ray fluoroscopic systems, Delcalix, and Indeca. Real-time electronic imaging systems are used in neutron radiography, gamma radiography, low- and high-enery X-ray radiography. Oldelft also manufactures equipment using the 100 x 100-mm film formats, such as X-ray reduction copier, photo-spot film camera, processor/film feeders, and framing equipment. Other products include the Combilabor 16/35 mm Cine Processor; ODSS III Scanning Stereoscope for viewing stereo pairs, and Oldelft darkroom goggles for use in color film processing areas.

NTIAC-015896

Olympus Corporation of America
Industrial Fiberoptics Department
4 Nevada Drive, New Hyde Park, NY 11042; 516/488-3880
The Olympus industrial fiberscope is a flexible fiber-optic borescope that permits internal inspection of U.S. military airframes and power plants for cracks, erosion, foreign object damage, etc., without disassembly. Brilliant cold light is supplied from a 150-W external source. The OM 35-mm, SLR cameras, SLR Polaroid camera, CCTV, and dual-viewing scopes can be utilized with the system. The brand new Olympus Selfoscope, a single-fiber borescope only 0.067 inch in diameter, is now available for quality control inspection within a very small cavity. New from Olympus: (1) the world's first series of flexible fiberoptic borescopes (Fiberscopes) with interchangeable objectives, four-way tip angulation, and teflon impregnated stainless steel sheaths; (2) ultraviolet, flexible and rigid borescopes; (3) ultraviolet light sources; (4) battery powered light sources; and (5) new polaroid-type cameras that affix to scopes for instant photographic records.

NTIAC-015897

Optronics International
7 Stuart Road, Chelmsford, MA 01824; 617/256-4511
Optronics manufactures image processing equipment designed to aid NDT technicians in computer-assisted image evaluation. Their scanning microdensitometer enables the technician to take advantage of pattern recognition and image enhancement techniques now in use by the space and satellite industry. Details as small as 0.0005 inch can be resolved. Film can be plotted in color or black and white from any computed data array. The entire instrument line can be interfaced to a mini-computer or magnetic tape recorder.

NTIAC-015898

OXY Metal Industries Corporation
Parker Divison
32100 Stephenson Highway, Madison Heights, MI 48071; 313/583-9300
Parker Division of Oxy Metal Industries Corporation (OMiC) is an industrial chemical manufacturer, supplying chemicals to the automotive, metal finishing, appliance, and aerospace industries. Biodegradable liquid penetrants, fluorescent and visible red, manufactured under license from Rockwell International, are supplied to the commercial and military manufacturing and repair facilities for nondestructive testing. Bio-pen penetrants feature high flash point (above 400 degrees F), low odor, brilliant indications, low dwell time, ultra low contaminants and are completely approved to military specification requirements. The water washable penetrants are highly resistant to overwashing, yet wash quickly from surfaces regardless of configuration or sensitivity level used. Biodegradable penetrants are called Bio-pen, non-biodegradable penetrants are called Accupen. All penetrants are manufactured in a dedicated clean room and are completely certified as to contaminants and flash point by batch number to all users.

NTIAC-015765

Pace Transducer Company
Division of C. J. Enterprises
P.O. Box 834, Tarzana, CA 91356; 213/996-4131
Branch: Canoga Park, CA

NTIAC-023711

Pacific Scientific
Belfab Division
P.O. Box 9370, 305 Fentress Blvd., Daytona Beach, FL 32020; 904/253-0628

Belfab Division, Pacific Scientific Company, manufactures welded metal bellows assemblies for pressure, temperature, sealing, and flexible joint applications and manufactures neutron detectors for research and power nuclear reactors. They also manufacture thermocouples and resistance temperature detectors (RTD).

NTIAC-015901

Pako Corporation
6300 Olson Memorial Highway, Golden Valley, MN 55440; 612/540-6300
The Pako Corporation manufactures an industrial X-ray film processor with several accessories.

NTIAC-015902

Panametrics, Inc.
NDT Division
221 Crescent Street, Waltham, MA 02254; 617/699-2719
Panametrics is a manufacturer of various products in the ultrasonics field of NDT. These products can be divided into four groups: transducers—made in U. S. by Panametrics—suitable for flaw detection, thickness gauging, research, and other applications; thickness gauges—made by Panametrics—highly accurate digital thickness gauges capable of making measurements in a wide variety of materials; instrumentation—made by Panametrics—suitable for both research and specialized industrial applications with, bandwidth of up to 100 MHz.

NTIAC-023712

Parker Research Corp.
P.O. Box F, 2642 Enterprise Road, Dunedin, FL 33528; 813/796-4066
Parker Research Corporation is a manufacturer of NDT equipment and supplies mainly dealing with magnetic particle inspection. Users include most branches of the military, aerospace, refineries, basic steel, and fabrication shops, as well as most airlines and aircraft manufacturers. There are dealers throughout the U.S. and major foreign countries.

NTIAC-015903

Parr Instrument Company
211-53rd Street, Moline, IL 61265; 309/762-7716
Parr Instrument Company performs hydrostatic testing on Parr Instrument Company pressure-reaction vessels only. This service is performed in-house for pressure-reaction vessels sold by Parr Instrument Company and for owners of Parr Instrument Company pressure reaction vessels.

NTIAC-015899

PCB Piezotronics, Inc.
3425 Walden Avenue, Depew, NY 14043; 716/684-0001
PCB supplies quartz transducer instrumentation for dynamic measurement of pressure, force, shock, and vibration. A complete line of signal conditioning for these sensors is included.

NTIAC-015905

Philips Electronic Instruments, Inc.
85 McKee Drive, Mahwah, NJ 07430; 201/529-3800
Branches: Nationwide
Philips Electronic Instruments, Inc., (PEI) is part of North American Philips Corporation. It is represented in the nondestructive testing equipment market through its X-ray spectrometers, X-ray diffractometers and accessories for these systems. PEI also offers transmission electron microscopes, scanning electron microscopes, and X-ray fluorescence systems. Closely related to the NDT field is Philips' complete line of industrial

X-ray inspection equipment. Philips Electronic Instruments is represented by nationwide sales offices, service forces, and dealers.

NTIAC-015906

Phoenix Chemical Lab., Inc.
3953 W. Shakespeare Avenue, Chicago, IL 60647; 312/772-3577
The Phoenix Chemical Lab., Inc., performs research, development, and analysis in the fields of fuels, lubricants, hydraulic fluids and protective coatings, rubber, plastic, and related environmental areas. Specialization includes oxidation, thermal stability, lubricity, flammability, thermochemical behavior, thermodynamics, instrument and test development, labeling, hazards analysis, and safety.

NTIAC-015907

Prewitt Associates
Mechanical Strain Recorder Division
1634 N. Broadway, Lexington, KY 40505; 606/299-9646
Prewitt Associates is the inventor and the manufacturer of the Record-A-Strain self-activated, mechanical, direct-recording strain gauges. Free from external (electric) power requirements, these recorders produce a permanent record of strains under most severe environmental conditions. Engineers and mechanics, as well as geophysicists, use them.

NTIAC-015908

Purex Corporation
Turco Products Division
Box 6100 M/C C-15, 24600 S. Main Street, Carson, CA 90749; 213/775-2111
Branches: Oakland, Lakewood, CA; Rockdale, IL; Philadelphia, PA; Cleveland, OH; Woodbridge, NJ; Tucker, GA; Chatanooga, TN; Houston, TX; and Mission, KS
The Turco Products Division of the Purex Corporation is a manufacturer and distributor of visible and fluorescent penetrant inspection products and systems for applications in aerospace, nuclear, and general industrial operations. Office and service personnel are maintained in key cities throughout the U.S., Canada, Europe, and the Far East.

NTIAC-015900

P. X. Engineering Company, Inc.
Nuclear Division
P.O. Box 565, Woburn, MA 01801; 617/935-6900
P. X. Engineering Company, Inc., is a steel fabrication shop engaged in the design and manufacture of heavy steel structurals, primarily for public utilities and petrochemical industries. Products include tanks, pressure vessels, heat exchangers, fuel racks, and other specialty weldments. Many jobs are for nuclear power plants and require welding of X-ray quality. P. X. Engineering Company, Inc., has its own machine shop, as well as its own radiography department, and therefore requires little or no subcontracting of orders. Their radiography department does accept subcontract work from others. They have a multibuilding facility and employ about 75 people near Boston, Massachusetts, with both rail and water transportation close at hand. They serve all of the continental United States and are also engaged in international trade.

NTIAC-015909

Radiation Equipment Co., Inc.
Inspection Systems Division
1495 Old Deerfield Road, Highland Park, IL 60035; 312/831-2900
Radiation Equipment (REC) specializes in equipment and systems for inspection, gauging, and quality.

Among the materials offered are radiographic supplies, lead screens, penetrameters, cassettes, magnet holders, magnifiers, complete dark room equipment; magnetic particle powders; dye penetrants, visible and fluorescent; optical testing utilizing microscopes, metallographs, optical comparators, measuring methods to micro-inch resolution; and borescopes for internal optical viewing. Facilities encompass a display room where newest equipment is available for demonstration and trial on customer's parts; machine shop for construction of special systems, as well as standard products; engineering offices; and a warehouse. REC distributes these products through local sales engineers in the midwest area and through mail and telephone outside the midwest. Equipment includes eddy current test equipment for alloy sorting; hardness variation; case depth crack detection, with capabilities for automatic handling equipment to sort parts, accept/reject, and incorporate dimensional gauging in the same machine; force gates for turnaround compression; coordinate measuring machines with computer programs for advanced gauging techniques; and closed-circuit TV systems for hookup to optical inspection/gauging equipment.

NTIAC-015910

Radiation Management Corporation
3508 Market Street, Philadelphia, PA 19104; 215/243-2950
Branches: Washington, D.C.; Chicago, IL; and Denver, CO
The Radiation Management Corporation offers services involving radiation and environmental protection and control, health physics, emergency management programs, and environmental and radiochemical analysis.

NTIAC-015912

Ranger Engineering Corporation
311-8 Thomas Place, Fort Worth, TX 76107; 817/293-7191
Ranger Engineering is a small company, primarily involved in the manufacture of Mossbauer spectrometers and related instruments. The facility is equipped to handle transmission, as well as backscattering samples, of iron-bearing material. A radioactive materials hood and counting system is available. Production facilities include a complete machine shop, electronics manufacturing, and testing facility. Darkroom and printed circuit board manufacturing facilities are also available. Ranger Engineering has supplied Mossbauer spectrometers on a worldwide basis. The research facilities include a Mossbauer spectrometer, proportional and scintillation detectors, multichannel analyzer, survey meter, an ultra fast linear amplifier, and single-channel analyzer.

NTIAC-023713

Rank Industries America, Inc.
Division of Rank Precision Industries, Inc.
411 E. Jarvis Avenue, Des Plaines, IL 60018; 312/297-7720
From micrometers to coordinate measurement and optical comparators to CCTV, Rank Precision has a complete line of inspection systems. X-Radiography, capacitive transducers, and eddy current gauges are some of the noncontact systems. Rank Precision also has off-the-shelf items and a systems application engineering group to custom design inspection systems.

NTIAC-015913

Reactor Experiments, Inc.
963 Terminal Way, San Carlos, CA 94070; 415/592-3355
Reactor Experiments, Inc., has been specializing in the development and manufacture of equipment for nuclear reactors, particle accelerators, and nuclear laboratories for 18 years. Our scientific staff has designed and developed a number of highly original products that have been widely used in nuclear power plants, universities, and hospitals, as well as industrial and government laboratories.

NTIAC-023714

Research Devices, Inc.
616 Springfield Avenue, Berkeley Heights, NJ 07922; 201/464-0668
Research Devices, Inc., is a manufacturer of electro-optical instruments, primarily infrared microscopes. These instruments are primarily used for production and failure analysis of silicon semiconductor devices. Other applications are to infrared solid state devices such as LEDs, lasers, fiber-optics, and photo detectors. Since the semiconductor materials are generally transparent in the IR, internal defects may be detected.

NTIAC-015914

Ridge Instruments Co., Inc.
4432 Bibb Blvd., Tucker, GA 30084; 404/939-1554
Branches: Oak Ridge, TN; Huntsville, AL; and Panama City, FL
Ridge Instruments is a designer and manufacturer of specialty nondestructive testing systems that are designed to meet the customer's specific needs. The largest applications are in film and real-time X-ray imaging, with in-motion radiography being a specialty. Large magnetic particle inspection equipment is also designed and built for both wet and dry techniques. Ultrasonic, eddy current, and dye penetrant inspection systems are also within the Ridge Instruments Company capability. Ridge Instruments also offers a unique microfocus, rod anode X-ray system having an 18-inch rod anode only 3/8 inch in diameter. Special positioners for this equipment are also offered. Ridge Instruments has an NDT catalog covering a complete line of X-ray, ultrasonic, magnetic particle and dye penetrant accessories.

NTIAC-015915

Rockwell International Corp.
Los Angeles Division
International Airport, Los Angeles, CA 90009; 213/670-9151
The Los Angeles Division (LAD) has investigated and developed innovative improvements in virtually every NDT discipline. Consultants are available to conduct feasibility studies, research new methods, or establish NDT systems for difficult NDT problems. The program can be conducted at the LAD, or the consultants can travel to the problem. Production inspection with ultrasonics, X-ray, magnetic particles, and penetrants is available. Laboratory testing and analysis of metals, paints, and various fluids is also available.

NTIAC-023715

Rockwell International
Energy Systems Group
P.O. Box 309, 8900 De Soto Avenue, Canoga Park, CA 91304; 213/341-1000
The Energy Systems Group has eight separate courses available that may be taken individually or in combination. All training is applicable to certification as specified in SNT-TC-1A. In addition, this training is appropriate for engineering understanding, supervision training, and state-of-the-art development. Courses include "Hands-on" operation of equipment. The courses presented are radiographic, ultrasonics, magnetic particle, liquid penetrant, eddy current, film interpretation, radiation safety, and radiation safety officer. All courses are comprised of lecture, audio visual aids, and use of equipment using hundreds of standards and specimen materials. These include natural and artificially produced discontinuities and defects. Using these specimens, the students are able to prove out the theory. Students will produce radiographs, make interpretations, and complete written reports on material examined by the ultrasonic, magnetic particle, liquid penetrant, and eddy current methods.

NTIAC-015916

Roentgen Industrial Corp.
1491 Old Deerfield Road, Highland Park, IL 60035; 312/831-2980
A series of products are offered for application in the field of X-ray examination. These products include

intensifying screens, magnetic cassette holders, film cassettes, safe lights, lead figures, optical measuring equipment, penetrameters, and Raydex custom-shaped film paks. Raydex custom-shaped film paks are custom-shaped film, intensifying screens, packed and sealed in a disposable vinyl cassette, individually designed to a desired shape to fit unusual contours to be X-rayed without shooting through obstructions and to identify the areas of interest and eliminate the areas one need not see.

NTIAC-015917

Rohrback Corporation
Rohrback Instruments Division
11861 E. Telegraph Road, Santa Fe Springs, CA 90670; 213/949-0123
Branches: Reading and Berkshire, UK

Magna instruments designs, manufactures, and sells instruments and sensors used to monitor corrosion and related effects in process and laboratory systems. Their principal product lines are based on electrical resistance and linear polarization resistance techniques. They also perform development work on and manufacture sensors for hydrogen embrittlement, erosion, scaling tendency, pH, cooling-water quality control, and similar types of devices. The organization operated for over two decades as the Instrument and Control Division of Magna Corporation and was recently split off to become the nucleus of Rohrback Corporation. The company operates from a modern 23,000-square-foot building near Los Angeles and sells to industry worldwide.

NTIAC-015919

Scandpower, Inc.
Fuel Technology Division
4853 Cordell Avenue, Bethesda, MD 20852; 301/652-0883

Scandpower, Inc., manufactures equipment that provides a measurement of the distortion of nuclear fuel rods.

NTIAC-015957

Scanray Corporation
Torr X-ray Division
1526 W. 240th Street, Harbor City, CA 90710; 213/534-4370

Torr X-ray Corporation manufactures cabinet type X-ray units operating in a range of 0-120 KVP and 0-150 KVP and 3 and 5 MA. These systems are offered in standard 24-inch or 48-inch cabinets, with or without fluoroscopic capabilities. Special size cabinets are also available. For applications requiring electronic fluoroscopy, complete systems with image intensifiers, image enhancers, and television readout are also available. These systems may be supplied in conveyorized revisions, if desired. All of these systems are offered throughout the world. Torr X-ray Corporation is located in Van Nuys, California, and offers these products through a dealer organization. Torr X-ray Corporation also manufactures an automatic exposure device that automatically controls exposure parameters, assuring uniform-density film regardless of thickness or density of the material being radiographed.

NTIAC-015923

Science Applications, Inc.
Nuclear Environmental Services
3 Choke Cherry Road, Rockville, MD 20850; 301/977-4480

Tracer gases are used to leak test condensers.

NTIAC-015922

Science Applications, Inc.
Radiation Applications Division
4030 Sorrento Valley Blvd., San Diego, CA 92121; 714/452-1720
Branches: 50 Offices Nationwide

Science Applications, Inc., (SAI) has a large group of highly accomplished professionals whose specialization includes experimental, theoretical, and instrumentation expertise involving atomic, nuclear, acoustical, and optical phenomena. These personnel have successfully developed techniques and instrumentation in the areas of acoustics, holography, nuclear gauging, activation analysis, thermal and cold neutron radiography, X-ray radiography and electro-optics, nondestructive testing instrumentation, development of 252CF-based neutron radiography equipment, development of techniques for monitoring radiation environments, and application of neutron activation analysis to the detection of pollutants in the environment. This division has the capability to design, develop, and fabricate innovative custom instrumentation to meet the challenging needs imposed by government and industry. Examples of custom instrumentation include the Coal Slurry Sensor, multi-ray ablation gauge for missile reentry vehicles, real-time X-ray imaging system, snow depth gauge, solid state photomultiplier tube, radon monitor, and real-time X-ray casting inspection system.

NTIAC-015924

Scientific Atlanta, Inc.
New Jersey Division
Randolph Park West, RT. 10, Randolph Township, NJ 07801; 201/361-3100
Branches: Atlanta, GA; England; France; and Canada

The New Jersey Division's most recent efforts have been in the vibration testing field, and a diversified line of vibration analyzers is now available to detect breakdown in rotating machinery before it occurs. Instrumentation for measuring torsional vibration is also available. They manufacture a complete line of low-frequency wave and spectrum analyzers, and their line of component noise test sets has set industry standards for component reliability. They also offer instrumentation amplifiers and telecommunication test sets. Many standard options and accessories are available for their products, and modifications can be made to meet a specific requirement upon request. Rental and lease/purchase plans are available for standard instruments to meet the customer's short-term requirements. They offer an active R&D program, and their engineering staff has the experience and capability to design custom equipment to fit individual user's needs. Products are developed, manufactured, and marketed from their facility in New Jersey, both nationally and internationally.

NTIAC-015920

Schonberg Radiation Corporation
2560 Wyandotte Street, Mountain View, CA 94043; 415/964-6214

The Schonberg Radiation Corporation is a distributor for NDT equipment and supplies. The equipment handled includes X-ray systems, Philips-Torr; ultrasonic instruments, Nortec; eddy current instruments, Nortec; penetrant, Sherwin "Dubl-Chek"; magnetic particle testing equipment, Uresco-Ardrox and Econospect; film and chemicals, Kodak and Dupont; processors, Kodak and Pako; survey meters, Dosimeters and Victoreen; and densitometers, X-Rite and Macbeth. Miscellaneous NDT supplies are magnetic powders and pastes, black lights, penetrameters, lead figures, step wedges and blocks, cassettes, lead and fluorescent screens, film hangers and dryers, film storage and darkroom cabinets, silver recovery units, and densitometers. X-ray machines and other NDT instruments are also serviced. Real-time X-ray viewing systems and special handling systems are built for automated NDT inspection.

NTIAC-015921

Schumacher and Associates, Inc.
1828 Trubute Road, Suite J-1, Sacramento, CA 95815; 916/924-9966

The primary specialty of Schumacher and Associates, Inc., is structural mechanics, analytical and experimental. In experimental structural mechanics, recent NDT contracts have been completed for design, fabrication, and installation of a laser instrumentation system for measuring structural deflections of a large liquid-metal, primary coolant pump; execution of test; monitoring; test data reduction; analysis; reporting; and design and installation of an instrumentation system for studying hydrodynamic effects in nuclear power plant components. The facility in Sacramento has a small lab where some NDT is performed. However, the above described projects were performed on-site. This is the case with most work in accordance with customers' requirements. To date, NDT efforts have been concentrated in the Los Angeles, Sacramento, and San Francisco Bay areas; however, such testing may be performed anywhere.

NTIAC-023716

Seaman Nuclear Corporation & Ontop
Computerized Roof Inspection Service
7315 South First Street, Oak Creek, WI 53154; 414/762-5100
Seaman Nuclear Corporation was started in 1962 and incorporated in Wisconsin in 1965 as manufacturers of nondestructive testing equipment for density/moisture determinations in the road-building/airport field. The corporation and principals are registered professional engineers in the state of Wisconsin and currently hold 12 patents in this field. The facility manufactures the equipment and has a laboratory for related ASTM tests. Seaman Nuclear is also the national franchisor of 95 professional firms offering surveys for detecting hidden moisture in flat roofs. Ontop also services about 250 companies/agencies requiring computerized moisture contour maps, using the nuclear method for detecting moisture. Seaman Nuclear also acts as professional witnesses in the roof field and as consultants in other nondestructive testing techniques. Experience deals with lasers; seismographs; digital recorders; remote weather stations; signs employing microprocessors; and consultants on the compaction of soil, asphalt, base aggregate, wet or dry concrete, and stabilization techniques for low-strength construction materials. Seaman Nuclear distributes its products and services worldwide.

NTIAC-015925

Siefert X-ray Corporation
P. O. Box 294, Fairview Village, PA 19409; 215/539-4700
Seifert X-ray Corporation is engaged in the manufacture of industrial X-ray equipment for radiography and real-time fluoroscopic inspection. They have an applications laboratory where prospective customers can forward their parts and components to evaluate the most appropriate inspection method. They manufacture two industrial lines of equipment: (1) the Eresco line of portable X-ray units, and (2) the Isovolt line, a stationary, constant potential unit. In addition, they also manufacture the Isodebyeflex line of X-ray diffraction units.

NTIAC-023717

Selective Electronic, Inc. (SELCOM)
Division of Selective Electronic Co. AB
P. O. Box 250, 625 Main Street East, Valdese, NC 28690; 704/874-2289
Selective Electronic manufactures two product lines, the Selspot system and the Optocator. The Selspot system is an optoelectronic movement monitoring system for the measurement of coordinates of multiple points. Small light-emitting diodes are used to identify the selected points. An optoelectronic camera detects the position of the diodes for registration and analysis of static, as well as dynamic processes in real-time, capable of two- and three-dimensional measurement. The Optocator utilizes advanced solid state optoelectronic techniques to provide precision dimensional measurement data for position, dimensions, contour, vibration, thickness, etc., on almost any material, regardless of the surface's texture, temperature, or color.

NTIAC-024507

Sensor Corporation
303 Scottdale Avenue, P. O. Box 140
Scottdale, PA 15683; 412/887-4080

Sensor Corporation manufactures eddy current instrumentation for alloy identification, defects detection, noncontact temperature measurement, and metal detection.

NTIAC-015926

Shannon-glow, Inc.
Tracer-Tech Division
7356 Santa Monica Blvd., Los Angeles, CA 90046; 213/876-2660
Shannon-glow, Inc., Tracer-Tech Division, is a specialist in luminous materials, fluorescent and phosphorescent; luminous paints; inks; dyes; stains; marking materials; inspection penetrants; leak tracers; identification and security marking inks; and measuring instruments for fluorescence.

NTIAC-015927

Sherwin Incorporated
5007 East Washington Blvd., Los Angeles, CA 90040; 213/261-0251
Technical representatives in key cities throughout the United States
Sherwin Incorporated is a manufacturer of liquid penetrants, fluorescent and visible. Products include penetrants, emulsifiers, removers, cleaners and developers. A complete line, encompassing water-washable penetrant systems, pre-wash hydrophilic emulsifier systems, post-emulsifiable systems, and solvent removable systems, is also available. The products are approved to military specifications and commercial speicfications such as ASME codes. Aerospace, nuclear power, and other critical industries' requirements are met. The products are available in aerosol spray cans as well as bulk, such as gallon cans, pails, and drums. Sherwin Incorporated also manufactures the Electro-magnetic Yoke, a hand-held magnetic testing instrument for use with magnetic particle method. Also available are dry and wet oxides, including fluorescent, for use in the process.

NTIAC-015928

Shiron Associates, Inc.
P. O. Box 235, Hallandale, FL 33009; 305/458-7316
Branch: Philadelphia
The Shiron NDT division performs custom equipment manufacturing and consulting activities for acoustic emission and vibration monitoring systems used by government and industry. Typical equipment applications include real-time, multichannel monitoring of motors, engines, bearings, and oscillating mechanical structures found in automated production and transportation environments. These monitoring systems can rapidly locate components whose acoustic emission properties have changed and thereby pinpoint structures that either have failed or are about to fail. Consulting activities are performed in the entire gamut of NDT techniques, with special emphasis placed on acoustic emission and vibration analysis techniques for major components of large-scale mechanical systems.

NTIAC-023718

Sierra Scientific Corp.
2189 Leghorn Street, Mountain View, CA 94043; 415/969-9315
Sierra Scientific Corporation manufactures high-performance video standard cameras and monitors. Cameras include several light-sensitive models for direct-image sensing or for televising an image from the screen of an X-ray-sensitive image intensifier tube. Other models are sensitive to X-rays through the use of an integral phosphor screen. The X-ray-sensitive models (Starlighter) incorporate the image Isocon tube and are used in vehicular tire, casting and weldment inspection. The monitors exhibit 1500-line resolution on a 15-inch diagonal screen.

NTIAC-023719

Sigma Laboratories, Inc.
P. O. Box 278, 88-11 31 Avenue, E. Elmhurst, NY 11369; 212/898-2427
Sigma Laboratories, Inc., has available the following Sigma models: Model ED—digital, direct-reading eddy current coating thickness tester; Model SM—nondestructive coating thickness gauge using electromagnetic principle; Model NI—nondestructively measures nickel on both metallic and nonmetallic surfaces; Model 1100—automatic beta backscatter coating thickness tester using the latest in the state-of-the-art components; Model Beta-vue 4000—computerized beta backscatter coating thickness tester; and plating thickness testers. Sigma Laboratories performs leak testing of isotopes and also all types of service/repair and calibration.

NTIAC-023720

Simpson Electric Company
853 Dundee Avenue, Elgin, IL 60120; 312/697-2260
Simpson Electric Company manufactures panel meters, meter relays, and electrical and electronic testing equipment.

NTIAC-015929

Society for Information Display
654 Sepulveda Blvd., Los Angeles, CA 90049; 213/472-3550
The Society for Information Display was founded in April 1963 to provide the proper environment for information exchange between individuals involved in information display technology. The Society promotes the use of information display, encourages its advancement, maintains a library of display information, exchanges and disseminates knowledge, promulgates definitions and standards, and stimulates new ideas in information display by providing a forum.

NTIAC-015930

Society of Photo-Optical Instrumentation Engineers (SPIE)
P. O. Box 10, Bellingham, WA 98227; 206/676-3260
SPIE is an independent, tax-exempt 501-C (3) organization. Established in 1956 as a technical and scientific professional society, it is dedicated to advancing engineering and scientific applications of optical, electro-optical, laser and photographic instrumentation systems and technology. Current membership is approximately 2,000 physicists, engineers, and other technical persons in the United States and 30 foreign countries who work in the optical sciences and related fields. The national offices of SPIE at Bellingham, Washington, employ approximately 25 people. Services that SPIE offers to members and to the scientific and engineering community include numerous seminars and technology-utilization programs on specialized topics held throughout the United States, liaison and cooperation with conferences held in Europe and the Far East, publishing of proceedings of these seminars, and publication of a bimonthly journal, "Optical Engineering." Journals and proceedings are sold by subscription, by standing order, and by single orders.

NTIAC-015931

Soiltest, Inc.
2205 Lee Street, Evanston, IL 60202; 312/869-5500
Branch: Cranford, NJ
Soiltest, Inc., is a supplier of equipment for quality control testing of soil, rock, concrete, asphalt, and other materials used in construction. In addition, Soiltest also supplies mobile units (truck- and trailer-mounted); vacuum valves and seals; geophysical investigation equipment; and a line of agricultural testing and handling equipment. International headquarters is in Evanston, Illinois. A sales office, training facility, and environmental research center are located at Baraboo, Wisconsin. Sales offices are located in Cranford, New Jersey. Sales representatives handle their products in all other sections of the United States and abroad.

About two-thirds of their total sales at this time is overseas. Customers are contractors; public agencies responsible for construction; engineers; research personnel; teachers, agricultural organizations; mining firms; laboratory operators; and manufacturers and processors of a broad range of products—building materials, textiles, plastics—just about any raw or processed materials that may be subject to physical and chemical testing.

NTIAC-015932

Soltec Corporation
11684 Pendleton Street, Sun Valley, CA 91352; 213/767-0044
The Soltec Corporation offers a line of strip-chart recorders, X-Y recorders, cathode ray tubes, oscillographic recorders, dot-printing recorders, and voltage/current recorders.

NTIAC-015933

Sonic Instruments, Inc.
1014 Whitehead Road Extension, Trenton, NJ 08638; 609/883-5030
Sonic Instruments, Inc., is a manufacturer of ultrasonic instrumentation and transducers as used in the field for NDT and as applied to materials testing. Sonic's main location and manufacturing facility is located in Trenton, New Jersey, and is supplemented by numerous sales offices throughout the world to provide both industrial and private users of UT equipment with both sales and applications assistance. Sonic is active in the development of ultrasonic testing techniques. Major advancements have been realized in a wide facet of applications; examples being Sonic's IC/OD system providing complete dimensional characterization of tubular products and, most recently, the development, in conjunction with E. I. duPont deNemours and Co., Inc., of the Rota-Sonic system for both dimensional and flaw characterization of plastic tubular products.

NTIAC-023734

Sonoscan, Inc.
530 East Green Street, Bensenville, IL 60106; 312/766-7088
Sonoscan, Inc., is engaged in the development, manufacture, and sale of very high-resolution ultrasonic test equipment and acoustic microscopes. The organization maintains a fully staffed applications laboratory for contract use by customers, for inspection problem solving, and for the development of instruments. Sonoscan serves the needs of industrial, government and academic organizations concerned with quality assurance and materials characterization. Sonoscan designs, manufactures, and sells standard and custom instrumentation for the quality control and analytical laboratory market places. The applications laboratory is implemented with two acoustic microscopes, an ultrasonic beam pattern analyzer, and conventional UT equipment. In-house electronics and model shops supplement the laboratory in the development of test fixtures and new techniques.

NTIAC-015934

Southern Research Institute
Mechanical Engineering Research Division
2000 9th Avenue South, Birmingham, AL 35255; 205/323-6592
The Southern Research Institute is engaged in the nondestructive characterization of aerospace materials, high-temperature materials, and metals through the use of ultrasonics, X-ray, radiometry, eddy current, porosity, and visual inspection. Nondestructive monitors are related to mechanical, thermal, and physical properties to guide quality control efforts. Research contracts are nationwide.

NTIAC-015935

Southwest Research Institute
P. O. Drawer 28510, San Antonio, TX 78284; 512/684-5111
Branches: Houston, TX and Washington, D.C.

Southwest Research Institute is a not-for-profit corporation having activities in applied research and development encompassing most of the basic technologies in science and engineering. The Institute has conducted programs covering a wide range of nondestructive testing disciplines. Specialized nondestructive testing equipment and instruments have been developed for a number of industrial applications. Significant work has been done to advance the state-of-the-art techniques, adaptations of conventional methods incorporating automation, and the detection of metal fatigue prior to failure. The nondestructive examination of nuclear power plant steam supply systems is a large activity at the Institute and is conducted on a worldwide basis. Also located at the Institute is the Nondestructive Testing Information Analysis Center (NTIAC), which is operated under contract to the Defense Logistics Agency. This center collects and maintains a computerized information bank in the field of nondestructive testing for dissemination to both government and private requestors.

NTIAC-015936

Spartan School of Aeronautics
8820 E. Pine Street, Tulsa, OK 74151; 918/836-6886
The Spartan School of Aeronautics offers a number of courses in the field of aeronautics. One of the courses offered is nondestructive testing, which provides training in the following areas to SNT-TC-1A, level II standards: radiography, X-ray, gamma ray, magnetic particle, penetrant testing, eddy current, and ultrasonics.

NTIAC-015938

Spectrum Laboratories, Inc.
P. O. Box 565, Piscataway, NJ 08854; 201/751-1400
Spectrum Laboratories, Inc., is an independent organization engaged in metallurgical testing, including general quality control testing, chemical analysis, physical and mechanical testing, nondestructive testing, metallurgical failure analysis, and engineering and corrosion testing.

NTIAC-015939

Spellman High Voltage Electronics Corporation
7 Fairchild Avenue, Plainview, NY 11803; 516/822-2130
Spellman High Voltage Electronics Corporation manufactures a wide variety of high-voltage power supplies, suitable for such applications as CRT displays, capacitor charging, lasers, electron microscopes, ionization chambers, corona testing, X-ray supplies, ion implantation and electron beam accelerators. This type of equipment has been manufactured for 30 years, and customers are serviced worldwide.

NTIAC-015940

Stafco, Inc.
621 S. W. Morrison, Portland, OR 97205; 503/227-4214
Branches: Idaho Falls, ID; Washington, D.C.; and Jacksonville, FL
Stafco is a consulting firm comprised of engineers and scientists who are also skilled writers and editors. The corporate headquarters is located in Portland, Oregon, with technical subsidiaries in Portland; Idaho Falls, Idaho; and Richland, Washington. The firm's services are primarily in the areas of technical review, program planning, and documnetation. In the energy and environmental fields, emphasis is placed on helping client firms meet various state and federal regulatory requirements for technical information. Examples of products of this service, particularly those with possible NDT association, include quality assurance programs for thermal power plants; quality operating and test procedures; and project management procedures to implement quality assurance programs and test reports. A subscription service, designated "rapid" for reporting assurance program identification documents, is offered that provides detailed information concerning reporting requirements for thermal power plants. Principal clients are electric utilities; government agencies; and government contractors involved in energy research and development, nuclear fuel processing, and miscellaneous related programs.

NTIAC-015918

St. John X-ray Laboratory
Box 192, RD No. 2, Califon, NJ 07830; 201/832-2449
The St. John X-ray Laboratory, established in 1925, is the oldest industrial radiation laboratory in the United States. Services offered include consultation, engineering, training, and expert testimony in litigation.

NTIAC-023721

Structure Probe, Inc.
P. O. Box 342, 535 E. Gay Street
Westchester, PA 19380; 800/345-8148
Branches: Metuchen, NJ and Bridgeport, CT
Structure Probe's three laboratories provide analytical research services in microscopy (TEM, SEM, STEM); microanalysis (EDS, WDS); and surface analysis (AES, ESCA, SAM, ISS, SIMS); as well as X-ray diffraction, thermal analysis, quantitative image analysis, and surface area measurements.

NTIAC-015941

Struthers Wells Corporation
Box 8, Penna. Avenue, Warren, PA 16365; 726-1000
Struthers Wells has a 4-MEV linear accelerator and performs ultrasonic, liquid penetrant, and magnetic particle inspection but does not normally perform such inspections for other organizations.

NTIAC-015942

Sundstrand Data Control, Inc.
Instruments (Dynamic) Division
Overlake Industrial Park, Redmond, WA 98008; 885-3711
Sundstrand Data Control Corporation, Instruments Division, is a large manufacturer of pressure, load, force, vibration, and acceleration transducers and related testing electronics.

NTIAC-015958

Superpressure, Inc.
8030 Georgia Avenue, Silver Spring, MD 20010; 301/589-1727
Branches: Carrolton, TX; and Savage, MD
The Magne-gauge Tester offered by Super Pressure, Inc., (formerly the American Instrument Company) employs NBS certified standards and is used to nondestructively measure (A) nonmagnetic coatings on steel or iron-base metal in four ranges of thickness; (B) electroplated nickel on steel or iron in two ranges; (C) material in one range; (D) delta-ferrite (2 to 28 FN) in austenitic weld metal; and (E) delta-ferrite (2 to 28 FN) in stainless steel castings.

NTIAC-015943

Sylvester, J. G., Associates, Inc.
900 Hingham Street, Rockland, MA 92370; 617/878-9000
Branch: Ponce, Puerto Rico
Although the firm is fundamentally based (for over 25 years) in NDE and materials testing, methods and equipment have been developed to perform accurate code quality underwater ultrasonic inspection. The approach utilizes an equipment system named the "Ultrascan III", which avoids many of the problems of current practices used in uderwater ultrasonic inspection. The method allows comprehensive, accurate code quality underwater shearwave inspection of welds, as well as straight beam and shearwave inspection for corrosion, general and pitting, in pipes and plates. The basis of the system is the underwater television monitor, which is built into the diver's helmet. This monitor displays the cathode ray tube at the surface. Thus, the

diver has the ability to move his transducer relative to CRT indications, allowing optimization of signals and tracking and defining defects. Another important feature of this system is the surface presentation of an underwater television camera affixed to the diver's helmet that allows the topside personnel to observe transducer placement on the workpiece. The system has been used on two different platforms in 75 feet of water. It will soon be used to inspect a natural gas pipeline; the pipe wall will be inspected for interior corrosion.

NTIAC-015944

Systems Scientific Laboratories, Inc.
1295 Boulevard Way, Walnut Creek, CA 94595; 415/937-6748
The Systems Scientific Laboratories, Inc., offers a series of metal alloy identification kits. The kits detect alloying elements by means of chemical spot tests utilizing electrographic methods.

NTIAC-015945

TAC Technical Instrument Corp.
Scotch Road, Mercer County Airport, Trenton, NJ 08628; 609/882-2894
TAC Technical Instrument Corporation manufactures an extensive line of ultrasonic inspection systems, primarily for pipe, tubing, and bar stock. The company also performs in-house ultrasonic inspection of these and similar materials. In addition, the company manufactures a proprietary line of sequential access memories used to control "downstream" marking or sorting of inspected material on moving conveyors. Feasibility studies, design and consulting services, and operator training are provided, covering applications of ultrasonics for nondestructive testing. Ultrasonically inspected pipe and tubing are employed in critical applications, which include nuclear (fuel cladding, coolant plumbing, etc.); heat exchangers; chemical reactors; aircraft (fuel and hydraulic lines); submarine plumbing; and other high-strength, high-reliability uses. Ultrasonically inspected bar stock is typically employed for machined, cold-headed, and forged parts for applications that include turbine blades, engine valves, bearings, high-strength fasteners, etc.

NTIAC-023722

TEAC Corporation of America
Industrial Products Division
7733 Telegraph Road, Montebello, CA 90640; 213/726-0303
Branches: Little Ferry, NJ and Arlington Heights, IL
Industrial Products Division is a service and distribution center for analytical video cassette recorders and accessories and airborne video cassette recorders and accessories.

NTIAC-023723

Team Corporation
9949 Hayward Way, So. El Monte, CA 91733; 213/422-3240
Team Corporation enjoys worldwide recognition in the field of high-performance, electronically controlled, hydraulic vibration equipment. For over 25 years, Team has provided hydraulic shakers, rotary and linear actuators, valves, hydrostatic bearings, slip tables, and ancillary equipment for environmental testing and simulation applications. Team has complete engineering design, manufacturing, testing, and support capabilities for its product line and sells and supports its equipment worldwide.

NTIAC-015948

Techalloy Company, Inc.
Rt. 113, Rahns, PA 19426; 215/489-7211
Branches: Union, IL; Perris, CA; and City of Industry, CA
A reliable and convenient metals testing and analysis service is now being offered by Techalloy to metalworking companies, testing centers, research laboratories, and other firms requiring metals evaluation. This service involves the use of the Bausch and Lomb Optical Emission Quantometer in addition to the Detech

Eddy Current Metals Analyzer and other sophisticated electronic equipment. The quantometer determines multi-element concentrations of many different metals and alloys in a matter of a minute, with a print-out record of elements and their percentages. This instrument has established a new, high standard of accuracy, reliability, and speed. Kevex-Analyst Metal Analyzers provide identification and/or sorting of up to 448 alloys, based on the simultaneous analysis of up to 19 different elements. Results are presented in the form of absolute identification within program parameters on video screen and on printed tapes for permanent record. With its variety of X-ray excitations sources and sample handling equipment, Kevex-Analyst provides great flexibility of applications. Other types of tests are also available, such as obtaining physical, mechanical, and electrical properties of metals. As producers of wire, rod, and strip in over 90 different alloys, Techalloy maintains one of the most complete assortments of testing and analys.s instruments in the alloy industry as part of its rigid quality control program operating in each of its four producing mills.

NTIAC-023724

Technicorp
2140 Hamburg Turnpike, Wayne, NJ 07470; 201/686-2321
Branches: Boston; Norwalk; Skaneateles; Lancaster, OH; Chicago; Houston; Dallas;, Pittsburgh; San Diego; and San Francisco
Technicorp is engaged solely in the manufacturing and marketing of NDT equipment that utilizes a thermoelectric principle of operation—the Seebeck Effect. The instruments are comparators in that a reading is first established for a known sample and then compared to the unknown material. The readings are a product of the chemical and crystalline structure of the materials, and although a surface or contact probe is used, the resulting readings are a property of the bulk of the material. The instruments are widely used for incoming and outgoing inspection and for sorting mixed materials. Any metal with an electrically conductive surface may be tested with these instruments. The units are lightweight and portable, and there are five models available. Technicorp is a small business and is a closely held private corporation, with manufacturing, R&D, and marketing facilities in New Jersey. All work, including assembly and repairs, is done in the New Jersey location. Manufacturer's representatives are located across the United States and Canada; exporting is handled through the New Jersey office. Technicorp offers free testing of customers' samples to determine the applicability of their instruments for the specific metals in question. In-plant demonstrations are also provided free of charge.

NTIAC-023732

Tech Ops, Inc.
Radiation Products Division
40 North Avenue, Burlington, MA 01803; 617/272-2000
Branches: Tulsa, San Francisco, and New York
Radiation Products Division manufactures depleted uranium, shielded gamma ray projectors and radioisotopes for use in industrial radiography. Radiation detection and warning systems are also available. Sales offices and service centers located worldwide.

NTIAC-015949

Tektran-NDT Products
Aircair Company Division
P. O. Box 406, Lancaster, OH 43130; 614/653-5618
Tektran-NDT Products is a supplier and manufacturer of ultrasonic and eddy current testing equipment for both flaw detection and thickness measurement. The company is a large-scale producer of total, "turnkey" ultrasonic test systems, including mechanical transportation equipment, ultrasonic instrumentation and transducers, as well as computer interfacing for data acquisition, storage, and recall. All of the logic, software, programming, etc., for computer work is performed in-house. Test systems have been supplied using 100 separate transducers/channels operating from one single instrument, as well as aircraft gantry systems with 11 axes of freedom, computer controlled.

NTIAC-015950

Telatemp Corporation
P. O. Box 5160, Fullerton, CA 92635; 714/879-2901
The Telatemp Corporation is a manufacturer of surface thermometer devices. The product line consists of infrared thermometers, 0-2000 degrees C (various models); Telatemp temperature labels, 100-500 degrees F; and paint/crayons, 40-1350 degrees C.

NTIAC-015951

Teledyne Engineering Services
303 Bear Hill Road, Waltham, MA 02254; 617/890-3350
Branch: Hayward, CA
Teledyne Engineering Services provides engineering consultation and services in mechanical, structural, metallurgical, civil, and electrical engineering. It also provides specialized materials testing, experimental stress analysis, cryogenic testing, and nondestructive examination services. NDE services are offered in ultrasonics, magnetic particle, liquid penetrant, and acoustic emission. Other services are offered in design and analysis of mechanical systems and structures; theoretical and experimental stress analysis; piping system design and analysis; design, design review, and installation management of nuclear, fossil-fuel-powered, and petrochemical plant modificatons; technical support of codes and standards for nuclear and non-nuclear pressure vessels; failure analysis; and materials testing.

NTIAC-015952

Teleflex, Inc.
Aerospace-Nuclear Division
P. O. Box 218, North Wales, PA 19454; 215/699-4861
Branches: Limerick, PA; Troy, MI; and Los Angeles, CA
Teleflex, Inc., Aerospace-Nuclear Division, manufactures push-pull controls for aircraft, vehicles, boats, and engines. They manufacture flux mapping systems for nuclear reactors and related devices. Service is offered in the United States and internationally. In addition, they manufacture and process "Sermetel" coatings for aircraft turbine engines and similar applicaitons. They also specialize in the manufacture of special stranded cables and conduits. Complete NDT inspection facilities are avilable for flaw detection in ferro-magnetic and nonmagnetic materials using "Zyglo" penetrant inspection and magnetic particle inspection equipment. Complete mechanical inspection facilities are available for measuring dimensional accuracies and surface conditions of complex castings; forgings and machined parts; and cables (stranded wire type).

NTIAC-023725

Teleweld, Inc.
416 N. Park Street, Streator, IL 61364; 815/672-4561
Branch: West Chicago, IL
Since 1927, Teleweld, Inc., has provided dependable technology and equipment to the railroad industry to help maintain their rails. It was discovered that some of the technology could benefit other industries. Two of the products are the versatile, portable hardness tester, "The Telebrineller" and the "Sonirail" rail flaw detector. It is now possible to determine the Brinell hardness of metals quickly, anywhere—in the field or in the lab. The Telebrineller was developed by Teleweld engineers to control and check rail-end work at the job site. Telebrineller is useful to many industries because of its size, portability, and accuracy. There are no delicate adjustments. The Telebrineller is used to check the BHN in areas where other types of testing equipment would be impractical. It is being used to check manufacturing operations in the metallurgic industries. Several oil refineries and pipeline operations depend on it to ensure safety and prevent losses. The Telebrineller has been used in the construction of nuclear-powered submarines. The Sonirail rail flaw detector provides a simple and economical means for detecting defects in rails when such defects have a horizontal component of 1/4-inch or more. Shorter defects can be detected, depending on location in the rail, rail surface conditions, and experience of the operator. The unit is designed to provide an efficient method for locating cracks ema-

nating from bolt holes, as well as horizontal split heads, head and web splits, and web and base splits. Compound transverse defects in the rail ball can be detected if the horizontal component extends over the center of the rail.

NTIAC-023726

Tencor Instruments
2426 Charleston Road, Mountain View, CA 94043; 415/969-6767
Branches: Reston, VA; and Munich, West Germany
Tencor Instruments manufactures nondestructive testing equipment, primarily for use in the production of semiconductor devices. The instruments are used to measure film thickness, surface topography, substrate flatness and thickness, noncontact metallization thickness, semiconductor resistivity and dopant type, and surface defects and contamination. Products are sold through manufacturer's representatives.

NTIAC-015953

Tenney Engineering, Inc.
198 Springfield Road, Union, NJ 07083; 201/686-7870
Tenney Engineering, Inc., is a manufacturer of environmental equipment. The company manufactures standard environmental test chambers ranging in size from 1.4 to 64 cubic feet and in capability from a simple, mechanically refrigerated temperature chamber to those that simulate temperature/ humidity/altitude-/pressure test conditions. Tenney also custom designs and manufactures a broad range of controlled environment rooms capable of simulating any combination of temperature/humidity/altitude/pressure test conditions to meet customers' special testing requirements.

NTIAC-015954

Terra-tek, Inc.
420 Wakara Way, Salt Lake City, UT 84128; 801/582-2220
Terra-tek, Inc., provides services in the United States and some foreign countries. The company offers materials testing and research, geotechnical sciences and consulting, manufacture of special testing equipment, and drilling and energy recovery research. Facilities include well-bore simulators, hydraulic testing machines, hydrostatic pressure vessels, fatigue machines, and ultrasonic test equipment.

NTIAC-023728

Testech, Inc.
212 Welsh Pool Road, Exton, PA 19341; 215/363-0909
Testech, Inc., is a primary manufacturer of ultrasonic immersion testing accessories, fixtures, and systems. The product line includes a wide range of manual and motorized manipulators, small and large tanks, and manual and motorized bridge assemblies. The product line also includes the most elementary ultrasonic immersion testing tools, as well as a complete line of complex operator-programmable and computer-compatible, microprocessor-based systems.

NTIAC-015955

Testing Machines, Inc.
Advanced Instrumentation Division
400 Bayview Avenue, Amityville, NY 11701; 516/842-5400
Branch: Carson, CA
An advanced level of predictive maintenance for ball and roller bearings is now possible with the SPM *shock pulse method. SPM is a unique method for determining bearing conditions in operating machinery.* Effective on all types of equipment using anti-friction bearings, SPM is not influenced by vibration, noise, temperature, or other external factors. The shock pulse method detects and measures the mechanical impacts (shocks) caused by bearing damage. By monitoring the bearing condition, bearing "health" can be deter-

mined and predicted from the time of installation throughout its lifespan. Necessary replacements can be planned in advance to avoid costly, unscheduled shutdowns caused by bearing failure, and bearing life can be extended.

NTIAC-023727

Test Systems International, Inc.
9114 Dice Road, Whittier, CA 90670; 213/698-4122
Test Systems International, Inc., is a small business that manufactures nondestructive equipment for any industry that deals with structural flaws and stress. The type of equipment designed and assembled includes crack depth indicators that determine the depth of surface flaws up to 2 inches; portable magnetic particle instruments, ranging from 750 amps to 1700 amps; magnetic particle yokes with a built-in light as a feature; and VIT CCTV portable video transport systems designed to fit the need. Customers are worldwide, ranging from steel mills to energy power plants. Test Systems is also a distributor for Sherwin penetrants.

NTIAC-015911

Texas Nuclear
A Subsidiary of Ramsey Engineering
P. O. Box 9267, Austin, TX 78766; 512/836-0801
Texas Nuclear (TN) provides noncontacting, level, density and analysis instrumentation for the process, mining, oil, gas, and power industries. TN offers the Alloy Analyzer, a nondestructive, portable, microprocessor-based, battery-powered, X-ray fluorescence analyzer capable of identifying 100 engineering alloys and 11 elements. Operator interpretation is not required because the Alloy Analyzer provides direct and automatic LED readout of alloy types, analyzed element, and percent of concentration. Typical measurement time is 20 to 30 seconds, up to a maximum of 2 minutes. The Alloy Analyzer is designed for on-site or field use. TN also offers an alloy identification service where a TN service technician provides nondestructive testing at your site using the Alloy Analyzer. TN also offers the Series 9200 Portable Analyzer, which is a proven tool for rapid elemental analysis in industry. The system can be used to analyze any element with an atomic weight greater than sulfur in the periodic table. Rugged and truly portable, the 9200 may be taken wherever on-the-spot analysis is needed.

NTIAC-015946

TFI Corporation
NDT Products Division
P. O. Box 1611, West Haven, CT 96516; 203/934-5211
Branches: Tucker, GA; Kirkland, WA; and Los Angeles, CA
TFI Corporation is a manufacturer of X-ray equipment and systems used in nondestructive testing. In addition to its standard line of X-ray equipment, TFI will design and fabricate special purpose X-ray generators, as well as incorporate standard or custom products into complete systems, consisting of materials handling and radiation-protective components. TFI has extensive experience in real-time X-ray imaging, with image intensifiers and various equipment for image processing. TFI maintains a competently staffed and fully equipped applications laboratory in West Haven, Connecticut. The purpose of the laboratory is to establish radiographic and fluoroscopic techniques for prospective users of TFI equipment and demonstrate equipment or systems sensitivity capabilities on customer samples. Other investigative work may be performed on a "free basis." The company will also furnish accessory items for radiography and is active in the film processor marketplace. Complete, mobile, radiographic laboratory trailers for field site use are also available to standard or custom specifications.

NTIAC-015947

TGM Detectors, Inc.
34 Bear Hill Road, Waltham, MA 02154; 617/890-2090
TGM Detectors, Inc., manufactures a line of Geiger Mueller tubes and ionization chambers.

NTIAC-015956

Tinker and Rasor
417 Agostino Road, San Gabriel, CA 91778; 213/287-5259
Tinker and Rasor offers an electrical holiday detector that is commonly used for inspection of brushed, sprayed or dip-applied protective coatings on electrically conductive materials. The detector uses an electrode consisting of a cellulose sponge dampened with an electrically conductive liquid, such as tap water. When a holiday is encountered by the electrode, current will flow from the electrode to the base material causing an audible signal to sound.

NTIAC-023729

Trienco, Inc.
P. O. Box 1876, 205 Apollo Road, Montrose, CO 81401; 303/249-8494
Trienco, Inc., is basically an electronics company involved in all facets of research, development, and manufacture of products oriented toward ultrasonic nondestructive testing and scanners for noncontact dimension measurement of production materials. Trienco, Inc., is heavily involved in the area of low-density, nonferrous materials and the automatic control of their manufacture. Air-coupled ultrasonics expertise provides a nondestructive testing basis for the integrity measurement of low-density materials. Laser and ultrasonic gauging systems are available. Heavy emphasis is placed on computer compatibility. A line of C-scan bridges and sound beam profilers is also produced. Trienco, Inc., is a major manufacturer of ultrasonic reference standards (test blocks).

NTIAC-015959

Trodyne Corporation
900 Corporate Drive, Mahwah, NJ 07430; 201/529-1800

NTIAC-015960

Twin City International, Inc.
P. O. Box 248, Audubon Industrial Park, 175 Pineview Drive
Amherst, NY 14150; 716/691-8855; Branch: Orange, CA
Twin City International, Inc., formerly Twin City Testing Corporation, manufactures and sells nondestructive coating thickness measuring instruments, based on the beta backscatter principle, eddy current principle, magnetic particle, coulometric principle, etc. Their instruments are the leaders, sold worldwide, for making measurements of coating thicknesses in an extremely rapid and accurate manner, on printed circuit boards, semiconductor wafers and packages, microelectronic circuitry, electronic components, jewelry, and any other application where an accurate control of thickness is necessary. In addition to offices and a plant on the east coast, they maintain a full sales and service facility in Orange, California. Products are sold worldwide, through representatives in major European and Far Eastern countries and in the United States by sales forces located in 11 major cities.

NTIAC-015962

Ultra-violet Products, Inc.
5100 Walnut Grove Avenue, San Gabriel, CA 91778; 213/285-3123
Branch: Cambridge, UK
Ultra-violet Products, Inc., manufactures a complete line of ultraviolet light sources and equipment for fluorescent inspection techniques, such as magnetic particle inspection.

NTIAC-015964

United States Testing Co., Inc.
1415 Park Avenue, Hoboken, NJ 07030; 201/792-2400
Branch: Reading, PA

United States Testing Company's activities in the nondestructive testing community consist of providing inspection and testing services, including ultrasonic, radiography, magnetic particle, liquid penetrant, and eddy current. Coverage is basically in the northeastern region of the United States, with field installation at major nuclear power generating stations throughout the United States.

NTIAC-015965

Unitek Corporation
Equipment Division
1820 South Myrtle Avenue, Monrovia, CA 91016; 213/574-7800
Unitek manufactures precision resistance welding equipment; precision 1200-degree C furnaces; and pull testing equipment (both destructive and nondestructive). Pull test equipment ranges from 10 to 1000 grams.

NTIAC-015966

Unitron Instruments, Inc.
175 Express Street, Plainview, NY 11803; 516/822-4601
A full line of microscopes, metallographs, telescopes, and related optical products is manufactured and marketed.

NTIAC-015963

Unit Process Assemblies, Inc.
60 Oak Drive, Syosset, NY 11791; 516/364-1080

NTIAC-015967

Universal Technical Equipment, Inc.
P. O. Box 371, Collingdale, PA 19023; 215/586-3070
Branch: Glenolden, PA
Universal Technical Equipment, Inc., represents leading manufacturers of materials and equipment used for X-ray, magnetic particle, liquid penetrant and leak detection. Related items are also imported.

NTIAC-015968

Universal Technical Testing Labs, Inc.
P. O. Box 372, Collingdale, PA 19023; 215/586-3070
Branch: Sharon Hill, PA
Universal Technical Testing Labs, Inc., is a full-service laboratory specializing in X-ray, gamma ray, ultrasonics, liquid penetrant, magnetic particle, eddy current, telespec, and leak detection services. The branch facility includes four exposure rooms where specialized ultrasonic testing, leak testing, and physical testing are conducted. A fleet of mobile units handle field site operations. Personnel have all NDT qualifications, including navy nuclear and ASME. Research and development and consulting and training are also performed.

NTIAC-023730

UPA Technology, Inc.
60 Oak Drive, Syosset, NY 11791; 516/364-1080
UPA Technology, Inc., is the leading producer of American-made plating and coating thickness-measuring instruments. Product users are found nationally and internationally.

NTIAC-015969

Uresco, Inc.
10603 Midway Avenue, Cerritos, CA 90701; 213/773-3828

Uresco manufactures magnetic particle, liquid penetrant, and ultrasonic testing systems and supplies. They are distributors of Pantak and Scanray X-ray systems and equipment. They also distribute, in southern California, a complete line of X-ray film and supplies, as well as other nondestructive testing apparatus. The principal office and plant has over 20,000 square feet of space. Engineering and assembly operations are carried on there.

NTIAC-015961

URS - John A. Blume and Associates, Engineers
San Francisco, California Division
130 Jessie Street, San Francisco, CA 04105; 415/397-2525
URS/Blume is dedicated to meeting each client's needs in the most responsive and professional manner. The staff of civil and structural engineers and professionals in geology, architecture, and computer technology offers services in their areas of expertise. These areas include civil and structural engineering design, architect-engineer services, earthquake engineering and risk analysis, marine engineering, engineering services for the nuclear industry, earth-sciences, research, and construction management. In the application of structural dynamics in analysis and design procedures, URS/Blume has developed nondestructive procedures for determinations of structural properties. Nondestructive evaluation capability has been employed on nuclear power plants, hospitals, and institutional buildings. Techniques have ranged from visual inspection to indirect measurements of properties. Part of the research efforts has been in conducting structural response investigations for the Nevada Operations Office of the U.S. Department of Energy. URS/Blume has participated in prediction measurement and analysis of the response of low- and high-rise structures to ground motion generated by underground nuclear expolsions at the Nevada test site and in natural hazards evaluation for DOE involving full-scale measurement of wind effect of high-rise structures. Additionally, URS/Blume identified the applicability of nondestructive testing techniques to the inspection of structures, utilities, and equipment under the cognizance of the Naval Shore Establishment. URS/Blume is a California-based firm with affiliates throughout the United States. Services are available in any location in the United States, particularly in California.

NTIAC-015970

Validyne Engineering Corporation
19414 Londelius Street, Northridge, CA 91324; 213/886-8488
The Validyne Engineering Corporation supplies electronic instrumentation and transducers. The product line includes pressure transducers, carrier demodulators, digital manometers, digital barometers, digital pressure transfer standards, and multichannel modular signal conditioning systems.

NTIAC-015971

VEECO Instruments, Inc.
Terminal Drive, Plainview, NY 11803; 516/349-8300
The VEECO Instrument Corporation markets a helium mass spectrometer leak detector. This instrument is used to detect small leaks, employing helium tracer gas. The electronic component industry uses the helium mass spectrometer.

NTIAC-023733

Velonex
560 Robert Avenue, Santa Clara, CA 95050; 408/727-7370
Velonex engages in the development and manufacture of pulse generators (especially in the area of medium and high-power outputs); various types of transient generators for simulating interference; AC to DC convertors for use in rugged environments (such as aerospace applications); and digital panel meters and event counters for a wide variety of applications, including those in miniaturized instruments and extremely rugged environments. Many of their high-power pulse generators have been used for nondestructive testing, such as for energizing piezoelectric transducers. Their instruments are used in many industries, such as electronic, semi-

conductor, metallurgical, power utilities, and processing industries; in universities; physical and chemical R&D laboratories; and government facilities. Products are sold on a worldwide basis.

NTIAC-015972

Vibra-metrics, Inc.
Vibration Measurement and Control Equipment Division
150 Bradley Street, East Haven, CT

Vibra-metrics is a manufacturer of vibration transducers of the piezoelectric and electromagnetic types for conversion of motion into an electrical signal proportional to cyclic velocity, acceleration, or displacement and associated electronic instrumentation to read out, monitor, alarm and analyze for predictive maintenance, quality assurance, safety, and structural analysis.

NTIAC-015973

Viking Laboratories, Inc.
440 Bernardo Avenue, Mountain View, CA 94043; 415/969-5500

Viking Laboratories, Inc., provides complete product reliability and evaluation test services in the military, industrial, and commercial markets. These services provide for the full range of physical environments (climatic and dynamic); electrical components (active, passive, and black-box hardware); and metrology (calibration and repair of electronic and electromechanical equipment with NBS traceability).

NTIAC-015975

Voland Corporation
P. O. Box 1002, 5 Skyline Drive, Hawthorne, NY 10532; 914/347-3040

The Voland Corporation is the manufacturer of high-precision equipment for weighing, force measurement, and mass standards; ultra-precision balances and mass comparators for laboratory and standards use; and precision scales and automated systems for quality control, sorting, and dispensing by weight. Also, contract ultra-precise weighing service is available. All standards are traceable to NBS.

NTIAC-015976

Volumetrics
Energy Science Center
P. O. Box 2084, 634 Airport Road, El Paso de Robles, CA 93446; 804/239-0110

Volumetrics offers instruments for leak rate measurements of valves, seals, and vessels, using both the volumetric replacement method and flow rate measurements.

NTIAC-015977

Walker Scientific, Inc.
17 Rockdale Street, Worcester, MA 01606; 617/852-3674

Walker Scientific, Inc., is part of the Walker Magnetic Group that has been in magnetics since the late 1800's. This long dedication to the science of magnetics has led to the development of two product lines that have been instrumental in advancing the state-of-the-art in this field: Walker/Magnemetrics Magnetic Measuring Instrumentation and Walker/Magnion Laboratory Magnet Systems. Together, these products have made Walker Scientific, Inc., a leader in magnetic systems and instrumentation throughout the world.

NTIAC-023731

West Coast Research Corporation
P. O. Box 25061, 1527 26th Street, Santa Monica, CA 90404; 213/478-8833
Branch: Los Angeles

West Coast Research Corporation has developed what is probably the broadest line of strain gauge instruments available. Measurements are offered of torque, force, pressure, flow, acceleration, displacement, and temperature. In addition, multicomponent and multivariable transducers are offered in a single package or balance assembly. Up to six components of force can be provided over a wide range of capacities—from gram ranges up to hundreds of kilopounds. The latest techniques in signal conditioning, display, and systems control are employed to back up the range at physical parameters offered.

NTIAC-015978

Williamson Corporation
70 Domino Drive, Concord, MA 01742; 617/369-9607
Williamson Corporation manufactures noncontact temperature-measuring instruments and control systems, ranging from portable instruments for general troubleshooting to a complete on-line temperature monitoring and control system. Typical industrial users include plastics, glass, paper, textile, steel, chemical, petrochemical, metal, and research and development firms. This equipment is sold all over the world.

NTIAC-015979

Winton Products Co., Inc.
P. O. Box 3332, Charlotte, NC 28203; 704/399-5151
The Winton Products Co., Inc., is a manufacturer of chemical leak detection fluids and application equipment for all pressurized systems, such as air, natural gas, LP gas, bulk plants, tanks, hydraulic systems, ship hulls, barge hulls, pipelines, etc. Pure oxygen systems, such as those used in hospitals, aircraft, aerospace, nuclear plants, etc., may also be leak tested with Winton products.

NTIAC-015980

Worthington Pump Corporation
Engineered Pump Division
Box 16, Harrison, NJ 07029; 201/484-1234
The Worthington Pump Corporation, Engineered Pump Division, provides RT, UT, MT, PT, and leak test services on nuclear castings, forgings, bars, plate, and steel weldments for customers. NDE for pump materials and rotation equipment is a specialty. Also provided is ASME "N" stamp equipment and military equipment per MIL-I-45208.

NTIAC-015985

Xetex, Inc.
660 National Avenue, Mountain View, CA 94043; 415/964-3261
Xetex, founded in 1969, was the first company to specialize in the commercial application of scintillation scanning (scintillography). Since the introduction in early 1970 of the Scintaflex System, the company has developed a variety of custom systems for specific applications. The Automatic Density Scanner is a typical example of these systems. This unit automatically scans a large carbon billet over its full length in four angular positions. A 12 CI CS-137 source in a completely shielded and interlocked enclosure is used. Density is determined to a 2-sigma accuracy of 0.25 percent every quarter of an inch. Data are simultaneously digitized for computer entry and display on a strip chart recorder. In addition to NDT products, the company has also pioneered a line of portable digital radiation monitors. These units provide direct digital display of radiation dose or doserate, eliminating the confusion and uncertainty often caused by meters and meter multipliers. Because of the extensive use of integrated circuits, these devices are small and consume little power, making them especially suitable for difficult field assignments. Xetex plans to continue its strong product development program in these and related areas and to expand its capability for handling systems development.

NTIAC-015981

Xmas, Inc.
8186 E. 44th Street, Tulsa, OK 74145; 918/663-4555

Xmas is a manufacturer of portable, gas-insulated, light-weight X-ray machines from 75KV to 300KV, 3MA. A specialty is manufacture of X-radiography products for pipelines and the oil and gas industry. Xmas serves all the United States and many foreign markets.

NTIAC-015982

X-Ray Industrial Distributors
P. O. Box 1015, Clifton NJ 07014; 201/773-9400
Branch: Philadelphia

X-Ray Industrial Distributors is both a distributor of industrial radiographic equipment and supplies and a designer and manufacturer of radiographic systems. Distribution and manufacturing is conducted from facilities in Clifton, New Jersey. The office portion is approximately 1200 square feet, with the warehouse and manufacturing being 8000 square feet. A complete NDT laboratory and darkroom are available for inspecting prospective materials. Sales are throughout the United States and internationally. Of special interest are the laboratory/production cabinet X-ray inspection systems, incorporating X-ray from 50KV to 430KV, with image intensification (three field); amplification; edge enhancement; digital storage (mini-computer); VTR; and conveyor operation for production examination.

NTIAC-015983

X-ray Products Corporation
7829 Industry Avenue, Pico Rivera, CA 90660; 213/723-0741

X-ray Products started business in 1939, primarily in the manufacture of medical X-ray equipment. The XRP Lab Division performs nondestructive testing, primarily for industry in southern California, but does receive parts and components from the entire U.S.A. The lab is equipped with 20 X-ray machines from 50KVP to 1MEV, along with other NDT and destructive testing equipment processes. This division also performs as an applications lab for the NDT Apparatus and Supply Sales Division.

NTIAC-015984

X-ray Products Corporation
NDT Apparatus and Supply Sales Division
7825 Industry Avenue, Pico Rivera, CA 90660; 213/723-0741

The NDT Apparatus and Supply Sales Division of X-ray Products Corporation is a wholesale and retail outlet for various X-ray machines, equipment, and accessories as manufactured by its affiliate, Schneeman Electronics, Inc. It is also the importer/distributor of the Seifert line of industrial X-ray equipment as manufactured by Rich Seifer and Company of West Germany. With its branch office in Portland, Oregon, it has widespread dealerships for all major brands of X-ray films and chemicals, as well as ultrasonic equipment, penetrant chemicals, and all manner of other supply and accessory items for industry. X-ray cabinet systems, including real-time imaging and material handling systems, are installed throughout the United States, with primary activities in the 11 western states.

NTIAC-015986

Zeiss, Carl, Inc.
444 Fifth Avenue, New York, NY 10018; 212/730-4400
Branches: Atlanta, GA; Boston; Chicago; Houston; Los Angeles; San Francisco; and Washington, DC.

Carl Zeiss is a subsidiary of Carl Zeiss of West Germany and the sole distributor in the United States of its precision optical products, such as light and electron microscopes for routine and research applications; surgical microscopes and opthalmic equipment; precision measuring instruments; photogrammetric and geodetic equipment; special and industrial optics and lenses; planetaria; and binoculars. The company has eight regional and branch offices and a network of dealers throughout the United States.