JPRS-ESA-85-028

26 SEPTEMBER 1985

EAST EUROPE REPORT

SCIENCE AND TECHNOLOGY

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ROMANIA

INTERNATIONAL AFFAIRS

SYMPOSIUM ON ROMANIAN COMPUTERS HELD IN PRAGUE

Prague TECHNICKY TYDENIK in Czech 16 Jul 85 p 9

[Text] The Computer Equipment Research Institute [ITC] of Bucharest together with the Romanian foreign trade enterprise Electronum organized a 4-day symposium in Prague of Romanian computer equipment and an extensive collection of programs available for the most widely varying applications.

Equipment

The micro- and minicomputers of Romanian origin are from the ICE Felix plant and include the M118 microcomputer system, the M216 tabletop microcomputer and the Independent 102F minicomputer. The central processing unit of the M118 system uses the 8080A microprocessor and has a timing (clock) frequency of 2 MHz, 8 interrupt levels, and works with 78 instructions.

The system is made up of a permanent memory with 64 kilobyte capacity, which can be expanded up to 256 kilobytes for multiuser applications; a 32 kilobyte EPROM memory; and a display memory of 16 kilobytes. There is a dual external memory with 8-inch floppy discs each with 256 kilobyte capacity. The display unit makes it possible to display 24 lines and 64 columns or 24 lines and 80 columns and a graphics mode with 256 vertical and 521 horizontal points. In addition, the reverse display mode and paging can be used. The program equipment includes the SFDX 16 operating system and the FORTRAN IV Compiler, COBOL Compiler, PL/M Compiler, BASIC, PASCAL Compiler, word processing, and multiuser BASIC languages.

The M216 tabletop microcomputer has a 2-microprocessor central unit with 8086 and 8080A microprocessors which have a timing frequency of 5 or 8 MHZ, 8 interrupt levels, and a set of instructions corresponding to the typical instructions for the 8080/8086 microprocessors. The microcomputer's RAM memory has a capacity of 128 kilobytes per module and it can be configured with up to 8 modules; the REPROM memory has a capacity of 32 kilobytes per module. The peripheral units of the M216 include up to four disc units, a 9-track magnetic tape unit, a dot printer with 64 standard ASCII symbols, and a graphics display black and white system with a matrix 24 by 80 for letter-figure characters with the ability to display 96 or 128 ASCII symbols. The M216 operating system functionally integrates into one set the 8-bit operating system functionally integrates into one set the 8-bit 8080 microprocessor operating system and the 16-bit 8086 microprocessor system. The M216 can work

with the languages BASIC Interpreter and FORTRAN IV (both with graphics capability), PL/M Compiler for 8080, PL/M Compiler for 8086, PASCAL Compiler, and multiuser BASIC.

The I-102F minicomputer is based on improved TTL semiconductor technology and its programming is compatible with that of the PDP-11 computer, since it employs the MINOS operating system and the AMS multifunctional system. The central processor of the minicomputer has 9 operational registers and 8 address modes and the time for one instruction of the register to register type is 400 nanoseconds. The maximum capacity of the main memorty is 248 kilobytes, which is made up of MOS circuits with 16 kilobyte capacity. The operator workspace for the minicomputer is equipped with a DAF 2020 terminal from the Feper plant, which is compatible with the Tektronix 4010 and Videoton VT-100 terminals. The terminal provides letter-figure display and also operates in modes for creating copies and for graphics output. The terminal screen provides displays of up to 512 by 480 pixels, the full set of 128 ASCII symbols, and the typical speed for displaying one point in the graphics mode is 15 microseconds.

Programs

For the minicomputer I-102F, Electronum offers a program inventory with a large library of programs which can also be used in the SM-4 systems and the main thrust of the 4-day symposium was the programs available.

This year the symposium was supplemented by an accompanying exhibition where computers were the main exhibits. The library contains 15 programs for industrial applications and 18 for computer assisted development [CAD], including, for example, the PIX program for designing planary connections or the program for simulating dynamic systems in automated control or in robotics, which has a title which sounds appropriate in Czech, PROSIM/MINI [Translator's note: PROSIM means "please" in Czech].

In addition, there are 14 programs for scientific calculations, 4 programs for medicine, 3 programs for use in metallurgy, 3 serving to protect the environment, 15 programs for agriculture, 6 for geodesy, topography, and meteorology, and several programs for demography and education.

6285
CSO: 2402/16

NEW BENEFITS FOR WORKING RETIREES

Prague RUDE PRAVO in Czech 22 Jun 85 p 2

[Text] A worker in certain branches, for example according to the difficulty, strenuousness and risks inherent in his workplace, is entitled to be placed in a higher retirement category. This concerns in particular mining, smelting, heavy machinery, hazardous chemical and other operations. On June 13 the CSSR Government dealt with this problem. We asked Comrade Vladimir Marik, Deputy Minister of Labor and Social Welfare, about the particulars of this government resolution.

[Question] What do these modifications in the area of retirement benefits pertain to?

[Answer] The CSSR Government approved changes in placing certain types of occupations into the 1st and 2nd categories for the purpose of retirement benefits. At stake are measures concerning individuals, but important also for the society and the economy, which will enable us to deal more effectively with certain urgent problems, such as, for example, making certain that general overhauls and assemblies in nuclear power plants, mines, and other heavy operations are carried out.

Directive No. 48/1985 of the CSSR Government, augmenting government directive No. 136/1975, Laws of the Czechoslovak Socialist Republic, which deals with placement of occupations into the 1st and 2nd categories for the purpose of retirement benefits, will improve the terms for evaluating the work of factory maintenance men and assembly men working on maintenance, who take turns alternatively in hazardous and non-hazardous workplaces. This concerns the type of work which occurs in practically all the branches of the national economy, not only in mines or nuclear power industry, but also in heavy and general machinery, in the electrical equipment industry, in the chemical industry, etc. Roughly 14,000 workers perform such work every day.

The innovation will be the evaluating of factory maintenance men each month in which they have been working primarily in hazardous workplaces. Until now, the requirement was that such performance be of at least 6 consecutive months' duration, or in the case of mining underground in deep mines 6 months within a calendar year.

[Question] Which occupations are newly considered preferential from the pension standpoint?

[Answer] It was decided to include in the 1st category with the provision of retirement of age 58 selected blue collar occupations and certain technical-managerial employees in coke operation in the smelting and heavy machinery sectors, for example in the Ostrava, Kladno and Kosice regions, and the fuel sector.

The approved social adjustments complement measures in the technical, preventive medicine, and organizational areas which are designed to lower health risks and are an expression of society's interest in this demanding and essential work. Individual occupations, in which the retirement benefits have been improved, will be defined and incorporated into department rosters by the Federal Ministry of Labor and Social Welfare and appropriate central agencies during the current year. A similar approach will be adopted in solving the problems or work with carcinogens (for example in the chemical industry).

[Question] When will these new measures become effective?

[Answer] As far as the occupation of factory maintenance men is concerned, the government directive will go into effect on July 1, 1985. It will apply to retirement benefits granted after this date, even if claims to them arose earlier. Selected workers in coke production will have their retirement benefits upgraded beginning on the same date as well. All the approved measure have as their goal society-wide and economic benefits, as well as the benefits of those working in the above mentioned occupations.

[Question] Many citizens, who are entitled to pensions, do not wish to stop working. Do they have to?

[Answer] No, they do not. Appropriate and effective employment of retirees plays an important role in fulfilling the demanding tasks of the national economy. We can see that from 1980 the number of retirees increased by 95,000 and at present time stands at 3.4 million. During the same time the expenditures for retirement benefits grew by 8 billion Kcs a year. Many working people, even after reaching the legal age limit for retirement (60 years for men, 53-57 years for women)--which is one of the merits of our retirement system and an achievement of our working class--retain the ability and the interest to keep on working.

Therefore, conditions were created for the employment of working retirees which answer the current needs of the national economy as well as the social interest of the workers. In blue collar and operational service occupations, retirees can work, receiving pensions as well as wages, for the full year, in other occupations, particularly in administration, up to 22,000 Kcs of gross yearly pay. In this amount are counted also those components of income which are included in the average monthly earnings for the purpose of calculating pensions, such as bonuses for agreements on work activity, hospitalization, etc.

[Question] How are these principles being applied in practice?

[Answer] In the course of time we shall be able to evaluate positively our initial experiences with the new system of employing citizens of retirement age, which has been in force since January 1, 1984. The economic leadership and trade union organizations have actively supported this measure, and by and large are following it in practice. Even inspections performed by our ministry show that directives for employing retirees are being respected. Only in isolated cases did organizations conclude agreements on work performance rather than work activity, in order to circumvent limits of retirement earnings, or wrongly designted professions of technicians and administrative workers as manual labor, so that they would be able to grant retirement benefits all year long, as well as wages.

While in 1981 there were 643,000 working retirees--recipients of old-age pensions--in 1984 there were already 669,000 of them. We consider it very important that most of the retirees work in blue collar jobs and in operational and service jobs (87 percent). Compared to 1981, the number of old-age pensioners working in blue collar and service jobs increased by 41,000, while in the number of professional workers there was a decrease of 15,000 to the level of 85,000 working people.

The new terms helped particularly in those areas where help was most needed--in performing manual labor, in trade, in providing services for the public, etc. Organizations appreciate the fact that the administrative work connected with employing working retirees has diminished.

According to our experience to date, we expect that advantages applicable to working retirees will continue to be an incentive for desired work activity, in order to support those sectors of the national economy where the work of these citizens is most needed and most beneficial. One can presume that, thanks to the advantageous age limits for old age retirement, interest in work from the ranks of retirees will continue.

[Question] How is the realization of these modifications in social welfare, approved beginning January 1, 1985, progressing?

[Answer] The most wide-ranging and most demanding tasks of social policy were carried out at the beginning of this year in the area of retirement benefits. Altogether almost 1,189,000 of the oldest and lowest pensions have been upgraded, most of them having been adjusted already beginning with the January payment. At the present time, we are proceeding to upgrade those pensions which can be adjusted at the request of the recipient. These are mainly those pensions which are the only source of income, some low pensions of participants in the struggle for liberation, and pensions granted after the year 1970, but for which entitlement was earned before January 1, 1971 and were therefore calculated on the basis of earnings prior to that date.

Thanks to the timely planning and all-around support of the Office of Retirement Benefits in Prague and Bratislava and the national committees, the whole adjustment was handled successfully. Similarly, the new law which makes it possible to grant maternal allowances for the care of only one child is achieving its goal, contributing to the improvement in living conditions of the youngest families. Our citizens can thus rest assured that the social policies of the party have the strengthening of social securities of life as their objective.

12605
CSO: 2400/545

CZECHOSLOVAKIA

WORKERS SPEAK OUT

Prague HALO SOBOTA in Czech 27 Jul 85 pp 1,7

[Workers' letters to the editor of the Workers' Column]

[Text] Nothing Has Changed in Our Plant

You have started to publish blue-collar workers' views on various problems in our society. I like the Workers' Column. I have been following it diligently from the beginning and agree with everything that RUDE PRAVO has published so far. As blue-collar worker, communist, I have been working in the same position in our plant since 1948 without having missed a single hour of work through my own fault, always trying to execute my work as well as I can and to be an efficient member of our collective. I am not afraid to publicly criticize whenever there is something I do not like.

The Workers' Column really met with response among the workers. We also put these articles on the bulletin board. However, as O. Cmiral from Frydek-Mistek said in his article "The Hard Truth Is Better" published in HALO SOBOTA of 18 June, the workers sometimes react in the following way: "Do you really think that something will change? Do not become a laughingstock!"

Why is this so? Some time ago you published the views on the overgrown, burgeoning bureaucracy in our society, I also expressed my view on the matter at that time. And what has changed, improved? For example in our small plant. As blue-collar worker I see how various decrees and directives are circumvented. Overgrown bureaucracy continues to depreciate our results. Does nobody see what is done with the people who retire from managerial positions? After all it is enough to find a new "chair" for them or literally to invent a new function or to reclassify them into the category D in order to make it possible for them to continue to work even after their official retirement.

Karel Randa, Strasice

How Comradely Criticism Is Sometimes Received

I have been following with interest the letters to the Workers' Column. I have read attentively also the views of Tibor Kovacik from Hradec Kralove

published in HALO SOBOTA in No 22 of 1 June 1985. His article, in my opinion, "hit the nail on the head".

At the present time the blue-collar workers' comments are not taken too seriously in some plants. There are places where the young blue-collar workers do not dare comment on the shortcomings in their own shop because they found out that the struggle was waged not against the shortcoming to which the blue-collar worker drew attention, but against the person who had pointed it out. I will give you a specific example. The lathe operator in the spare parts shop referred to the waste of costly material. He drew attention to the fact that the supply department secured round steel bars of large diameters from which he had to make very small spare parts and this resulted in big waste. The blue-collar worker experienced also big time losses in production. Since he touched upon the inferior work of the foreman and supervisors, the work in his shop became hell so he had to quit...

Supervisors sometimes cover up the organizational and production shortcomings and expect the blue-collar workers to help them in this effort. Those who are obedient are then appropriately rewarded in their job evaluation. Those who criticize and want to help the society are regarded as rebels and undesirable elements in the shop. It is so because they expose the inability, indolence, slapdash of supervisors.

I want to mention something else. Every year every plant and enterprise makes so-called comprehensive analyses which are sent to the supervisory organs. What are the experiences with these analyses in some instances? The discovered shortcomings namely recur every year and in somewhat modified form reappear in the new comprehensive analyses. Many value judgements refer to the inferior work of the entire concern, sector... Why does not the superior organ take appropriate steps to rectify the situation? Because it would have to put its work place in order in the first place. And this of course cannot be done...

Ladislav Hajny, Svatoborice

More Modesty

As a young girl I worked under the so-called blue-collar manager. Those were the people who had not titles, but were not lacking blue-collar know-how and "peasants' common sense". Education certainly is necessary, but is not by itself qualification for a manager's position. Blue-collar managers consequently appreciated the fact that they enjoyed such trust--to manage, direct and bear the responsibility. They were proposed to the manager's position by the party to which they were responsible for their actions. Some of the present, mostly college educated managers would need some of the former managers' modesty. At least sometimes I have the impression that many a manager or deputy manager immodestly associates his function with the fact that its integral part is a chauffeur and service car also for the private trips, luxurious and ostentatious furnishings of the office, funds and gifts, conferences in a luxurious recreation center, but also his own

villa, weekend house, foreign-made car, recreation at the seaside and the son or daughter studying at the university. These are the managers who with their petit-bourgeois attitudes think that without all this they would not hold out against the others.

Jirina Nova, Pribram

Who Pays for the Drunkards?

I also want to contribute to the Workers' Column and to protest with my letter against the increasing consumption of alcohol during the workhours. If we look at some construction sites for example in the forenoon, we will not find a single worker there. On the other hand the nearby restaurant is packed with the construction workers. The statistics usually include only the number of treated and registered alcoholics, but not all people depending on alcohol. However, if we drop in the restaurants in the evening, we can see how many people sit there and drink until the closing time every day. What is the quality of their work likely to be the next day? I am a blue-collar worker and cannot imagine that I could properly work after sitting in the taverns late into the night. What is the performance of the people who drink every day until their restaurant closes? How do they meet their norms?

The Constitution enjoins every citizen to protect his health. However, what should we think of the person who had drank a lot (as many as 20 glasses of beer per day) some years ago and actually all his life and who is now being treated because of his ailing kidneys or liver at the state expense? Moreover, he receives disability benefits prematurely! He himself did harm to his body and now all of us have to pay because he unnecessarily was destroying his own health?

I am not a party member, but I cannot refrain from participating in the discussion going on in the Workers' Column where the readers write what they mind and to what they cannot remain indifferent. I fully agree with everything that you have printed so far. And I join the ranks of those who headed by the communist blue-collar workers started the struggle for the elimination of improprieties and other burning problems.

Miroslav Benda, Vimperk

10501
CSO: 2400/538

REPORT ON ONCOLOGICAL RESEARCH

Prague RUDE PRAVO in Czech 31 Jul 85 p 3

[Article by Michal Strida: "Regulation of Immunity to Tumors"]

[Text] Immunology belongs to the disciplines deemed to contribute to the solution of one of the most significant problems of contemporary medicine--malignant growths. Tumor cells, similar to microorganisms causing infectious diseases or to foreign transplanted organs, induce in the human organism defensive immune reactions. In most cases however, they are not sufficient to destroy the tumor which induced them.

The cells of each individual tumor differ in fact in quality and quantity of the tumor antigen. The system easily recognizes cells with a high content of antigen and destroys them as foreign cells or mutated own cells which should be attacked. The cells with insufficient production of tumor antigen escape the immune control, they multiply and their populations cause development of the tumor and destruction of the organism. These are only the main outlines of the problem, in the solution of which are concentrating at present the foremost scientific centers in the entire world.

Among such scientific centers belongs also the Institute of Molecular Biology and Genetics of the Czechoslovak Academy of Sciences, where for more than 25 years Jan Bubenik MD, Dr Sc has worked. This year's recipient of the Klement Gottwald National Prize was awarded to him for his extensive research work representing an important contribution to the definition of the laws on regulation of immune reaction to experimental and human tumors. It could be characterized in general as a search for methods on how to intervene with the immunity to tumors and to influence it in supporting those of its components which destroy and cure the tumor; or, conversely, to suppress those components which could have a contrary effect, i.e. to contribute to the development of tumors. Simultaneously with Swedish scientists but independently of them, Dr. Bubenik was the first in the world to call attention to the seemingly absure fact that the organism forms antibodies which accelerate the growth of the tumor.

The discovery of the molecular basis and the dynamics of the creation of antibodies accelerating tumor growth instigated a worldwide research aiming to discern the causes which block the curative reactions of the cells. Quite naturally, this also incited the search for methods of removing such substances from the human organism, particularly from blood circulation. Further research of the collective directed by Dr. Bubenik proved that in tumors caused by certain retroviruses, some antibodies, when applied at the initial stage of the tumor growth, may prevent the development of cancerous disease. This finding was later repeatedly confirmed abroad as well.

It is obvious that experiments with tumorous disease cannot be done on patients; it was therefore necessary to find tumor cells which could be developed in a tissue culture in the laboratory, either permanently or over a long period of time. In 1973, Dr, Bubenik isolated such a line of cells from human carcinoma of the bladder. He oriented his research toward the tumorous disease of the bladder because, according to clinical practice, this highly malignant illness often remains unchanged for many years and furthermore reacts favorably to treatment. From this experience it could be deducted that the immunological mechanisms assert themselves significantly in such tumors. The results of the laboratory experiments made by Dr. Bubenik showed that human bladder carcinomas contain a tumor antigen causing a cellular as well as an antibody immune reaction in the organism and that this reaction may be favorably influenced by certain treatment methods.

The Czechoslovak strain of cells containing a specific antigen of the bladder tumor which had been used for this research can be cultured permanently in laboratory conditions. It was marked as line T 24 and is presently used by many of the most important laboratories active in tumor research. In this cellular line, also American scientists later discovered and characterized in detail a first human gene causing tumorous growths, the so-called oncogene. The T 24 line became a part of the collection of the international bank of human tumor cells. The results of the hitherto existing research corroborate that the oncogene T 24 is present in other human tumors as well.

The results of the almost 20 years' research work of Dr. Bubenik, rewarded by the Klement Gottwald National Prize, have been assembled in seventeen original works and two study collections; they contributed particularly to the clarification of basic questions on the structure and functioning of live substances. And some of them were already directly applied in diagnostics. For example, the method of the cytotoxic test on plastic slides is used in our country and elsewhere in the world to observe the immunological profile of patients during the tumor growth period and during its treatment.

As far as the exploitation of immune reactions for the acutal treatment of tumors is concerned, Dr. Bubenik sees the main problem in the influencing of fine regulation of immunity, which has many factors. Lately for instance, some highly specific monoclonal antibodies, able to react

only with the antigen contained in the tumor, were discovered. For laboratory and partially also for clinical research use, these antibodies are prepared in the Institute of Molecular Biology and Genetics of the CZAS.

Another way to apply immunological research in clinical practice is the isolation of substances of regulatory character, enabling unlimited multiplication of immune white cells under laboratory conditions and thus to sustain immunity. Until now, it was possible to culture over a long period of time in laboratory only the tumor cells strains, while normal healthy tissues survived for only a short time. The addition of a substance called interleukin-2 to the tissue culture makes it possible to culture, for unlimited time and in needed quantity, also immune white cells which are then introduced by transfusion to the patient. Moreover, even repeated administration of interleukin-2 alone retards in some cases the growth of tumor cells.

In present clinical use, the immunological methods are applied particularly in cases of an early diagnosis of liver, intestinal, and placental tumors. The antigen produced by these tumors is diagnosed by extremely sensitive isotope methods in blood serum, and lately the monoclonal antibodies are being increasingly used for such verification.

Immune reactions may be used not only for monitoring, but for the actual treatment of tumors as well. Dr. Bubenik points out however, that next to the classical treatment methods, such as surgery, radiation and chemotherapy, in the future immunological methods will be able to help to destroy everything the surgeon cannot see, for example distant small metastases or only groups of cells circulating in the blood. Many substances, called immunomodulators, supporting immune reactions are being used already now: for example, interferon, used for treatment of patients at the USSR Oncological Center in Moscow, commercially produced already in the USSR. Very hopeful as well is the application of monoclonal antibodies for the treatment of tumors. As we are dealing with highly specific antibodies which accumulate preferentially on tumor cells, it may be possible to use them as carriers which would insert directly into the tumor effective cytostatics, radioisotopes, or toxins.

It is obvious that a substantial international cooperation is necessary for oncological research. And it is primarily in the socialist countries where such a cooperation is being widely developed. The results of the long-term research of Dr. Bubenik and his collaborators, rewarded this year by the Klement Gottwald National Prize, represents an important contribution to such cooperation, and they have been greatly appreciated internationally.

12707
CSO: 2402/18

CZECHOSLOVAKIA

CONFERENCE ON POLYMERS HELD IN PRAGUE

Prague RUDE PRAVO in Czech 17 Jul 85 p 3

/Interview with Vladimir Kubanek, CSc., director of the Institute of Macromolecular Chemistry of the Czechoslovak Academy of Sciences, on the occasion of an international conference by Michal Strida; date and place not specified/

/Text/ From 8 to 11 July, the 28th international microsymposium on Polymer Composites took place in Prague with participation by some 130 top scientific workers from 16 countries. The 17th Europhysics Conference on the Morphology of Polymers is taking place from 15 to 18 July with the participation of over 200 experts from throughout the world. The Institute of Macromolecular Chemistry of the CSAV /Czechoslovak Academy of Sciences/ is the organizer of both scientific meetings, which will deal with the theory, preparation, and utilization of new polymers. The microsymposium was held under the auspices of the International Union for Pure and Applied Chemistry /IUPAC/ while the conference now taking place was sponsored by the European Physics Society.

We are speaking with the director of the Institute of Macromolecular Chemistry of the CSAV, Professor Vladimir Kubanek, CSc., on the significance, tradition, and international recognition which our research in polymers has gained to the extent that he is entrusted with annually setting up such an international meeting.

/Question/ Just why did the institute of which you are director become the organizer of such meetings?

/Answer/ One must recall that even before the war Czechoslovakia had a very good tradition in the research of polymers, materials in whose molecules certain groupings of atoms are repeated in a regular order. We succeeded in building up the internationally recognized Czechoslovak Polymer School on its basis. Indeed, up to this year, which is 25 years since the institute was formed, its workers have organized 34 such meetings. In the past few years, two microsymposiums annually have proven to be the optimum number. Even the most important Western Macromolecular research centers are not this active organizationally. At this time we have already done the organizational work for the microsymposia which will take place in 1987.

/Question/ Who participates in these meetings and how are they organized?

/Answer/ The microsymposium on polymer composition was attended by 130 of the top experts, among whom were such persons as Academician N. Yenikolopyan from the USSR, Academician F. Tudoz from Hungary, Corresponding Member of the Polish Academy of Sciences M. Krzyzewski from Poland, Dr J. Halpin and Prof J. Manson from the US, Dr I. Ward and Prof A. Jenkins, representatives of IUPAC from Great Britain, and Prof M. Takayanagi from Japan. Half of the participants of these meetings were specialists from Czechoslovakia and the other socialist countries and the other half were representatives of the most advanced capitalist countries. However, the organizers have no interest in further expanding the number of participants in these meetings, since their operational nature and the high professional level could both suffer from this.

In terms of their subject matter, the meetings are oriented along lines which correspond to the main goals of the state plan for basic research and scientific-technical development and they thus directly assist in theoretical and practical application here of information from world science and in the development of international scientific cooperation.

Thus, for example, polymer composites are composite materials which have a great future ahead of them. In Czechoslovakia, basic research on them is conducted by the Institute of Theoretical and Applied Mechanics of the CSAV, in addition to the Institute of Macromolecular Chemistry. A typical polymer composite is, for example, tires, where various polymers are used in the production of cords. But materials containing polymers are constantly more often being used to reduce the weight of aircraft and a wide range of machinery. Often it is not just a case of making things lighter, but of creating such properties that neither metal nor the polymers themselves have. Composite materials are successfully being used in electronic equipment, in the automotive industry, and in packaging technology, but also even in the production of dental protheses and the possibilities for their use is constantly expanding.

/Question/ What are the goals of these meetings?

/Answer/ The goal of the microsymposia on polymer composites is to support mainly basic research in them, which to a certain degree is lagging behind a widespread and somewhat unrestrained utilization of these materials. Also, 80 percent of the participants are theoreticians and only 20 percent workers in applied research and practice. Thanks to this connection, for example, we are producing polymer sealing rings for electric locomotives which are one meter in diameter by utilizing new catalytic systems for rotational casting under a Czechoslovak patent.

I said that in this case it is a matter of research far in the future which we support financially, materially, and mainly with personnel. We therefore also are beginning construction of new buildings and we are expanding cooperation with applied research, the higher schools, and production.

While the microsymposium on polymer composites was relatively narrowly limited, the conference on the morphology of polymers reaches into practically all areas of polymer chemistry. This is also why there is a larger number of participants.

/Question/ What will the macromolecular meetings contribute to our science?

/Answer/ It is very difficult to put their contribution in numbers. But the decisive fact is that our science gets hold of the latest information, not after it has been published, but immediately through personal contact with the leading representatives of the field. The time factor is also very important in science. There are also opportunities for direct confirmation of methods, exchange of samples, and publication.

This is also a lot of good political press for socialist science and thus also for the socialist society. Finally, discovering that in this field we are among the world leaders helps influence those scientific workers and that part of the technical intelligensia who think that "in the West, everything in their field is the most...".

The opportunity to consult with scientists from all over the world and to get the latest information is not just of benefit to our institute and our country, but is also a significant contribution for all socialist science and for the workers at the academies of sciences in all of the socialist countries. At these symposia, plans are finalized for bilateral and multilateral cooperative work of the academies of sciences of the socialist countries and also agreements are reached on cooperative work between the CSAV and the leading scientific institutes of the capitalist countries. Such meetings are often the birthplaces not only of scientific cooperation, but also of arrangements for production under license.

The themes of the symposia and the discussion conferences are planned 5 years in advance and always correspond to the planned tasks for basic research in the following 5-year plan. Through the efforts of their organizers, the professional level achieved will be further raised in keeping with the current needs of world and socialist science.

/Comment/ Thank you for the discussion.

6285
CSO: 2402/17

USE OF MYCORRHIZAL FUNGI IN TREE CULTURE

Prague RUDE PRAVO in Czech 10 Apr 85 p 4

[Article by Michal Strida: "Inoculated Trees"]

[Text] There are several ways to recognize a healthy forest. The simplest one is to find out whether there are any fungi growing in it. Of course, this must be done during the season when carpophores are formed, otherwise we would have to dig deep down to the roots and check whether any mycorrhiza is formed there.

The word mycorrhiza is not widely known to the public, as indicated by the lack of its Czech equivalent. It is a term for the symbiosis of the mycelium--undergrowth of certain fungi--with the roots of higher plants, for example, spruce, oak, beech as well as heather, blueberry or cranberry shrubs. For instance, it determines the germination of orchid seeds and the multiplication of high-grade tropical hybrids and species. Generally, mycorrhiza is formed in the topmost layer of soil. It represents the decisive share of underground biomass which is of special importance for overall nutrition of higher vegetation, particularly trees.

Oxides of sulphur and nitrogen, and possibly some other gaseous emissions affect forest growth both directly (damage to pine needles and their shedding) and indirectly. If they penetrate the soil in the form of the so-called acid rain, they damage the mycorrhiza of the forest growth. For example, 50 species of fungi used to form mycorrhiza in the Krkonose Mountains 25 years ago and today barely 5 species may be found there, and even those in lesser amounts than some years ago. Among the fungi resistant to the effects of pollution in that area are particularly Russula emetica, two species of [koznatka - Lentinus], Lactarius rufus (all of them inedible) and especially Tricholama [sulphureum pessundatum] (poisonous) which is common in the lowlands as well as in the fir and pine woods in the highest areas. In the forest affected by pollution in the GDR mycorrhiza is formed today only by Tricholama and Russula emetica.

Mycorrhiza forms a kind of a safety blanket around the roots of the trees and helps them obtain nutrients, especially phosphorus, from the soil; if disturbed, fine roots die and that accelerates the overall withering of the trees. Experts from the ecotoxicology and ecophysiology department, whose director is Eng Vaclav Mejstrik, ScDr, of the Institute for Environmental Ecology at the CSAV

[Czechoslovak Academy of Sciences], focused therefore on search for mycorrhizal fungi suitable for areas affected by pollution, on possibilities of laboratory and industrial multiplication of the mycelia of the most suitable fungi, and on their utilization in the treatment of seedlings, particularly of conifers cultivated in large-scale nurseries under nearly sterile conditions, which frequently causes their death or long years of weakness after their transplant in polluted areas.

In modern large-scale nurseries, where trees are cultivated on an artificial substrate and protected by numerous pesticides, it is impossible for mycorrhiza to develop naturally as in forest nurseries where the spores and mycelia of appropriate fungi easily penetrated from the surrounding woods to the tender roots of the trees. When planting seedlings of forest trees whose roots are not coated -- protected with the mycelium of suitable fungi -- for example, during reforestation of the Krusne Hory range or of the stripmining sites in the North Bohemia Kraj, 50-60 percent of all young trees perish; in multimillion production this means enormous economic losses. Therefore, every increase in the tree's immunity not only represents a direct economic effect, but above all, it will be favorably reflected in the restoration of health to our woods.

The method developed by the experts of the Institute for Environmental Ecology at the CSAV is based on laboratory multiplication of suitable mycelia, which is done in the fermentation department of the Microbiological Institute of the CSAV. The resulting mycelium is enclosed in granules--an organic mass in the form of pellets less than 1 cm in diameter, developed by chemical condensation; they provide internal humidity necessary for the preservation of the spreading capacity of the mycelium for the period of 1 month after its transfer to an appropriate environment. The granules are easy to store. The technique of their use is very simple. Seedling in nurseries are inoculated--vaccinated--by dissemination of a sufficient amount of granules. This process may be easily mechanized, for example, with the use of regular spreaders. With frequent irrigation the mycelium spreads rapidly and soon mycorrhiza develops on the roots of young trees. Because the organic substances which maintain the humidity of the mycelium must be imported, the experts from the Institute for Environmental Ecology are trying to replace them with domestic clay. If they succeed, the method proposed by them for better rooting of transplanted trees from large nurseries will be even more effective.

The method has been tested thus far in the forest nursery enterprise of the Agricultural College in Kostelec nad Cernymi Lesy, on a small scale also in Janov in the Krusne Hory range, and it will be tested on creeping Juniper in the Sumava and Krkonose Mountains. Experts of the above-mentioned institutes focused on its testing in 7 conifers: native spruce and 2 exotic spruces highly resistant to pollution--[smrk pichlavy] and [smrk omorice], Scotch pine and black pine which are used for recultivation of stripped areas, and creeping juniper which serves mostly to protect the highest deforested areas of the Krkonose Mountains against erosion, and larch which sheds its pines every year and is therefore considered as a timber tree for areas affected by pollution. In cooperation with the Institute for Applied Ecology and Ecotechnique at the Agricultural College in Kostelec nad Cernymi Lesy, experts are studying this year the possibility of improving the rooting process of beech cuts by inoculating them with a suitable mycelium.

Last year work began on research of another type of mycorrhiza which is present in deciduous trees as well as in most agricultural crops.

Research and identification of the most suitable fungus for symbiosis with the root system of this or that tree in changing conditions of various locations are quite a lengthy process. The technology of production of seedlings inoculated with appropriate mycelia, however, is simple, fast and gradually applicable not only in conifers and deciduous forest trees but, for example, in orchards and some agricultural crops, in fields as well as in hothouses.

Experts of the Institute for Environmental Ecology have now isolated about 30 species of mycorrhizal fungi and tested them in laboratories; they are planning a series of experiments to demonstrate the usefulness of those fungi in the field. In the forest nursery in Lounovice several thousands of seedlings inoculated with appropriate mycelia are ready for planting. In experiments conducted thus far 70-100 percent of the spruces took root, which will mean considerable savings in large-scale planting of trees.

The whole technology of cultivation of mycelia, preparation of granules, their storing and use may be easily mechanized; experiments conducted thus far confirmed that with relatively modest outlay it may be possible in broad application to increase considerable the number of transplanted trees which take root, particularly in pollution-stricken areas. Although in other parts of the world, for example, in the USA, France, the Netherlands and Britain methods are being studied for the use of mycorrhizal fungi for protection and improved nutrition of forest and fruit trees and of some agricultural crops, the Czechoslovak method seems the cheapest and the most suitable for practical requirements of forestry and agriculture. Several states in Europe which must deal with the same problem as we--reforestation of areas affected by pollution--have shown interest in its application.

9004
CSO; 2402/19

POLAND

COMPUTERIZED FREIGHT CAR TRAFFIC MANAGEMENT SYSTEM PROFILED

Warsaw AUTOMATYKA KOLEJOWA in Polish No 3, Mar 85 pp 63-67

[Article by Stanislaw Chadrych: "Current Freight Car Information System [Bewag]"]

[Text] 1. Historical Background

The idea of using data processing systems in freight car documentation at the Polish State Railroads [PKP] first arose in the 1960's. The use of modern computers on foreign railroads called, among other things, for unifying the international car numbering system. In 1967-68, the old six-digit car numbering system was replaced by standard 12-digit car numeration.

A general inventory of rolling stock was taken to establish the actual number of available cars. Inventory cards were delivered to the Mechanized Computing Center [OZO] of the PKP, as it was called then, in Olsztyn, where a file of punched cards was created which were processed on digital-analog computers. Limitations of these computers and the related difficulties in the updating of documentation led to a decision, in 1972, to transfer the files onto magnetic tape and use the computer installed at the OZO in Warsaw. A system of computerized data processing for freight car documentation [EWAG] was developed and introduced into operation. Its purpose was to maintain a current collection of data on PKP service and freight cars. Data were updated monthly on the basis of six kinds of documents prepared by the Rolling Stock Department, car sheds and car repair and maintenance shops.

The monthly periodicity of updating limited the capacity for timely error correction. In addition, uneven document influx sometimes delayed updating by as long as two months. These delays were the weak point of the system.

The need for a regular change of car numeration in 1980-84 (according to the principles of UIC and OSZhD) and experience with operation of EWAG systems led to the decision, in 1979, to develop a modernized version of the system. This version (BEWAG) was implemented on an ODRA-1305 computer equipped with modern facilities such as magnetic disks and data

transmission components. It became possible to register the changes in data on a current basis and thus improve the system reliability.

In later years, it was decided to expand the documentation by including the cars added to PKP rolling stock (with code letter P indicating the property of nonrailroad enterprises otherwise called nonrailroad or private, in 1981) and industrial freight cars added to the PKP (in 1983).

Currently, the system component covering the freight cars and service cars of the PKP has been practically completed, although improvements and modifications suggested by operation practice at the computing center and by users have to be made.

The components covering the cars with letter P and industrial cars are still in the process of development: data have been collected and work is continuing on bringing them up to date to offer current services to the users.

2. Data Reliability in System Files

With numeric and qualitative data on equipment of long-term use, which are the unique source of information for maintenance and financial services, the most important aspect is maintaining the documentation up to date. This can be attained by collecting documentation on the basis of inventory lists and verifying these lists with the actual status. Such inventories are easy to compile for equipment which is installed in a fixed location or is kept in such locations for a longer period of time. Railroad cars, however, do not belong to this category. They are engaged in continuous movement on PKP rail lines and on foreign railroads. In view of the large number of objects (some 230,000 cars), keeping the documentation current requires the use of a continuous inventory process.

At PKP, the quantitative aspects of the rolling stock are mainly the responsibility of rolling stock traffic and financial services. There are frequent complaints (especially by traffic service) that the rolling stock described in the BEWAG system does not correspond to the actual state of equipment, as there are discrepancies between the data in the system and the traffic dispatcher reports.

These discrepancies are due to at least three causes:

1) alternative definitions (the number of units is interpreted differently in traffic service and in rolling stock inventory service);

2) errors in traffic dispatcher reports; and

3) failure to bring the documentation system into correspondence with the actual status of equipment.

Some of the problems concern only the third of the above factors, suggesting that a general inventory of the rolling stock should be taken to eli-

minate it. The results of an inventory could provide the basis for bringing the documentation up to date.

From experience we know that each rolling stock inventory involves errors of between 10 and 20 percent.

The results of an inventory are affected by the weather, terrain, responsibility of inventory teams (which consist of individuals with different qualifications, sometimes failing to realize the importance of their task).

The source of data on punched cards were inventory cards compiled during such general listings of rolling stock. The results were not satisfactory, and until now during repairs we come across freight cars with pre-1976 numeration. These data collections were brought up to date by inclusion in the data of information on new cars and scrapping old ones. The data on restructuring and the attendant changes of freight car numbers have not been introduced. These files have gradually become obsolete. Following the introduction of EWAG system, for approximately two years the emphasis was laid on coordinating the analytic data (in the system) with synthetic data provided at CKS. One of the methods used here was to register units in current maintenance. Since the data were reported on documents, it was impossible to correct errors in freight car numeration that were committed when documents were prepared. After data transmission was introduced and the numbering system changed, it became possible to detect discrepancies during the course of periodic maintenance and repair performed at the Rolling Stock Repair Enterprises [ZNTK].

Hopefully, after the change in numeration is completed, it will be possible to bring the documentation into line with the actual situation. This is confirmed by the fact that several hundred cars are currently found annually and discrepancies in car numbers (between documentation and reality) are established during periodic maintenance and repair.

Additional capability for eliminating the discrepancies is provided by the introduction of CETAR and INTERWAG systems, which conduct numeric registration of freight cars as they cross Poland's national border. This capability has already been utilized during the inventory operations.

In the near future the data from these systems will be used for current updating of documentation systems.

3. Computer Hardware and Selected Numeric Data

The information system BEWAG is implemented on an Odra-1305 computer. The computer system comprises:

--a central processor with working memory of 256,000 words;

--multiplexer with six connected telegraph lines;

--tape memory units;

--disk memory units with capacity of 8 million characters;

--line printer; and

--punch card reader.

Data are transmitted through automatic telegraph lines (with commutation) from 10 stations at ZNTK and the Computing Center.

The data base contains information on the following equipment:

--approximately 230,000 freight and service cars of the PKP;

--some 40,000 freight cars incorporated into PKP rolling stock (with letter P) which are owned by nonrailroad enterprises; and

--some 15,000 industrial and technical cars of the PKP.

The data base consists of 12 main files, auxiliary and working files, and some 90 programs organized in subsystems and modules.

The files (as well as safety reserve copies) occupy the following capacities:

--magnetic disks: 10 batches of capacity 8 MB;

--magnetic tape: 150 tape cassettes of data preserved for one week, 75 for a month and 40 for a year.

Fourteen system analysts and programmers are employed in system development and maintenance.

In 1983, the system maintenance and operation took approximately 140 hours of computer time monthly. In view of annual rolling stock balances conducted in January and February, the average should be increased to 240 hours per month.

4. System Functions

The BEWAG system has three main functions in rolling stock documentation:

1. Collecting and updating data on three groups of cars, i.e., freight, commercial and service cars of the PKP, freight cars incorporated into PKP rolling stock (with letter P) and industrial cars of the PKP.

2. Providing information on technical and operational structure of the rolling stock utilized in the planning procedures for the purchase of new cars, scrapping and periodic maintenance.

3. Supply of analytic and synthetic, financial and accounting information on rolling stock as a long-term asset of the PKP.

The system functions for the individual categories are implemented by the subsystems: FREIGHT CARS, PRIVATE CARS and INDUSTRIAL CARS. These compo-

nents have attained different degrees of completion. The FREIGHT CAR component performs all the functions and has been completed, while in PRIVATE CAR and INDUSTRIAL CAR components the inventory process has been started and the functions are being implemented gradually.

5. System Operation

The subsystems perform (or will perform) the following functions for the individual categories of cars.

A. For freight and service cars:

1. Registration of newly acquired cars from investment title documents (newly built cars), units received free of charge from other groups and "found" cars.

2. Registration of scrapped cars.

3. Registration of periodic maintenance and repair operations at ZNTK and WGW.

4. Instructions for change of numeration at ZNTK and registration of its execution.

5. Registration of modifications of operational characteristics of the cars.

6. Printout of documents indicating the changes.

7. Preparation of monthly reports on documentation changes.

8. Preparation of annual qualitative and quantitative balance sheets of rolling stock.

9. Preparation of analyses of rolling stock fleet in operation and industrial characteristics.

10. Preparation of annual plans of regular maintenance and repair.

B. For cars included in PKP fleet (with letter P):

1. Registration of inclusion of cars into PKP stock.

2. Registration of release of cars from PKP stock.

3. Issuance of instructions on numeration changes and registration of their execution.

4. Registration of regular repair and maintenance work performed at ZNTK and WGW.

5. Preparation of analyses of rolling stock inventory included in PKP fleet with regard to technical and operational characteristics.

C. For industrial cars of PKP:

1. Registration of additions to inventory.

2. Registration of scrappings.

3. Registration of regular maintenance and repair.

4. Registration of modifications of industrial and operational characteristics.

5. Quarterly reports on documentation changes.

6. Annual analysis of the composition of rolling stock and its distribution.

6. Specific Data on Cars

A. The following data are indicated for each car in the freight car group:

1. Car number (current).

2. Car number (previous) in case the number has been changed.

3. Launch year.

4. Subtype code, indicating the industrial and operational parameters.

5. Previous subtype code (for service cars).

6. Car series.

7. Code indicating the last periodic repair, the periodicity (planned and emergency), the type of repair (inspection, medium, capital) and serial number of repair (in a given repair category after the last overhaul).

8. The date of last periodic maintenance.

9. Name of maintenance unit or car manufacturer.

10. Initial cost in zlotys.

11. Depreciation as of Dec 31 in zlotys.

12. Date of car inclusion in the inventory (fiscal year)

13. Manufacturer's number.

14. Station of registration.

15. User (for service cars).

16. Numeric indicator of car condition, for instance, new car, car with changed (unchanged) number, car under repair, etc.

17. Date of last car information input.

In addition, for cars removed from the inventory, the following data are included: date of removal, number of decision, requalification symbol indicating the use of the car after removal, cause of removal, depreciation as of removal date.

18. Additional depreciation (for cars removed from inventory prior to end of depreciation period).

The subtype code indicates the following operational and industrial parameters: design type, axles, carriage type, maximum load, car weight, loading length, loading surface or capacity, suspension type, bearing type, brakes, braking system, heating, maximum allowed speed and maintenance periodicity.

B. For the cars of the category "included into PKP stock," the following date are indicated: car number (current), car number (previous), year when built, subtype code, car series, last periodic maintenance code, date of last maintenance, unit performing the maintenance, station of registration, data of inclusion in PKP inventory, number of inclusion agreement, owner identifier, date of removal from PKP inventory, indication as to whether the car is eligible for renewed inclusion in the inventory, indicator of the car condition and the date of last information input.

The subtype code also defines the same parameters as for the basic freight cars. On request of the owner, financial data can be introduced.

C. For cars of the industrial category, the following data are indicated: current car number, current car series, previous car number, previous car series, year when built, car purpose, car user, car load, type of latest maintenance and repair operation, date of latest maintenance, maximum load, axle number, bearing type, carriage type, braking system and brake type.

Data on cars are recorded in files on magnetic tape, forming the main system data base. For data transmission and on-line access, magnetic disk files are used. These files comprise data required for change of numeration, for commercial freight cars, service cars and cars added to the PKP inventory. Separate files are kept for "old" numbers (assigned prior to 1980) and "new" numbers.

The file for "old" numbers contains: the "old" car number, the repair unit number, the car condition indicator, data for assigning of new number (the replacement system, the repair cycle and the series code) or the new car number.

The "new" number file includes: "new" car number, the repair unit number, the "old" car condition indicator and the car number (for cars built after 1980, this place is left blank).

7. Data Updating

Updating is performed by two techniques:

1. Data transmission in direct access mode from remote terminals.

2. By conventional techniques, i.e., transfer of data from documents onto magnetic tape or punched cards, carried out at the computing center.

On-line remote transmission is performed for information on the following:

a) purchase of newly built cars;

b) car removal from inventory;

c) numeration changes;

d) periodic maintenance and repair at ZNTK;

e) cars "discovered" during the course of repair at ZNTK.

The conventional techniques are used to enter the information on:

a) inclusion of cars from different categories;

b) periodic maintenance and repair operations at WGW;

c) car "discovered" outside of the ZNTK system and financial data for all such cars;

d) corrections to financial data;

e) corrections to car numbers.

The updating of information on cars assigned to PKP inventory and the industrial cars will be conducted by conventional techniques on a monthly basis.

8. Output Information System

Output information is produced by the system in various forms and with various frequencies, depending on the purpose and application of the data. They are described under the following five categories, distinguished by presentation form and purpose:

1. During data transmission, the following information types are sent out in reponse to a message:

a) confirmation of message reception,

b) eventual description of the reason for nonreception of a message,

c) new car number,

d) previous car number,

e) unit number and type of repair for cars currently under repair.

These information messages are sent mainly to ZNTK to clarify discrepancies between current status and documentation.

2. Information collected in the files is transferred daily to INKOM systems, which present it on screen monitors from which hard copies can be made.

These data are intended for Car Management Administration and provide current status reports on repairs at ZNTK or the rolling stock inventories.

The following numeric information can be obtained through these channels:

a) cars with new numeration categorized by types and numeration methods (new cars, cars renumbered at ZNTK),

b) cars under periodic repair at ZNTK, indicating type of repair and car category,

c) cars received for maintenance and cars after repair, categorized as above,

d) total inventory of rolling stock classified by design types (with operational and engineering characteristics),

e) the inventory according to car types and number of axles,

f) inventory total according to the car systems and categories.

3. Changes in the documentation as a result of influx of new units (purchases, transfers free of charge and "discoveries"), as well as reductions (removals from documentation), and reconstruction of cars reported in printouts. These printouts confirm the changes in documents and information files. Quantitative value and numeric information reports are produced (frequency of reporting given in parentheses):

a) (annual) report on the number of newly built cars with the breakdown into commercial trade cars and private cars according to categories,

b) (annual) report indicating the total value of newly built cars with categorization as above,

c) (annual) quantitative-value reports of new cars with classification into commercial freight cars and private cars according to month of purchase and category,

d) (annual) numeric index of newly built cars indicating: car number, subtype, purchase date, initial value, depreciation as of year-end and factory number,

e) (after each operation and annual) numeric list of cars received free of charge (from other groups) specifying the following: car number, subtype, year when built, weight, initial value, depreciation as of the beginning of the year when received and date of acceptance registration,

f) (after each beach and annual) numeric list of discovered cars indicating: car number, subtype, year when built, weight, initial value, depreciation as of the beginning of the year when found, discovery date and registration date,

g) (after each batch) entry into protocols for cars removed from inventory according to the cause of removal, decision number and requalification symbols; the entry indicates car number, year when built, initial value, depreciation as of the month of removal and additional depreciation;

h) (monthly cumulative) report of quantitative-value data for cars removed from inventory classified according to the requalification symbols, indicating number of cars, initial value, depreciation as of the month of removal from inventory and additional depreciation,

i) (annual current) report of quantitative-value data on cars removed from the inventory indicating the month and car type,

j) (annual) report on the number of cars removed from inventory classified by type, number of axles, cause of removal and car age,

k) (annual) numeric list of cars removed from inventory including car number, decision, requalification symbol, year when built, subtype, initial value, depreciation as of the month of removal and additional depreciation,

l) (annual) numeric list of cars whose category type has been changed indicating current car number, subtype, year when built, initial value, depreciation, previous car number and previous subtype.

4. The fourth category of output information consists of printouts produced after the end of the fiscal year and utilized in compiling the quantitative and value balances, planning periodic maintenance and repair operations, and in the current work of railroad services. These are:

a) quantitative-value list of cars as of Dec 31 of each year classified into depreciable and nondepreciable property according to the car types; specifically: number of cars, initial value, depreciation at year's end;

b) list of depreciation write-offs during the year classified by car categories and depreciation rates indicating the write-offs for cars on balance as of Dec 31 removed from inventory during the year;

c) report on inventory status and operational and industrial data on standard track commercial and service freight cars of PKP as of Dec 31, as well as cars removed from inventory during the year; the report contains detailed operational and technical characteristics for the individual car types and categories;

d) schedule of periodic repair and maintenance classified by type and car group at ZNTK.

5. On user request, other data compilations can be generated. These are mostly single-time orders requiring additional programming. In 1983, a large proportion of the reports were concerned with the reevaluation of property and rolling stock inventory.

9. Planned System Development

In the future, system improvements will be introduced as regards the utilization of available files of data on commercial and service freight cars.

The consecutive introduction of the following systems modules handling data on cars added to the PKP rolling stock and the industrial cars will be put into operation, making these files availabe to the users. There are also plans to start work on developing a similar system for passenger cars.

In conjunction with the introduction of disk memories of a higher capacity (60 MB) at the computing center, the appropriate reformatting of the system will have to be undertaken. The use of these storage capacities in the system will make it possible to expand the range of registered data and make them accessible to broader user groups.

9922
CSO: 2602/32

FLAWS IN SOVIET MARINE ENGINE FUEL INJECTORS ANALYZED

Gdansk BUDOWNICTWO OKRETOWE in Polish No 5, May 85 pp 203-205

[Article by Jozef Drozdowski, DSc(Eng), and Andrzej Sadowski, MS(Eng), Higher Maritime School in Szczecin: "Injectors of Ship Engines M-400 and M-401: Operation Data"]

[Text] Observations and analysis of the use of the components of the M-400 and M-401 engines have confirmed that the short failure-free operation periods of these engines were largely due to deficiencies of the fuel system. The weak link in this system is the injector, whose operation is crucial for the quality of fuel combustion, the thermal load of the engine and its proper operation.

Observing the individual cylinders in fast-revolution engines M-400 and M-401 is impossible. Observations of the combustion process in the cylinder have to be based on a limited number of indicators and their correlations. The operating manual does not specify the periodicity of preventive injector replacement. It only recommends testing them on occasions of general inspection after 540 operational hours.

The operation conditions of high-speed hydrofoil boats equipped with the M-400 and M-401 engines do not allow emergency change of injectors to be made during the movement, because it is a diffcult job for which the engine has to be dismantled. This adds significance to timely preventive injector replacement. The absence of recommendations and experimental data and the fear of an injector "leaking" and its effects result in excessively frequent preventive injector replacements. Yet, this increased frequency of component replacement does not produce any significant reduction in the risk of engine failure [3].

The results of operational tests reported in this paper are an attempt at a general evaluation of the failures and the desired periodicity of injector replacement.

Injector Evaluation Prior to Installation

In the two types of engines under study, injectors are positioned centrally on the cylinder axis. They are positioned in a chamber containing six

cylinders and the inlet and exhaust camshaft. The technical characteristics of the jet nozzle are:

--number of orifices, 8;

--orifice diameters, 0.35 mm;

--injection angle, 140°; and

--needle diameter in the conducting portion, 6 mm.

Before the injector was mounted in the engine, it was tested and regulated on a stand. The test included: leak test, long-term pressure tightness test, measurement of the pressure at the needle orifice, spraying test, sound evaluation, dripping test, test of the needle movement and measurement of the variation of injector orifice diameters.

All together, 17 injectors (the available reserve) were tested, of which five were rejected for the following reasons: poor jet quality, 2 units; inadequate pressure tightness and leakage, 2 units; inadequate results of dripping test (five drops), 1 unit.

Special attention was given to tightness in the leakage test, because the importance of this factor has been confirmed in practice [4]. The results of tests of 12 injectors recognized as well-functioning and selected for subsequent studies are given in Table 1.

Operational Studies of Injectors

Principles and Methods

Injectors were tested on a Meteor hydrofoil boat with M-400 engines and Kometa hydrofoil boats with M-401 engines. Four injectors were installed in an engine, because only for four cylinders it was possible to place a thermometer to measure the temperature of combustion products. All injectors were in good technological condition, with injection pumps regulated and tested on a diagnostic stand. All injectors were used in similar exploitation conditions determined by the type of work performed by main engines with the following technical data:

Engine Characteristics	M-401	M-400
Rated power [kW]	1100	1000
Revolutions [s^{-1}]	29.6	28.3
Cylinder diameter [m]	0.180	0.180
Piston stroke [m]	0.200/0.209	0.200/0.209
Number of cylinders [units]	12	12
Cylinder type	V	V
Additional load	2 turbine loaders	centrifugal compressor with drive from crankshaft

Table 1. Information Chart of Injectors Prior to Installation (main engine made in the USSR)

Injectors	Results of testing precision pair: flaws observed: Thin scratches	Granularity	Cracking	Needle adjustment	Pressure in opening [mPa]	Spraying quality	Sealing test: time of pressure drop from 1.7 to 14.7 mPa	Drops per 10 injections: no. of drops	Leakage test: Nozzle
				Left-hand engine M-400					
1	no	no	no	light	20.1	correct	14	1	dry
2	no	no	no	light	20.1	correct	19	3	dry
3	yes	no	no	light	20.1	correct	23	1	dry
4	no	no	no	light	19.6	correct	14	1	dry
				Right-hand engine M-400					
5	no	no	no	light	19.6	correct	18	2	dry
6	no	no	no	light	20.1	correct	16	1	moisture traces
7	no	no	no	light	19.6	correct	17	1	dry
8	no	no	no	light	20.1	correct	27	9	dry
				Left-hand engine M-401					
9	no	no	no	light	19.6	correct	16	2	dry
10	no	no	no	light	20.1	almost correct	15	1	dry
11	no	no	no	light	20.1	correct	15	1	dry
12	no	no	no	light	20.1	correct	20	1	dry

A simple diagnostic system (easy for implementation by the ship mechanic) was developed for the analysis of the operation of the main engines in order to evaluate the work of the injector system in current exploitation. The following parameters of engine operation were used:

rotation speed: 25 s^{-1} during forward movement, 12.5 s^{-1} during maneuvers;

combustion product color: combustion products were tested in each cylinder every 60 hours. The appearance of a large quantity of black stains indicated a "smoking" of the cylinder;

orifice pressure: it was controlled by disconnecting the fuel duct from the injector pump and connecting it to the tester;

temperature of the loading air: this temperature was controlled, because the engine design does not ensure its constancy;

fuel pulsation: controlled by holding between fingers the end of the injector fuel supply hose;

combustion product temperature: in stabilized conditions and proper combustion of fuel, this is an indicator of engine load. The temperature range was analyzed by the following criterion:

$$\frac{t_{w\ max} - t_{w\ min}}{t_{w\ sr}} < 0.1,$$

where $t_{w\ max}$ is the maximum exhaust temperature; $t_{w\ min}$ is the lowest exhaust temperature; $t_{w\ sr}$ is the average measured temperature; $t_w \leqslant 0.1$.

If the temperature rose more than 10 percent, the condition of the system was tested by dismantling the injector from the engine.

Since the fuel quality has a significant effect on operation conditions and service life of the injector [5], the engine manufacturer specifications for fuel (USSR standard GOST 4749-49) was compared with the fuel actually used during the test (Table 2).

Table 2. Comparison of Fuel Characteristics

Physicochemical properties	Manufacturer's requirements	Fuel used according to data of Chief Petroleum Board [CPN]
Cetane number	45	45
50 percent evaporates at temperature above [°C]	290	290
90 percent evaporates at temperature above [°C]	350	350
Kinematic viscosity [cSt]	3.5-8.0	8.8
Sulfur content [%]	under 0.2	0.8
Ash content [%]	under 0.02	0.009
Gum content [%]	under 0.5	0.86

We see that the quality of the fuel used in operation deviated greatly from the standard requirements. This concerned especially the sulfur and carbon contents, which are ingredients with a particularly damaging effect to engine operation and service life of its components.

The data on the operation quality of the injector were collected from the time of its installation in an engine and marked on failure charts. After injectors were dismantled from the engine, they were tested on a stand. The results of the stand tests are given in Table 3.

Table 3. Information Chart of Injectors After Dismantling from Engines: Results of Injector Tests After Dismantling

Injector	Service time [h]	Drops per 10 injections: no. of drops	Time of pressure drop [s]	Pressure at opening [mPa]	Type of damage
1	778	11	6	19.1	Improper spraying, appearance of jets
2	880	5	13	18.6	Poor spraying, appearance of jets
3	857	7	6	16.7	Continuous flow, no sound, much carbon deposit
4	106	-	0	13.2	Needle lagging
5	813	13	9	18.6	Poor spraying, large drops, proper sound
6	860	-	0	12.7	Needle lagging
7	880	7	8	18.1	Mediocre spraying, hard sound, much carbon deposit
8	880	3	15	19.1	Poor spraying, improper sound
9	880	5	10	19.1	No damage
10	190	-	0	11.3	Needle lagging
11	820	4	7	19.1	Poor spraying, jet bending
12	107	4	4	14.7	Poor spraying, good operation after spring replacement

Test Results

Injector Operation Performance

Two groups of injectors are distinguished:

--injectors replaced as a result of failure: 4, 12, 10, 1, 5, 11, 3 and 6 (in the order of operation time) and

--injectors replaced in preventive maintenance: 2, 8, 9 and 7 (in the order of service time).

The main parameter that determined the replacement of injectors in case of failure was the rise of combustion product temperature by more than 10 percent.

Based on the service time of injectors, we computed:

--the mean service time of injector:

$$t_{sr} - 1/n \cdot \Sigma t_i = 671 \text{ [h]},$$

where $n = 12$ is the number of injectors; t_i [h] is the injector service time;

--standard deviation:

$$S = \sqrt{\frac{1}{n} \sum_{i=1}^{n} (t_i - t_{sr})^2} = 311.92;$$

--Student's t-test range for $t_a = 1.363$:

$$\delta = \pm t_a \frac{S}{\sqrt{n-1}} = \pm 128.$$

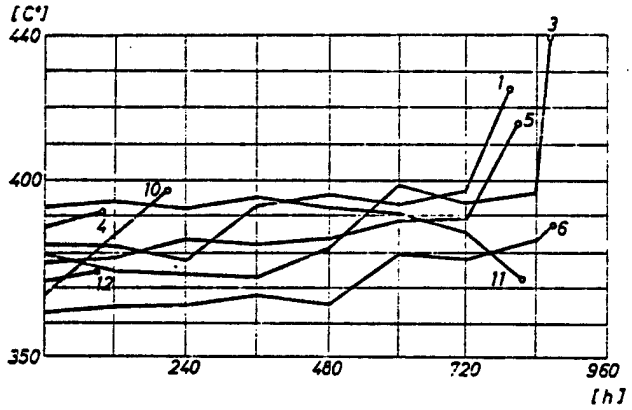

Figure 1. Combustion products temperatures: cylinders with injectors replaced in an emergency.

Emergency replacements of injectors occurred in two separate time periods. Failures discovered soon after installation can be classified as accidental and probably associated with the manufacturing process. After 750 service hours, we observed significant differentiation of combustion product temperatures and an increased failure frequency rate.

Based on these results, it can be assumed that 750 service hours is the proper operation time of an injector when the preventive replacement should take place.

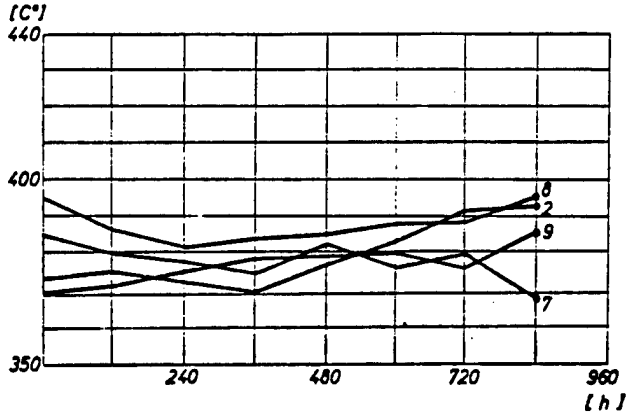

Figure 2. Combustion products temperature: cylinders with injectors replaced preventively.

Injector Wear and Tear

Data on injector wear and tear are given in Table 3 based on visual inspection of the working surfaces, as well as microscopic measurements of jet orifices.

Jet orifices: None of the openings were more than by 10 percent larger than the allowed nominal size. Many openings had a circular cross-section. Of a total of 95 openings, as many as 24 had a smaller than nominal diameter, indicating faulty manufacture. At the exit of the openings, slight loss of metal was observed, but inside they retained the original shape and smoothness.

Needles and conducting elements: Inspection of jet nozzles revealed no longitudinal scars caused by mechanical wear. Traces of carbon compounds on the conducting surface of jet nozzles at the side of the orifices indicated intensive blow-in of combustion products into the injector.

Seals of needle nests: Around the sealing surface were damaged areas caused by interaction of contact forces with the lubricant leak (pitting desquamation). These flaws can be prevented mainly by thermochemical treatment of injector components [6].

Effects of Corrosion and Fuel Coking

Inspection of dismantled injectors revealed large areas covered with gum resulting from fuel coking. Penetration of gas resulted in contamination of jet openings and needle surfaces. The sediment adhesion to the surface is extremely strong. The coking phenomenon is an effect of poor fuel quality, insufficient cooling of the injector and incorrect injection process and excessive temperature in the combustion chamber. Numerous traces of corrosion were seen on the surface of the injector (nozzle). It resulted from a high sulfur content in the fuel. The burning of sulfur produces sulfur dioxide, which reacts with water steam to produce sulfuric acid, an aggressive corrosive medium.

Conclusions

1. The analysis of temperatures of combustion products, pulsation of injector fuel ducts (pressure wave) and the control of the combustion process made it possible to identify all principal failures of injectors.

2. An analysis of the injector service time and the damages observed resulted in the recommendation that injectors be replaced preventively after 750 hours of service.

3. The large proportion of emergency replacements of injectors indicated their poor quality. It is recommended that design, material and process changes be analyzed so as to improve the product quality.

4. Fuel quality has a significant influence on the service life of a system. Compliance with the manufacturer's fuel specification is essential. This prolongs the injector service life and has a positive effect on the performance of all engine systems.

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CSO: 2602/31

POLAND

RECENT DEVELOPMENTS IN NONFERROUS METALS APPLIED RESEARCH

Katowice RUDY I METALE NIEZELAZNE in Polish No 5, May 85 pp 204-205

["Research and Implementation Work by the Nonferrous Metals Institute"]

[Text] Attempts at Recovering Useful Metals from Neutralized Sludge

In settling lagoon no 1 at the Glogow 1 Copper Refining Plant there are about 100,000 tons, dry mass, of neutralized sludge which contains large quantitites of lead, zinc, copper, and silver. The sludge is the remains of neutralized industrial wastewater and circulating water from the flue gas wet scrubber for the shaft furnaces, and from the periodic storage of sludge from the wet scrubber for shaft furnace flue gasses.

Metals present in the sludge appear mainly in the form of sulphates and sulphides.

Presently, lagoon no 1 at the HM [Refining Plant] Glogow 1 is unused and the sludge has undergone dewatering and thickening.

Samples taken at various points and depths of the settling lagoon show the following chemical composition in percent; Pb - 8 to 12, Zn - 2.5 to 3, Cu - 1.5 to 3, Ag - 100 to 200 grams per ton, CaO - 20 to 30, MgO - 1 to 2, SiO_2 - 4 to 6, Al_2O_3 - 1 to 2, Fe - 1 to 3, Sag - 12 to 14, Corg - 5 to 8.

During research tests were conducted on the separation of lead and zinc from the neutralized sludge with the addition of 10 to 20 percent of quick coke in a rotary furnace.

The oxidized concentrates of lead had the composition of 36 to 41 percent lead, and 2 to 3 percent zinc.

The yield of lead concentrates was at about 90 percent, and zinc at about 60 percent. Copper at 85 percent and about 75 percent silver remained in the slag. After processing, the slag from the neutralized sludge contained Pb - 0.6 to 0.9 percent, Zn - 0.8 to 1.1 percent, Cu - 2.9 to 3.1 percent, and Silver at 140 to 160 grams per ton. It is possible to recover the copper and silver by the use of mechanical enrichment technology with copper ore or the direct refining of the slag with copper concentrates in the shaft furnace process.

The Separation of Arsenic and Lead during the Production of Anode Copper

Lead and Arsenic are metals which accompany copper ores and decisively determine the quality of anode copper that is being produced. Recognizing their behavior can be utilized for;

--improving the various technologies for removing these impurities so that they may be eliminated from the process for the purpose of improving the quality of anode copper composition which to a great extent determines the effectiveness of the electrolytic refining process and the quality of cathode copper

--description of the phases during which the impurities can be removed most effectively from not only the point of copper quality but to increase their concentration in products derived from the separation process which are then separately processed

--the description of products which could be the raw materials for recovering these metals

In the report totals of metal mass for copper, lead and arsenic were presented for two selected work periods at the HM Glogow 1. The separation of elements was described in intermediate products, waste, and products in the technological cycle of melting copper concentrates in the shaft furnace.

Data for the totals was taken directly from shift reports and own observations conducted during the test period.

From the mass totals it appears that the separation of lead from copper occurs in the first two pyrometallurgical processes, that is in the shaft furnace process and the converter treatment of copper matte. The separation of arsenic is as follows;

--to the copper matte is imparted, about 34.5 percent

--to flue dust about 49 percent

--to converter copper about 21 percent

--to converter dust about 9.5 percent

--to anode copper about 21 percent arsenic from the charge to the shaft furnace process

The large degree of arsenic migration into the anode copper creates the necessity for a modification in the fire reduction process, eventually to the converter treatment of the copper matte, in order to reduce arsenic to levels lower than permitted.

The Crystallization of Lead-Silver Alloys with a Low Concentration of Silver in Relation to the Speed of the Crystallization Front

In the metallurgy of lead, and especially its fire reduction, one of the most important phases is de-silvering. Presently, this is being done by using the Parkes method in almost all the lead refineries in the world.

The lead de-silvering operation belongs to the most costly and work intensive phases of the lead refining process. The high cost of this operation is due partly to the fact that to separate the silver from lead in the form of intermetallic phases, zinc of a rather high purity must be used. The constant search for lower costs has led to development of research in this area. Omitting electrolytic refining in solutions or molten salts one can name three chief directions for research in lead refining;

a - utilizing the thermodiffusion phenomenon
b - the zone refining processes
c - improvement of the presently unused Pattison method

The work that was conducted had, as its object, the exploration of possibilities for separating the silver contained in lead as a silver rich intermediate product by using the qualities present in alloys with a subeutectic composition. It was proposed that such a process could be found across the slowly moving crystallization front of a fluid Silver-Lead alloy contained in a vertical column whose length is large in relation to its diameter. The effect of the speed of the crystallization front on the separation of concentrated silver in the alloy of Lead-Silver with a low concentration of Silver (0.1 percent Ag). It was concluded that the average concentration of silver in solidified lead decreases in relation to the decrease in the speed of the crystallization front.

The critical speed for the crystallization process was determined, that is the speed at which the concentration of silver in solidified lead is lower from the concentration of silver in the final alloy. The critical speed for the process of crystallization under the conditions of the tests was 0.1 centimeters per minute.

The Selection of Additives to Modify the Chemical Composition of Suspended Slag for the Purpose of Lowering Process Temperature

The direct refining technology of copper concentrates into blister copper used at the HM Glogow 2 creates many technical and technological problems. The basic problem is the assurance of assuring a proper life expectancy for the melting apparatus, the fluidized bed furnace. This is linked to the action of the molten copper on the refractory lining of the fluidized bed furnace hearth and the action of slag, with a high concentration of copper, on the interior lining of the walls. The high temperature, the high degree of oxygen saturation of the copper, cause it to penetrate the lining. In this research steps were taken to find a technological additive whose introduction would cause a drop in the temperature of the suspended slag and the blister copper.

As corrective additives the following were chosen; calcium oxide, ferric oxide, granulated electric furnace slag, sodium carbonate, and fluorite.

Laboratory tests depended on the addition of a specified amount of the modifying additive into a sample of the suspended slag and the measurement of the change in its viscosity as a function of temperature.

The results of the viscosity measurements for the suspended slag show that a 6 percent addition of calcium oxide allows the attainment of suspended slag at 1250 degrees Celsius with a viscosity that typical industrial suspended slag has at a temperature of 1320 degrees Celsius.

Moreover, laboratory studies were done on the effects of adding calcium oxide to suspended slag and the resultant separation of lead between the suspended slag and the blister copper.

On the basis of these tests it was concluded that the introduction of calcium oxide at 6 percent to the suspended slag mass produces a small increase in the concentration of lead in blister copper.

Presently, industrial tests are being conducted on the use of calcium oxide to lower the temperature of the fluidized bed process and to determine its effects on the technological indicators in the process of melting copper concentrates in a fluidized bed furnace.

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CSO: 2602/30

POLAND

BRIEFS

NEW STERILIZER THERMOMETER--A temperature sensitive indicator for use in dry sterilization has been designed by the Center for Medical Technology in Warsaw. It is intended for monitoring sterilization processes occurring in specialized chambers where the sterilizing agent is hot air. The indicator consists of a glass tube, sealed at both ends, which is half filled with a green temperature sensitive mixture. The indication of proper functioning of the sterilization process on medical instruments occurs when the color of the temperature sensitive mixture turns from green at the beginning of the process to white at the end when a temperature of 180 degrees Celsius is reached. [Text] [Warsaw RZECZPOSPOLITA in Polish 27-28 Jul 85 p 4] 12411

NEW SHEET METAL PRESS--At the BESTER Steering Apparatus Technology Enterprise in Bielawa a press has been constructed for stamping large size transformer plates. The apparatus consists of three machine tool sets; for cutting holes, shapes, and for parting. These machine tools are hydraulically driven. The main press is the stationary element. The other two elements may be moved horizontally and vertically which makes the cutting of various size plates possible. Material handling is done with the help of a pneumatic handler. [Text] [Warsaw RZECZPOSPOLITA in Polish 27-28 Jul 85 p 4] 12411

COSMIC X-RAY RADIATION RESEARCH--The contributions of Polish astronomy are growing. Every so often one hears about significant advancements in research, discovery, interesting theories. Recently another success was scored by a Polish astronomer, Dr Andrzej Soltan from the Astronomy Center at the Science Academy in Warsaw, who is the co-author of a discovery which explains the phenomenon known as the x-ray background in space. Dr Soltan, together with a group of astronomers from Harvard University, participated in preparing the program and analyzing data from observations of x-ray sources in space. [Text] [Warsaw RZECZPOSPOLITA in Polish 27-28 Jul 85 p 4] 12411

CSO: 2602/30

ROMANIA

PLANS FOR EXPANSION OF SCIENTIFIC RESEARCH, TECHNOLOGY

Bucharest ERA SOCIALISTA in Romanian No 13, 10 Jul 85 pp 13-16

[Article by Florin Teodor Tanasescu]

[Text] Considering the general trends in world development as well as the strength of our socialist industry, we must devote particular attention to the new technical and scientific revolution, so that Romania's industry and its entire economy will be brought to the level of the newest and most advanced achievements of today's science and technology.

Through its revitalizing orientations, the Ninth Party Congress has represented a turning point in the evolution of modern Romania, inaugurating an era of profound revolutionary transformations, the era most fertile in achievements in our nation's history, the era whose standard carries the name of Nicolae Ceausescu, an outstanding personality in the contemporary world, the founder of our country's bright present and future. The exceptional results obtained during this era of utmost flowering in all areas of our society, most powerfully illustrate the decisive role of science and technology in assuring the country's multilateral progress.

As an essential factor in our intensive economic development, based with determination on the priority utilization and exploitation of qualitative elements, scientific research and technologic development have contributed substantially during the past two decades to the rapid progress of our socialist economy. Industry, to begin with, as well as agriculture, increasingly benefit from the achievements of science and technology, in turn presenting researchers and designers with constantly new and more complex problems. Domestic scientific research has become a moving force in Romania's economic progress, and technical disciplines--as areas more closely related to industry, and to the economy in general--have been and are directly involved in the fulfillment of programs to develop the country's own base of raw materials and energy, to reduce specific consumptions and derive greater value from resources, to increase exportation and reduce importations, and lastly, to increase labor productivity and economic efficiency in all areas of activity.

Since the Ninth Party Congress, moved by the orientations and indications of the secretary general of the party, Nicolae Ceausescu, science and technology have achieved an increasingly strong position in our country. Measures adopted through the years have provided a sound material basis for research activities, improved the training system for the necessary personnel, and expanded the role of science and technology in all areas of socioeconomic life. Through its constant concern to stimulate Romanian scientific creativity, the party has assured an organic bond between this creativity and society's need for progress, and has based socioeconomic development and the entire socialist construction on the newest advances of the technical and scientific revolution. The 215 institutes for scientific research and technologic development, the approximately 100 agricultural research and production stations which now exist in our country, as well as their activities, demonstrate most convincingly the intensive integration of science into economic and social life, and its development closely related with the needs of man and of society.

Under the direct guidance of academy member, doctor engineer Elena Ceausescu, chairwoman of the National Council for Science and Technology (CNST), scientific research and technical engineering activities have obtained remarkable results in the most diverse fields, thus demonstrating the creative power of our people, its capability of achieving technical and scientific results to meet the greatest demands of our era.

Particularly noteworthy is the qualitative jump achieved by Romanian scientific research and technical creativity during these past two decades. More and more products, technologies, processes, and technical production lines are now built from domestic designs, our country thus achieving a positive balance in the transfer of technology through licenses. During this period, in the technical sciences alone, domestic designs have been used to create and develop new families of special electric motors and specialized machine-tools, to diversify the fabrication of computers, and to build new families of computers and minicomputers, as well as electric and diesel electric locomotives, electric equipment for well drilling, including undersea drilling platforms, trolley buses and subway cars, professional electrical equipment and attachments, specialized products for precision machining and optics, equipment for process automation, and electrotechnologies.

It is particularly significant that beginning with the Ninth Party Congress, scientific research and technical engineering were assigned special chapters in our party's basic documents, which define both the strategies to be followed and the major objectives to be fulfilled. The statement of an integrating, blended concept of the place and role of technical and scientific creativity derives from the fact that this area is covered by a specific program approved by the 13th Party Congress, a program whose guidelines are aimed at the 1990 period, and in the long range future, until the year 2000. This revolutionary concept for the profound integration of science and technology in our economic and social life, promoted with exemplary consistency by the secretary general of the party, Nicolae Ceausescu, is the backbone of Romania's entire development strategy for the next stage. "We

have very strong forces, and we have obtained good results which demonstrate the capabilities of our research," pointed out Nicolae Ceausescu at the recent joint plenary session of the National Council of Workers (CNOM) and the Supreme Council for Social and Economic Development (CSDES). "We must make better use of these forces and of our available resources, so that during the next five-year plan research will be able to play a more important role in achieving the new technical and scientific revolution. This will determine the fulfillment of our entire five-year plan!"

Strategy for Intensive Economic Growth in the Technical and Scientific Revolution

Consistently pursuing the basic orientations of previous five-year plans, the future tasks planned for scientific research and technical engineering cover several decisive areas: higher economic efficiency, accelerated structural changes in production, scheduled progress on investments, better training for the work force, development of foreign trade and international economic cooperation, higher standard of living and quality of life, and so on. In economic efficiency for instance, a primordial requirement is that 85 percent of the growth in national income during the next five-year plan be assured from higher social labor productivity, an exceptionally significant task. Similarly, one characteristic of the level reached by development is that industry--which during the next five years will double its productivity with respect to 1980--will have to assure 55 percent of this growth by introducing and disseminating technical progress, particularly through the application of new manufacturing technologies, production mechanization, automation, and robotization, endowment with high efficiency machinery and installations, and the modernization of existing ones.

The construction of equipment operating on non-conventional principles, which will assure high productivity in industrial processes, represents a priority task for research. For example, it can be shown that the construction and development of electroerosion machines has doubled labor productivity in tooling, a basic area of industry in which prototypes are built. If we assess the advantages offered by technologies based on lasers, ultrasonics, electromagnetic shaping, high energy electron beams, and high frequencies in processing and control operations, as well as in various industrial processes, we can better understand the extremely powerful impact of these technologies on manufacturing; hence the need to establish "contracted" programs for developing and adopting such new techniques. The formulation of technologies for various products must be closely correlated with a constant reduction in the consumption of materials and energy used to manufacture these products, consistently seeking to eliminate those technologies which do not reduce consumption. In this respect, it is necessary to implement on a wider scale new technologies specific to microelectronics, precision mechanics, and specialized chemistry, which will concentrate higher values in a small volume of materials; this will determine the establishment of a number of priority development areas whose efficiency is becoming apparent.

Ever since the Ninth Party Congress, great emphasis has been placed on the priority growth of high technology industrial branches and sub-branches, based on "cutting edge" technologies, rich in new discoveries and inventions resulting from recent advances in science and technology: the metallurgy of special products, precision and low volume chemistry, electronics, micro-electronics, precision mechanics, the production of high performance, complex machines and tools, and so on. This assures the most efficient utilization of material resources and social labor, as well as high technical and economic competitiveness for our products on the international market, in addition to a positive influence that will propagate through our national economy.

This concept requires continued careful concern for selective development of branches, sub-branches, and products. According to the orientations established by the 13th Party Congress, structural changes are anticipated based on improving the quality and technical level of production, assuring longer product operating life and reliability through modernization and redesign, lower weights, sizes, and specific consumptions, higher efficiency, as well as lower operating, maintenance, and repair costs. To this end, we will disseminate modern methods of quality analysis and control, and of product design and fabrication. One significant illustration of the great efforts being made in our country to implement in production the advances of the scientific and technical revolution, are the congress directives that by 1990, about 95 percent of the production will be of world class, and that 2-5 percent of this production will exceed this level.

The strategy of intensive economic growth and the restructuring caused by the development of scientific research and the accelerated and efficient introduction of technical progress in the economy, inevitably determine an appropriate investment strategy, the latter being oriented primarily toward expanding the domestic basis of raw materials and energy, fulfilling the land improvement program, developing and modernizing industry, agriculture, and all sectors which promote technical progress and improve economic efficiency. These effects will occur together with the continued promotion of the policy for rational location of production forces, for socioeconomic improvement of all counties and localities in the country, so that the entire population will benefit to a greater extent from the application of scientific and technical achievements, and from equal living and working conditions.

The intensified economic development based on the achievements of the technical and scientific revolution, represents a major avenue for raising the national income per inhabitant, as a foundation for raising the standard of living and the quality of life. Thus, fully consistent with the orientations laid down two decades ago by the Ninth Party Congress, the 13th Party Congress strongly emphasized the unbreakable bond between economic progress and improved general wellbeing. "The socialist society," pointed out Nicolae Ceausescu in the report to the congress, "can develop only on the basis of high efficiency and profitability in all areas. The more we reduce material and production costs, and increase profitability and efficiency, the more we will increase the national wealth, the national income, as a secure basis for the development of our socialist society and for raising the material and cultural standard of living of the people."

Under these conditions, each member of our society is responsible for the labor invested and materialized in final products and the quality of those products. It is consequently necessary to strongly increase the technical and economic creative initiative of all workers, and to raise everyone's responsibility, so as to assure an optimum relation between the useful result obtained in the national economy with each unit product, and the effort made by the national economy for this purpose. It is a matter of exploiting to the fullest, not only material and financial resources, but primarily the creative capabilities of man, scientific and technical research representing today some of the most important functions of modern enterprises.

As a matter of fact, our own and world experience shows that the potential of a national economy, as well as that of an enterprise, to overcome eventual difficulties encountered on the world market, is best assured in areas which do have adequate fundamental and applied scientific research, inventions, and innovations, in other words when creativity factors are fully used. That is indeed why creative activities in research, inventions, innovations, and improvements, must become true mass movements, effectively supported by all economic, public, and administrative factors, which assume the responsibility of facilitating these activities and promptly implementing in the economy the results they obtain.

The time factor plays a fundamental role today. Because scientific and technical progress throughout the world is moving more and more rapidly, techiques and technologies that are in current use, products, and the results of scientific and technical research also become outdated more rapidly. It is therefore necessary that science, technology, and production, act in close concert to drastically reduce the period between the time of scientific discovery, its transformation into patents, and its effective transfer to production. A reduction in the duration of the research-design-production cycle is today of decisive importance to assure a sustained rate of economic growth, and to increase the technical and economic competitiveness of products.

In the concept of our party and of its secretary general, the development of scientific and technical research presuposes a significant improvement in its efficiency, which above all means a substantial increase in the number of invention patents obtained through domestic research and introduced into production; at the same time, the topics of scientific research, and implicitly, the patents, must concern as much as possible, "breakthrough" problems which will open new avenues to progress for industry, agriculture, constructions, transportation, and so on. In fact, as early as the Ninth Party Congress, Nicolae Ceausescu indicated that "we will have to expand the basis of the electronics industry, which is particularly important for the future development of the economy, since it will determine the expansion of production automation in keeping with the demands of the technical and scientific revolution."

These orientations have remained the foundations of the continued development of the electrical and electronics industry in our country, as well as of the production of computer equipment. They continue to remain valid in the tasks and objectives established by the 13th Party Congress for the 1986-1990 five-year plan, which stipulate accelerated automation, conversion to electronics, and robotization in production and other socioeconomic activities, as well as new actions to modernize and redesign products, improve the technical and quality levels of products, improve technologies, reduce specific consumptions and material costs associated with products, and lead to the most efficient utilization of material, labor, and financial resources. At the same time, modern methods of management, organization, and planning will be disseminated as an integral part of the new economic and financial mechanism, so as to strongly increase labor productivity, profitability, and economic efficiency in all areas.

Growing Role of Cutting Edge Fields and Technologies

The long range orientations for Romania's socioeconomic development until the year 2000 stipulate the general implementation of automation in production and other socioeconomic activities, as well as the development of the national information processing system, based on a network of appropriately sized and interconnected computers and other electronic equipment. The development of the production of such equipment in our country has allowed information processing to be used on an increasingly wider scale in the most diversified fields of activity, primarily to computerize industrial processes and control technical processes in various areas (chemistry, metallurgy, mining, the light industry, and so on), and for testing installations, with profound implications for better product quality, optimized consumptions, and so on.

Today, computer assisted design is an instrument used in more and more fields, offering both a guarantee of high quality for the results obtained, and the possibility of general implementation and shorter cycles in research and technologic transfer of solutions. A large number of examples, such as computer assisted design of electric motors, tools and devices, automation schematics, and so on, demonstrate the great reserves still available in this area for great labor productivity growth in design, engineering, and planning activities. That is why CNST, under the direct guidance of its chairwoman, Elena Ceausescu, has established a long range program aimed at developing this field, thus creating conditions for the rapid and efficient solution of important problems which are now facing industry.

In practice, any product modernization and redesign for longer life and more reliable operation, reduction in weight or specific consumption, higher efficiency and lower costs for operation, maintenance, and repair, as well as the application of modern methods of quality analysis and control, and of product design and manufacturing, imply sustained efforts of research, rapid finalization, and implementation of positive results. At the same time, scientific research and technical engineering are asked to actively sustain efforts toward lower consumptions of raw materials, fuels, and energy, as well as the derivation of higher values from all resources--generally speaking the

entire group of actions and measures that are expected to reduce to 53 percent the proportion of material costs in products by 1990, which in turn will reflect the high levels of efficiency and quality characteristic of the development of our national economy in the years to come.

To achieve these priorities, the machine construction industry will develop at an average annual rate of 7-7.5 percent during the 1986-1990 five-year plan, which is above the country's average rate of industrial production growth. Even higher average rates of development than those of the machine building industry are forecast for a number of cutting edge sub-branches which generate significant changes in the economy and in the labor sphere, such as electronics, electric equipment, and precision mechanics.

The profound changes forecast for the industry's structure and quality level will strongly affect agriculture and the other economic branches. During the 1986-1990 five-year plan for instance, all agricultural work will be comprehensively mechanized, chemification will be carried out as required by intensive agriculture, and new varieties of high productivity grains and plants, as well as new breeds of animals, will be created.

A period of qualitative changes in the development of production forces, such as the ones in which we are now drawn by the new technical and scientific revolution, also requires more fundamental research to assure the long range steps for higher creativity on the part of human genius in fields that determine socioeconomic development. As Elena Ceausescu showed in her address to the 13th Party Congress, it is necessary that "we develop fundamental research in mathematics, physics, chemistry, biology, and other fields which will provide a new perspective on the knowledge of the structure of matter, of the mysteries of nature and life, and on human knowledge in general."

Implications of Transforming Science into a Direct Production Force

The conditions of the new stage of the technical and scientific revolution are creating a fundamental qualitative change in the system of science and technology; not only is science increasingly becoming a direct production force, but scientists, researchers, inventors and innovators, engineers, economists, designers, and so on, are becoming a particularly dynamic element of the productive collective worker. The collective nature of the results is thus even more apparent, in the sense that they no longer belong to a single person, but rather to a team capable of working together and efficiently, and of approaching and comprehensively and rapidly solving problems and research topics.

Similarly, under present conditions, scientific research activities prove to produce and create utilization values, so that a large number of its products become goods that are sold and bought on the domestic and international markets. All of these show that science has become one of the most solid forms of national wealth. Moreover, science and technology today revolutionize the economy, enabling and hastening its development, overall efficiency, and the efficiency of its spheres, branches, sub-branches, and products. As

such, in the general mechanism of intensive expanded production, scientific and technical research does in fact play the role of priority sector of production. Hence the imperative need--repeatedly emphasized by Nicolae Ceausescu--to develop science and technology ahead of the construction of means of production, and necessarily ahead of the production of consumer goods and services.

The original concept of organizing Romanian scientific research in the light of the need to fully cover research topics and reduce as much as possible the idea-result cycle--consistently promoted by the RCP and its secretary general--has more than proven its judiciousness. In this respect, the development of industrial production activities within research institutes has made it possible not only to verify solutions, but also to achieve highly perfected technologies that incorporate high levels of innovation, and therefore high economic value. This type of organization for scientific research and technical engineering activities most efficiently meets the present stage of our country's socioeconomic development, a stage that requires the fabrication of high technology, specialized products, which thus imply a perfected design, and solutions that can be diversified to other applications. Such solutions can be fully assured through the current structure of institutes for scientific research and technical engineering. Examples of products fabricated by specialists in our institutes (such as special motors for robots, traction equipment, testers for specialized electrical and electronic equipment and components, and so on), products that are more intensively demanded on foreign markets at competitive prices, prove the judiciousness of this strategy.

As Nicolae Ceausescu pointed out to the recent joint plenary session of CNOM and CSDES, the increasingly important tasks that are facing our scientific and technical research demand an intensified research activity, and its concentration on highly significant objectives. This will lead to a more efficient research activity, in the sense of establishing and approaching priority programs based on a strong concentration of scientific and technical forces in various areas, thus shortening the time required to obtain results and implement them in production.

The new stage of the technical and scientific revolution also demands in an equal measure, a stronger organic integration of scientific research and design with production, education, and the training of personnel qualified for advanced areas of modern science and technology. Considering the priorities established in the development of various branches of the national economy, education during the next five-year plan will assure the professional training of nearly 2000 persons--qualified workers, technicians, foremen, engineers, and other specialists with higher education--particularly for machine construction, metallurgy, the mining, oil, chemical, and construction industries, materials design, as well as agriculture.

The strong growth in the role of science and technology imposes the modernization of education on the basis of the newest achievements in knowledge and technology. The task outlined by the 13th Congress is for

education to assure the multilateral training of young people in several trades and specialities, so as to facilitate their transfer from one activity to another as a function of the requirements of social life. Particularly important in this context is the system for upgrading and retraining all the working personnel, emphasizing multiple qualifications so as to assure the operative adaptation of workers to the profound changes brought about by technologic progress.

The era of technical and scientific progress in which we find ourselves influences and will continue to influence to an increasingly large extent, all areas of activity, all factors, and all means for organizing and managing society. Of course, such a vast and multilateral process does not proceed on its own. As Nicolae Ceausescu stated to the joint plenary session of CNOM and CSDES, "we cannot achieve that which we have planned without seriously involving research and without increasing the role of research in all areas of activity. The technical and scientific revolution and general progress will be achieved only on the basis of the newest advances of science and technology, not of those that are known, but of new discoveries in all fields. We must propose that in the future, Romanian research will maintain and develop this role of science pioneer!"

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