JPRS 70076

1 November 1977

WORLD

WIDE

TRANSLATIONS ON ENVIRONMENTAL QUALITY

No. 152

DISTRIBUTION STATEMENT A
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Indexes to this report (by keyword, author, personal names, title and series) are available through Bell & Howell, Old Mansfield Road, Wooster, Ohio, 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

BIBLIOGRAPHIC DATA SHEET	1. Report No. JPRS 70076	2.	3. Recipient's Accession No.
4. Title and Subtitle TRANSLATIONS ON ENVIRONMENTAL QUALITY, No. 152			5. Report Date 1 November 1977 6.
7. Author(s)			8. Performing Organization Rept. No.
9. Performing Organization Name and Address Joint Publications Research Service 1000 North Glebe Road Arlington, Virginia 22201			10. Project/Task/Work Unit No. 11. Contract/Grant No.
12. Sponsoring Organization Name and Address As above			13. Type of Report & Period Covered 14.

15. Supplementary Notes

16. Abstracts

The serial report contains translations from the world press of articles and press commentary on environmental pollution and its effects and pollution control technology, organizations, and programs.

17. Key Words and Document Analysis. 17a. Descriptors

Worldwide
Pollution
Environmental Control
Meteorology
Ecology

17b. Identifiers/Open-Ended Terms

17c. COSATI Field/Group 4, 6, 18G, 18H

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
Unlimited Availability Sold by NTIS Springfield, Virginia 22151	UNCLASSIFIED	58
	20. Security Class (This Page) UNCLASSIFIED	22. Price A04

JPRS 70076

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WESTERN EUROPE

WEST GERMANY

POLLUTING INDUSTRIES TO BE FINED

Buenos Aires LA PRENSA in Spanish 28 Sep 77 p 6

[Text] It was announced yesterday that a system of pollution liability rates will be applied to sectors producing harmful industrial effluents.

The proceeds of these fines will be used for programs of study and research into pollution control.

This information was released during a press conference called by Manuel Diaz Dorado, under-secretary for Environmental Planning, Luis Urbano Juagueri, technical adviser to the Secretariat of Transport and Public Works, and Navy Commander Dr Adolfo J. Maillet, under-secretary for hygiene medicine in the Secretariat of Public Health.

These civil servants spoke about the interdepartmental coordination work done during the current year which enabled them, after doing research and gathering data, to establish that a high percentage of the industries are discharging clandestine liquid effluents which cause water pollution.

In connection with the proposed liability payments, it was said at the meeting that a study of the nation's sanitation works has been completed and is currently being studied by the departments with jurisdiction in this matter. The study proposes to levy these fines with the purpose of inducing industrial sectors into having waste-treatment plants. The proposal is based on the criteria of giving an index number and increasing the liability payments determined by the length of time elapsed since payments started.

Through this method, it was pointed out, the increasing amount of the fines will show to the industrial sector concerned the advantage of having the treatment plants required to produce effluents which comply with the established quality standards.

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BRIEFS

CERTAIN DETERGENTS BANNED--Tigre (Buenos Aires). The local City Council has issued an ordinance banning the manufacture, retailing, marketing and use of hard detergents (non-biodegradable). According to reports, the step was taken when it was found that this type of detergent is one of the major causes of water pollution. To avoid inflicting losses on the industries which manufacture these substances, they have been granted a period of 6 months to change to the production of soft detergents (biodegradable). [Text] [Buenos Aires LA PRENSA in Spanish 23 Sep 77 p 8] 8796

CSO: 5000

THE BATTLE AGAINST POLLUTION OF THE SEA

Havana BOHEMIA in Spanish 16 Sep 77 pp 16-23

[Text] One of the great problems of a universal nature confronting mankind to an alarming degree is that of pollution of the natural environment.

The indiscriminate use and abuse of the resources which exist on the globe and the lack, in most countries, of a preventive policy that would deter or reduce this ominous threat have brought about a critical situation with obvious consequences.

In the specific instance of the pollution of the sea with petroleum, it has been statistically proven through the Intergovernmental Maritime Consulative Organization (IMCO), a United Nations specialized agency, that between 1954 and 1974 the volume of crude oil shipped via seaways increased from 150 million tons to 1.4 billion tons. In other words, within two decades, the transportation of that fuel by sea increased tenfold.

It has likewise been predicted that, by 1980, such shipments will increase to about 2.4 billion tons carried from the extraction areas to the consumption centers.

These statistics also indicate that, if there should be a corresponding proportion between the oil that is shipped and the amount spilled into the sea, the pollution would be even more serious; because, whereas up until 1954 only an average of half a million tons were spilled from tankers, that figure should have been about 5 million in 1974, but did not exceed 1.5 million, thanks to the development of specialized technology and procedures.

The Pollution: Oil reaches the sea in a variety of ways: through natural sources, from land-based operations, from installations inside the country and off-shore, and from ships.

Oil pollution may be divided into two types: accidental (resulting from accidents) and operational (caused by the unloading of hydrocarbons).

Although there are a great many products derived from petroleum, from the standpoint of pollution they may be divided into three categories: crude

oil, fuel oil and refined petroleum products. Of all these, crude oil represents 85 percent of all the hydrocarbons shipped by sea as cargo, and it is the most common pollutant of the three categories.

Crude oil loses its lightest fractions slowly, as a result of evaporation, with a natural increase in its viscosity and density, thereby causing a reduction in its expansion capacity.

After its lightest fractions have evaporated, the crude oil can combine with seawater to form an emulsion resembling scum, with a change in color as well.

The Harmful Effects: There are differences between the effect caused by a sizable oil spill which occurs over a long period of time and that caused by the small spills which are very common.

The first instance is known as "acute pollution," and, although the impact may be rather serious, there is usually a complete recovery with the passage of time.

The second, known as "regular pollution," is generally far more serious, because the continued presence of the polluting substance makes a recovery of the species impossible and causes possible environmental damage.

An example of acute pollution wherein an extensive radius of the European coast was affected by a single spill was the disaster which happened to the tanker "Torrey Canyon" in 1967; and, more recently, the leak from an oil well located on the floor of the North Sea, opposite the Norwegian coast.

In the other instance, the areas located closest to an oil refinery or a liquid unloading terminal may be damaged by regular pollution.

Views On Combatting Pollution: At the international conclaves specializing in this matter of battling environmental pollution, opinions have been expressed to the effect that the oil spilled into the sea should be allowed to reach the coast, where it could be collected manually.

Conversely, others maintain that, once the oil has reached the shore, the beaches used for tourist recreation would be affected; and therefore such access should be prevented.

As a recommendation, the latter suggest that all available means should be used, including burying the oil with specially treated sand, or spraying it with chemical dispersion agents, followed by mechanical agitation. It is claimed that, if this were done, the composition of the chemical dispersion agents might prove as harmful as the hydrocarbon in the water, or more so.

Others, in turn, point out that burying the oil is not satisfactory because it would reappear on the surface, conveying its negative effects.

Recovery in Ports and Harbors: All the equipment for removing oil from port waters works more efficiently if there is a thick layer. Many mechanical devices have been designed to collect the oil.

This activity is usually backed up by log booms, of which there is a large variety on the market. These booms make it possible to curb the expansion and spot the oil slicks.

For example, we could mention that the Soviet Union uses small barges which specialize in oil recovery. They combine a separating and pouring system (to process the oil and water mixture) with one for floating solid intake.

In many locations, a separator recovers between 200 and 500 tons of polluting oil per year, and from 200 to 600 tons of waste.

The Battle in Cuba: Within the context of the worldwide effort to battle environmental pollution, we can claim that our country is executing a foresighted policy for protecting animal and plant life from dangers which are confined mainly to the seawater.

For this purpose, and as part of a set of measures to be implemented for curbing and eliminating pollution of the sea, by virtue of a decree published in the Official Gazette on 30 December 1975, the revolutionary government confirmed its adherence to the agreement on prevention of pollution of the sea through the dumping of waste and other substances and their residue. This agreement was approved by the IMCO at a ceremony held in London during 1972.

The first article of this agreement stipulates that the contracting parties will, both individually and collectively, promote effective checking of all sources of pollution of the marine environment; and pledge, in particular, to take all possible steps to prevent pollution of the sea through the dumping of waste and other substances which could pose a threat to human health, harm biological resources and marine life, limit the possibilities for recreation or interfere with other legitimate uses of the sea.

The second article likewise adds that the contracting parties will, in accordance with the terms of the subsequent articles, adopt effective measures individually, depending upon their scientific, technical and economic capacity, as well as collecitvely, to prevent pollution of the sea caused by spills, and will coordinate their policy in this regard.

It may be appropriate to use the context of this legal report to point out that it is incumbent on the Ministry of Transportation's Maritime Security Directorate, in its capacity as representative of the national maritime authority, to participate in the implementation of this international agreement on the dumping of waste and other substances into the sea (Dumping/72), with the backing of the nation's research institutions.

Thus far, we have summarized a few of the more prominent aspects of the international problem of pollution of the sea with oil and other substances, as well as citing Cuba's adherence to a specific agreement sponsored by the United Nations.

With the foregoing as a point of departure, this reporter took his investigation from the realm of the national effort to the pursuit of information which could clearly indicate that there is an awareness in our country of the seriousness of this threat, as well as what is being done and what plans have been made to eliminate the hazard.

It is not superfluous to reiterate the fact that, from an international standpoint, the sea has always been regarded as an ideal dumping ground; something which is entirely understandable in our case when we consider that Cuba is a long, narrow country in which the coast is always close by.

In the specific instance of the ports, this situation is more evident because the urban and industrial settlements are usually and preferably located in coastal areas; and, therefore, the waste from industrial and human activity tends to be discarded in their vicinity. The same thing holds true for the rivers, which also empty into the sea, their negative feature being the fact that their slight volume and length does not afford them a sizable self-cleansing capacity.

Havana Harbor, Main Sources of Pollution: Generally speaking, some of the household and industrial waste from the city of Havana is dumped into its harbor, through direct and indirect routes.

Waste is dumped directly by industrial and service installations located on the shore or connected to it, as well as by ships and vessels anchored in port. Added to all this is part of the sewage from the city and polluted water from storm drains; and no less serious is the irresponsible manner in which some individuals dump sewage and waste of various kinds.

Indirectly, what is dumped and spilled along the course of the Luyano and Martin Perez Rivers, and in Tadeo Brook, is carried toward the harbor, contributing greatly to its chronic pollution.

Results of the Sea's Pollution: The chronic oil pollution in the harbor of Havana is not due to either large spills or sporadic runoffs. It is caused by the constant spills that occur in small quantities, for which the water's self-cleansing action is limited. The cumulative nature of the volumes of pollutants and the meager renewal and circulation of the harbor water contribute to this.

The results of this may be summarized as follows: The oil slick that exists in the harbor impedes the gaseous exchange between air and water, limiting the renewal of the dissolved oxygen, thereby seriously affecting the plant and animal life in the harbor.

The normal standards for water in the harbor of Havana have been seriously upset, chiefly the nitrogen compounds and the hydrogen sulfide (hydrosulfuric gas). Hydrogen sulfide is a toxic, foul-smelling gas.

The organic pollution exceeds all permissible limits.

The pollution affects shipping, and the solid waste puts considerable amounts of shipping equipment out of commission temporarily. For example, there are broken rudders and propellors, clogs in pipes, damage to hulls....

The microorganisms and bacteria colonies damage the layers of paint on the ships, becoming embedded in the hull; which causes increased use of fuel due to additional friction, while also causing rust problems.

The microorganisms and bacteria attack the concrete in the port installations and rot the wood. In this case, there is more corrosion of the metal structures than would occur in unpolluted ocean water.

The hydrocarbon pollution is extremely harmful to the sea birds.

The water which the ship takes on for its operations damages the installations, especially when polluted water is used for cooling their machines.

After making these statements, we should stress the fact that, in the case of Havana harbor, pollution is a problem the solution to which is complicated; because its geographical shape is that of a pocket which, although it affords a good entry for ships, has a negative effect on the process of renewal in its water, added to the fact that the prevailing winds and tide levels do not foster such renewal.

The large industrial and demographic concentration does not foster it either, because dealing with the pollution resulting therefrom demands large investments, the total volume of which has not yet been determined.

System for Battle: Now that we have made this enumeration of the more notable negative effects which the pollution of the sea and, more specifically, of Havana bay, has on the natural environment and in the economic area as well, we should also observe that a system for battling this evil has been devised and is being implemented to some extent. This system, which is on principle an emergency one by nature, has been backed with collaboration from various research entities and institutions.

Specifically, it has been proposed that the Ministries of the Chemical Industry, Culture, the FAR, Interior, Transportation, Fishing, Public Health, Justice and Mines, as well as the People's Government Organs and the Cuban Academy of Sciences, could play a leading role in coping with, curbing and preventing pollution problems.

This battle system calls for the adoption of the following measures, among others: the use of a simple piece of equipment for cleaning the port's water and collecting the floating solids in the harbor; the use of a floating incinerator to collect and burn the garbage from ships anchored in the port; the planning and construction, at the Maritime Shops Enterprise, of a special barge to take on the floating solids collected in the harbor (this barge would have a testing capacity in its inner tanks, which would receive mixtures of water and hydrocarbons to be subsequently delivered to the oil terminals); and the use of a Soviet machine for cleaning ports, which collects floating solids and hydrocarbons, while simultaneously separating them.

This battle system is due to be prepared and fully operative by the end of the current 5-year-plan.

Likewise, as a supplement, studies made by the Ministry of Transportation indicate that seaport development cannot be regarded as complete unless the problem which causes the pollution of the water is dealt with properly. On the basis of this premise, the master plans for future port development have taken the significance of this matter into consideration. That is to say, in cases where it is necessary, these plans call for the designing of specific port sanitation systems which will curb the harmful effects on the marine environment.

Nevertheless, it is pertinent to note that, although the pollution problem in other Cuban ports is not so shockingly serious as in that of Havana, they require suitable preventive measures; for example, in the ports of Santiago de Cuba, Cienfuegos and Matanzas, where pollution studies have begun to a greater or lesser extent. For this purpose, close coordination has been arranged between the Ministries of Public Health and Transportation and the Academy of Sciences, respectively.

The Merchant Fleet: The Ministry of Transportation has made an analysis regarding the fleet which will make it possible to determine what equipment should be installed on board the freighters in order to prevent signs of pollution.

For this purpose, systems for treating sewage, bilge water separators, insulated pipes for universal outlets, etc., have been included in the contracts for the purchase of several newly constructed merchant units.

In the case of tankers, there are plans to install water-hydrocarbon separators to clean the ballast water and the tank washing water, as well as to collect hydrocarbons, with a view toward their delivery to on-shore facilities for the latter's use.

The dry cargo ships built in Denmark, such as the "Juarez," "Bolivar," "San Martin," "Jose Marti," "O'Higgins" and "Sandino," are provided with the aforementioned equipment.

It is extremely important to stress the fact that, despite its inadequate scientific and technical development for dealing with so new and complex a problem as pollution of the sea water, our country is expending great effort in that endeavor. This has been proven, among other things, by its use of the experience of the countries in the socialist camp, especially that of the USSR Ministry of Maritime Fleet, with which agreements for bilateral collaboration have been signed. It has likewise participated in the analysis of various problems and topics relating to pollution of the sea within the framework of the CEMA [Council on Economic Mutual Assistance].

Cuba has also sought experience in this special field of battling pollution from other countries.

Moreover, we might add that the first system of mechanical and marine equipment for cleaning water will be run by the Ministry of Transportation, through the Mambisa Terminal Enterprise in Havana.

The operation of this equipment demands highly qualified technical personnel, and training plans are being devised for this purpose which, in some instances, will be channeled through bilateral agreements for advice with countries that are experienced in dealing with the problem of pollution of the sea.

It likewise behooves us to report that the Ministry of Transportation's Port Development Center will have an operative laboratory for the systematic control of water quality in native ports, as well as other aspects of pollution.

Conclusion: We do not wish to conclude without observing that, as has obviously been reflected in this article, the socialist community has, for years, been preparing to safeguard the marine environment from the pollution caused by ocean-going traffic and other factors, these being matters dealt with in legal instruments which have been discussed on the international level. An example of this is the international agreement on prevention of pollution of the sea by ships, dated 1973.

Although still in the beginning stage, Cuba has embarked upon an intensive, serious endeavor in search of solutions to this evil which affects all of mankind, namely, the pollution of the environment, and of the sea in particular.

The following departments of the Ministry of Transportation were sources of collaboration, consultation and information:

Directorate of Maritime Security, Center for Port Development, Directorate of Marine Engineering, Directorate of Science and Technology, Center for Marine Development, Maritime Shops Enterprise (Casablanca Shipyard), Mambisa Terminal Enterprise in Havana.

Information in its field was also supplied by the National Committee for Environmental Protection and Conservation of Natural Resources (COMARNA), which is attached to the State Committee for Science and Technology.

Pollution?

The term "pollution" has been accepted in referring to the contamination of the environment, whether it be that related to the atmosphere, the earth, the sea, etc. It is, essentially, the infection or defilement of the planet in all its aspects: liquid, solid and gaseous.

In view of the great significance which mankind has attached to this problem, which affects the lives of everything inhabiting the earth, this term has come to the forefront of international concern. This has been proven by the success that has been achieved in battling it by many developed and developing countries.

For example, in Sweden work is being done on reusing industrial waste, and they have succeeded in recovering mercury, gypsum, etc., from sewage, and fats and proteins from slaughterhouse waste, creating salable products from them.

In the Union of Soviet Socialist Republics, a special program has been undertaken to protect the Ural and Volga Rivers which is being carried out by many facilities for treating industrial waste on the riverbanks. Over a billion rubles has been allocated for this activity. Also, since 1972 scores of machines to collect oil and accumulated waste in the water of ports and harbors have been built.

In Great Britain, they have succeeded in decontaminating vast water deposits, including the Thames River, and methods and plants have been created to prevent or eliminate water pollution.

Moreover, although the scientists engaged in studying pollution of the sea find new causes or polluting agents every day, the main causes which pose an immediate threat to mankind are:

Oil spills, whether they be accidental or deliberate; the dumping of sewage and drain water from cities; polluting atmospheric precipitation, and other radioactive, toxic, etc. substances dumped into seas and ocean in an uncontrolled manner.

There has been negative experience in the area of pollution of the sea. This is illustrated by accidents such as that of the vessel "Torrey Canyon," which occurred off the British coast in 1967, as well as others caused irresponsibly, such as the United States Government's dumping of containers carrying toxic and poisonous substances into the sea, at great risk to mankind and to other species inhabiting the planet.

Incinerator

A garbage incinerator with the most up-to-date technology, equipped to burn 2.5 tons of garbage in an 8-hour work day, and with a capacity for receiving 6 cubic meters of refuse or solid waste.

According to the plan of the Ministry of Transportation's Center for Marine Development, this machine will be mounted on a special barge which will collect the garbage from all the ships anchored in port. It will also be able to take on and treat the garbage or waste from industrial installations adjacent to the port.

It is supplied with a combustion system which affords control of gases, eliminating ashes and incombustible particles which could pollute the atmosphere.

National Committee for Environmental Protection and Conservation of Natural Resources Created

In compliance with a resolution of the Council of Ministers dated 1 December 1976, the National Committee for Environmental Protection and Conservation of Natural Resources (COMARNA) was recently established at the headquarters of the State Committee for Science and Technology and attached thereto.

Article 27 of the Constitution of the Republic stipulates that: "In order to insure the welfare of the citizens, the state and society protect nature."

It also states: "It is incumbent upon the competent entities and upon every citizen to see to it that the water and atmosphere are kept clean, and that the soil, flora and fauna are protected."

The plank on scientific policy approved by the First Congress of the Communist Party of Cuba includes, among the specific goals to be attained, both environmental protection and the utilization of natural resources, with a recommendation for the creation of a permanent body which would bear responsibility for such activities.

Several subcommittees will operate within the framework of the COMARNA's internal structure, namely: the Subcommittees for Protection of the Atmosphere; Protection of Soils; Protection of Subsoils; Protection of Terrestrial Water; Protection of Marine Resources; Protection of Vegetation and Flora; Protection of Fauna; Protection of Tourist Resources; Protection of the Environment in Human Habitats; Protection Against Harmful Waste; and Education and Publicity.

PHOTO CAPTIONS

1. p 16. Condition of certain low areas of Havana harbor resulting from the effects of the polluting action of the rivers emptying into it.

2. p 17. Design of special barge for cleaning the port of Havana, the construction of which has been planned by the Casablanca Shipyard (Maritime Shops Enterprise].

3. p 18. One of the national merchant fleet's new units provided with antipollution equipment required by international standards.

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5. p 20. Areas containing an accumulation of oil slick which damages the ships' hulls and paint.

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7. p 23. Sketch illustrating the methods used to collect large oil spills in ocean waters.

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CHEMISTRY, WASTES AND THE RUBLE

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 4, Jul-Aug 77 pp 63-70

/Interview with Anatoliy Vasil'yevich Nikolayev, director of the Institute of Inorganic Chemistry of the Siberian Department of the USSR Academy of Sciences, by correspondent Z. Ibragimova; date and place not given/

/Text/ The achievements of chemical science are indispensable in the rational utilization of natural resources and in the creation of waste-free technologies. This was the subject of a conversation which an EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA correspondent had with A.V. Nikolayev, director of the Institute of Inorganic Chemistry of the Siberian Department of the USSR Academy o Sciences. The interview with this promiment Soviet scientist proved to be his last appearance in the pages of our journal; Anatoliy Vasil'yevich died on 13 February 1977.

/Question/ Anatoliy Vasil'yevich, the new concept of "waste-free technology" presents the fascinating possibility of having no wastes at all and none of the ecological problems associated with them, as well as the possibility of drawing all valuable resources into active circulation. The popular press is already using this concept widely, but for the chemists themselves is this reality or a dream?

/Answer/ Let us talk first about the wastes themselves. A forest is cut down--a simple, ancient, very familiar activity. But branches are left behind, and they clutter up the wood-cutting areas. What to do with the branches is a question which has not yet been decided. The trunk which is obtained is then sawed up and sawdust results. Again the question: what should be done with it? Coal is burned--also a fairly ancient practice. As it burns, coal forms carbon monoxide, and this is a waste gas. Before the coal is burned, it is crushed to make

it burn better, and this process produces dust in enormous quantities. The dust is harmful, as are the ashes which remain after combustion and which must also be neutralized. And if you obtain steam during this process, you must purify the water, which again produces wastes and requires in addition a fairly complex system for monitoring the state and behavior of the water.

Let us take a saline solution which contains ordinary cooking salt. It cannot simply be put into an evaporator. It is necessary to first remove magnesium, sulfuric acid impurities and so forth--the solution must be purified, and this entails the emergence of wastes. And when we concentrate this solution by evaporation, the droplets of steam ordinarily attract to themselves sodium chloride. Potassium, bromine and other substances accumulate in the remaining liquid and begin to spoil the salt itself.

Let us return to mechanical production. What, it would seem, is simpler? We see everything, we can "touch" everything. But heat, this is again the combustion of coal. Mechanical treatment--once again sawdust and shavings, And rolling? Before a sheet is rolled, you must remove oxides from it, that is, it must be treated with sulfuric acid. Ferric sulfate must be obtained, and it cannot be dumped into the drainage system because it "eats" the pipes. Rolling is not chemistry, but if you want to cover an item with nickel, for example, then purely chemical complications arise.

I have listed for you four very simple processes; they produce wastes which are not dangerous to life. Theoretically, of course, because coal dust is not quite harmless. And, indeed, we work with substances which contain very harmful and dangerous impurities. When you obtain energy through uranium fission, you deal with 20 elements of its fission products with which it is complex and dangerous to work. Plutonium, for example, requires, or required in any case, until recently, nearly 80 operations before it is put to use.

Look at copper sulfide ores. They are being extracted from greater and greater depths, and they have a higher and higher arsenic content. And arsenic is a poison. One-tenth of a gram is enough to kill a man. In water five-hundredths of a milligram of arsenic per liter is permitted. And that's your problem. The farther you go, the fewer the sulfide ores on the surface, the deeper we "go in after" them, the more arsenic we shall obtain. We need to get rid of it, but that is not all: a user needs to be found for it, but users are afraid of arsenic.

The level of technology at present is such that we not only obtain harmful products contained in the original raw materials, but sometimes we also introduce harmful substances into the production cycle. Gold, for example, can be isolated by means of a cyanogen process. And cyanogen, as is well

known, is a poison which acts instantly. Some organic production units require compounds of mercury, a poison which is even stronger than arsenic.

Thus, wastes accompany every aspect of our processing activities. Man's oldest production units continue to produce wastes with which we even today do not really know what to do. (Maybe I am inadequately informed, but, in my opinion, the recovery of logging wastes is still an unsolved problem.) I began with the forest, and I will end with simple chemical examples, and, as you see, nowhere was I able to discover waste-free technology. In my opinion, it is a bit early to formulate the question in that way. Another ideal "looms" in front of chemists--to get rid of everything harmful by means of one process. We have been led to this idea by the well-known sad history of the American Great Lakes, in which, as you know, a person cannot even swim without risk, not to mention the life of these lakes and their practical use. We must aim for a situation in which the products of industry, those which we call wastes, can be easily neutralized and can be put more readily into residential and industrial circulation systems. For this reason, I think that we must now find a very effective means for removing dangerous substances from wastes with the aim of pumping these harmful substances into the Earth's interior. It is possible that with time better methods will be found; for example, atomic industry wastes may be turned into stone, but that is the future, and that is not always and not only chemistry.

/Question/ Anatoliy Vasil'yevich, could you please cite some examples of private solutions to the problem of wastes, a problem which you have formulated in your own way? Examples of chemical solutions?

/Answer/ Of course I could, this is the work of our institute. That same arsenic is an associated mineral of the nonferrous metal ores. A very undersirable by-product, its "harmfulness" has been known for a long time, and the maximum permissible concentration of arsenic in water reservoirs, as I have already said, is five-hundredths of a milligram per liter. Very precise purification methods are necessary to remove arsenic; the work is this area is extremely complicated, and at present I cannot imagine the technology which would completely free us of arsenic wastes. Here--together with the search for purification methods--there is an important task: to find new areas for the use of arsenic in large quantities so that less will be thrown away than at present. Arsenic is used in medicine, agriculture and the forest industry, but still only in very insignificant amounts.

Under the leadership of A.A. Mazurova, candidate of chemical sciences, our institute has worked out a phosphate method of removing arsenic from the waste waters of nonferrous metallurgy enterprises. The method, which has been introduced in the Urals, has been highly rated by those who work with it: the cost of treating one cubic meter of waste water with lime milk reaches 40 kopecks but is only 16 kpecks with our method, which also provides a higher degree of purification.

An installation with a capacity of 12,000 cubic meters of water per day has been put into operation and is working extremely well. But, I repeat, this is one aspect of the problem--neutralization. The other, no less important aspect is recovery. The attitude toward arsenic was formed several centuries ago, and, just imagine, the psychology of our ancestors is a tangible barrier to an increase in the number of commercial consumers of arsenic, an increase which is now essential. Arsenic is being used successfully somewhere abroad for the preservation of timber: wooden structures preserved with this posion generally last 50 instead of five years. But in our country the appropriate ministry to this day does not allow the production of arsenic preparations--it fears them like ...200 years ago.

And here's an example for you from a completely different area. Agricultural workers have asked us to remove ammonia from poultry houses. A small thing, it would seem, a poultry house, but a problem which is, incidentally attracting the attention of scientists throughout the world. The unpleasant atmosphere of poultry farms, this and the labor conditions (young people do not want to work here, despite the opportunity to earn well), and the conditions of poultry maintenance, result in serious consequences: a high rate of illness and low productivity. For the information of our readers: among domestic animals, pigs are the worst polluters of the environment and chickens are second. The air in cow barns and poultry houses contains ammonia, hydrogen sulfide, organic odor-forming substances, dust and microorganisms. There is not yet any universal method for purifying this air, and the search for such a method is directly related to the problem of environmental protection. The poultry house of the farm which appealed to us disposes of 250 kg of ammonia per day. With the transition of animal husbandry and poultry raising to an industrial basis the problem of creating a satisfactory microclimate and of protecting the environment from them is becoming ever more acute.

V.L. Bogatyrev, doctor of chemical sciences, is the head of a group of staff members from our institute who have developed a simple method for removing the most harmful components from the poultry house. On the basis of this method an installation has been developed which makes a poultry house unlike a poultry house, eliminating its traditional distinctive odor. Without going into specific details, I will only say that in the GDR, for example, improvement in the microclimate of poultry houses has by itself resulted in a 15-20 percent increase in production efficiency. You can see the obvious advantage of the fight against wastes, although the "problem of the poultry house," seems to some very small against a background of massive industrial problems.

For chemists the struggle against wastes and harmful impurities involves a multitude of various means and methods, approaches and decisions. From my viewpoint the key decision involves solid solutions. I love solid solutions perhaps because it seems to me that in the problem which interests you the future belongs to them.

What is a solid solution? Descriptively speaking, it is the behavior of substances when they form crystals without distinguishing who is who, and it is very difficult to separate them in a solution. If, for example, gold and copper form a solid solution, the copper dissolves during this process rather than the gold; the copper protects the gold. In solid solutions with arsenic the carrier is dissolved but the arsenic is not. And if this solution is acted upon by water, it yields phosphate, but it does not give arsenic. And chemists already know that this kind of solution can be kept for a long time, that it will not be destroyed if water gets into it, and if it is dissolved, it will be selectively, and in the necessary direction. All these circumstances--the completeness of the capture and the firmness of retention--force us to see solid solutions as a primary aid in matters of purification. We were the first to propose this method, again for arsenic, and it has proved to be both cheaper and more efficient than the others. It has now been recommended for the entire industry (nonferrous metallurgy).

But this is all chemistry, and the fight against harmful wastes is by no means always our problem...

/Question/ And economics?

/Answer/ The economic aspects are difficult. It used to cost ten rubles to treat a ton of arsenic wastes, and now it costs five rubles. Efficiently? Well, relatively... The economic policy in regard to wastes has not, in my opinion, been worked out. If the work related to the removal of harmful components from production wastes were accounted for in the fundamental indices of enterprises, then the enterprises would, of course, show greater interest. But as long as treatment installations constitute extra expenditures on top of the manufacturing costs of goods, who is going to love them passionately? And, naturally, we sometimes run into a reluctance on the part of enterprises to introduce new treatment processes--the obvious economic barrier is influencing them. Before we consider the effectiveness of methods to combat wastes, we need to learn how to calculate the damage inflicted by harmful discharges. The fines which are paid at state expense are hardly feared at all. Recently they have begun to levy fines which management itself must pay, and immediately there appeared various kinds of equipment. They said, we will dilute the arsenic a little, the wastes won't be quite so terrible, and then we will see.... But this most ill-fated arsenic can turn up both in rivers and in lakes, in diluted concentrations, it is true, but it will, however, accumulate! And all because of what? The problem of wastes has still not been thought out economically.

At one time I was the scientific secretary of the Committee to Mobilize Resources in the Volga area. In the course of the committee's work we discovered the following: in one place chromium was being dumped while many other enterprises needed this chromium. And when we described all the wastes of the enterprises of Kazan', it turned out that the majority of them could be used. Chemistry is well developed,

the difficulties are now in economics. It is necessary to have the organization which would give a detailed evaluation of all the data on the wastes of every rayon or industrial group. It may turn out that some of the wastes could be profitably delivered to the appropriate plants for utilization. It seeme to me that the combined treatment of wastes from a whole series of enterprises may yield completely unexpected results. Let us say, phosphoric acid is dumped here and arsenic there; they could be combined. Another alternative: one plan discharges alkaline waters, a second discharges acidic waters. Chemistry could combine them, but life... Plants are sometimes located far away from each other so that there is no point in thinking about such combinations. I am deeply convinced that industry must be directed by economists rather than engineers. The economists would think about these questions when siting new enterprises.

By the way, regarding economics... There is a paradox: the more successful a new method and the lower the costs to introduce it, the worse it is for the originators: Why was I defending our method of removing arsenic from waste waters? Because it is economical from the point of view of the state. But when I began this work, many unflattering compliments were directed at me. And in the case of the gold, here they also considered that nothing would come of it. But we worked out a method which gives us gold with a purity of "six ninths." We obtained superpure gold and the reward for the method was nothing. No one was able to calculate what kind of profit our method gives because the price of "six ninths" gold was unknown (they began to sell it at approximately the same price as ordinary gold). The method proved to be successful, the costs to introduce it were negligible. Maybe it was for this reason that "they forgot" to reward the originators? And this is not chemistry...

In conclusion let us dream a little. In the future it will become possible to vaporize wastes. Then, by using an electrical or some other kind of process we will obtain steam, which we can force to produce work. The insignificant precipitate of the recent wastes we will bury. This is one alternative. I am convinced that whatever difficult problem may arise, science will solve it without fail. The many solutions which have already been found provide the grounds for hoping that we will successfully cope with the problem of wastes. To achieve this it is necessary to study them a little more seriously.

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WASTE FREE TECHNOLOGIES, THE ENVIRONMENT

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 4, Jul-Aug 77 pp 70-76

/Article by E.B. Golland, candidate of technical sciences, Institute of Economics and the Organization of Industrial Production of the Siberian Department of the USSR Academy of Sciences, Novosibirsk; Yu.A. Fridman, candidate of economic sciences, Forecasting Laboratory of the Institute of Economics and the Organization of Industrial Production of the Siberian Branch of the USSR Academy of Sciences, Kemerovo and E.I. El'bert, candidate of technical sciences, Kuzbas Polytechnical Institute, Kemerovo: "Technology and the Environment"/

/Text/ New Approaches Necessary

Ideas about environmental protection are quite frequently related to the confrontation of two systems: material production and nature. In the West voices are heard in regard to the necessity for limiting production: either because of the terrible consequences of environmental pollution or because of the desire not to permit a reduction in production efficiency along with growing expenditures for protection of the environment. In our opinion, it is possible to have effective growth of production without damage to the biosphere. It can be achieved through the spread of waste-free technologies which ensure a harmonious solution of the ecological and economic problems of the rational utilization and reproduction of natural resources.

Efforts to protect the environment cannot by themselves completely stabilize the level of its pollution inasmuch as departmental independence and the distribution of capital investments among individual branches and production units does not always permit the establishment of the best possible protection installations. And if, in addition we consider the low level of responsibility which industries have for environmental protection, then we can understand why ministries do not willingly finance and organize the establishment of protective installations. Fines imposed by public health inspection organs cannot have any substantial significance since they have little influence on the

economic indices of enterprises. For this reason a significant increase in investments in traditional (well-known and feasible) measures for environmental protection does not guarantee the desired results.

Under present-day conditions it is necessary to have new approaches to environmental protection which would take into account opportunities for socialist production and scientific-technical progress. We see the foundation for such an approach in the further growth of efficiency of public production on the basis of the complete and coordinated utilization of raw materials, as well as the development and introduction of waste-free manufacturing processes. The main tendency in the work being carried out in the area of environmental protection is not the opposition of production and the environment, but rather the protection of the latter as the result of the complete utilization of raw materials and the spread of waste-free technologies.

Waste-free technology is a relative concept: a certain amount of effluent and discharge nonetheless remains, and its absorption by the external environment is inevitable. In our opinion, waste-free technology is that kind of method for obtaining high-quality products under which wastes do not hinder the maintenance of the external environment's cleanliness.

The influence of integrated processing of raw materials on improvements in production efficiency are sufficiently well known. But as soon as complete processing becomes unprofitable to the producer, he momentarily "forgets" the second, no less important, purpose--environmental protection.

Complete processing of raw materials and waste-free technology as a rule lead to the output of multi-component production, some of which is not a direct target of the industry, and for this reason it is not interested in these items. For example, an enormous amount of slag obtained at a metallurgical production unit may serve as the initial raw material for the production of building materials but ... the target of ferrous metallurgy is the output of metal and not of building materials. For this reason more than 50 percent of the slag finds its way to slag heaps, taking up space and contaminating the area. The same is true of the production of a number of chemical and other products made from the discharges of enriching factories and metallurgical production units. According to data from the Scientific Research Institute of Economics of Gosplan USSR, during the combustion of solid or liquid fuel and during the processing of sulfur-containing sulfide ores, the amount of elemental sulfur discharged into the atmosphere is several times greater than the annual amount required by all of the nation's industry.

The idea of creating waste-free technologies was born not from the desire to protect the environment while reducing the amount of waste discharged, but rather from the desire to obtain cheaper end products from secondary types of raw materials (by-products) than could be obtained from the use of expensive and hard-to-obtain natural raw materials.

Protection of the external environment was generally not included in the tasks of developing a production system (sometimes even in the presence of such strong feedback as corrosion). At the best the external environment was viewed as a "storage area" for unusable liquid and solid wastes.

Beginning approximately in the sixties massive construction of treatment installations was started. The expenditures to establish and operate these facilities began to be classified as production costs. Certain indices for the use of natural resources (the dilution of effluent) began to be included in the number of restrictions considered during site selection for new enterprises. However, these measures proved inadequate, and while the reprocessing of wastes or their conversion into a useful product had not yet been organized, the hard principle of the production system prevailed: the lower the expenses for environmental protection, the cheaper the products.

A necessary condition for the operation of a single ecological-economic system is the application--when rating the efficieny of waste-free technology--of criteria which are different from those used in an economic (production) system. It seems to us that a group of special indices must be worked out to take into account the following goals of an ecological-economic system:

1. Efficient operation and development of the branches of the national economy.

2. Preservation of the hydro-aero system.

3. Normal reproduction of soil, plant and other biological resources.

4. Rational use of mineral natural resources.

5. Maintenance of the health and normal life activities of the population.

A general condition for the realization of these goals is the effective operation and development of a special economic and legal-administrative mechanism, a scientific board for the use of natural resources.

Economic indices are fundamental, in particular, the economic evaluation of the damage inflicted by a production system on the surrounding environment and on man. In this regard it is usually recommended that certain types of damage be judged according to the resulting expenditures and others according to the additional expenses incurred.[1]

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1. "Vremennaya metodika opredeleniya ushcherba, nanosimogo narodnomy khozyaystvu zagryazneniyem atmosfery vrednymi vybrosami po predpriyatiyam chernoy metallurgii" /Temporary Methodology for Determining the Damage to the National Economy by Atmospheric Pollution from Harmful Wastes throughout Ferrous Metallurgy Enterprises/, Khar'kov, 1972.

It seems to us more correct to determine that portion of the physical volume of the national income which is preserved or lost depending on whether waste-free technology is used or not.

Let us address ourselves to the working practices of one by-product coke enterprise.[1] The existing technology here has limited potential for the satisfaction of present-day demands of the organic synthesis industry, which uses only benzene with a very low impurity content. The benzene-containing and gaseous hydrocarbons are lost along with the wastes as a result of the inadequacies in the equipment. In addition, these inadequacies lead to extra losses of gaseous hydrocarbons.

At the same time a hydrogenation process for the production of benzene has been developed and has undergone industrial testing. Its application makes it possible to obtain especially pure benzene with a very low content of foreign matter. This technology may be classified as waste-free. The additional capital expenditures total 960,000 rubles. The cost of one ton of especially pure benzene increases by nearly 27 percent. The per unit capital investment for one ton of benzene, taking into account the improvement in its quality, increases as a result of its small production volume from 171 rubles/ton to 213 rubles/ton. It might seem that waste-free technology is economically ineffective.

But we will rate the effectiveness of the new technology while taking into account its influence on natural sulfur. The total damage to the national economy caused by benzene production based on the old technology was determined by adding up the figures for local damage to forestry, agriculture, municipal services, public health, industry, etc. Data on the per unit damage served as the normative basis for the calculation of local damage. It turned out that the total damage came to more than two million rubles per year. If this amount is subtracted from the sum of current expenditures for new technology, they will prove to be significantly lower than expenditures for the former production system. It follows that the proposed technology significantly improves the quality of production, preserves the natural sulfur and is more effective when compared with that which is currently in use.

Certain Practical Problems in the Realization of Waste-Free Technology

Special target programs are one of the most effective ways to protect nature. They have been worked out for Baykal, the Volga, Ural and Tomi river areas and for the cities of Kemerovo and Novokuznetsk. They involve all those who contribute to the pollution in the implementation of measures to protect the environment. However, every participant receives

1. Calculations carried out with the assistance of O.A. Semenova.

receives funds to build protective facilities only under well-known, approved technological projects in strictly limited amounts. As a rule, expenditures to search for new scientific and technical solutions, including waste-free technologies, are not reflected in this kind of program. We consider the establishment of complete standard design solutions for regions in which very different branches of the national economy are concentrated, designs which can be subsequently used in other regions of the country, to be the main condition for the transition to the use of waste-free technologies. It is wise to combine two transitional routes to the operation of ecological-economic systems with waste-free technologies. The first calls for the identification of the most dangerous pollutants and the creation of a barrier in the form of waste-free technology for them. The second route is the gradual shift by enterprises to the use of waste-free technologies at all stages of production.

In the Kuzbas, the coal, electrical-power, metallurgy, chemical and food industries are being intensively developed. A large number of production units were set up during the first five-year plans and the post-war years, and obsolete technology is characteristic of these units. The uncoordinated efforts of individual industries to protect the environment were not leading to the complete elimination of manufacturing wastes and for this reason the USSR Council of Ministers adopted a decree "Regarding Measures to Prevent the Pollution of the Tomi River by Untreated Sewage and the Pollution of the Air in the Cities of Kemerovo and Novokuznetsk by Industrial Wastes." The decree was the foundation on which work was started in several fields simultaneously, including the development of waste-free technologies.

In accordance with the government decision, forecasting and planning of the permissible industry-derived pollution of the environment. In this connection, a production base is being established for forecasting and planning; it has a centralized data bank, and it works out methods to forecast environmental pollution in the various areas. Scientific-research and experimental-design projects are being carried out with the aim of protecting the environment from the harmful effects of production. An experimental-testing facility is being established to work out standard manufacturing and technical solutions for industry.

The development of waste-free technologies is organically linked to the solution of the problems of the complete utilization of raw materials. Let us cite an example. The Podzemgaz Station at South Abinsk in the Kuzbas has been in operation for more than 20 years. Its only commerical product was and is energy-producing gas. Complete reprocessing of coal based on the hydrocracking of resin makes it possible to obtain in addition ammonium sulfate, phenol, raw benzene, and pyridine bases. Since the power-chemical processing requires purification of the condensate, it is essential to build a biological treatment station for waste water.

This entails capital expenditures of about one million rubles and annual costs up to 100,000 rubles. With the transition to the production of commercial phenols (in addition to the production of gas), volume is increased by approximately 1.5 million rubles. Profits in comparison with the production of gas and with allowances made for the expenditures for treatment of the waste water increase nearly 5-fold. With the implementation of the integrated system including the hydrocracking of resin, the cost of the gas is reduced 11-fold, and the complete protection of the environment is ensured. All this restores underground gasification to the number of competitive methods for the utilization of coal.

Organization of Scientific Research and Training of Personnel

The establishment and utilization of waste-free technologies for all branches of industry and the protection of the environment on this basis calls for the organization of a scientific center in every major region to coordinate the work being carried out under the entire special target program. Its main goal is to develop a set of proposals concerning the transition of the leading branches of industry to waste-free and effluent-free manufacturing processes.

The unsatisfactory training of personnel for the operation of existing treatment facilities and the sphere of future waste-free production units can even now be clearly seen at the beginning stage in the implementation of the comprehensive program for the creation of a healthy external environment. In this connection, it would be wise for the scientific center to organize four sections for the training of specialists with higher qualifications and to entrust them with the fulfillment of a broad range of concrete tasks:

general fundamental training of young specialists on the basis of individual plans (specific for the leading industries of the region) during first and second year course work at higher educational institutions;

comprehensive industry-wide training of future engineers, public-health physicians and researchers (at universities), etc. during their third and fourth year courses, according to a program coordinated with the enterprises to which the young specialists will be sent after graduation;

scientific training of fifth-year students with mandatory participation by future engineers in the operation of experimental (testing) installations for special purposes;

periodic (once every five years) retraining of engineers for the purpose of having them master the new achievements in the field of environmental protection and the creation of waste-free and effluent-free technologies.

The basic goal of this kind of training is to form a new psychology of the engineer and to give him fundamental ideas about his future work, which differs somewhat from the work of a specialist oriented toward a single industry.

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NONFERROUS METALLURGY, THE ENVIRONMENT

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 4, Jul-Aug 77 pp 77-80

/Article by N.I. Antipov, candidate of technical sciences, director of the Gidrotsvetmet State Scientific-Research and Planning-Design Institute of the USSR Ministry of Nonferrous Metallurgy, Novosibirsk: "Unity of Goals"/

/Text/ Nonferrous metallurgy is a broad field for the development of new technologies. During the last twenty years hydrometallurgical methods of processing the ores of nonferrous metals have been intensively developed and implemented. This provides the opportunity to solve in an integrated way the major problems of nonferrous metallurgy:

to expand the raw material sources by including relatively poor ores, ores which are difficult to concentrate, oxidized and mixed ores of heavy nonferrous metals, sludge, dust, tailings and lost ores in untouched blocks;

to achieve complete utilization of raw materials by including valuable components in commercial production;

to reduce or completely eliminate the discharge of harmful impurities into the air and water.

The main inadequacy of present-day pyrometallurgical methods for the processing of primary mineral raw materials and concentrates lies in the discharge of large quantities of toxic gases and dusts into the atmosphere, in addition to the significant expenditures of energy for the melting of empty rocks. Every year more than 1.5 million tons of copper, tens of thousands of tons of zinc, lead, and other valuable components are lost during the processing of sulfide, copper, and copper-nickel concentrates. A further increase in the scale of nonferrous metal production based on pyrometallurgical technology would be accompanied by a significant increase in the amount of sulfur brought in for processing, and this would lead to further air pollution.

The problem can be solved by shifting to a process of autoclave leaching by which elemental sulfur is obtained. Iron is removed in the form of commercial oxide, and nonferrous metals are extracted and separated by sorption or extraction technology.

The scientific and technical potential created within the industry makes it possible to efficiently develop production on the basis of the implementation of progressive new technologies, while taking into account the goals of complete utilization of natural resources. At the present time the scientific project which has been started exceeds the technical-economic opportunities for its realization, but this reflects the need and opportunity for rational, planned expansion of production, rather than forced restriction of it due to the consequences of biospheric pollution.

Until recently, increases in the number and volume of valuable components--when these were extracted from mineral raw materials--were of the greatest interest to those involved in production: when technical innovations in pursuit of this goal were implemented, the plant immediately began to obtain a tangible economic effect. For example, in the lead-zinc sub-industry, 18 elements are extracted from polymetal raw materials, including cadmium, gold, silver, bismuth, selenium and indium. They total nearly one-fourth of the total volume of commodity production and provide the Ust'-Kamenogorsk Combine with more than half of its profits and the Balkhash Combine with about one-third of its profits.

After publication of the 29 December 1972 decree of the CC CPSU and the USSR Council of Ministers "Concerning Strengthened Protection of Nature and Improved Utilization of Natural Resources," we began to better understand the direct link between the two problems, the unity of the ecological and economic tasks of production. During the Ninth Five-Year Plan 232 water treatment facilities and water recycling systems were put into operation, as against 123 during the Eighth Five-Year Plan. In addition, a significant number of treatment facilities were introduced as part of units at newly-built major enterprises. Now there are already more than 130 enterprises in the industry which use industrial effluent in water recycling systems; 68 of them have reached a water return rate of 70-90 percent, while 30 have completely ceased the dumping of untreated effluent into water reservoirs. Production volume has increased 34.7 percent in five years, while fresh water consumption by nonferrous metallurgy enterprises has remained at practically the same level. The two billion m^3 increase in water demand as a result of production development was satisfied by reusing water following purification. In the Tenth Five-Year Plan the industry received about 0.5 billion rubles for the construction of treatment facilities; this was twice as much as during the years 1971-1975. Seven hundred staff members of the industry's scientific-research and planning institutes were employed in the search for measures to protect the environment.

Several of the most significant achievements should be noted. The Kazmekhanobr Institute developed and applied a method for removing liquid chlorine from the effluent (as well as automation of the process) at the Kentau Enriching Factory and the Angren Extracting Factory. The Giredmet Institute and the Irkutsk Branch of the All-Union Planning Institute of the Aluminum-Magnesium Industry completed a set of research and design projects on the removal of fluorine from waste water, and a process for the regeneration of fluorine using this product has been worked out and introduced at a number of aluminum and creolite plants.

A process of biological purification has been worked out, including a method for the biological pretreatment of industrial effluent in settling ponds, and the conditions have been created for the reproduction of bacteria. The introduction of this method at the Balkhash Mining and Metallurgy Combine has made it possible to reduce the condentration of copper, molybdenum and arsenic by 4- or 5-fold and to significantly reduce the pollution of Lake Balkhash caused by waste water. A system has been introduced for the treatment of cyanogen-containing effluent of enriching mills by using wastes from titano-magnesium production. As a result, 118,000 tons of scarce calcium hypochlorite worth 3.5 million rubles were saved in 5 years. As we can see, when approached rationally, environmental protection proved to be extremely profitable.

There are, however, no grounds for complacency. A number of treatment facilities have not yet been put into operation as scheduled. The main reasons are the quality of work by construction organizations, the lack of complete equipment for facilities under cnnstruction, and the lack of necessary attention to construction on the part of industrial enterprises and associations, industry and geographical subdivisions of the Ministry of Nonferrous Metallurgy.

For example, the problem of how to neutralize arsenic-containing wastes has still not been solved. Some of the wastes have been put in the category of virulent substances and they require expensive special burial. The work of the Leninogrosk Polymetal Combine is worthy of attention: it calls for wastes to be introduced into concrete for filling in drifts in mines. A number of institutes have proposed putting arsenic into deposits which are difficult to dissolve. To evaluate these proposals it is essential to study the possibility of storing the deposits under conditions in which there is contact with air, and water is present. The problem is that as a result of hydrochemical processes some of the deposits turn into a soluble form and in this way they immediately become a source of infection for ground and rainwater.

Research conducted at our institute since 1973 shows that removing arsenic on the basis of iron sulfide makes it possible to obtain deposits which can be stored. When held in the air--in contact with water--they do not pollute the water above the maximum permissible

concentration over a period of three years. In accordance with the results of the data from this project, planning was begun on a facility for the Leninogorsk Polymetal Combine. The Gidrotsvetmet Institute is also doing work that takes into account the conditions of other enterprises in the industry.

Research into the removal of arsenic in the form of trisulfide is of great interest. It is sound practice to use the property of arsenic trisulfide which allows it to change into a vitreous state for the purpose of its effective and economical burial.

In this way scientific investigations and practical experience show that our arsenal contains reliable and technologically efficient methods to remove arsenic from the production unit, and they are methods which simultaneously ensure the protection of the environment.

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INDUSTRIAL EFFLUENT DISCUSSED

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHELNNOGO PROIZVODSTVA in Russian No 4, Jul-Aug 77 pp 81-82

/Article by V.D. Kuz'min, engineer, State Planning and Scientific Research Institute of the Petrochemical and Petroleum Refining Ministry, Gor'kiy: "Needed: Payment for Waste Water"/

/Text/ After the adoption of the CC CPSU decree "Concerning Measures to Prevent Pollution of the Volga and Ural Rivers by Untreated Sewage," construction began everywhere on biological treatment plants (BTP) And indeed they are building one in our city, too. But a BTP is a half-measure; after treatment the effluent goes into the same river anyway. Of course, it is better to send the effluent into the river through a BTP, than not to, but it would be even better not to discharge it into the river at all. And where should it be discharged? I answer: treat it and put it back into the water supply. Treat it not because it will be emptied into the river, but because it will be returned to production. There are not many who do this today.

There exist, it is true the "Fundamentals of the Water Legislation of the USSR," the "Rules for the Protection of Surface Waters" and other documents. However, at any plant or any institute people know: it is sufficient to write "effluent directed to BTP," since no inspectorate will ask why it isn't going into a return water system, nor will it try to discover what happens to the effluent after the BTP. And indeed the "Rules for the Protection" require this!

The "Rules for the Protection" contain the following remarkable point: "It is forbidden to discharge into a body of water effluent which could be excluded by means of rational technology or returned to a water circulation system." But is this requirement met? In our institute all the leaders are unanimous: why reduce dumping if we will have a BTP? If the effluent is returned to production there will be more trouble involved. Also, the water which has been returned to production will prove to be insufficiently pure and the quality of output will suffer.

We need measures to turn economics from the enemy of nature into her ally. It would be good, for example, to introduce a charge for water, and not so much for what is taken out of the river as for what is ruined by the discharge of waste water.

How much water is polluted when waste water is discharged? This can easily be calculated on the basis of the applicable rules and norms. For example to dilute 1 kg of sodium adipate to a harmless concentration requires 1,000 m^3 of ideally pure water. And there are substances which are more dangerous. If we know what quantity of pure water is required to dilute units of wastes to a harmless concentration, we can determine whether the resources of any given river are sufficient for natural neutralization of harmful substances. The installation of treatment plants improves the situation but does not remove the necessity to calculate what quantity of wastes a river can handle. And even when the efficiency factor of a BTP is brought up to 90 percent, it is inadequate in the majority of cases. Our respective calculations were made by using the example of methyl methacrylate in the amounts in which it is discharged into the Oka.

But if there were a charge for water! If only a plant had to pay every day for the dumping of harmful substances as much as for the corresponding amount of polluted water!

If there were a BTP the charge could be set lower, for example, ten times lower if it could be firmly proved that 90 percent of the harmful substances were removed during the treatment process. But all the same this would be a high charge--millions of cubic meters of water would also cost quite a lot! If a charge for water were introduced, it would be cheaper to return it to a plant's water supply system, as the norms require, than to dump it into rivers, as is generally the practice.

Even if the water-user assured us that his water was "pure," all the same he would have to pay to discharge it. This would stimulate the return of water into water circulation systems. If the waste water is pure, return it to the production unit. And if you are afraid to return it, that means it is not so pure and you should pay for the damage inflicted on nature.

By itself one measure--charging for waste water--will not solve, of course, all the problems of environmental protection.

But if it has already been decided to use a method for stimulating the work of enterprises on the rational utilization of natural resources such as charging for water, then this should be done more consistently.

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BURYAT SUIT ON POLLUTION OF COMMERCIAL FISHING GROUNDS

Moscow KHOZYAYSTVO I PRAVO in Russian No 8, Aug 77 p 89

[Article: "Arbitration Practices"]

[Excerpt] An enterprise that pollutes commercial fishing grounds with raw sewage must bear the responsibility for damage caused to the fishing industry.

The State Arbitration Commission of the Buryat ASSR Council of Ministers satisfied the suit of the Baykal fishing industry administration Baykalrybvod for compensation for damages caused to the fishing industry due to the loss of roe and salmon young during the 1975-76 winter resulting from the dumping of raw sewage into the river by a combine.

The cardboard box combine in a statement for reconsideration of the decision pleaded that the plantiff did not show causal relationship between the dumping of raw sewage into the river and the loss of fish. The combine also disputed the correctness of the calculations relied upon for the basis of the decision.

The combine's arguments were found to be without basis by the USSR State Arbitration Commission. The fact that there was river pollution by effluents discarded through the rain drainage system was confirmed by data from the hydrometeorological service and the Trans-Baykal Basin Territorial Administration. The action of the combine's sewage water on the development of roe and salmon young was studied by a scientific expedition from the Petrozavodsk State University. Its conclusions established that salmon young emerging from the roe found to be under the influence of the combine's sewage water, even if placed immediately in fresh water after coming out of the egg, display symptoms of pathological changes caused by intoxication. Additionally, research established that the sewage water from the cardboard box combine has a quality frightening to sires that might cause departure of the spawning group from the spawning grounds situated lower than the combine's sewer drain.

Under these conditions the combine's guilt in causing damage to the fishing industry has to be considered conclusive. The extent of damage caused to

the fishing industry as a result of dumping sewage water and other waste products in commercial fishing waters has been determined in accordance with the Methodology for Computing Damage affirmed by the USSR Ministry of the Fishing Industry dated 16 August 1967 number 30-1-11 and coordinated with the USSR Ministry of Finance and the USSR Ministry of Land Reclamation and Water Management.

Owing to what has been stated, the decision of the State Arbitration Commission of the Buryat ASSR Council of Ministers was left without change (case number N-1-18 for 1977).

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UKRAINIAN SEMINAR ON PROTECTION, UTILIZATION OF WATER RESOURCES

Kiev PRAVDA UKRAINY in Russian 23 Aug 77 p 3

[Article: "Multiplying Natural Riches--The Republic's Seminar on Protection and Utilization of Water Resources"]

[Text] The Poltava region has abundant natural wealth. Here there are forests and oak woods, more than 60 rivers extending 3,500 km, and the man-made Kremenchugskoye and Dneprodzershinskoye reservoirs. In the oblast much has been done to conserve and multiply water resources. Outlined for the present five-year plan is the adjustment of 200 km of river beds and the construction of about 40 water regulating facilities. More than five million rubles were spent last year to accomplish these measures. Work is being done according to a long-range plan proposed by the Khar'kov State Water Management Planning Institute [Khar'kovgiprovodkhoz]. In accordance with a program of anti-erosion measures, up to 3,000 hectares of water protecting forest planting takes place annually and great attention is given to cultivation without turning the soil. The fish catch and breeding in ponds is improving. A complex of measures is being carried out to protect water resources from pollution by industrial and domestic sewage water. Last year 5.6 million rubles were allocated for modernization and construction of sewage treatment plants.

A speech concerning the experiences of Poltava's people was delivered at the republic's seminar on the protection and utilization of water resources which took place in the oblast. Its participants--responsible workers of the USSR Ministry of Land Reclamation and Water Management [Minvodkhoz], managers and specialists of the republic's ministries and departments, oblast and municipal executive committee workers, scientists from scientific-research and planning institutes--acquainted themselves with the organization of work of the water conservation and anti-erosion services at the enterprises and establishments in the oblast.

The minister of the Ukrainian SSR Ministry of Land Reclamation and Water Management, N. A. Garkusha; academician K. M. Sytnik of the Ukrainian Academy of Sciences; first deputy chairman of the Ukrainian SSR Gosplan, V. A. Masol; first deputy chairman of the State Committee of the Ukrainian SSR Council of Ministers for the Protection of Nature, Ye. L. Litvinov; and the

chief sanitation surgeon of the Ukrainian SSR, A. I. Kas'yanenko, delivered speeches at the plenary session.

The reports and speeches noted that in the republic after the May (1966) Plenum of the CC CPSU extensive work was conducted in battling soil erosion, for the efficient use of soil, water, minerals, trees and other natural riches by the kolkhozes, enterprises and organizations. In recent years to regulate river flow and to increase the water supply 317 reservoirs and ponds were built on the rivers with a capacity of about three billion cubic meters, 380 km of shoreline was stabilized, 2,000 km of protective dams were erected, and dozens of thousands of hectares of river, ravine and gully shoreline were planted with trees. In just the last five-year plan more than one billion rubles were spent on the construction of water conservation projects. The overall capacity of sewage treatment plants reached 16.5 million cubic meters daily. This allows for the recycling of about 90 percent of the sewage water.

In noting the successes achieved the participants at the seminar devoted great attention to unresolved questions and dwelled upon problems of non-utilized reserves and opportunities. A business-like conversation took place on reasons for the slow introduction of scientific recommendations made by the water management services and on nonfulfillment of capital investment plans in building special projects. It was observed that here and there floodplains and steep hills were being tilled leading to the flooding of basins. Operational anti-erosion hydrotechnical facilities are not being used efficiently everywhere. Care is not being exercised everywhere for water conserving forested belts. At various industrial enterprises there is insufficient concern for purification of sewage water. Control over the work at purification sites is weak.

In the light of the decree of the Central Committee of the Communist Party of the Ukraine and the Ukrainian SSR Council of Ministers "On Intensification of the Protection of Nature and the Improved Utilization of Natural Resources," those who gave reports and delivered speeches underscored the necessity to intensify control everywhere over fulfillment of water management work plans, to concentrate capital investments and the efforts of the economic organs, ministries and departments at important projects, to effectively use available sewage treatment plants and to accelerate the construction of new ones.

At the seminar recommendations were adopted on intensifying the protection of nature and improving the use of water resources.

Participating in the work of the seminar and delivering a speech was G. I. Vashchenko, member of the Politburo of the Central Committee of the Communist Party of the Ukraine and first deputy chairman of the Ukrainian SSR Council of Ministers.

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FRANKFURT JUSOS TO HOLD ENVIRONMENTAL CONFERENCE

Frankfurt FRANKFURTER RUNDSCHAU in German 8 Sep 77 p 16

[Article by "pli": "Socialist Congress on Environmental Problems--Attempt To Influence SPD with 'Comprehensive Plan'"]

[Text] The Frankfurt Young Socialists [JUSO] and the Offenbach Socialist Bureau are organizing a joint "environmental congress" from 28 October to 6 November at which more than 1,000 participants from the entire FRG are expected. This was announced by spokesmen of both organizations at a press conference in Frankfurt on Tuesday [6 September]. The congress is to attempt to work out a comprehensive socialist concept on environmental problems.

In a joint statement, both organizations stress that the "interest-oriented assessment" by politicians and economic spokesmen is leading to a "hiding of the dangers and thus to a worsening of the ecological crisis." On the other hand, the basic environmental movement is likewise suffering from "considerable deficiences." It is no longer possible to make the assumption that ecological problems "will solve themselves, as it were, as a result of a general reform of basic principles of the social order." The construction of nuclear power plants, for example, is creating conditions that are no longer reversible.

According to the Frankfurt JUSO chairman, Martin Wentz, the congress is to be instrumental in the adoption of a "moratorium" on nuclear power plants at the federal SPD congress, scheduled for 2 weeks thereafter. This means halting the construction of any power plants in the process of being built and closing already existing nuclear reactors "to the extent that the development of alternative technologies permits."

This is a "compromise formula" that would be acceptable, the JUSO chairman said. In principle, the Frankfurt JUSO's continue to advocate the immediate stop of construction and operation of all nuclear plants.

For the next two weekends, numerous seminars and discussions are planned. Some of the topics will be causes of the destruction of the environment, environmental crisis and the Third World, labor unions and the environmental

movement and prerequisites of successful resistance. Prominent local and foreign speakers have already promised to participate, as have some from citizen's action groups and the academic world. Among them are futurist Robert Jungk, Elmar Altvater, Joachim Hirsch, Armin Kleist, Johano Strasser, Jakob Moneta of the Metalworkers Union and Heinz Brandt.

As part of the congress, which is taking place in Frankfurt at the initiative of the Club Voltaire, an "action week" is also planned. At the Harmonie cinema, films will be shown from the antinuclear movement, and the Club will organize a special program. Films on environmental problems are to be shown at various community centers. An attempt is also being made to enlist the cooperation of the Theater am Turm.

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TEMPORARY STORAGE OF NUCLEAR WASTE IN BAVARIA DISPUTED

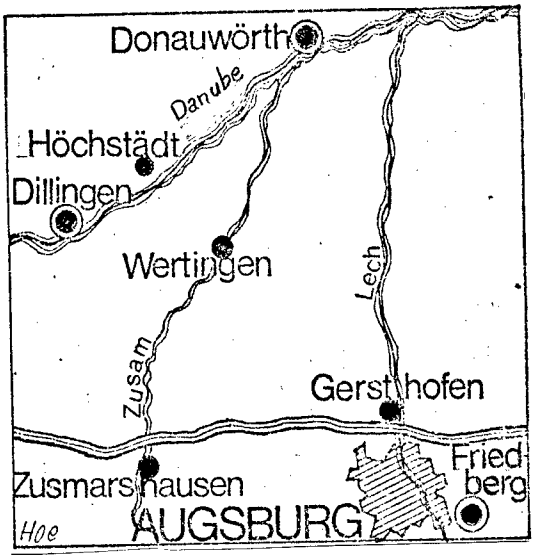
Munich SUEDDEUTSCHE ZEITUNG in German 2 Sep 77 p 19

[Article by Christian Schneider: "Nuclear Waste Plans Surprise Government"--"Deliberations on Possible Temporary Storage Near Wertingen/RWE Owns Property There"]

> [Text] The Bavarian government on Thursday reacted with almost speechless surprise to newspaper reports--as already briefly reported--of the intention to build in Donauried near Wertingen in the rural Swabian district of Dillingen a temporary storage facility for exhausted fuel elements from nuclear power plants. The appropriate authorities in the Ministry for the Environment conferred the entire day on the new situation. Consultations were still going on as this article went to press. None of those asked in Munich questioned the truth of the information being circulated by the Federation of Citizens Supporting Environmental Protection (BBU); the BBU, as the Bavarian Economics Ministry acknowledges without irony, has always been very well informed."

On Wednesday in Karlsruhe the BBU specified a total of six possible sites for the construction of temporary storage facilities for nuclear waste from German nuclear power plants. Two of these are in Bavaria, and the location near Wertingen in Donauried is "the most highly favored."

One of the factors favoring this site is that the Rhine-Westphalian Electricity Works, Inc. (RWE) owns several pieces of property there. These were intended to be the site of a nuclear power plant which was built, however, at Gundremmingen on the Danube [River] only a few kilometers away.



The experts also have another reason for believing that Wertingen, which is situated on the Zusam [River], is a good site for a temporary nuclear waste storage facility. The building of such a facility, it is said, would be most sensible in the vicinity of an already existent nuclear power plant--in this case, Gundremmingen.

That such a temporary storage facility will be built is now no longer in doubt, since the construction of a central processing facility with permanent storage capacity near Gorleben in Lower Saxony has been delayed repeatedly. Doubts as to the current completion date for this project were already clearly expressed at a nuclear energy hearing a few weeks ago in the Bavarian Landtag. There it was made public for the first time that the supporters of nuclear power plants in the Federal Republic were looking around for possible locations for temporary storage facilities, and at the same time there was talk of two locations in Bavaria. In spite of repeated pressure from several deputies, the veil of secrecy was, however, not lifted then. Sometime after this the technical authorities in Bavaria were informed "that the energy companies were also looking in Bavaria for locations for temporary storage facilities, but no one knew where."

It is especially unclear as to whether the location near Wertingen is intended to be the central temporary storage facility for nuclear waste from all parts of the country until the facility in Gorleben is built or whether only a so-called regional temporary storage facility for existing nuclear power plants in Bavaria is to be built in rural Dillingen Kreis. Simply explained, a temporary storage facility is basically a large pool of water in which exhausted fuel rods from the nuclear power plants are stored until later reprocessing. The water in this out-sized "swimming pool," according to one expert, would be heated to a maximum of 35° C by the fuel rods. The water in the storage pool could then be cooled either by means of a main drainage canal or through compartmentalized cooling installations similar to those at the Isar I nuclear power plant in Ohu near Landshut.

Experts say that in principle the storage basin should be sheltered in a concrete building constructed according to the same specifications prescribed for reactors in order to guard against catastrophes caused by external influences. The safety risk of such a facility would be minimal. The same experts also explained that they prefer the building of such a separate temporary storage facility to the longer-term temporary storage of exhausted fuel elements directly in nuclear power plants, as is planned for the installation in Ohu I near Landshut.

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ENVIRONMENTALISTS, NUCLEAR PROTAGONISTS AIR DIFFERENCES

Munich SUEDDEUTSCHE ZEITUNG in German 8 Sep 77 p 6

[Article by Rainer Klose: "Environmentalists Complain in Bonn"--"BBU Sees Only Proponents of Nuclear Energy on Advisory Committee"]

[Text] The "Federation of Citizens Supporting Environmental Protection" (BBU) has complained that government advisory committees are made up almost exclusively of supporters of nuclear energy. At a press conference in Karlsruhe the BBU made public a letter to Minister of the Interior Werner Maihofer in which it demanded, "in the interest of objective advice for politicians," a balanced "parity" on the advisory committees.

The letter names as examples the Radiation Protection Commission, the Reactor Safety Commission, the Nuclear Technology Committee and the committees to establish DIN [German Industrial Norms] units in the field of nuclear energy. According to the federation of environmental protectionists, until now not a single scientist critical of nuclear energy has been on any of these commissions. The BBU recalls that in 1976 Minister Maihofer promised the BBU directors that he would appoint critical scientists to the committees. This has not yet been done, however.

The letter further states that as long as this grievance is not corrected, the government runs the risk "of making one-sided decisions because of one-sided advice" in questions pertaining to nuclear energy. At the same time along with this letter the BBU presented documentation "on advisory practices of the official Radiation Protection Commission."

Through a country-wide campaign the federation of environmental protectionists wants to draw attention to one possibility for conserving electricity. The BBU has called upon the people to collect used aluminum. Its idea is to set up collection points for used aluminum all over the country. Moreover, the BBU is suggesting that aluminum no longer be used as a packaging material.

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BUSINESS, UNIONS RATIONALIZE CURTAILMENT OF NORMS

Frankfurt FRANKFURTER RUNDSCHAU in German 1 Sep 77 p 6

[Article by Winfried Didzoleit: "Protection of Environment Makes for Strange Bedfellows--Why an Industrial Manager Joins Maihofer in Fighting the Economics Ministry and the Competition"]

[Text] Protection of the environment makes for strange bedfellows. In Hagen the appointed state secretary of the Federal Ministry of the Interior, Guenther Hartkopf, and the management spokesman of Feldmuehle AG, Robert Layton, fought arm in arm, though not with equally clear words, for observance of the ecological norms deriving from the sewage tax law and against approval of the expected requests for waivers. The decidedly less rigid representative of the Economics Ministry, on the other hand, shook his head pensively and suggested that the economic situation be looked into carefully, in detail, if the enterprises in a year or two should begin to direct their attention to the hardship clause.

The strange coalition is easy to explain. More than a year ago in the operation of cleaning up Lake Constance, Feldmuehle was told that it would have to cease its paper production at the Baienfurt works if it did not manage to reduce the sewage drastically. Since the Flick managers evidently did not consider closure to be the right alternative, they tried to meet the demands of the environmental protection authorities and, lo and behold, managed to do so. Says Layton: "We were forced to invent something, and, with the help of federal funds, we did." Since the time when the third phase of the purification system in Baienfurt went into operation, the sewage load has diminished substantially. In relation to the chemical need for oxygen, 80 percent of injurious materials have been removed from the water.

But, of course, this has cost money. Investment in behalf of the Baienfurt works is estimated at DM 50 million and operating costs at DM 8.5 million a year. Member of the board Guenther Jacobs has figured an increase in costs of 15 percent as a result of the sewage treatment, and now the Flick company apparently is afraid of competitive strains if generous use is made of the hardship clause built into the sewage tax law effective as of 1981. Says member of the board Layton: "What kind of situation would we be in if we had to compete with toilet paper that is not burdened with this increase?"

Since this attitude fits into the plans of the Ministry of the Interior, State Secretary Hartkopf happily nodded his agreement. Yes indeed, he said; Feldmuehle had furnished practical proof of its being possible to go very far with environmental protection. This being so, "requests for waivers will encounter little sympathy," he announced brusquely, knowing full well that he might face quite a few things in this area. For he realizes clearly that once the law takes hold "a large number of people will come to Bonn arm in arm."

Hartkopf is alluding here to another strange coalition which has been created quite often by environmental protection. When it is a question of ecological norms, and jobs are allegedly or actually in jeopardy, management and labor unions sometimes discover that they are, after all, in the normally often maligned same boat. Then, together and not infrequently for reasons that are in the selfish interest of the enterprise, they try to lower the standard. In the case of the Hagen-Kabel Feldmuehle Works, however, when it came to the idea of producing manuscript paper from old paper and presenting a decomposition installation which would not harm the environment, Hartkopf clearly showed his colors: There will be virtually no approvals of requests for waivers nor subsidies for new installations; at best there will be an extension of the special depreciation allowances that expire in 1980. Those allowances are for existing installations which must be raised to the new technological level.

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ITALY BLAMED FOR CATASTROPHIC DECREASE OF MIGRATORY BIRDS

Frankfurt FRANKFURTER RUNDSCHAU in German 3 Sep 77 p 13

[Article by Theo Loebsack: "More Insecticides Needed Because of Bird-Hunting --Consequences of Mass Shootings in Italy"]

[Text] As always at this time of the year, the migration of birds is starting this month. Birds from northern, eastern and central Europe are going on their journey to their winter quarters in Africa. Many are using Italian land to stop over en route, but increasingly few "make it across." The reason is a scandalous situation south of the Alps, the extent of which is barely known in any detail hereabouts.

According to statistics of the Max Planck Society, in our country the number of songbirds alone has decreased in a few years by some 50 to 90 percent. The reason is not only the ever-increasing reduction of the lebensraum of the fowl in their native breeding land or the increasing pollution of the environment through insecticides, but the bird hunt customary in Italy.

In lieu of finding quiet resting places after crossing the Alps, the birds encounter in Lombardy alone about 220,000 licensed hunters with their shotguns, who--as early as 28 August, according to a new Lombard law--have prepared a really warm reception for the migratory birds. The birdcatchers are no less active. As traps, they use sophisticated devices--the so-called "roccoli." Here the birds are caught in nets extended vertically between rows of trees planted in circles. There in the "roccoli" the pegged decoy birds--birds with broken legs and wings, dazzled and artificially molted fowl which have spent whole months in the dark--give their fellow species the impression of paradisical feeding places with their "spring song."

In addition to the "roccoli" there are numerous other traps, and also birdlime twigs and slings made of horsehair. Even fishhooks are used in order to catch waterfowl gullibly snapping for the bait. On some islands the vegetation is burned down in order to deprive the birds of their hiding places, thus making them foolproof targets even for poor shots.

According to a report by the EC Commission in Brussels, annually about 300 million birds fall victim to the Italian large-scale massacre. They include

more than 80 million small songbirds--fowl largely under wildlife protection in their native lands. It has been calculated that 1.5 billion rounds of ammunition are used on birds in Italy every year and that the host of people possessing hunting licenses has reached 2 million--more than the strength of the NATO European forces. Added to this are about 200,000 poachers who participate in the slaughter illegally.

More than 5 million shotguns are in use, as well as so-called "little duck cannons"--guns which with their widely dispersive ammunition are particularly effective against birds flying in formation. It is said that thanks to these murder weapons whole flocks can be liquidated with a few shots.

As recently as in 1970, 500,000 signatures were collected in Italy in protest against the killing of the birds, enough for a referendum. But the government in Rome blocked the referendum. In 1972, a bill submitted by 11 Italian senators designed to abolish bird hunting foundered on the joint interests of the birdcatchers' lobby, of arms manufacturers and of gastronomical enterprises which offer the tiny bird carcasses as delicacies in broiled, roasted or poached form.

How catastrophic the situation is can be seen from an impressive statistic. Figuring an annual catch of about 300 million birds and 5 grams of bird food in the form of insects per day, in a single month the killed birds would have consumed 45 million kilograms of insects. The bloodletting of birds by trigger-happy and trap-setting hunters thus contributes to a situation where increasingly strong insecticides have to be employed to combat the rampant infestation of harmful insects, where there is more and more squirting and spraying and use of poisonous substances in the environment.

One of the organizations in Germany which have made it their task to counter the massacre of birds in Italy is the Committee Against the Killing of Birds, with Vice President Dr Inge Jaffke, at Neuer Wall 26, Hamburg 36. The committee has branches all over the FRG, and its volunteer members in the past few years have been drawing attention to the barbarous doings of a small group of the population in our neighboring country through rousing publications, gatherings, protest letters to politicians and other actions.

Thus, the question was raised whether vacationers and tourists wanted to honor again and again with their presence places where European songbirds were systematically annihilated, and whether the Italian legislators might not be forced to take more rigorous action if Italian goods were boycotted abroad. Nor does the day seem far away when militant protectors of the environment will tackle the explosive problem. The European migratory birds do not belong to individuals or to any one country but are a precious common good, worthy of preservation. Their brutal annihilation by a part of the population south of the Alps is therefore not at all an "internal affair" of Italy's; it concerns all Europeans.

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LACK OF OXYGEN CAUSES ANIMAL KILL IN BALTIC

Frankfurt FRANKFURTER RUNDSCHAU in German 5 Sep 77 p 20

[Text] KIEL, 4 September (DPA)--There has not yet been sufficient research into the extent to which environmental factors affect the flora and fauna in the Baltic Sea. To make up for this lag, participants in an international symposium of marine biologists which ended in Kiel this weekend decided to study these effects using ecological laboratory experiments, since this was the only way of determining the strains the Baltic Sea could withstand.

As was reported by the coordinator of the symposium, Prof Hans Theede of Kiel, various ecological factors, but of course extreme natural circumstances, have eliminated all animal life in an area of about 100,000 square kilometers, or one-quarter of the entire area of the Baltic Sea. The main cause of this, he said is the increasing lack of oxygen in the deeper areas.

Nevertheless, he stressed, the acute pollution of the Baltic has "at least not become worse" following the construction of many purification installations. There is no danger of a sudden biological "capsizing"; rather, the dangers must be viewed over the long term. An "accidental" supplying with oxygen, such as happened during a thorough mixing of the Baltic Sea waters after the flood tides of the past 2 years, can, however, cause only a temporary improvement.

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BAVARIAN FORESTERS ALARMED OVER SPREADING FIR DISEASE

Munich SUEDDEUTSCHE ZEITUNG in German 3-4 Sep 77 p 19

[Article by Christian Schneider: "The Fir Trees Are Dying in the Forests"--"Mysterious Tree Disease in Bavaria and Baden-Wuerttemberg/Alps Region Spared"]

> [Text] Forest owners and forestry officials in Bavaria are currently disturbed over the number of mysterious fir tree deaths. The situation appears critical because no one knows the causes and there are as yet no effective countermeasures. "The fir trees are dying before our eyes," was the situation described by Professor Schuett of the Forestry Research Installation at the University of Munich. If this threatening process is not halted, experts believe that in the foreseeable future the fir tree will appear only in school books and technical literature.

The first alarms reached the Agriculture Ministry in summer of last year. Because reports were piling up from different forestry bureaus, the ministry demanded that the main forestry bureau make an exhaustive investigation both in national as well as in private and community forests. In Professor Schuett's opinion the result, which is now available, justifies the adjective "catastrophic."

The Bohemian Forest has been especially hard hit; between 14 and 41 percent of the fir tree stands in individual forestry districts have been stricken by the mysterious disease. Large-scale felling operations are becoming necessary. The fir trees in the the Upper Palatinate Forest, as well as in the forestry districts of Freising and Anzing, have also been substantially endangered in part. Isolated reports of damage have been received from the districts of Starnberg, Fuerstenfeldbruck, Rosenheim and Geisenfeld. So far, stands of fir trees in the Alps region itself appear not to have been hit.

An alarm was also sounded in the Black Forest. Experts from Bavaria and Baden-Wuerttemberg met in July of this year for their first exchange of findings. Forestry officials from both Laender agreed to have aerial

photographs taken with false-color film of the major areas of damage and to establish control areas in which the development of the damaged fir trees could be carefully watched.

In the meantime, fir tree deaths have assumed international proportions. Forestry workers in Austria, Poland, Czechoslovakia and France are also having to grapple with the same phenomenon as in Bavaria and Baden-Wuerttemberg. "If things go much further," says Professor Schuett, "it will look bad for the further existence of fir trees." The fir tree makes up about 3 percent of the trees in Bavarian forests.

Observation for 100 Years

In a special issue of the FORSTWISSENSCHAFTLICHEN CENTRALBLATTES Schuett writes that forestry literature has dealt with fir tree deaths for more than 100 years. As with many other forest diseases, it is characterized by clearly defined outbreaks and recessions. Years of intensive outbreaks are relieved by extensive disease-free periods. This is no cause for reassurance for forest workers, however, because before the disease dies down by itself, the last fir tree stands could long since have been stricken.

"Up until now there have been more theories than reliable information as to the causes of the disease," says Professor Schuett. Fir tree deaths have been connected most frequently with a lack of water. In fact, the disease occurs more intensively after long periods of drought. It has also been proposed that in dry periods the fir trees are especially susceptible to damaging beetles, insects and fungi. Still, the experts are agreed that "dryness, however, is unquestionably not" the sole cause.

Schuett therefore believes it urgently necessary to research the causes of this mysterious disease scientifically, for as long as nothing is known of the causes, it is useless to discuss preventive control measures. However, the Bavarian Agricultural Ministry, which is thoroughly familiar with the precarious situation, has not yet authorized such a research project. Schuett wants to present a research program by the end of September. Private forest owners are especially anxious about the problem since, financially speaking, they will be the hardest hit. They are pressing the ministry not to wait any longer to grant the research project contract.

Besides its economic value, the fir tree is important to forest vegetation. Because of its deep root system it is especially sturdy, which is why it serves above all in mountain forests as a "barrier" against wind damage. Moreover, the root system is a stabilizing factor on slopes threatened by erosion.

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