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Worldwide Report

ENVIRONMENTAL QUALITY

(FOUO 5/80)

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WORLDWIDE REPORT

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CONTENTS

USSR

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NONFERROUS METALLURGY TAKES MEASURES TO PROTECT ENVIRONMENT

Moscow PROMYSHLENNAYA ENERGETIKA in Russian No 2, 1980 pp 2-5

[Article by O.N. Bagrov, engineer, USSR Ministry of Nonferrous Metallurgy: "Power Engineering in Nonferrous Metallurgy and Environmental Protection"]

[Text] Rapid industrial development has placed before humanity the very acute problem of protection of the environment, on the correct and timely solution of which the health and well-being of this and future generations depend. Pollution of the environment occurs everywhere that energy resources are produced and consumed.

The effect of fuel-energy complexes (fuel extracting enterprises, hydro- and thermal electric power plants and so on) on pollution of the air and water basins is widely known. The energy technology processes of industrial production can have a no less harmful effect on the environment.

Industry consumes 60 percent of the fuel extracted in the country, 70 percent of the electric power produced, and 30 percent of the total use of water. In addition, enterprises produce and consume other energy resources (compressed air, oxygen, hot water, technological steam and so on), the centralized supply of which over great distances is technically impossible or economically unprofitable. Depending on the technical level the power engineering and energy technology processes (the stages of production) can either be the source of pollution of the environment or insure its protection. The chief goal now facing industry is the creation of waste-free production facilities operating with the maximum energy efficiency with closed material and energy balances.

The effect of industrial enterprises on the environment and the effect of the technology of consumption on their fuel-energy resources can be traced using the experience of nonferrous metallurgy. Used during the production of nonferrous metals are diverse pyrometallurgical, chemical, hydrochemical and other processes, which lead to the formation of a significant quantity of polluted waste waters, harmful discharges of technological gases, slags, sludges and other byproducts which cause extensive contamination and contain toxic substances. In addition, the majority of components contaminating

the waste waters and technological gases are valuable products of industrial production processes. Therefore in nonferrous metallurgy dust-gas-water purification facilities are an integral part of technological assemblies and shops.

In the USSR Ministry of Nonferrous Metallurgy adopted as the basic direction of protection of basins of water was the introduction of total return water supply, and for protection of the air basin--the development and introduction of combined effective processes of purification of technological gases and outfitting all technological aggregates with effective dust and gas purification systems, insuring the minimum expenditure of water and a reduction of harmful discharges of dust and gas into the atmosphere.

In all sectors of the national economy measures are being developed for nature conservation which are a component of the annual and five-year plans for development of the country's national economy. At enterprises in nonferrous metallurgy long-range planning of nature conservation measures has been done since 1966. In the 8th Five-Year Plan spent for these purposes throughout the sector was 160 million rubles and 193 nature conservation projects were introduced, and for the 9th Five-Year Plan the figures are, respectively, 497 million rubles and 336 projects. Allocations have been set aside in the 10th Five-Year Plan amounting to 745 million rubles and it is planned to erect 384 facilities for protection of the water and air basins.

Large gas-purification installations have been erected at the Bratsk, Bogoslovsk, Krasnoyarsk imeni 50 letiya VLKSM, Irkutsk, Volgograd, Tadzhik and other aluminum plants, at the Novosibirsk, Dneprovsk imeni 50-letiya Sovetskoy Ukrainy, Chelyabinsk and other electrode plants, the Elektrotsink and Ukrtsink plants, the Krasnoural'sk imeni Ordzhonikidze and the Kirovgrad imeni S.M. Kirova copper smelting combines and many other enterprises in the sector. Very large water purification facilities have been introduced at the Ust'-Kamenogorsk Lead and Zinc Combine imeni Lenin, the Yuzhuralnikel' Combine and a number of other enterprises. Much has been done to improve the water systems of the majority of enterprises in the sector.

The volume of work in nonferrous metallurgy for development of secondary energy resources [VER; vtorichnyye energeticheskiye resursy] has been considerable. According to the data as of 1 January 1979 there are 96 waste-heat boilers in operation, and 158 systems of evaporation cooling (IO; isparitel'noye okhlazhdeniye), and 46 air heaters. The total output of heat energy owing to the use of secondary energy resources in 1978 came to about 4 million Gcal. Thanks to the outfitting of technological aggregates with heat-utilization installations the expenditure of fossil fuel was reduced by 1 million tons of standard fuel, which made it possible to improve the condition of the air basin in regions where enterprises of the sector are located.

Waste heat installations have had a still greater effect on increasing the effectiveness of the operation of gas-purification facilities: there has been an improvement in the preparation of technological gases for purification and utilization by means of cooling and coarse dust-trapping, efficient removal of them from operating units has been organized, and hermetization of technological units has been insured, which has sharply improved the condition of the atmosphere in the shops. The use of waste heat installations has made it possible to reduce the volumes of gases and to insure transportation of them over considerable distances along gas pipelines, which in turn has created the conditions for energy-technology combining of production between shops in the framework of an industrial complex. This is especially important for utilization and decontamination of sulfur-containing furnace gases.

In the working spaces of the furnaces the concentration of sulfur dioxide SO_2 in the gases reaches a level that is adequate for utilization of them in sulfuric acid manufacture. For instance, at the outlet from the working space of the reverberatory furnace the content of SO_2 is equal to 4 percent, from the boiling layer furnace 12 percent, the convertor 12 percent, the rotary kiln 4 percent, the oxygen-suspended smelting furnace 80 percent and so on. Previously used methods of cooling furnace gases by suction of atmospheric air or cooling in coolers led to rarefying the gases and reduction of the SO_2 concentration in them. In addition the gases became unsuitable for utilization in sulfuric acid production and were discharged into the atmosphere.

Power engineers of the sector were able to outfit many technological units with evaporative cooling systems, with gas-tight take-offs, with reliably operating coolers of gases (waste-heat boilers), and to carry out rational diversion and transport of gases to the gas-purification and sulfuric acid shops. The schemes of gas exhaust operating at a number of plants include a gas-proof furnace uptake, a waste-heat boiler, a rough dust trapping chamber, a traction unit, fine gas purification and a high-speed highly sensitive system of automatic regulation of the hydraulic regime. These schemes, providing the maximum possible utilization of the sulfur from technological gases at all furnaces must be introduced everywhere.

It should be noted that the gas-proof bypass and rational systems of cooling and preparing the gases are necessary not only for processes of treating sulfide raw material, but also for other processes, including in aluminum production, for instance for furnaces for calcination roasting of the anodic mass.

The conversion of metallurgical furnaces from flow-type to evaporative cooling has made it possible to reduce the annual consumption of fresh water for the sector by more than 350 million cubic meters.

A positive result with respect to improving the sanitation of the air basin was obtained thanks to replacement of coal with highly efficient

types of fuel--mazut and natural gas. Their share in the sector's fuel balance rose from 37.3 percent in 1970 to 53 percent in 1978. The transition to heating with natural gas and mazut insured not only intensification of production, but also reduction of the loss of charge materials with the gases, and also created the opportunity for a transition to more ideal processes.

The use of oxygen has a direct relation to the energy part of production. The conversion of pyrometallurgical processes to forced oxygen blowing led to a radical reorganization of old processes and to the creation of new technological processes and has yielded favorable ecological results. In nonferrous metallurgy the use of oxygen has increased 10-fold since 1965.

The traditional work of power engineers and technologists, connected with a saving of primary and maximum utilization of secondary energy resources, also contributes to a reduction in pollution of the air and water basins. At many enterprises they are systematically reducing the specific expenditures of energy resources, and the use of secondary energy resources is being increased annually by 5-10 percent. In the last three years the expenditure of fuel in the sector with an increase in the volumes of production and domestic consumption of heat and fuel has not increased.

For 1978 there was a saving against the planned expenditure of 300 million kilowatt-hours of electrical and 1,180,000 Gcal of heat energy, and also 151,200 tons of standard fuel. The work performed in the sector yielded perceptible results. In the last 10 years the absolute consumption of fresh water has been reduced by 9 percent, and the total water use has increased by 60 percent owing to the use of recycled water. At the present time 120 enterprises have a return water supply, and at 30 of them the proportion of return and recycled water reaches 85-97 percent.

At the majority of enterprises the discharge of dust and harmful substances into the atmosphere has been reduced considerably. Thus, at the Chelyabinsk Zinc-Electrolyte Plant imeni Kirov and the Ryaztsvetmet Plant the discharge of harmful production wastes into the atmosphere has ceased, and recycling of water has reached 96-98 percent. The sanitation basin inspectorates have no complaints against the operation of these enterprises.

It should be noted, however, that at nonferrous metallurgy enterprises it is necessary in the future too to intensify the work for creation of ecologically clean waste-free production processes. Whereas at the first stage of solution of the problem of protection of the environment there were the tasks of ascertaining the volumes and studying the nature of the wastes of production which were contaminating the environment, and of establishing the ways to eliminate them, then at the second stage, which is now being implemented, we are solving the problems concerning suppression of harmful emissions in the technological process itself, of their maximum utilization through pre-outfitting of units and shops with

purification facilities, modernization of operating purification units and improvement of their operation. Being solved at the same time are problems of the third stage--the creation of production facilities with complete exclusion of pollution of the environment.

The scientific and technical basis of conversion of many production facilities for fulfillment, with minimum labor and material outlays, of the tasks of the third stage is their energy technology construction--the combining of the process in the limits of the basic technological aggregates and stages of production and shops in the framework of the enterprise or combine. Improvement of the production processes in nonferrous metallurgy has a specific feature, determined by the multiple-component composition of the charge and the necessity of complex utilization of raw material and the fuel-energy resources. Ores and concentrates of nonferrous metals almost always contain sulfur, which is a good fuel. Its total content in raw material processed during a year with respect to heat-producing capacity is equivalent to 5 million tons of standard fuel. For this reason the processing of ores and concentrates on the basis of energy technology is the most rational.

In connection with the creation of complex processes with the maximum energy technology combination in the development of nonferrous metallurgy a large role is played by power engineering. At the present time the highly developed power engineering base of nonferrous metallurgy enterprises determines in many ways the production potential of the sector. The power engineering services in addition to the traditional role (uninterrupted supply of energy for production) are providing the introduction of automation of all processes of production and of electronic computer equipment, and they are taking part in the organization of the latest technological processes (electrolysis, electrothermics, electroheating, electrosmelting, galvanics, gas furnace thermal engineering, plasma processes, and others).

An energy technology unit or stage should satisfy the following modern requirements:

A high specific and aggregate productivity with a high stability (greater length of the between-repair campaign);

Stability and continuity of processes;

Complex utilization of raw material and all types of fuel-power resources with high energy efficiency of the process;

Maximum automation;

Exclusion of environmental pollution.

The most complete observation of the indicated requirements can be attained only through combined production of metals and heat energy. The basic

task of the unit is to insure the optimum regime of the metallurgical process, but this task should be closely coordinated with the power engineering of the process. The heat produced during the metallurgical process should first of all be directed for insuring the optimum regime of the process, heating up the blowing, the fuel, the charge,and the surpluses of it should be directed for purely energy purposes.

Typical energy technology units operating at the present time in the sector are the installation for oxygen-torch melting of copper concentrates (Almalyk Mining and Metallurgical Combine imeni Lenin) and the oxygen-suspension cyclone electrothermal installation (Irtysh Polymetals Combine). Work is being done successfully to create smelting in a liquid bath. The Tsentroenergotsvetmet Production Association jointly with the Irkutsk branch of VAMI [All-Union Institute of Aluminum and Magnesium] have created a unit for roasting petroleum coke, consisting of a rotating roasting furnace with a cooler, a dust chamber, a waste-heat boiler, electrofilters and a forced-draft device. Installation of four such units at the Bratsk Aluminum Plant has made it possible, in addition to the considerable economic benefit from improvement of technology, to produce an additional 150,000 Gcal of heat energy in 1978. Analogous units are being introduced at the Krasnoyarsk Aluminum Plant imeni 50-letiya VLKSM and the Tadzhik Aluminum Plant.

Introduced at the Ust'-Kamenogorsk Lead-Zinc Combine imeni Lenin was an energy-technology unit for rolling, developed by the Uralenergotsvetmet Production Association. This unit makes it possible to increase the productivity of the furnace by 20 percent, to improve working conditions and to save 6,500 tons of standard fuel per year. Twenty-two such furnaces are operating in the sector. The Tsentroenergotsvetmet Production Association jointly with the Gipronikel' Institute, the Belgorod Energomash Plant and the TsKTI [Central Boiler and Turbine Institute] imeni I.I. Polzynov created an energy technology unit for the convertor stage, which is being assimilated at the Severonikel' Combine imeni Lenin. It is planned to introduce about 50 such units in the sector, which will make it possible annually to produce an additional 2.5 million Gcal of heat energy. The utilization of secondary energy resources is a component of energy technology aggregation, since waste-heat installations serve as a powerful technical means of preventing pollution and preservation of the environment.

It is impossible to consider the complex of energy technology process stages without its automation. At the present time any technological and energy problem should be studied in inseparable relation and on the basis of full automation, since only such a way of posing the problem will make it possible to find the ideal technical solutions and insure the greatest saving of labor and material resources. Automation of the technological processes will yield a positive result also in optimization of the operation of purification installations.

Thus, the following means are being utilized for protection of the environment at an industrial enterprise:

Reorganization of the technology of production on the basis of energy-technology amalgamation with the maximum saturation of technological schemes with waste-heat recovery installations;

The use of intensifiers of production--hot blasting and oxygen;

Replacement of hard coal with natural gas and mazut;

Maximum and complete automation of processes;

Organization of effective operation of gas and water purification units;

The saving of primary energy resources and the maximum utilization of secondary energy resources.

In connection with the peculiarities of solution of the problem of protecting the environment in nonferrous metallurgy the organizing centers for nature protection are the power engineering services of the ministry and the enterprises. Despite the fact that much work has been done and definite results have been obtained, the problem of protecting the environment in regions where nonferrous metallurgy enterprises are located still remains unresolved.

Foreseen in the plans for protection of the air and water basins is the development and introduction of new energy technology processes and technologies insuring a reduction in the expenditure of water and in harmful discharges, enlarged combined gas-proof transport systems, complete return water supply with bringing recycling of water in the next few years up to 80-85 percent of the total use of water for industrial purposes, and the standardization of water consumption and water drainage. Also planned is the complete stoppage of discharge of unpurified waste waters. Planned in the field of protection of the air basin is the maximum utilization of sulfur dioxide, cessation of dust discharges, reduction (to sanitary norms) of harmful discharges into the atmosphere in regions where enterprises of the sector are located. In all this work it is difficult to overestimate the role of the power engineering services of the enterprises and specialized power engineering organizations of the sector, in connection with which their further organizational reinforcement, and material and technical outfitting are required.

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USSR

BOOK ON USSR CONSERVATION DOCUMENTS PUBLISHED

Moscow OB OKHRANE OKRUZHAYUSHCHEY SREDY: SBORNIK DOKUMENTOV PARTII I PRAVITEL'STVA, 1917-1978 GG. (On Environmental Protection: Collection of Documents of the Party and Government, 1917-1978) in Russian 1979 signed to press 19 Feb 79, inside front cover and pp 347-352

[Annotation and table of contents from book compiled by A.M. Galeyeva, candidate of philosophical sciences, and M.L. Kurok, candidate of philosophical sciences, Politizdat, 100,000 copies, 352 pages]

[Text] Included in the collection are the basic documents of the party and the government regarding organization of scientific nature utilization and conservation of nature in the USSR. They vividly reflect the principled and consistent policy of the Communist Party and the Soviet government in the area of environmental protection.

The book is addressed to publicists, political information specialists, agitators, teachers of educational institutions, and also everyone who is occupied with questions of nature conservation.

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ITALY

MERCURY, INSECTICIDE CONTAMINATION OF FISH LIFE IN PO RIVER

Milan CORRIERE DELLA SERA in Italian 24 May 80 p 27

[Article by Roberto Marchetti, professor of ecology at Milan University: "Po River Fish 'Seasoned' With Mercury and Insecticides"]

[Text] The levels of poisoning of the fauna have not yet reached the danger point, but analyses show that the river's is seriously jeopardized.

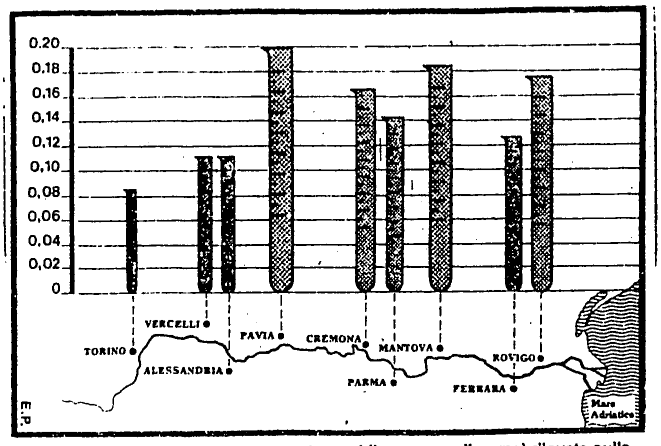
The Po is experiencing many difficulties. In a previous article (the CORRIERE of 26 April) we listed so many that even the recent and extremely serious pollution by CONOCO hydrocarbons pales by comparison. And yet, despite all these difficulties, a significant index is that of the continued presence of fish, an important factor in arriving at an evaluation of the quality of the water, and this seems to contradict the picture which has been painted.

The number of species of fish living in the river (34, of which 6 are migratory) has, in fact, not decreased in the course of a century; it has even increased by 7 species. Among the latter are the rainbow trout, salmerino, Persian sole, Persian trout and catfish, all imported in about 1900, and the gambusia [a type of larva-eating minnow] which spread as far as the Po (after 1920) from the waters of the Roman countryside in which it had been stocked to combat malaria. Recently, the European sheathfish, of Yugoslav origin, appeared in the Po. Among the original species there are several of high quality, such as the speckled troup, grayling, shad and sturgeon.

If we limit ourselves to this enumeration of species, our conclusion could only be that we are dealing with waters of good quality. But if, on the basis of information gathered by specialists of the University of Parma and the Institute of Research on Waters (CNR), we examine the density and distribution of the species of fish in the Po and the degree of contamination of each one, we get quite a different picture.

For example, in the upper course of the river, between Turin and Chivasso, we note the complete or almost complete disappearance of the grayling,

scazzone and lamprey; other species, such as the loach, gudgeon and the like, have been drastically reduced in number. The effect of dams has been more far-reaching than that of pollution, limiting the area of expansion of migratory species: the sturgeon, which for a century has not ascended beyond the dams of Casale Monferrato, now has great difficulty going beyond the Isola Serafini breakwater constructed for the Caorso Nuclear Power Plant. In any case, fishing for sturgeon has become increasingly less productive, and even more so downstream from this dam. For the same reasons there has been a drastic reduction in another migratory fish, the shad, which had its reproduction area in the upper tributaries of the Po, now blocked off. At least some species seem to be unaffected by the reduction process brought about by dams: the barbels, dace, tench, pike and, in the central stretch of the Po, even catfish.



Quantità di mercurio (in milligrammi per chilogrammo di carne) rilevata sulla muscolatura di cavedani prelevati in nove punti del fiume.

Quantity of mercury (in milligrams per kilogram of flesh) found in the muscular system of chub taken from nine different points of the river.

Certain species, which are still abundant in the river, have been examined to isolate the phenomena of the accumulation of poisonous compounds in their organs. About 200 chub gathered between Turin and Ferrara have, without exception, shown the presence of mercury in their muscular system, in both the inorganic form and in the more poisonous form of methyl mercury. The maximum found was 0.380 milligrams of total mercury per kilogram of flesh. In addition to this information, published by the Institute of Research on Waters, the same institute recently found in 300 specimens of alburnus alborella and chub gathered between Turin and

Mantua and absence of DDT but a constant presence of its metabolic elements (DDE and DDD which are formed during the decomposition of the DDT) or of BHC, both of which products are used as insecticides. The values observed range from a minimum of 0.01 to a maximum of 0.12 milligrams per kilogram of flesh for derivatives of DDT.

Together with these contaminants of agricultural origin, the same fish revealed a consistent presence of polychlorobiphenyl (PCB), compounds highly resistant to decomposition and widely used industrially (0.1 to 0.6 milligrams per kilogram of flesh). With these levels of contamination, it is not astonishing that even the marginal elements of the Po ecological system are found to be contaminated, as typically occurs with aquatic birds which have fish as part of their diet (the peewit gull, tern, coot and the like).

At the conclusion of this concise survey it should be pointed out that none of the findings obtained up to now exceeds the limits considered dangerous by the health-control organizations. But this conclusion should not put our minds at ease: the changes described are an indication of a profound regression taking place in the Po River system, one which does not concern only fish and fishermen. It is absolutely correct that the Lombardy and Emilia-Romagna regions have taken drastic steps to effect an improvement in the prevailing conditions and enforce payment for damages incurred by those who have seriously polluted more than 100 kilometers of the Po with hydrocarbons. But the Po's worst ills still remain: those which attract the least attention, which can be revealed only through sophisticated analyses and which often show up much later when recovery is no longer possible. The diagnosis of these ills now exists: the scientific world has done its part by furnishing the Po's clinical picture. It is now up to those who are in power, in the state, regions, local communities, to take action through all valid legal means to correct these conditions with the urgency which the situation demands and before that clinical picture is transformed into a death certificate.

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