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INTERNATIONAL

WORLD HERRING POPULATION THREATENED

Hamburg DER SPIEGEL in German 1 Aug 77 p 78

[Text] European fishermen went after herring without regard for available resources. Now that the schools have been thinned out, they are looking for a substitute.

To Nico de Niet, captain of the Dutch fishing cutter "Scheveningen 33-Maria," the inconceivable happened one afternoon. While the boat was dragging its nets off the Scottish Coast, a patrol boat of Great Britain's Royal Navy suddenly pulled up alongside.

Her Majesty's naval Officers demanded inspection of the cargo of fish. After a look into the cargo compartment, the Britons placed the Dutchman under arrest. Boat, nets and cargo, including 8,000 kg of herring, were confiscated.

Only a few days after the Dutch cutter was stopped, a judge in Scottish Aberdeen imposed a fine on Captain de Niet amounting to the equivalent of DM 100,000 for defying a herring-catching ban promulgated by London.

It is true that the Dutch Minister for Agriculture and Fisheries, Alphonse van der Stee, as late as at the beginning of last month, berated the Britons' rationale for their ban on catching herring as "hypocritical and sanctimonious". However, by mid-July, the Dutch also realized that North Sea herring can only be protected from extinction by drastic conservation measures. For the danger already exists that herring, once a cheap protein source of the poor because of its wide availability, is becoming gradually extinct or at least a rare delicacy.

Since the end of the war, North Sea fishermen have pursued herring with increasingly improved, technically ever more sophisticated catching methods. The fleets, made speedy and mobile by means of large horsepower engines, located the schools of herring with sonic echo soundings, encircled them with nets which they pulled out of the water closed on top like a gold purse. For there was demand for the fish as green herring, salted herring, smoked bloater, sour herring rolls or pickled fat herring.

At first the yield was enormous. As recently as 1968, herring fishermen of the nine EEC countries hauled about 1,000,000 tons aboard their vessels.

Five years later, the excellently equipped flotillas netted only 570,000 tons. And last year, EEC fishermen could only supply 183,000 tons of herring to industry and consumers, approximately 70,000 tons less than the German fish industry alone can process annually.

Previously, fishermen had overfished other catching grounds and decimated them hopelessly, e.g. the Barents Sea, among others, located between Norway and Spitzbergen.

A similar threat hangs over the schools of herring in the area between Dogger Bank and Skagerrak. If the Europeans continued to fish as before, a commission official stated, "things can no longer turn out well" because even young fish, merely suitable for fish meal, were fetched from the sea before reaching spawning age.

According to scientists, North Sea herrings at this juncture have only a spawning stock of about 150,000 tons whereas at least 400,000 tons are necessary to permit a lasting regeneration of the schools.

Therefore European ministers for agriculture agreed in Brussels in mid-July to a catching ban to last initially until 30 September.

However, the EEC governments concurred that the protection period for herring would have to be extended at least to the next year, better yet to 1979.

Nevertheless, Europeans will not entirely have to do without herring. According to a resolution of EEC Ministers, it will be permitted to catch this year a total of 70,000 tons outside the zone between Dogger Bank and Skagerrak. EEC fishermen are compelled now to look for the desired fish, particularly west of Scotland and Ireland.

Based on calculations of EEC experts, another 183,000 tons of herring should be netted in the Eastern Atlantic. And in the Western Atlantic, off the North American Coast, EEC fishermen could even land 250,000 tons. According to EEC experts, this year the Baltic will yield catches totalling 420,000 tons of herring--too little, however, to balance the losses in the North Sea.

In the German fish-processing industry alone, a deficit of about 50,000 tons is expected this year. Some processing plants, according to Association Speaker Ernst Rudolphi, could well close down. Of a total of 14,000 jobs, 2,000-3,000 are in jeopardy.

The German consumer, whose annual herring consumption is about 6 kg, will have to pay more for the fish in the future: experts in Brussels estimate that the cost of herring will increase by almost 20 percent.

Substitutes for the rare and expensive herring could be the bluish whiting, at least that is the hope of the experts of the Marketing Institute of the Fishing Industry at Bremerhaven.

This relative of haddock and codfish is also a denizen of the North Sea. However, its skin fits so tightly that the meat "comes off in shreds" during filleting, according to a Bremen expert. Fish researchers ponder now how to process successfully the bluish whiting.

The fishery experts now plan to fish for the grenadier fish, called rat's tail, which is available in large numbers in the North Atlantic.

However, in the view of one expert, "the fish is so ugly that it can only be offered in filet form".

9073

CSO: 5000

INTERNATIONAL

CONTINUING POLLUTION OF WESER REPORTED

Frankfurt/Main FRANKFURTER ALLGEMEINE in German 19 Jul 77 p 9

[Article by Wg: "Murder of a River"]

[Text] Every day life in the Weser River is getting a little closer to its end. Those who are responsible for the river by their negligence are not concerned because they do not get hurt. The GDR potash industry in Thuringia, right behind the Iron Curtain, continues to discharge enormous quantities of dissolved salt residues into the Werra, a tributary, which conveys them into the Weser. Meanwhile, the river has become completely saturated with salt and what amounts to almost a catastrophe has lost its ecological balance down to its estuary because of this daily pollution amounting to many thousands of tons.

Although the Laender of Lower Saxony and Bremen may argue about the heat tolerance levels of the river in conjunction with projected power plant construction, they will ultimately agree on an acceptable solution. Communities and industry adjacent to the river do meet, step by step, at high cost to themselves, the standard set for water purification. The GDR, however, continues to ignore the complaints concerning the Weser's salt pollution which has multiplied in recent years. This unfortunately resembles a properly denounced early capitalist practice: I don't worry about leaving my dirt behind as long as nobody can take any action which would force me to be considerate--purification plants and filters would only drive my production costs up. It is high time that the GDR is made to realize by means of actual consequences that the natural environment is politically indivisible and that a "state boundary" starting right behind one's house does not absolve the polluter of his responsibility.

9073
CSO: 5000

MILLIONS LOST IN CAVIAR DUE TO CASPIAN POLLUTION

Teheran TEHRAN JOURNAL in English 13 Aug 77 p 3

[Text]

TEHRAN, — Pollution of the Caspian Sea has delivered another blow to Iran's caviar industry, which lost \$7 million worth of export earnings during the spring months this year.

Iran, which exports most of its caviar including the "golden" variety, could meet orders from only 60 tons against 104 tons during the corresponding period (March-June) last year.

There was no telling if the whopping 42 per cent fall in exports would be checked during the remaining two thirds of the year.

The drop in earnings from \$37 million to \$30 million was expected further to aggravate the condition of the Caviar industry.

Heavy pollution of the Soviet northern side of the Caspian, the world's largest inland body of water, was also reported.

CSO: 5000

VILLAGES SAID AFFECTED BY POLLUTED AL-RUMAYLAH RIVER

Damascus AL-THAWRAH in Arabic 4 Aug 77 p 10

[Article by Jalal al-Hayik on "the story of more than thirty villages which used to get their drinking water from the now polluted Rumaylah River]

[Text] One day the people of the village went out to welcome the river that ran in their direction. They wondered whether it was a heavenly blessing or a gift from the earth. The river was small and hardly sufficient to irrigate all the village land. The villagers rushed to irrigate their land. The children raced to swim in it. The road was shortened for the livestock that used to go a long distance to drink from another river. This village was al-Shamfaniyah in northeast Syria. The waters of this river were but the waste of oil production which has catapulted human civilization to its acme. A day and some hours later, a child died and others were affected. Some livestock and some land died. The real nature of the water of this river coming from the depths of civilization to the hunger of the poor became evident.

What is the story of this river, how did its water gather and why did it move into this village and afterward into more than 30 villages in the same area? During the thirties, oil exploration began in the Syrian Arab country and during the fifties [oil] was proven to exist in the northeast Syria, especially in the Karatshawk area and actual production began in the sixties. The problem we are dealing with started with the beginning of oil production. Accompanying the oil gushing from its beds underground are amounts of water which at the beginning may not exceed one percent of the oil produced. As the length of time of production increases so does this percentage [of water] which may reach in some wells one hundred percent. The increase of the water to oil ratio depends on a number of factors of which these are the most important:

- the amount of oil in the layer
- the size of the oil-producing layer
- the quality of the producing layer
- the method of production and the amount produced: there is self-production

when the oil gushes by itself because of the well pressure and there is production by pumping. Self-production carries a smaller percentage of water with the oil than mechanical production by pump. Increase in the water affects the amount of oil produced. Therefore, a well may be closed when the water reaches a percentage where production becomes uneconomic, depending on various factors that determine results.

What [Is the Origin of the] Water Accompanying Production

Oil deposits are usually found in coal or sandy layers. Water lies under the oil layer or at its ends. This is what is called oil deposits which are covered by a gaseous dome. When wells are drilled, water pushes the oil and some water mixes with the oil. As time goes on, this small amount of water increases due to the decrease of pressure in the layer.

The oil and accompanying water are taken to main gathering stations where chemicals are added to help separate the water. Oil is then taken to stations where the water and salts are separated. Gas is first separated, then the liquid is driven to specially prepared storage [tanks] to separate salt-rich waters through sedimentation. This is possible due to the difference in specific gravity between water and oil: oil is drawn from the top of the storage, water from the bottom. Oil is piped to refineries and drainpipes. As for salty water, its amount is small at the beginning of production and is taken to a closed basin called the evaporation basin where salts are sedimented.

As time went by and the amount of water increased, this basin was no longer large enough for the water piped into it. It was flooded and the water leaked into small canals and moved towards neighboring lands and small neighboring villages. Soon, this water gathered and moved into low-lying areas in the form of a river.

When the inhabitants of a neighboring village realized the danger threatening them, and after useless contacts with officials in the oil sector, they used their effort and money to dig a course to divert the "river" and its threat. This river resumed its course to the other villages. In time, this river grew larger and crossed larger areas.

To throw light on this problem, one has to explain what kind of water this is and what effect it has on the different facets of life in the area.

This water is replete with melting salts such as chlorine impurities and others. The percentage of these salts increases according to the layer and may reach 100 thousand parts in a million. Salty water has extremely harmful effects on the various aspects of life:

1. Salts settle on the land and turn it into a wasteland, killing all plantation. Furthermore, it penetrates the soil and makes it totally useless for agriculture.

2. This salty water mixes--especially during winter--with rainwater thus covering more land and causing greater damage to arable land.

3. This water passes by villages and inhabited areas. It is very harmful to the health of all creatures due to the salt and gas it contains. As a whole it is considered poisonous--something which creates problems for the inhabitants of the area and their livestock. Some livestock may drink this water and be poisoned. Children may swim in it and get sick or even die.

4. The poisonous gases may continuously evaporate as the water runs--something which pollutes the environment and consequently affects public health. This harm to human beings may creep invisibly and gradually become unmanageable. Sometimes, it may lead to inexplicable cases of death.

Such effects clearly show what the inhabitants of northeast Syria are going through. To show the true size of the problem, two important points must be made:

1. Salty water rushes from main oil production areas through an area of more than thirty villages extending from the Rumaylah area to south of al-Rad. Since the course of the river is irregular, salty water spreads in many directions covering large areas of up to 15 to 20 square kilometers in some areas and killing all forms of life. Such is the case in al-Sijlah, Zuwayhir, and Jiz'ah area.

2. The river of salty water flows near the village of Fattumah into the fresh water of the Rumaylah river. The two join course and continue flowing. The problem becomes more dangerous once we know that about 30 villages which used to get their drinking water from the Rumaylah river before it was polluted by salty water have now been deprived of its fresh water. In the Sabkh area where ground water is salty and undrinkable, the area inhabitants used to depend wholly on the water of this river. Furthermore, these were areas that depended on rain wells. Salty water mixed with rain water has deprived them of these wells. A visit to these villages is enough to make you feel the tragedy these people live. Even for their drinking water, they are under the mercy of tank drivers who bring them this water. After the water of their only river has been polluted and this they look at its flow like someone who turns the pages of his memory. Once we have witnessed the most important aspects of this serious phenomenon which does not augur well towards our progressive steps, shall we stand frozen before it?

Are we to accept that the negative effects of the production means in our country be reflected on the individual himself as well as on the sources of his livelihood and life?

We must search the oil world for a solution to this problem. It seems that the matter is not as easy as we may think. In most oil-producing countries of the world, this salty water accompanying oil is extracted and carried by rust-resistant pipes back underground into specially prepared wells by

means of mechanical pumps made in a certain way. In this country, however, the problem has existed for 8 years. It seems that a study is now underway to solve this problem in a manner similar to that of oil-producing countries, although we still seek temporary solutions to most of the problems we face. An important question remains: is the problem going to be finally solved by retaining salty water underground and sparing that area and its lands? In fact, that alone is not a solution since the problem has worsened and another problem no less serious has developed. The dead land is not going to support life again by stopping the flow of salty water into it. The people of this area who rely totally on agriculture for their living are now without a source of livelihood. The solution, therefore, will have to include the plight of these people either by building model villages for them in other areas to which they can be transferred, as was the case with the inhabitants of villages in the al-Ghan area of the Euphrates basin, or by conducting an intensive and expert study at the agricultural level to find the best solution.

Finally, it should be noted that one of the simplest axioms say in effect that man is the nerve of civilization and its mover throughout the ages. For us to leave a serious problem facing a number--no matter how small or large--of our people for nearly 8 years without the proper solution is to run against our cultural aspirations for the future. Proper planning and studied consideration of both negative and positive results before embarking upon any economic project is the best way to protect the individual against becoming a scapegoat of the civilization of society.

8676
CSO: 5000

OPEN-PIT MINING LAND BEING RESTORED

Johannesburg THE STAR in English 18 Aug 77 p 12

[Article by Mike Nicol]

[Text]

Opencast mining has an ugly history. It scars the countryside and rips up farmlands.

Yet this way of mining, according to mine experts, is a cheaper and more effective way of extracting coal than underground mining and will be used more widely in the Transvaal in future.

Ironically a large portion of the country's good farming area lies within the Transvaal's coal bearing region.

Of South Africa's 103-million ha of land available for farming, only 5.1-million ha can actually be cultivated, points out Mr D. J. Bosman, vice-chairman of the Transvaal Agricultural Union.

"On this comparatively poor agricultural soil," he says, "the farmers have to produce sufficient food for the country's growing population."

'Stripped'

"I feel that the cost of restoring land must be part and parcel of mining costs. If the destruction of irreplaceable soil is added to the liability side of our balance sheet, the long-term development advantages of mining may in some cases even prove negative."

In 1971 Optimum Collieries, near Hendrini in the Transvaal's eastern highveld, began large scale opencast coal mining. By using this method they set a precedent which is expected to be widely used in future.

CARE visited the mine recently to gauge the impact of these large mounds of black shale, rock and earth against a background of farmland. Optimum, fortunately, are conscious of this impact and are making every effort to restore the land they have "stripped."

Presently the mining is being carried out on what was poor grazing land.

"We hope to leave this land in a better condition than we found it," says mine manager, Mr Mike Fleming.

This is no idle boast. The spoil heaps are being bulldozed into undulating hills at the rate of 12 ha a month, and planted with grass and pine trees.

"Once this has been planted with trees it will blend with the environment in such a way that evidence of previous mining operations will hardly be noticeable," he says.

The man directing the restoration work is opencast manager Mr Louis Botha. Part of his project included turning one of

the unfilled "strips" into a lake.

In the crystal clear water there are black bass and carp which he feeds each morning with mielie pap. It is his dream that in two years' time people will be able to camp and fish around the lake.

Vital

Problems start in Mr Fleming's eyes, in five years when the mine begins digging into maize growing country.

"I would rather plant pines and put our bulldozers into clearing potential mielieland than pretend we can return the soil to its original quality," he argues.

In the United States, mining companies are raising livestock and growing crops on reclaimed land, but at great cost.

The same situation will probably develop in South Africa, and it is with this in mind that Mr Bosman recommends: "Action on the restoration of mined-out land is at all times vital in South Africa with its limited and fast diminishing land."

ZAIRE

BRIEFS

REVOLUTION PARK CONSTRUCTION HALTED--All construction work in the Kinshasa Revolution Park by GROUPEPIMMO [Realty Group] has been suspended by order of the State Commissioner for Environment, Conservation and Tourism. Citizen Kakiese Ofine, managing director of Zaire's Institute of Zoological and Botanical Gardens announced this action had been taken pursuant to departmental order No. 054 DCNT-BCE 77 of 22 June 1977 relative to protection of the Kinshasa Revolution Park. By arrangement with certain departments of the Kinshasa City Hall, GROUPEPIMMO had begun destroying the park to build a series of stores similar to those the firm had previously built on Rukadingi and Marais avenues. This construction work having destroyed the large culverts that serve to drain water from the Gombe area through Revolution Park had caused flooding in the park and its surrounding area, including the city's central market. [Text] [Kinshasa ELIMA in French 28 Jul 77 p 1] 8041

CSO: 5000

FUEL INDUSTRY VERSUS ENVIRONMENTAL PROTECTION

Kiev EKONOMIKA SOVETSKOY UKRAINY in Russian No 6, Jun 77 pp 58-63

[Article by M. Tikhonov, candidate of technical sciences: "The Fuel Industry and Environmental Protection"]

[Text] The Fundamental Directions for the Development of the USSR National Economy in 1976-1980 devote a great deal of attention to problems of environmental protection, and emphasize that the harmful effect of wastes on the environment may be sharply reduced through introducing efficient new methods and systems of developing mineral deposits and advanced industrial extraction processes.

The fuel industry is among the industrial sectors that do the most damage to the inhabited environment when they are in operation. This is particularly true of the coal industry, due to damages of the earth's surface, pollution of the water and air, noise loads from the operation of the fans for the principal ventilation of the mines, etc.

The geological mining conditions under which the coal beds occur in the deposits of the Ukraine cause rock to be obtained when mining work is done, and moreover, the shallower the bed being worked, the more of it, and vice-versa. The average dynamic thickness of the beds being worked in the republic is within a range of 0.84-1.30 meters, and with this amount a great deal of rock is obtained, which is primarily turned out on the surface.

In the last 15 years the amount of rock yielded from the republic's mines per 1000 tons of extraction, despite a reduction in this indicator for the L'vovsko-Volynskiy Coal Basin, on the whole for the Ukraine, is quite high. In 1975, for example, 62.5 million tons were yielded, for which 19.2 million rubles were spent (with the cost of transporting along the surface and storing tons of rock in the dumping ground being 0.321 rubles on the average). Since the Donbass coal industry was developed, there has been so much barren rock accumulated on the surface that it has become one of the basic sources of air pollution and has taken up over 7500 hectares of fertile land.

Within the limits of the Donetsk and L'vovsko-Volynskiy coal basins there are now 1259 rock heaps (including the dump heaps from the dressing mills), of which 52.6 percent are being burned and 500 dump heaps are not in operation. Most of the rock heaps are located in the cities and the workers' settlements. In Donetsk, for example, there are 116 units of them. Approximately 6 million cubic meters of rock are dumped on them each year. The heaps reach a height of 120 meters.

In addition, in the Donetsk Basin there are about another 200 small rock heaps from the prerevolutionary period: they have already been covered with vegetation, and most of them are located on unproductive lands.

During the Tenth Five-Year Plan, seven mines with a total capacity of 16.8 million tons a year are to be put into operation at the existing enterprises. Due to this, seven waste piles with a yearly discharge of about 1 million tons of rock will be added.

The presence of waste rock piles on the earth's surface in general, and of the burning ones in particular, cause the climatic conditions of industrial regions to deteriorate. The waste piles have become a serious and dangerous source of environmental pollution. Since the amount of rocks issuing from the mines, given the present extraction process, increases with the rise in volumes of coal extracted, the problem of the rock waste piles has also become an urgent one, and its solution requires theoretical and engineering developments, as well as economic studies.

The solution to this problem should proceed in two directions. The first is the elimination, with minimal cost, of the harmful effect on the environment of the existing rock waste piles, and the second is the development of measures to prohibit the formation of new rock waste piles, that is, for waste-pile-free coal mining.

The elimination of the harmful effect of the existing and inactive waste piles of the mine rocks on the environment is implemented by dismantling them and carting the rock away, beyond the limits of the population center, usually to a ravine, by planting greenery on the rock waste piles, using the rock from the waste piles as building and filling materials, raw materials for fertilizer production, etc.

It is too expensive to eliminate the waste piles by dismantling them and carting the rock away. For example, carting away two rock waste piles with a volume of 500,000 cubic meters at Donetsk cost about 1 million rubles. The cost of restoring one hectare of land in this way varies within a range of 200-500,000 rubles or 2-4 rubles per cubic meter of rock. Nevertheless, this method should not be rejected completely. Its use in each specific case requires careful discussion and technical-economic substantiation, taking into consideration the hydrological and ecological factors. If, for example, the city or settlement has ravines that spoil the landscape, in this case it will be efficient to fill them in with rock from the nearby

waste piles, and then to cover them with a layer of fertile soil and plant trees. In this way a nice park was created for the workers' recreation in Donetsk.

Planting greenery on the waste piles of mining rocks is cheaper than dismantling them. In this case, the burning rock waste piles are first extinguished. After that, the cones are reformed, and there are many of them, into flat pieces. Slopes are laid out, terraces are cut, fertile soil is brought in, which covers the surface of the waste pile with a thickness of 0.5-0.7 meters. Then young acacia, ash, poplar and willow trees are planted, in the hope that in time the dead mountain will become a forested hill. This method has been used to landscape the waste piles of the Tsentral'naya-Zavodskaya Mine and Mine No 11 in Donetsk. The cost of landscaping one hectare is 5-50,000 rubles.

Extinguishing and landscaping the waste piles of rock is the concern of specialized organizations of the UkSSR Ministry of Coal Industry. These organizations are provided with equipment and staffed by a certain complement of associates. Methods and devices have been developed to extinguish the cones and flat waste piles of rock. The most efficient method, as practical work has shown, is extinguishing with water, with the reforming of the waste pile, since it makes it possible to perform the work on a wide front and with the least physical labor input.

The most efficient trend--utilizing the mine rocks by making building materials from them and using them as filling material--is being developed more slowly. In other coal-extractive countries, however, they are quite widely used in the construction of roads, airfields, etc. In the Federal Republic of Germany, for example, the rock from the mines and the dressing mills is used to build roads and dams. In 1970, 64 million tons of rock were taken from the mines here, of which 30 million tons were placed in waste piles and 34 million tons were used to fill in the space that had been worked.¹

In England, over 400 million tons of rock from waste piles are suggested for use in the construction of a third airport for the capital, and this constitutes over 40 percent of the major waste piles of rock in the country.² Here the rocks from the mine waste piles, mixed with cement, are used to pour off for road bases, and when mixed with bauxite produce an abrasive-resistant road covering; the manufacture of light and heavy fillers for concrete, etc. is being set up.

In the Polish People's Republic,³ the rocks from the mine waste piles are used on an industrial basis. The Polish-Hungarian Khaldeks Society was organized for this purpose as early as 1959. Its enterprises are now processing 4 million tons of rock a year, and at the same time are obtaining about another 450,000 tons of coal with a combustion heat of 5000 kilocalories per kilogram. The rock is used to produce brick and cement, as a filler in the manufacture of light concrete slabs, and also as material for filling up the worked-out space at mines. Rock waste piles in Katowice are utilized completely, and here there is about 40 million tons of rock a year from the mines.

The waste rock from our basins, the predominant components of which are: SiO_2 (50-55 percent); Al_2O_3 (20-23 percent); Fe_2O_3 (3.8-6.4 percent),⁴ may be used efficiently in brick production as burn-out and inert additives and to increase the content of aluminum and iron oxides in the brick.

The use of rock of this chemical composition in the mixture of brick plants in our country in a volume of 6-7 percent will make it possible to reduce the period for drying the brick in natural dryers by 1-2 days, and to increase the output of brick from 1 square meter of furnace flue by 15-18 percent and save fuel. The brick plants of the UkSSR Ministry of Building Materials in 1975 used approximately 30,000 cubic meters of waste rock, which is extremely insufficient.

According to the data from individual studies,⁵ the mine waste piles contain from 5 to 20 percent coal. If one takes even 10 percent as the average, the total amount of coal appearing in the rock waste piles every year is approximately 6 million tons. This is the yearly extraction of two large mines in the Donetsk Basin. A small part of this coal is recovered, and the rest of the amount is not used.

It appears to us that there is an urgent need to engage in wider assimilation of scientific developments with respect to utilizing the rock from mine waste piles, and to engage in this on a scientific basis. For this purpose, after summarizing the results of the research of numerous institutes, a technical-economic report should be drafted on the comprehensive utilization of waste pile rock and acquiring coal in this way. This will increase the percent of utilization of secondary resources, which was mentioned in the Fundamental Directions for the Development of the USSR National Economy in 1976-1980, and promises great economic benefits. Furthermore, which is very important-- the climatic conditions of the industrial regions will be improved.

Since the mine waste piles do great damage to the inhabited environment, the waste piles of barren rock must in general not be on the surface. This can be achieved by leaving the rock in the mine and by full utilization of the part of it that does appear at the surface.

In the early period of development of the coal industry, there was a slowdown in leaving the rock in the mine because of the lack of reliable and economical fill-up and transport devices. At that time the problems of environmental protection were not so critical, either. Now, when the mining technique has taken great strides, favorable conditions have been created for leaving the rock in the mine by embedding it in the space that has been worked.

The Krasnyy Oktyabr Mine of the Ordzhonikidzeugol' Association may serve as an example of coal extraction with the filling up of the worked-out space. At this mine the hydraulic embedding contributes to reducing the cost of coal extraction. According to the data of the Institute of Mining Affairs

imeni A.A. Skochinskiy, coal extraction with hydraulic filling ensures a saving of up to 3 rubles of current expenditures in a ton of coal extracted. Pneumatic filling of the worked space is used at the Mine imeni Gor'kiy in Donetsk. The filling work is also done at other mines in the Donetsk Basin.

As is known, the sources of obtaining rocks in a mine are working (47 percent) and supporting (51 percent) the mines. A total of 2 percent of the rock is obtained from cleaning-up operations.

The total quantity of rock obtained in a mine from working and supporting the mine workings may be determined according to the formula:

$$Q = L\gamma S_{np} + KtS_{cs}L_1 (\tau).$$

where Q is the total quantity of rock (tons); S_{np} is the area of the cross section of the shaft in the tunneling through the rock (m^2); γ is the volumetric weight of the rock in the loosened state ($tons/m^3$); L is the length of the tunneled shaft (m); K is the yield of rock during repair ($tons/m^3$ per year); t is the time of supporting the shaft (years); S_{cs} is the area of the cross section of the shaft inside (m^2); L_1 is the length of the supported shaft (m).

All the values included in the formula (1) or known are easily determined, with the exception of the yield of rock from supporting the shafts (K). The amount of this variable depends on a number of factors, including the physical and mechanical properties of the wall rocks, the type of supports, the method of protecting and tunneling the shafts, etc. This value is determined by a purely empirical method. For the supported panel and wall drifts of the L'vovsko-Volynskiy Coal Basin, secured by a pliable metal support made of a special shape, with a longwall development system, the value for the variable that we determined was $1500 tons/m^3$ per year, and with the bord-and-pillar development-- $0.3 tons/m^3$ per year.⁶

Approximately 89 percent of the shafts in the Donetsk and L'vovsko-Volynskiy basins are tunneled through the bed and only 11 percent--through rock (crosscut, field drifts). The bed of the working is driven through either by a short or long wall. In the first case, the rock obtained from drifting the working is discharged entirely onto the surface, and in the second--is filled into the so-called prop.

Systems of driving the shafts with a long wall were worked out for the mines of the Ukrainian part of the Donetsk and L'vovsko-Volynskiy basins, on the basis of the existing and planned technique.⁷ Their use will make it possible to leave in the shaft the rock obtained from tunneling the workings along the layer, by means of which its discharge onto the surface will be reduced by approximately 50 percent. The rock coming from tunneling the shafts through the rock (crosscut, field drifts), which is approximately 10-12 percent, is to be used to fill in the worked space of the longwalls.

The yield of rock from the support of the mine workings may be reduced by conversion to the bord-and-pillar workings, tunneling the shafts in stable wall rock, using special supports, etc.

It is, however, impossible to avoid completely the repair of the workings. Therefore, some quantity of rock from the support of the mine workings will be obtained, and it is recommended that it be filled into the worked-out space of the longwalls. This does not result in making the tons of coal obtained more expensive, since the expenditures to fill the rock in the worked-out space are equal to, and at some mines even less than, the expenditures to transport it to the waste pile.

Formed during the working of the beds is the so-called worked-out space, which in most cases is now filled in with rocks that fall in from the roof, and this causes a shift in the entire layer of covering rock. Since the coal is now extracted at large areas and relatively slight depths, the process of shifting the rock of the roof is completed by the settling and deformations of the surface and the formation of basins.

The process of the shifting of the rocks and the settling of the earth's surface takes place more intensively as the mining is done at less depth, and also with the greater capacity of the bed being worked. From this standpoint, unfavorable conditions are being formed in the Western Donbass (Dnepropetrovskaya Oblast). Here the coal beds with a total depth of 4.5-8.5 meters occur at a depth of 160-205 meters. The terrain of the locality is characterized by the presence of uplands and lowlands, and the river valleys are widely developed. When the Samara and Vol'ch' rivers are at high water levels, a tidal space 10-15 kilometers wide is flooded, and under the floodplains of these rivers are 37.2 percent of balanced coal deposits, suitable for excavation.

It is expected that working 5-11 beds of this capacity under the floodplains of the rivers will cause noticeable settling of the earth's surface by 4-7 square meters. As a result of this, during the high waters, the lower part of the earth's surface will be inundated, and the area of the inundation will reach 20,900 hectares, on which are located villages, recreation areas, forest tracts, orchards and meadows.

Under these conditions, in our opinion, the complete filling in of the worked-out space of the longwalls will be an efficient device, and the sole device to ensure the full extraction of the coal deposits under the floodplains of these rivers and eliminating the flooding of a large area on the surface.

Therefore, we regard leaving the rock in the mine as a necessary and comprehensive measure that will increase the coefficient of extraction of the coal deposits, prevent the formation of waste piles on the surface of the mines and will reduce to a minimum the harmful effect of mining on the environment. For this it would be expedient to plan the volume of coal

extraction with complete filling in of the worked-out space, and to provide incentive for the supervisors who yearly reduce the amount of rock discharged onto the surface.

The axial-flow fans for the main ventilation of the mine are very disturbing when they are in operation: their monotonous noise can be heard for 2-3 kilometers, and since they operate on a 24-hour basis, this is very burdensome for people.

In order to reduce the noise, Dongiprouglesh developed standard mufflers for all the axial-flow fans in operation at the mines of the UkSSR Ministry of Coal Industry. At the mines under construction, the fans are as a rule installed with noise suppressors, which ensure adherence to the permissible sanitation norms. The design of these suppressors should be improved, however, so that they will be more efficient and economical.

Brown coal is extracted in the Ukraine mainly in the Dneprovskiy Basin, by the open-cut method. At the beginning of 1976, seven open-cut coal mines were in operation. The total area occupied by these open-cut mines for mining and industrial structures is 7810.4 hectares, and of them, 6712 hectares are for the mining work. As the coal reserves are worked out, these lands will be compulsorily restored and turned over to kolkhozes or sovkhozes for use according to the direct purpose. The restoration will be carried out in accordance with the planned procedure from the plans of the UkrNIIProyekt Institute of the USSR Ministry of Coal Industry.

The recultivation plan stipulates the removal of the surface layer on the areas allocated for open-pit workings, and then taking it away either to waste piles prepared for recultivation, or to storages. The restoration begins with the leveling of the waste piles with bulldozers, with the subsequent covering of the leveled surface with a layer of soil at least 2 meters thick, on which chernozem will be strewn, after which the restored area will again be leveled by bulldozers.

The recultivation work is carried out in this sequence throughout the operative period of the mine. The restoration work is essentially an integral part of the over-all industrial process of extracting coal by the open-pit method.

The expenditures for the recultivation work are included in the total production cost of the coal extracted. They are not identical for each open-cut mine, but vary within a wide range. At the Bandurovskiy Cut, for example, the costs are 28.6 kopecks per ton, or 3.9 percent of the total production cost of the ton of coal extracted.

The work of the dressing mills also has an adverse effect on the environment. It is manifested in the pollution of the earth's surface with the wastes from the dressing (rock and tailings) and of the air--with gases emanated by the drying units. As is known, dressing mills are constructed and will

continue to be constructed in order to remove the mineral impurities in the coal and thus raise its quality. The more incombustible substances are removed, the higher the heat-producing capacity of the dressed coal, and, consequently, the higher its quality. In this case the rock yield in quantitative terms is regarded as the indicator of the perfecting of the industrial process for dressing, and is a desired result.

The amount of dressing wastes increases in direct proportion to the volume of dressed coal and the percentage of its content of mineral impurities. These indicators will increase in the future. Consequently, the rock waste piles at the dressing mills will increase. At present these wastes are not widely used. They should serve as the raw material for the production of other products, and not become the source of environmental pollution.

The scientific research institutes have developed many ways of using the wastes from the dressing. The restricted nature of their application, in spite of the great economic and social effect obtained from utilizing waste-pile rock, in our opinion, may stem only from reasons of an organizational nature.

A substantial source of air pollution at the dressing mills are the drying units, which release stack gases to the atmosphere with a high content of sulfuric and nitric oxides and coal dust. A substantial portion of the harmful discharges are caught by the gas purification units, which, however, do not guarantee the necessary sanitation norms. A large field of work is opened here for scientific and practical workers in developing efficient and economical purification devices.

The process of extracting coal by the surface method is as a rule accompanied by pumping the water out of the mine workings and discharging it on the surface. Every year, in the Ukrainian part of the Donetsk Basin alone, 565-570 million tons of water are discharged, which constitutes approximately 3 cubic meters per ton of coal extracted. Unfortunately, however, it is impossible to use the mine waters without purification even for technical needs, since they contain a suspension of a number of mechanical impurities, as well as mineral salts. Discharging the unpurified waters from coal mines onto the earth's surface leads to silting up the beds of the rivers and reservoirs, salination of the soils and other adverse effects on nature.

In order to improve the sanitation conditions of the environment and increase the drinking water resources, which are in short supply in the Donbass, work has been developed in the republic to purify the mine waters to the degree at which they can be used for technical and household needs, instead of drinking water. Work is being done on a wide scale to seek reliable and economical means of purifying mine waters:

In 1974 the associates of the Laboratory for Improving Methods of Purifying Industrial Runoff From Coal Enterprises (Donugi),⁹ compiled an album of industrial systems of purification installations for their use when planning

new and renovating existing enterprises. The album describes 15 types of units designed for coal and shale mines to purify mine water used for technical needs, instead of drinking water (see Table). The technical-economic indicators for the existing purification units are shown in the table.

At present a great deal of drinking water is consumed in mine baths, boiler houses, for dust-suppression at mine workings and for other purposes. For each ton of coal extracted in the Ukrainian part of the Donbass, approximately 0.96 cubic meters of drinking water is consumed, or 188-189 million tons per year, and 3.1 times more is discharged onto the surface.

For each cubic meter of drinking water, the UkSSR Ministry of Coal Industry pays 11 kopecks, which with coal extraction of 188.5 million tons constitutes approximately 20.7 million rubles. Purification of 188.5 million tons of mine water, which with respect to its chemical and physical properties may replace drinking water, with the average cost of purifying a cubic meter of water at 1.9 kopecks, will cost a total of 3.6 million rubles.

The oil fields are included among the passive objects with respect to the nature of the interaction with nature. Nevertheless, developing the petroleum deposits has an adverse effect on the inhabited environment: the ecological system is disrupted, the agricultural resources are reduced as the result of drilling wells, laying petroleum pipelines, structures for multiple and final pumping stations, etc. At the same time there are losses of petroleum in extraction, preparation, collecting, transporting and storage. At the Chernigovneftegaz oil fields the principal losses occur in the preparation. The total losses of petroleum in the republic in 1975 were 157,300 tons.

When entering the soil, sea, rivers and lakes, the crude oil does a great deal of damage, since it is a potent poison for everything living: it has an adverse effect on physiological processes, causes pathological changes in tissues and organs and disrupts the work of the enzymatic apparatus and the nervous system.

In order to reduce to a minimum the petroleum losses, the enterprises of the Ukrneft' Association are using more efficient methods of developing the deposits, and other measures. In the future it is planned that automated measuring units of the Sputnik type, a closed system of petroleum collection, reservoirless delivery of the petroleum, equipping the raw materials and commodity reservoirs with airtight fittings, etc. will be put into operation. It is assumed that by means of this the petroleum losses will be reduced by 55,000 tons by 1980.

A great deal of water is extracted along with the petroleum. It is purified, after which it is pumped into absorbing layers, and also used to maintain the bed pressure. At the deposits of the Donetsk-Pridneprovskaya depression, for example, the bed pressure is maintained mainly by using sewage waters.

Technical-Economic Indicators of Purification Units

(1) Показатели	(2) Единица измерения	(3) Производительность установки м ³ /час			
		(4) тыс. м ³ /год			
		150	40	30	20
		1317,6	325,5	249,0	172,0
(5) Сметная стоимость	(10) тыс. руб.	230,0	31,1	29,6	26,2
(6) Удельные капитальные вложения	(11) руб./м ³ год.	0,174	0,095	0,118	0,152
(7) Среднее значение	(11) »	—	0,135	—	—
(8) Эксплуатационные затраты	(12) тыс. руб./год.	33,7	3,9	4,0	3,5
(9) Себестоимость очистки	(13) коп./м ³	2,8	1,2	1,6	2,0
(7) Среднее значение	(13) »	—	1,9	—	—

Key:

1. Indicators
2. Unit of measurement
3. Productivity of unit in m³/hour
4. Thousand m³/year
5. Estimated cost
6. Specific capital investments
7. Average value
8. Operating costs
9. Purification cost
10. Thousand rubles
11. Rubles/m³ in a year
12. Thousand rubles/year
13. Kopecks/m³

In order to prevent pollution of the soil cover, when the wells are drilled, closed systems for utilizing the sewage waters are applied, with a unit for additional pumps. In some cases drilling without a reservoir is carried out.

A large amount of resources are consumed every year at the Ukrneft' Association to construct facilities to utilize casing-head gas in the eastern areas of the Ukraine. Nevertheless, approximately 25 percent of it is consumed in the flames. There are particularly high losses of casing-head gas at the Chernigovneftegaz and Poltabaneftegaz fields.

Burning up the casing-head gas in the flames does a great deal of harm to the environment, since a considerable amount of oxygen is lost from the atmosphere in the process, and carbon dioxide and steam enter it, instead. In addition, a unique temperature field is formed around the flames, and in a radius of approximately 200 meters, in the winter, there is no snow cover established because of the intensive evaporation of moisture.

Sections of land are allocated for the oil fields. At the beginning of 1975, with respect to the association, there were 7587.7 hectares, including 5929.9 hectares in constant use. To restore the lands allocated for temporary use, at the enterprises, there are special brigades, which are supplied with the

appropriate equipment. In 1974, 834 hectares of land were recultivated and returned to permanent land users, for the restoration of which 418,000 rubles were spent (recultivation of 1 hectare cost approximately 500 rubles). The areas of land allocations for the construction of wells, discard lines and petroleum and gas pipelines were also reduced.

In contrast to the coal- and petroleum extraction, the extraction of natural gas has no perceptible adverse effect on the environment, with the exception of the fact that the gas fields occupy a certain area, reducing the agricultural resources. After the gas field operation has ceased, however, the land will immediately be turned over to the kolkhozes (sovkhozes) to use directly.

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USSR

MINSK LAGS BEHIND IN AIR POLLUTION CONTROL

Minsk SOVETSKAYA BELORUSSIYA in Russian 30 Jun 77 p 2

[Article by A. Myznikov]

[Text] The streets of Minsk become more crowded every year. Citizens of Minsk now use over 60,000 passenger cars and 20,000 motorcycles. All these machines bring people comfort and are necessary conveniences, but at the same time they are the cause of many concerns and at times even alarm.

"The amount of exhaust gases from motor vehicles poisoning the air increases constantly," writes to the editor Yu. Polinskiy, mechanic of the SU-7 [Construction Administration] from Zaslavl', "This is due to a lack of proper monitoring of the condition of the internal combustion engine. But, in fact, the products of incomplete combustion of gasoline exhausted into the air are harmful to the health of the people and to the environment."

The writer of the letter is correct. And, by the way, his thoughts are of great concern today to scientists, doctors, city planners, GAI [City automobile inspection] workers and many other services fighting for clean air in our cities. In Moscow, for example, on Komsomol'skaya Square, on the Varshavskaya Highway, in the region of Lyublino, the VDNKh and several other places unusual little houses made of silvery metal appeared. These are original air pollution observation and monitoring posts. All of them are equipped with sensors and devices for sampling air. Moreover, mobile laboratories are sent out daily into the streets of the city. Device indications and analyses are sent to the central high-altitude hydrometeorological observatory created on the Ostankino TV tower. Analyses of the results are sent immediately to the Moscow Soviet ispolkom. It is characteristic that in Moscow, in spite of the constant increase in traffic, air pollution is being reduced constantly.

All motor vehicles in Moscow were placed on a strict mode of efficient utilization of fuel, and engines are adjusted not to pollute the air with exhaust gases. In addition, a considerable part of the buses and trucks was changed over to a less toxic fuel--liquefied gas. Similar measures are being taken in Leningrad, Kiev and other large cities in the country.

Minsk is a modern, growing city. Our guests, no matter where they come from, are delighted with our drinking water, tasteful and clear; they praise the landscaping of the capital; the cleanliness of its streets and squares. But so far Minsk lags behind a number of cities in the country in fighting air pollution. And yet, the experience of Moscow and Leningrad shows that in the first priority it is necessary to monitor motor vehicle transport which accounts for up to 70 percent of the total amount of toxic exhausts in large cities. Carbon monoxide is the product of the operating process of the engine. Its amount in exhaust gases depends basically on the composition of the fuel mixture of gasoline and air. The quality of the mixture must be carefully regulated by the carburetor for efficient operation of the engine insuring a more complete and clean combustion of the gasoline.

Besides carbon monoxide, exhaust gases of the engines operating on ethyl gasoline contain about 200 chemical components many of which are far from being harmless to our health. Benzpyrene, nitrogen oxides and other toxic exhausts are especially plentiful when the engine operates on a rich mixture.

Operators of passenger cars and motorcycles in Minsk burn 380,000 tons of gasoline annually. And how it is burned--with a clean flame or with puffs of smoke poisoning the air--this question is difficult to answer today.

Technical inspection of private cars and motorcycles make it possible for GAI workers to check the proper operation of engines and the oxide contents in their exhaust gases once a year. But characteristics of the work of the engines may change sharply in the course of their operation, since the screw regulating the quality of the carburetor mixture is accessible to anybody, while in their attempt to raise power, drivers consciously enrich the mixture. This means that it is necessary to have constant monitoring by special posts on suburban roads and streets of the capital. This requires a great number of special devices--gas analyzers. It is obvious that the GAI does not have enough of them for organizing mass monitoring.

So far there is only one plant in our country that manufactures gas analyzers. And it is far away from the republic. The demand for these devices is very great. In the opinion of specialists, students combined in NTO [Scientific and Technical Society] circles of engineering vuz,

could develop portable gas analyzers successfully, and their production could be organized in radio and device building plants. Then all motor vehicle inspectors, workers of the GAI and sanitary inspectors from the active workers of the city sanitary-epidemiological station would be equipped with devices for testing engines for the toxicity of exhaust gases. Gas analyzers are very much needed also in motor vehicle enterprises where, speaking plainly, proper attention is still not being given to monitoring the content of toxic components in exhaust gases of the motor vehicles. Thus, a raid by workers of the GAI and the city sanitary-epidemiological station in September of last year indicated that nobody has been interested in this question for a number of years in Motor Vehicle Combine No 2, and that even an order to the enterprise did not define responsible inspectors.

Of 61 motor vehicles inspected by the participants in the raid, 21 vehicles had a high CO₂ content in the exhaust gases. This, when Motor Vehicle Combine No 2 has 1650 vehicles, and they are constantly engaged in transporting foods and other freight within the city.

The situation is not better with operating buses, the fleet of which increases constantly. The large "Ikarus" buses are especially favored by Minsk citizens. The writer of this article had the opportunity to review I. Pal, the leading designer of the 200 series of the "Ikarus." He expressed regret that when buying buses with powerful diesel engines in Hungary we do not equip them with special devices and tanks of liquefied gas for complete combustion of CO₂ in the exhaust mufflers of the engines. Then the buses would not be followed by clouds of smoke and carbon monoxide.

Test raids on terminal stops established that bus drivers do not turn off the engines during long interruptions in operation. This pollutes the air noticeably. Sudden occasional raids by strict inspectors and their fines do not solve problems of smoke screens on the populated roads of Minsk. The carbon monoxide content on Kozlov and Moscow streets and on Privokzal'nyy Square is considerably greater than the permitted norm. Devices indicate a considerable concentration of carbon monoxide at all crossings in the center of the city.

In February of this year, a meeting of the active workers of the party and the industry was held at which measures of the Minsk gorkom of the Belorussian party and the ispolkom of the city Soviet of Workers Deputies were approved on strengthening the safety and improvement of the environment of the city.

A resolution was adopted to organize, at all technical service stations for motor vehicles, a test of machines for the content of carbon monoxide in the exhaust gases and issue to motor vehicle owners special tags with an indication of the time of their validity. This year an environment protection laboratory will be opened, and starting in 1978, mobile posts will

be created for checking the toxicity of exhaust gases of carburetor engines. Moreover, the possibility is being studied of changing Minsk over to using non-ethyl gasoline and it was proposed to eliminate gas-filling stations on Krasnaya and Aranskaya streets.

Minsk still lags behind Moscow, Leningrad and Kiev in green-planted areas. A detailed plan was developed for a green belt around our capital. It will become a powerful filter for the city air.

It is our opinion that the time has come to pose the question of creating in Minsk a single center which would coordinate the operation of all services fighting for the purity of air.

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USSR

ENVIRONMENTAL PROTECTION IN CHERKASSKAYA OBLAST

Kiev RABOCHAYA GAZETA in Russian 15 Jul 77 p 4

[Article by V. Sidorenko, senior inspector of the Cherkasskaya Oblast Inspection Administration of the Government Committee on the Protection of the Environment of the Ukrainian SSR Council of Ministers]

[Text] In our oblast, as everywhere else, great attention is given to the protection of the environment. Party and Soviet organs, and the Society for the Protection of the Environment are mobilizing broad masses of workers for thrifty regard for natural resources. The government allots annually a large amount of money for the protection of the environment. It is sufficient to say that in the Ninth Five-Year Plan period about 18 million rubles were spent for the construction of environmental protection facilities. In 1976 alone, there were built and put in operation purifying installations with a capacity of 91,000 cubic meters and systems for circulating the water supply with a capacity of 16,000 cubic meters per day. At present, 115 industrial and municipal enterprises in our oblast have purifying installations, 73 of them with full biological purification. Their total capacity is 455,000 cubic meters per day. The discharge of unpurified drainage decreased seven times during these years, while the volume of water in circulating systems tripled.

Much is to be done in the Tenth Five-Year Plan period. Over 20 million rubles were appropriated for building various installations. Not only managers, but ordinary workers know about this. They are told about this constantly on radio and in newspapers.

It would seem that we have everything. The government gave the money. The people know about the volume of work to be done, where and what kind of purification structures and circulating water supply systems must be built. Each facility has builders. Yet, the situation at the construction sites is bad.

In the Cherkasskaya Oblast, it is planned to build powerful gas cleaning installations. The construction is being done by the "Cherkasskhimstroy" Trust (Comrade Areshkovich, manager). But how is the work done! It has not once assimilated the appropriated money since 1973. In 1974, for example, the plan for assimilating capital investments was fulfilled by 25 percent; in 1975--by 15 percent. Nor was an important facility put in operation in 1976 either. Installation work is frozen and imported equipment lies idle.

Everybody looks for the guilty ones. They blame the managers of the Zhitomir Structural Steel Plant of the Ukrainian SSR Minmontazhspetsstroy [Ministry of Installation and Special Construction Work]. They deny the complaint: "We do not fill such orders, you manufacture them at local enterprises."

In a word, Ivan kicks Peter, while in the meantime the air in the region of the southern industrial center, naturally, does not become clearer and purer. The air is polluted by the exhausts of the Chemical Fibers Plant, the "Azot" Production Association and the TETs.

A great deal of gas pollution is produced by motor vehicle transport enterprises. Motor vehicles with poorly adjusted engines go out on their routes and pollute the air. This happened in Motor Vehicle Enterprise 2233, in the warehouse of which there has been valuable monitoring-diagnostic equipment for 2-3 years.

Sewer systems are being built slowly. In the Zolotonosh, for example, due to the fault of the oblast department of municipal economy, less than half the money allotted for building sewer systems was used. In Cherkassy itself, capital investments for the same purpose were assimilated only by...18 percent. The pressure sewer at the Poultry Combine at Smela was not put in operation. Cleaning installations of the Steblevskaya Cotton Factory have already been waiting for 3 years to be put in operation. Yet, contaminated sewage from this enterprise drains into the beautiful Ros'!

It must be said that somebody does not pay proper attention to the protection of open water reservoirs. Individual kolkhozes in the Cherkasskiy and Chernobayevskiy rayons continue to soak hemp in rivers and lakes. Some Ukraine SSR Minprostroy [Ministry of Industrial Construction] enterprises in Uman', Zolotonosh and Smela discharge petroleum products any place. Purifying installations in Vatutin, at the Milk Plant in Chigirin, at the Fruit Canning Plant in Zvenigorodok are still not operating efficiently enough.

One cannot be silent about the fact that new, large animal husbandry complexes are being built without a clearly thought-out system for environmental protection. This is fraught with great unpleasantnesses.

Discussions were held for a long time and many resolutions were adopted in this connection. Apparently, the guilty ones must be held to stricter account for the harm caused to the environment, and for failure to put in operation expensive and very much needed environmental protection facilities.

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PURIFICATION FACILITY BUILT IN GOR'KIY

Moscow EKONOMICHESKAYA GAZETA in Russian No 31, Jul 77 p 15

[Text] The largest complex of purification facilities (Fig. 1) on the Volga designed by the "Giprokommunvodokanal" Institute was erected by Trust No 12 of the Glavvolgovyatskstroy. With its start in operation, the discharge of contaminated water into the Volga and Oka in the region of Gor'kiy stopped entirely.

Prefabricated reinforced concrete structures were used widely in the course of construction. The work was done by progressive methods. Thus, equipment was installed in large units weighing up to 50 tons. As a result, the actual construction cost was 1.6 million rubles lower than the estimated one.

The design and construction of the purifying installations at Gor'kiy were proposed for the competition for the 1977 bonus of the USSR Council of Ministers.

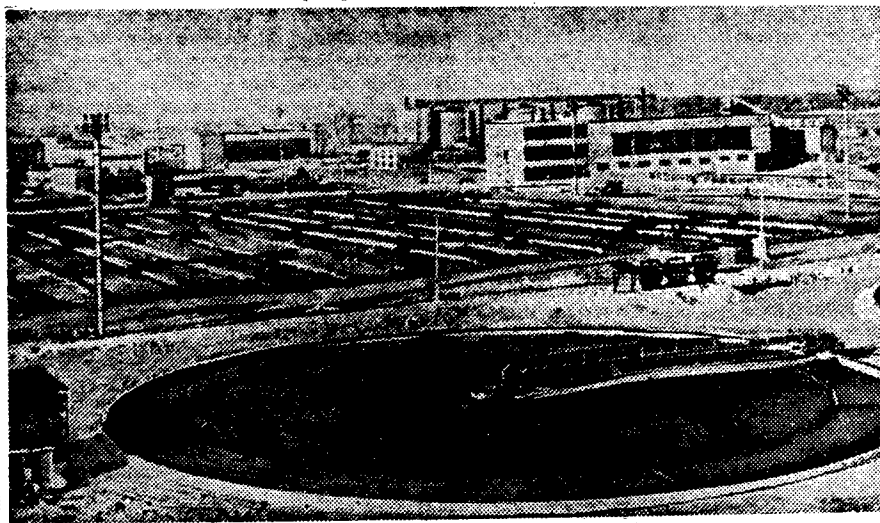


Fig. 1

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ENVIRONMENTAL PROTECTION, FORESTRY

Kiev EKONOMIKA SOVETSKOY UKRAINY in Russian No 6, Jun 77 pp 74-77

[Article by L. Il'yev, professor, doctor of economic sciences, L'vov Forestry Engineering Institute, and R. Gordiyenko, engineer-economist: "The Problem of Environmental Protection and the Use of Timber Resources"]

[Text] Today the problem of man's place in the world and of the relationship between people and nature, in addition to its lasting philosophical significance, has also acquired tremendous practical urgency. Society has now achieved a level of development at which the consequences of production and technical intervention in the course of natural processes must be taken into consideration and the elemental aspects in the relationship between society and nature threaten all of mankind with serious misfortunes. At the same time, it is now that society is beginning to have at its disposal the necessary technical means to affect the natural environment profoundly, on a large scale and consciously, to organize it efficiently, reproduce natural resources, etc.

The development and implementation of measures for environmental protection, optimum utilization and reproduction of natural resources was outlined as one of the important directions in the development of the USSR national economy in the Tenth Five-Year Plan in the decisions of the 25th CPSU Congress. It is sufficient, for example, to note that for these purposes, in 1976 alone, on the whole for the country, 1.7 billion rubles of state capital investments were spent. There are plans to spend 11 billion rubles total during the five-year plan for environmental conservation.

Efficient, economical, careful use of natural resources usually requires increased expenditures, which are paid back by high preservation of natural resources, as well as the possibility of solving not only economic, but also social problems involved in nature protection--preserving pure air and water, fertile soil, forests, attractive landscapes, etc., necessary for man's all-round development, his culture, creative forces and capacities, health and energy. Therefore, the measures directed toward providing the present and future generations with natural wealth, and thus, toward their efficient, optimum use, have now been raised in our country to the level of extremely important measures of the economic policy of the party and the state.

Until recently, as is known, the exchange of substances between nature and society was represented in the plans in a one-sided way, namely: what and how much people take from nature--how many dams will be built and where, in what area the earth will be tilled, how many agricultural products will be obtained. This planning, however, did not take into account the way in which the exchange of substances would change within nature itself, under the influence of anthropogenic factors. That is why society, in achieving the proposed goals, and not taking into consideration the consequences of its intrusion into the natural cycle, as a rule comes up against first one and then another negative process, and is forced to spend tremendous resources to neutralize it. The need to take into consideration the effect of human activity on nature was clearly determined at the 25th CPSU Congress. The speech by L.I. Brezhnev emphasized that agriculture also requires an approach from the standpoint of environmental protection. Agriculture is regarded as a tremendous, constantly operating mechanism of the protection and cultivation of living natural wealth.

The boundaries of national production have now been expanded, and reproduction of man's environment and preservation of the over-all system of survival and its improvement on a regional and global scale are becoming a production assignment. The manifestation of increasingly close ties among enterprises through the environment show that water, air, forests and soil are direct participants in the industrial processes taking place at a limited rate and requiring consideration and planning, just as the production processes at industrial enterprises. The development is progressing to the point where the relations existing between the enterprises and the environment are becoming just as intensive as among the individual shops. Today's progress in technology extraordinarily expands the possibility for both the specific and the elemental destructive effect on nature frequently accompanying production development. Many measures, if they are carried out in a bureaucratic and non-comprehensive manner, without taking into consideration the "reverse reaction" of nature, damage or may cause considerable damage to the country's economic system, the health of the people and their living conditions.

In the interrelations between society and nature, a primary role is played not only by the scientific-technical, but also by the social aspect, since people interact with nature not as the sum of individuals, but as a certain social organism. The social system is by no means a matter of indifference in this sense, and has a profound effect on the nature of society's attitude toward nature. The system based on private property, even though it may implement individual acts for the protection and efficient use of nature, on the whole creates difficulties in principle for a transition to systematic efficient organization and transformation of nature in the interests of the people.

During the nineteenth and the first half of the twentieth century, 500 million hectares of forest were destroyed in the world, while the area of artificial, restored and created forests during this developmental period of capitalism was not over 2-3 million hectares.

Under the conditions of capitalism, economic operations are based exclusively on obtaining direct profitability, and this is in profound contradiction to scientific use of the environment.

A socialist society regulates its development on the basis of long-term comprehensive planning of the entire national economy as a whole, which specifies the optimum use of natural resources and nature conservation. The striving toward the optimal interaction with nature for the socialist society was specified as early as K. Marx. "The collective man," he wrote, "and the associated producers efficiently regulate their exchange of substances with nature, and place it under their general control, instead of its dominating them as a blind force; they improve it with the least input of forces, and under the conditions most worthy of their human nature and adequate to it."*

Any transformation of nature should be economically thought out and should promise a certain economic effect, and moreover, it should be greater than other possible methods of satisfying society's demands for natural resources. Unless the economic data is taken into consideration, the research in transforming nature will be insufficiently purposeful. Furthermore, the economic analysis must begin with the positive aspects of the effect of national production on nature. It is a mistake to underestimate it. National production must not be shut down; it is impossible to cease the extraction of petroleum, even though its film still pollutes the rivers, lakes and seas; it is impossible to give up industrial operations in forests, etc. Another way is open: to divert national production away from the unfavorable results of its effect on nature, purposefully intensify the production growth rates, create even more highly developed productive forces, develop new technology, especially biochemical, and by means of it, regulate the effect of production on nature and on the processes of the cycle of matter and energy in nature.

Forest resources occupy an extremely important place in the over-all system of the biosphere. We know what a tremendous role the forests play in all spheres of human endeavor. The solution to the problem of nature protection on the whole, unquestionably, also touches upon the problem of using the forest resources. The Fundamental Directions for the Development of the USSR National Economy in 1976-1980, with respect to forestry, specify an increase in the productivity of the forests, efficient use of the forest resources and carrying out measures ensuring the careful, and at the same time complete utilization of useful products and properties of the forests. In this case, it is very important to emphasize the need for a comprehensive approach to the study of the forest resources. The importance of forests in the country's national economy is now multifaceted. In addition to the large amount of consumer values which the forest now gives in the form of timber, fruit, berries, medical and technical plants, etc., the forest tracts have a number of so-called "imponderable" useful properties and functions, even though at

* K. Marx and F. Engels, "Sochineniye" [Works], Vol. 25, Pt 2, p 387.

present science knows methods of determining most of the useful properties and functions of the forest (sanitation-hygienic, water-regulatory, soil-protective, recreational, etc.).

The forests are the sources of extracting a considerable amount of oxygen, absorb carbon dioxide, clean the air of dust and harmful impurities, deposit medicinal bactericide-fungicide-protozoocides, transport a considerable amount of sediment from surface to intrasoil runoff and protect the soil from washing away and erosion. The Carpathian forests have a wealth of useful industrial fauna. The steady output of numerous mineral springs in the Carpathians provides for the forests growing in the area nourished by these springs. The fact that over 2 million tourists a year visit the many exceptionally beautiful regions of the Carpathians and that hundreds of thousands of people are treated at the world-famous Carpathian health resorts is also closely related to the forest. Resting in nature, even for a short time, is not only esthetically important, but is also a definite economic factor. Studies made by us showed that regular rest in the forest for two days off, other conditions being equal, ensures an increase in labor productivity by an average of 3 percent.

The total economic effect, taking into consideration multi-purpose use of the forests, is 450-640 rubles per hectare per year. In this case the relative proportion of the value of the timber, from the entire sum of the useful effect is not over 7-10 percent.

The foresters of Volynia, merely from utilizing the wastes of the byproducts, obtain over 30 rubles of net income per hectare of forest. About 300 rubles of income from 1 hectare of plantings here is obtained from the utilization in their lifetime of the trees, as the result of extracting birch sap and resin.

Comprehensive use of the useful properties and functions of the forest necessitates an allowance for this when organizing and carrying out forestry operations. The correct solution to the problem of using the timber is particularly important. Scientists and production workers are engaging in discussions with respect to this. It should be emphasized that in the forests of the Carpathians, a great deal has been done for more efficient utilization of the forests' timber resources. The timber is utilized within the range of estimated woodcutting, gradual and selective cutting is being introduced on a wide scale, forest restoration work is being carried out to a great extent, biotechnical measures are being implemented, etc. But all of this does not make it right to consider the situation with respect to utilization of forest timber resources in the Carpathians as more favorable.

When seed forest felling is carried out gradually, in 2-3 stages, the soil erosion is 150 percent less than the erosion with continuous felling (the erosion under these conditions is reduced from 500 to 200 tons per hectare). This is also a calamity, but 150 percent less. It cannot be regarded as normal to have unprofitable organization of logging, when there are tens of

millions of cubic meters of overmature forest. Many other such problems may be mentioned. We will discuss, from the standpoint of nature conservation, the problem of industrial timber felling.

Felling the timber means the disappearance or at best a change in the state of the forest tracts. This change of a single component in the complex of natural relationships necessarily brings about a certain change in the entire complex: the climate in a certain specific region, the water exchange regime of the soils, making the rivers shallower, etc. All this has an adverse effect on the sectors of the economy, the natural basis of which is the former state of the climate and the water exchange regime in the soils and the hydrographic system of this region. Consequently, the workers of the forest sectors, when felling, transporting and processing the timber, must take into consideration the interests of other sectors. Taking these interests into consideration essentially means merely a change in the historically formed and presently existing methods of forestry and industrial timber felling.

We will demonstrate this using the example of forestry operations in the mountainous section of L'vovskaya Oblast. During the last two decades there has been a considerable reduction in the amount of chopping down of the timber, in accordance with the procedure of principal use (continuous and gradual cutting of the mature forest). While the actual amount of the principal use of the forest was formerly over 300,000 square meters, the cutting down of the timber is now reduced by over 33 percent. This measure has had a substantial effect on the preservation of the forests and preventing the erosion of the mountain slopes. It is enough, for example, to note that in 1948-1959 the mud flows in the Carpathians, as the direct result of immoderate timber felling on the mountain slopes, were repeated on an average of every other year. Now these catastrophic phenomena occur much less often. One of the reasons for the continuing mudflows, torrential flows and floods continues to be the cutting down of the timber in the mountains. The point is that, with the felling being sharply reduced, there was practically no change in the technique and process of timber felling. One does not have to go far back in the past to consider the consequences of the torrential downpours and floods in 1974. Within L'vovskaya Oblast alone the damage from them constituted several tens of millions of rubles. Using the approach of the standpoint of comprehensive consideration of the effect of chopping down the timber in the mountains on the environment, it can be stated that with an actual cost per cubic meter (for logging operations), of 14.6 rubles, the total national economic expenditures and losses occurring for each cubic meter of timber procured in the mountains are over 66 rubles. Such figures indicate that cutting down timber on the mountain slopes should be done by means of devices and methods of felling that are new in principle. Obviously, the national economy must use the timber that is cultivated, in whatever group of forest stock it is found. The problem lies in how to chop down, log and remove the felled timber from the forest.

The existing process for industrial logging in the mountain forests is not compatible with the task of increasing the protective, sanitation-hygienic, recreational and many other important functions of the forests. New forms of organizations and methods of using the timber resources, new in principle, must be developed.

One of the ways of solving this important problem is the introduction of methods of primary transport of the timber, by means of helicopters and other types of air transport. A series of experiments made in our country showed the biological, forestry and economic expediency of using helicopters in selective and other types of gradual felling. There is active research being done in this direction abroad, as well. This is a method of transporting timber that is new in principle. Notice should be taken of the obvious advantages inherent in it: the forest conditions are fully preserved, and the forest's fulfillment of its protective functions is not disturbed; there is a possibility of drawing into economic circulation the forest sections that are located in inaccessible regions of the Carpathians (according to estimates, 22.8 million cubic meters of mature beech forest is located in an area with difficult access); there is a solution to the problem of cleaning the forest sections and concentrating all the timber items at warehouses (small timber, branches, coniferous needles, etc., which may be utilized); there is no more need for expenditures for the construction and maintenance of expensive logging roads, which in the mountains cost over 40,000 rubles per kilometer of road.

The cost of procuring one cubic meter of timber, when whole trees are transported by an MI-8 helicopter, is 21 rubles, which is lower than the actual cost of timber procurement in many timber combines in the Carpathians. It should be noted that in the experimental work, a passenger helicopter was used which was not adapted for timber transport. An inexpensive helicopter should be designed that is simple, but has a certain reliability, load hauling capacity and low speed.

We are quite convinced of the national economic expediency and promising nature of using aircraft in the primary transportation of timber in the mountain forests. It is just that the solution to this problem must be regarded not formally, but with the exertion of maximum efforts and great enthusiasm.

The increased efficiency in the use of natural resources, including those of the forests, requires the immediate implementation, on a wide scale, of such measures as the economic evaluation of various types of resources, the improvement of planning systems with the compulsory inclusion of planned regulation of the exchange of matter between nature and society, the introduction of the principle of payment for the use of natural resources, and material responsibility of the users for the preservation and reproduction of these resources.

Carrying out such measures will make it possible to consider natural resources as an integral part of the country's national wealth, will create material incentive for the enterprises to have a careful and concerned attitude toward natural resources and will make it possible to determine, in accordance with a centralized procedure, the expedient limits of investing funds for the protection, use and reproduction of natural resources.

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BRIEFS

PURIFYING COMPLEXES--Odessa (Ratau)--The construction of two rubbish-burning plants is specified by the general arrangement of sanitary purification of the city developed by the "Ukryuzhgiprokommunstroy" Institute and approved by the ispolkom of the Odessa City Soviet. Questions of protecting air, water and the environment are the center of attention of those who were elected by the people. Powerful purifying installations were just put in operation at the "Stroygidravlika" Plant. According to the recommendation of a group of deputies, the latest methods are used here for neutralizing industrial sewage. Specialists evaluated the complex of purifying installations highly at the Metal Rolling Plant of the Association imeni Dzerzhinskiy. [Text][Kiev RABOCHAYA GAZETA in Russian 29 Apr 77 p 2] 2291

PROTECTION AGAINST SEA POLLUTION--Ukraine--A new specialized ship at the Zhdanovskiy Port is capable of cleaning over two hectares of marine surface per hour. Using special shields, the marine "yard man" cuts a thin layer of water along with petroleum waste products and floating rubbish, and directs them to a sedimentation tank, leaving behind a clean surface. Having stability on waves, such a cleaning ship, built at a local ship-repair plant, can operate not only within the port, but also beyond it, participating in expeditions in the open seas. Having assimilated the novelty, Zhdanov marine workers fulfilled one of the important points in the program of protecting the Azov-Black Sea basin from contamination. [Text][Riga SOVETSKAYA LATVIYA in Russian 10 Apr 77 p 1] 2291

AIR POLLUTION ANALYZERS--Kemerovo--The installation of equipment for the first system of air pollution monitoring began on the territory of the "Azot" Production Association. The analyzing devices will be able to determine the presence of harmful components in the air and send the information to a data collecting center. Such monitoring will help in establishing and eliminating quickly the causes of harmful exhausts. In the very near future, 24 such gas analyzers will begin operating in the zone of each large enterprise in the city and on highways with especially dense motor vehicle traffic. [Text][Moscow TRUD in Russian 19 Apr 77 p 4] 2291

THERMAL PURIFICATION OF INDUSTRIAL DISCHARGES--Voroshilovgrad--The Lisichanskiy Petroleum Processing Plant began taking 300 cubic meters less of river water per hour with the putting in operation of an installation for rendering thermally industrial discharges safe. [Text][Moscow TRUD in Russian 19 Apr 77 p 4] 2291

WATER PURIFICATION--Baku, Azerbaydzhan--The manufacture of the "spring" purification equipment developed by the republic Scientific Research Institute of Water Problems began in Azerbaydzhan. A model of water purification created by nature itself in the ground was embodied in special filtering devices. The "spring" is designed for purifying water in those regions of the country where rivers and irrigation canals are the only source of water supply. It does not require chemical reagents and reduces the costs to a fifth of those of ordinary installations. [Text][Moscow IZVESTIYA in Russian 25 May 77 p 2] 2291

FIGHT AGAINST AIR POLLUTION--Kazakhstan--Another boiler installation, the fifteenth since the start of the current five-year plan period, ceased issuing smoke in Alma-Ata. It was all eliminated by laying new main lines and apartment heating networks here. At the same time, six boiler installations were converted to natural gas. Many other measures were taken in recent times to improve the environment in the capital of the republic. Over a hundred stations were created here for monitoring and adjusting motor vehicle engines in order to reduce the air pollution by toxic exhaust gases. Diesel buses were removed from city routes. Basic passenger and freight traffic routes were reviewed in accordance with recommendations by scientists which made it possible to reduce the traffic density in densely populated districts. This was also facilitated by extending the length of trolley-bus lines. A new powerful TETs is now being built on the outskirts of the city. It will make it possible to eliminate, in the current five-year plan period, all small boiler facilities that contaminate the air. [Text][Kiev RABOCHAYA GAZETA in Russian 24 Jul 77 p 1] 2291

EFFECT OF ARAL LEVEL ON ENVIRONMENT--Nukus--An expedition of the Institute of Geography of the USSR Academy of Sciences, the Computer Center and the Institute of Natural Sciences of the Karakalpakskiy affiliate of the Academy of Sciences of the Uzbek SSR began a comprehensive study of the effect of the reduction in the level of the Aral Sea on the environment. Studies will be made of the interrelationship between sea and underground waters, and the patterns in the formation of their chemical composition. This will make it possible to determine how a change in the "intake" of mineral salts will affect vegetation, animals and the soil. Scientists will develop recommendations for the utilization of the Central Kyzylkumy--the basic pasture land of the autonomous republic, the delta of Amurdar'ya--the main agricultural zone, and the Ustyurt Plateau--promising for developing animal husbandry. The data obtained in the process of field studies will be processed by the computer center on Aral Sea studies. [Text][Moscow SEL'SKAYA ZHIZN' in Russian 3 Jul 77 p 4] 2291

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