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Report of Findings

A USAID Project Consortium led by CH2M HILL

ENVIRONMENTAL POLICY AND TECHNOLOGY PROJECT

Transmission of EPT Deliverable
Delivery Order 10, Novokuznetsk Task 5

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FROM Steffen Plehn, Novokuznetsk Project Manager

DATE November 30, 1994

PROJECT NUMBER 100264 50

Attached is a summary report documenting the findings of the first round of industrial environmental audits in Novokuznetsk, conducted between September 12 and October 20, 1994 This is a deliverable for

Delivery Order Number 10
Novokuznetsk Subproject
Task 5

Please contact me if you have any questions

Attachments

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MEMORANDUM

CH2MHILL

TO Steffen Plehn
Novokuznetsk Project Manager

FROM Jim Mavis
Audit Team Leader

DATE November 30, 1994

SUBJECT Report of Findings
Round 1 Audit In Novokuznetsk

I Introduction

A team of U S environmental specialists in air quality, water and wastewater, solid waste, energy, and worker health and safety visited Novokuznetsk, Russia, between 12 September and 20 October 1994 to work with local engineers, scientists, and regulators in evaluating the environmental conditions of industry Two large steel complexes were audited, while two other facilities, a ferroalloys plant and an aluminum smelter withdrew from the program The withdrawal of the ferroalloys and aluminum plants was apparently prompted by concern about potential risks to commercial arrangements these two companies have been pursuing since their initial agreement to participate in the program

The findings of the audits of the two steel plants are described below At the time the American specialists left Novokuznetsk, English versions of the reports were unavailable, so conclusions and recommendations actually presented in the reports (which were prepared by the Russian teams) may differ somewhat from those presented below

II Emission to Atmosphere - Findings

The coke batteries in both Zapsib and KMK release volatile organic material to atmosphere during at least a portion of their operating cycle Coke oven doors do not always seal tightly, permitting some leakage, and sometimes ignition of organic matter Improved maintenance was suggested, but Zapsib claims the problem is caused by poorly disciplined workers Pollutant discharge was also evident, especially at KMK, at the end of the operating cycle, when the cells are reopened to atmosphere Part of Zapsib's capital improvement program includes installing modern coking facilities that would have reduced emissions

At Zapsib, it is believed that particulate emissions from the coke quenching system might be reduced with the installation of baffles, and the use of better quality "technical" water Such improvements were part of the company's capital improvement program, and the

baffles may have already been installed, according to one source

Boilers and other combustion devices are operated on a variety of fuels during the course of a shift Without automatic firing control equipment, operators must manually regulate the air-to-fuel ratio, resulting in frequent hydrocarbon-rich stack emissions Automatic combustion controls would correct this condition, but such capital improvements are presently out of reach because of funding limitations

Particulate emissions are released as molten iron and slag flow from blast furnaces through uncovered floor runners In the U S these runners are covered, but the materials used in the Russian steel plant runners need to be replaced too frequently for covering to be feasible A more durable material needs to be purchased (or developed domestically) and installed so these runners can be covered Covering would reduce the emission of metal fume (fine particulate material), improve safe working conditions near the blast furnaces, and reduce heat losses

Air pollution control equipment in these Russian steel mills is not as well maintained as it is in U S steel mills The Russian factories apparently find the cost of maintaining an inventory of replacement parts prohibitive, and have not taken the time to straighten deformed plates in the electrostatic precipitators to improve performance (Their electrostatic precipitators are more than 10 years old, and lack some of the more modern design features that have made such units in the west reliable and effective in controlling particulate emissions The electrostatic precipitators at Novokuznetsk's two steel plants may also be undersized) Better emission control equipment would require expenditure of scarce capital

At present, Russian industry only has access to low-temperature fabric for baghouse filters, although much more heat-resistant materials are available in the west Existing baghouses in the two Novokuznetsk steel mills must cool hot stack gases by dilution with cool outside air in order to avoid damaging the fabric Nevertheless, temperature excursions sometimes occur and baghouse fabric can be damaged When affordable high temperature filter fabric becomes available, it should replace low temperature fabric now used in hot gas streams Baghouse collectors might also replace the existing, older, inefficient electrostatic precipitators (Alternatively, more reliable, properly designed, modern electrostatic precipitators might be installed on hot gas streams to reduce the need for dilution air, and to improve the buoyancy of stack gases to improve dispersion during atmospheric inversions)

III Wastewater - Findings

The KMK Steel complex intends to discontinue discharging wastewater and has partially-constructed facilities for settling suspended solids and filtering the remaining particulate matter Construction of these treatment facilities has been suspended because of lack of funding It was claimed that another 2 or 3 years would be needed to complete construction and make other changes within the complex before wastewater discharge could be eliminated Although substantial capital expenditures would be needed to complete the

unfinished construction, it appears that KMK may be significantly underestimating the difficulty of eliminating industrial wastewater discharges A stepwise approach to reduction or elimination of wastewater should be pursued at both KMK and Zapsib to assure that excessive corrosion, and scaling of pipes and equipment does not occur as a result

Both KMK and Zapsib expressed an interest in reducing the salt load in their industrial wastewater Much of the salt in Zapsib's wastewater is brought into the plant with their raw water supply, which includes water discharged from the adjacent electric power plant KMK's salt load is largely the result of water softener regeneration and boiler blowdown It was suggested that collection and reconstitution of water softener regenerant salt by conventional chemical processes be investigated, in order for the salt to be reused instead of discharging it with plant wastewater The proposed process has been used in the chlor-alkali industry, but is not known to have been applied to water softener regenerant salt The proposed approach needs further technical confirmation before capital resources are committed

Industrial wastewater from the Zapsib rolling mill is discharged when recirculating water accumulates too much suspended matter A circular clarifier should be installed to remove solids, thereby reducing or eliminating wastewater discharges from this portion of the facility

Zapsib and KMK lack modern equipment for the chemical analysis of heavy metal pollutants that are normally present in steel mill wastewater at low concentrations Both plants need to secure the capital needed to obtain the proper instrumentation (atomic absorption spectrometers or induction-coupled plasma analyzers) so the plants can perform routine monitoring of their wastewater streams

IV. Solid Waste - Findings

The largest-volume solid waste stream from either of the two steel complexes is iron ore tailings from KMK's ore enrichment operations at the sintering plant The tailings are stored in two completed piles, located on the banks of the Kondoma River, and at a third active impoundment in a nearby valley The two completed piles are uncovered and are reportedly the source of dust and potentially, metalliferous leachate The tailings do not support plantlife (probably because of nutrient deficiency) and there is visible evidence of erosion There are currently no known economically means of recovering the remaining mineral values from these tailings, which include non-magnetic iron oxide, gold, and other metals A suggestion has been made to revegetate the two inactive piles, both to control erosion and suppress dusting

Zapsib maintains a sludge pond which is constructed above grade, adjacent to a river, and which was constructed with plant waste products as construction materials The suitability of these materials for construction of the berm in not known Local regulators want Zapsib to close the pond before the hydrostastic pressure within the pond exceeds the berm's bearing capacity The pond has observable seeps , and has never accumulated enough water to return to the plant This indicates that the pond is leaky The seeps and

perimeter groundwater should be routinely monitored for metals, and the plant needs up-to-date analytical equipment such as an atomic absorption spectrometer to perform these analyses

Some solid materials that are captured in air pollution control systems have sufficiently high iron values that they might be recycled back into the process Zapsib is reportedly evaluating this option

V Energy - Findings

Most of the energy-saving measures that were identified apply to both of the steel plants In many cases, routine or preventative maintenance programs comprise the recommendation For example, steamline insulation replacement or steam leak repair could lead to significant energy savings

Building heat is not now being recovered at either facility Recovery of heat from building ventilation air is practiced economically in some U S industrial facilities and should be investigated (at least in the rolling mills) in anticipation of the time when Russia's fuel and energy costs approach those of the world market

Energy is dissipated whenever steam pressure is reduced and the lower pressure steam is desuperheated As an alternative to throttling and desuperheating, useful energy can be recovered if (large quantities of) steam can instead be passed through an energy recovery turbine An exhaustive survey of energy recovery opportunities was not feasible during the limited period of the audits

Currently, coal gas is recovered as a fuel for fired equipment in the plants Carbon monoxide in Zapsib's converter gas is not now recovered, but it might be economically recoverable and upgraded to further reduce reliance on outside fuel sources Zapsib was aware of this possibility, and needs capital to explore and implement such a project

Large motors with variable loads such as fans with duct louvres, or pumps with throttling valves are sometimes outfitted with variable speed (electronic) speed controllers Such variable speed control equipment is not now used at the steel plants, and should be evaluated

VI. Worker Health and Safety - Findings

Manufacturing and industrial facilities in the U S provide their workers with the equipment and training necessary to protect against accidents and lost time injuries, and occupational diseases Although both Zapsib and KMK provide workers in high risk areas with some form of protection, additional protective equipment and a formal safety (training and record keeping) programs are recommended Most workers lack ear plugs, hardhats, safety shoes, respirators, and other equipment in areas where they would normally be required in most western factories

Many of the most difficult working conditions in the steel plants occur in high temperature areas Because of this, it was recommended that the plants seek funding to purchase instrumentation to monitor the radiant heat index, which can be correlated to worker heat stress

The overhead crane operator in the steel pickling room at Zapsib is exposed to warm, humid acid vapors The crane car needs to be ventilated to protect the operator

VII Conclusions

Most, if not all of the major pollution sources in each of the steel plants were already known to the plant personnel The main reason corrective action has not been taken is that capital is too limited for even the most urgently needed capital improvement projects Many of the simplest and least expensive measures have already been implemented This leaves the cost-prohibitive projects to be undertaken when funding is available, probably in connection with the overall plant modernization program

The means of attracting capital is unfamiliar to the steel plant management (and to virtually all companies in the eastern bloc) Accounting practices had previously served the purposes of a production-driven economy, but records do not cover much of the cost, material consumption, and marketing analysis data major investors would require Both debt financing and market forecasting are foreign concepts, and litigation as it is pursued in the U S is unknown Consequently, some of the motivation for taking action on environmental or worker safety matters is diminished The benefits of reducing energy consumption are easier to justify, especially if there is a short payback period

Both plants expressed an interest in achieving "zero discharge," that is, elimination of any wastewater leaving the facility KMK was actively pursuing such a project, but ran out of money before they could complete planned modifications Zero discharge has been achieved in some industrial facilities in the U S , but the cost and technical requirements are formidable Although there is a Russian institute that specializes in industrial water management, a member of Zapsib indicated that the institute has not solved practical industrial water problems facing industry, and expressed an interest in accessing U S expertise This may be an area where U S technical know-how can be shared with local professionals

The biggest problem facing the steel plants is securing capital financing to modernize old facilities Environmental improvements and energy efficiencies would result from capital improvements of basic production systems Consequently, the plant management find it difficult to justify capital investments solely to improve environmental performance