PD-ABG-952

# TRIP REPORT #1 NEFTOCHIM

## BOURGAS, BULGARIA

## WASTE MINIMIZATION PROJECT

## JULY 19 - 23, 1993

WORLD ENVIRONMENT CENTER
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## I. ITINERARY

| | | | |
|---|---|---|---|
| o | July 19, 1993 | - | Meeting with various Neftochim managers to discuss the project |
| o | July 20 - 21 | - | Tour of facility - Continue Discussions |
| o | July 22 | - | Conclude Tour - Present findings to Neftochim Waste Minimization Committee |
| o | July 23 | - | Meeting - U.S. AID, Sofia |
| o | July 23 | - | Meeting - Ecotech |

## II. EXECUTIVE SUMMARY

A WEC waste minimization team consisting of Mr. Glenn B. DeWolf, Project Director, Radian Corporation, Mr. Samuel Weiss, pro bono specialist, and Thomas J. McGrath, WEC staff, made a reconnaissance trip to the Neftochim Refinery and chemical complex to identify the most appropriate manufacturing process for a waste minimization demonstration project (WMDP).

Neftochim is the largest refinery and chemical complex in Bulgaria and is considered to be the jewel of Bulgarian industry.

A tour of the facility indicated several excellent opportunities for waste minimization. The team had the benefit of reviewing the environmental section of the Davy McKee U.S. AID Energy Report.

The WEC waste minimization team's observation agrees with the Davy McKee recommendation of performing a project to reduce volatile organic compounds (VOCs).

Neftochim estimates total VOC emissions of 237,000 tonnes per year. Approximately six percent are from leaks. If the WMDP can reduce this amount by 25%, the resultant savings would be in excess of $500,000.

## III. MEETINGS

The initial managers we met with were:

| | | | |
|---|---|---|---|
| 1. | Eng. Vladimir Georgiev Nikolov | - | Deputy Manager of Technological Department in the petrochemical section |
| 2. | Mr. Asen Petrov Mollov | - | Technological Engineer in the refinery section |
| 3. | Mr. Todor Valkanov Keremidtchiev | - | Ecological Department |
| 4. | Mrs. Mariana Angelova Michailova | - | Manager of Scientific Lab Ecology in the Institute for Crude Oil Processing and Petrochemistry |
| 5. | Mrs. Sijka Angelova Stojanova | - | Technological Engineer in a scientific lab "Crude Oil Processing" in the Institute for Crude Oil Processing and Petrochemistry |
| 6. | Mrs. Christina Uzunova | - | Project Manager in "Neftochim Project" |
| 7. | Mr. Atanas Ivanov | - | Manager of "Crude Oil Processing" Department in the Institute for Crude Oil Processing and Petrochemistry |
| 8. | Mrs. Maria Zeljazkova | - | Manager of catalytic lab |
| 9. | Mr. Marev | - | Manager of "Ecological" Department |

There was obviously strong interest in the project based on the questions. There was also support for the objective of the WMDP to change peoples' attitudes about pollution prevention and to help spread the concept to other industrial organizations.

We were pleased that Mr. Sarastov, Executive General Director, an extremely busy person, devoted as much time as he could to us. He personally selected the waste minimization committee. The members of the committee are:

| | | | |
|---|---|---|---|
| 1. | Mr. G. Sarastov | - | Executive General Director of Neftochim |
| 2. | Mr. Evtim Tzintzarski | - | Director "Ecology and Public Relations" |
| 3. | Mr. Svetoslav Iordanov | - | Specialist in the Financial Department |
| 4. | Mr. Petar Kovatchev | - | Deputy Director of "Neftochimproject" |
| 5. | Mr. Ivan Sariev | - | Director of the Institute for R & D |
| 6. | Mr. Matju Baikov | - | Director of Petrochemical Section |
| 7. | Mr. Nikola Nikolov | - | |
| 8. | Mr. Apostol Apostolov | - | Municipality Bourgas |
| 9. | Mr. Zivko Tasev | - | Chemical Institute for High Education |
| 10. | Mr. Nino Ninov | - | Ministry of Environment Protection, Sofia |

On Thursday, July 22, Mr. Sarastov assembled the waste minimization committee and informed the WEC team that these are the people we have to convince that our project will be beneficial.

The WEC team with the strong support of Mr. Ivan Marek, Manager of the Ecology Department, explained the project and obtained the support of all present.

Thomas J. McGrath has recommended to Mr. DeWolf that he contact Malcolm Pirnie, Inc., consultants for the Chemopetrol WMDP, to discuss the VOC project at Chemopetrol and determine how the approach there could be used at Neftochim.

Subsequently, Mr. DeWolf did contact Malcolm Pirnie, Inc. and receive information which will help in this WMDP.

Friday, July 23, Messrs. Weiss and McGrath briefed Mr. Gerald Zarr, U.S. AID Representative, about the trip and the schedule for other WEC programs.

Mr. Zarr was gracious in his comments about the WEC programs. He offered his continued support which is most appreciated and contributes to the success of

the programs.

Mr. McGrath met with Christian Spassov, Ph.D., President of Ecotech Products. This consulting firm worked on the U.S. AID energy program.

An agreement was reached for Ecotech to function as the WEC Coordinator for Bulgaria.

## IV. OBSERVATIONS

Neftochim is an enormous facility which occupies over 12 square miles. The fugitive VOC emission reduction project will give us more visibility than any other waste minimization project. However, even this project is extremely small in the context of the facility's size.

The budget will permit us to purchase one Organic Vapor Analyzer. It will take years to survey this entire facility with one analyzer. Several should be used. We will be able to use the information obtained to demonstrate fugitive VOC emissions and calculate cost savings. If the budget was larger, we could "speed up" the project through the use of computers and software.

We believe that we will have a successful project that properly publicized will help attract the attention of Bulgarian industry to the benefits of waste minimization.

## V. GLENN B. DE WOLF'S REPORT

# TECHNICAL MEMORANDUM

TO: Mr. Thomas McGrath, Vice President, World Environment Center

FROM: Glenn B. DeWolf, Radian Corporation

COPIES: Don Jackson, Dennis Dalrymple, Samuel Weiss (Consultant), Project File 700-101-02

DATE: 25 August 1993

SUBJECT: **Neftochim Site Visit Report**

## 1.0 INTRODUCTION

This memorandum summarizes findings of a visit to the Neftochim Oil Refinery and Chemical Complex in Bourgas, Bulgaria. The visit was conducted as part of the World Environmental Center's (WEC) Waste Minimization Demonstration Program. U.S. AID and WEC have a Cooperative Agreement to provide U.S. expertise for technology and skills transfer to Central and Eastern Europe industry and governments. The objectives are:

- Effective environmental pollution reduction
- Improved worker health and safety
- Efficient energy management
- Increased social awareness

One of the WEC programs is to identify and implement waste minimization demonstration projects at selected industrial facilities. The purpose of this visit was to initiate such a program at Neftochim. The Neftochim complex is Bulgaria's main petroleum and petrochemical facility. The main goals of the initial visit were to:

1) Obtain basic information about the facility;
2) Identify potential waste minimization projects for the WEC program; and
3) Recommend the initial demonstration program.

A number of possibilities for a program emerged and a tentative final selection

was made based on considerations of technical resources and feasibility; budgets; and time constraints within the specific context of Neftochim.

## 2.0 SUMMARY OF FINDINGS

Based on a four day review of selected major processes and areas of the facility, the team found that Neftochim personnel are well aware of and making steady progress toward improved environmental controls and waste reduction. They are handicapped by a lack of money and information resources. A goal of the demonstration waste minimization effort is, therefore, to find a program that can reduce environmental pollution and generate some financial savings early in its implementation that can be leveraged to provide funds for waste reduction, generate still more savings and so on. The Neftochim staff had already identified many of the key air, water, and solid waste issues. Many solutions had been implemented, were underway, or were being considered. The following issues emerged as primary ones during our four days of review, discussions, and meetings:

- Volatile organic compound (VOC) emissions;
- Wastewater sludge;
- Wastewater volume; and
- Solid plastic and rubber wastes.

The first three emerged as the primary focus of our investigations as explained in more detail later in this report.

A program to reduce VOC emissions from equipment leaks was selected as the demonstration project. The program will purchase an Organic Vapor Analyzer (OVA), provide training for a screening study for equipment leaks, and lay the foundation for a full Leak Detection and Repair (LDAR) program consistent with standard U.S. practices in this area. Savings will accrue from reducing hydrocarbon losses.

## 3.0 METHODOLOGY

The WEC team consisting of Mr. Tom McGrath, Vice President of WEC; Mr. Samuel Weiss, Consultant; and Mr. Glenn DeWolf, Radian Corporation, visited the site from Monday, July 19 through Thursday, July 22, 1993. We were hosted by Mr. Ivan Marek, the environmental director, and other members of the plant management and technical staff. Mr. Marek was our main contact. Neftochim provided an interpreter, Mrs. Diana Stanislavova. Copies of business card received are shown in Attachment A. We did not receive cards for all the persons we met. The overall site visit consisted of initial meetings, general orientation to the facility, technical sessions, a technical closing meeting, and a formal managerial closing meeting.

At the initial meeting on the first day, Mr. McGrath introduced WEC, the team, and explained the WEC program. A general orientation to the facility followed with discussions of some of the key environmental and waste issues faced by the plant. Various members of the Neftochim staff presented information. There was a general tour of the facility and a closing meeting on the first day which established an agenda and schedule of activities for the reminder of the visit.

Specific areas of the plant and issues were examined in more detail on the second and third days. On the second day we concentrated on the refinery, including visits to the atmospheric crude distillation unit, desalters, fluid catalytic cracking, and crude oil storage area. On the third day, we concentrated on the petrochemical section, including the polystyrene area, styrene-butadiene rubber area, the main wastewater treatment plant, and the marine terminal.

On the fourth day, the WEC team presented findings to Mr. Marek and appropriate members of his staff. Agreement was reached prior to presentation of these findings to a management and technical advisory committee later the same morning. The site visit was concluded on the fourth day.

It was agreed that Mr. DeWolf and Mr. Marek would communicate in the ensuing weeks to exchange information, and that Mr. DeWolf would make a return visit sometime in the October-November time frame to assist the plant in beginning the project.

## 4.0 FACILITY DESCRIPTION AND WASTE MINIMIZATION ISSUES

The Neftochim complex is Bulgaria's largest petroleum and chemical facility. It consists of an oil refinery and numerous downstream chemical operations. Crude oil is imported by tanker, unloaded at a remote terminal and transported to the refinery by pipeline. There are three 50,000 cubic meter crude oil tanks on refinery property. Other tankage consists of various petroleum and petrochemical products. A number of tank farms are located at different places on the property.

### 4.1 General Description

The refinery processes ten types of heavy crude imported from several countries. These countries include Libya, Egypt, Iraq, Syria, Tunisia, Arabia, and areas of the former Soviet Union. Sulfur content and other crude properties are highly variable so blending is required. Crude sulfur content reaches 1.8%. The atmospheric residuum reaches 3.5% after the lighter fractions are removed. Because this matches boiler feed sulfur content, the power station uses this as supplementary fuel. At this time, however, regulations specify a sulfur content of no more than 2%. The plant does not currently

have the means to meet this requirement.

Crude is received at a marine terminal. Underground pipelines convey the crude to storage tanks at the refinery. These tanks are a source of some of the waste oil that enters the wastewater treatment plant. This waste results during manual draining of the tanks to remove tank bottoms water. The aqueous tank bottoms - crude oil interface is difficult to detect and some oil is also drained. This refinery has a special problem with excessive amounts of water in the crude oil because the different sources of the oil result in widely varying amounts of water and there is insufficient tank capacity to allow a long enough holding time for the water to settle out before processing the crude. This is believed to contribute to overloading the desalters and compounding the operating difficulties discussed later in this report. Implications of tank draining on wastewater loadings is discussed in the section on wastewater.

Overall refinery processing produces a variety of standard refinery products and supplies feedstocks to downstream petrochemical and polymer product operations.

The following process units comprise the refining and petrochemical sections of the facility:

- Crude oil electrodehydration and desalting;
- Atmospheric distillation;
- Gasoline fractionation;
- Catalytic reforming;
- Aromatics production;
- Alkylation (sulfuric acid process);
- Thermal cracking;
- Fluid catalytic cracking;
- Pentane isomerization;
- Hydrodesulfurization;
- Middle fraction separations;
- Absorption gas fractionation;
- Sodium sulfide manufacturing;
- Fuel oil vacuum distillation;
- Olefin production;
- Ethylene oxide and ethylene glycol production;
- Ethylene diamine production;
- Acetaldehyde production;
- Octanol - butanol production;
- Phenol and acetone production;
- Hydrocarbon resin production;
- Polyacrylonitrile fiber production;

- Polystyrene production;
- Styrene-butadiene rubber manufacture;
- Low density polyethylene production;
- High density polyethylene production; and
- Polypropylene production.

## 4.2 Air Emissions

Air emissions at the facility result from the typical sources for a refinery and petrochemical plant. These emissions have previously been estimated by Neftochim staff. A summary is presented in Table 1. Details of these estimates were not readily available for our review at the time of the visit but can be made available to us on a selected basis. Air emissions were considered for reductions part of the waste minimization program where such reductions could result in economic savings to the plant. The emissions that could potentially result in such savings are: VOC and NOx reductions. The former were selected as offering the greatest potential benefits in the short term.

VOC emissions arise primarily from direct venting, equipment leaks, the wastewater treatment system, and waste sludge holding areas. It was determined that it might be within the means of this program to deal with equipment leaks and direct venting. Therefore we focused on potential improvements for these sources.

Based on experience at refinery and chemical plants in the US and other parts of the world, equipment leaks are amenable to ready and significant control through a formal leak detection and repair (LDAR) program. Also, these emissions are found in all parts of a facility, whether petroleum processing or chemical operations, wherever VOC are present. In this particular facility, there were also significant VOC emissions, as styrene, from direct process venting in the styrene-butadiene rubber (SBR) rubber plant. Both of these source categories are believed to be amenable to relatively quick reductions with appropriate procedural changes and minimum capital investment.

Tank emissions can occur from tank vents or from leakage. Fixed roof tanks appeared to be universally fitted with conservation vents which, while open to the atmosphere, are still superior to completely open tank vents. However, breathing losses will occur from these vents due to filing, emptying, and diurnal variations in temperature, with the corresponding expansion and contraction of tank contents. Leakage is a problem with some of the floating roof tanks.

VOC emissions from the wastewater treatment system appear to be significant. The main wastewater treatment plant is a large facility with a large surface area of

wastewater for evaporation of VOCs during the treatment process. In addition, there are two large sludge storage ponds in the vicinity of the main wastewater treatment plant which also appear to be a substantial source of emissions.

Control of VOC emissions, which represent a loss of hydrocarbons from the refinery, is a significant waste reduction issue.

Emissions of sulfur oxides and nitrogen oxides arise from combustion sources. These include power boilers and direct fired heaters. Currently the fuel at this refinery includes both 3.5% sulfur fuel oil and fuel gas.

Particulate emissions arise from combustion sources, from the catalytic cracking unit, and from rubber and plastic manufacture. These latter two sources appear to be minor relative to others. PM emissions from the FCC unit are controlled by an electrostatic precipitator.

One waste gas issue that appeared important to the refinery involves the plant waste gas venting and flare system. Process waste gases from normal process venting and some pressure relief venting discharge to a common header system. This system connects to a fuel gas system and to the flare system. The fuel gas system consists of compressors which pressurize the gas to distribution line pressure. Excess waste gas discharges to the flare system. At the present time, the quantity of gas that can be compressed is limited by the quantity of condensible hydrocarbons entering the system. This limits the compression ratio for the compressors, reduces the fuel gas line pressure and hence volume processed, and increases the amount of gas that must be discharged to the flare.

An improved condensation system is being considered for reducing the quantity of condensibles, so that more gas can be sent to the compressors rather than to the flare. A survey and characterization of all sources of waste gases and condensibles prior to design of such a system could identify the major contributing sources of the condensibles and lead to possible reductions in these sources, by improved process control for example, and thus reduce the requirements for down stream condensation for hydrocarbons removal from the gas stream. This could also lead to design of local condensing systems that might offer some advantages to a single large system for the total gas stream. We did not see that we could assist with this program with the available project funding, so while we recognized its importance to the plant, we had to restrict ourselves to other potential programs.

## 4.3 Wastewater

Wastewater is divided into four groupings:

- Industrial wastewater;
- Electrodesalting wastewater;
- Chemically polluted wastewater; and
- Domestic wastewater.

Industrial wastewater includes all refinery wastewater except cooling tower blowdown and stormwater. Electrodesalting wastewater results from crude oil dewatering and desalting and contains more salt and has a higher alkalinity than other waste water. Sour water (acidic, high sulfur) streams combine with this wastewater. Chemically polluted wastewater derives from the petrochemical sections of the complex where there is some direct contact of water with chemical products. This category is reported to be the most polluted wastewater stream. Finally, there is domestic wastewater or ordinary sanitary sewage from throughout the complex. All wastewater is treated. The main wastewater treatment plant receives the above four categories as separate streams and provides appropriate treatment sequences of combined streams in the treatment process.

Wastewater arises from both refinery and chemical operations. Oily wastewaters collect in an open drain system and are routed to wastewater treatment. The main wastewater treatment plant consists of primary through secondary treatment. We visited this facility. There is also a primary only treatment facility for a lesser portion of the total wastewater for limited sectors of the plant. We did not visit this facility. The main plant was built after 1970 and includes various expansions and additions. The older plant was built between 1960 and 1970.

The treatment in the main plant consists of conventional mechanical separations, oil/water separation, chemical treatment, dissolved air flotation (DAF) (operating at 5 atm), biological treatment (two stages for some streams), and oxidation ponds for the final effluent. Effluent samples are taken regularly and the effluent apparently meets current, though not proposed and stricter, effluent limits. These new limits impose a 5 mg/L BOD or COD limit, and are reportedly based on strict Western European or German standards.

Two primary waste minimization opportunities are the potential for reducing the total wastewater volume, and reducing the hydrocarbons lost through the wastewater system. This quantity has been estimated as an unacceptably large fraction, in relative terms, of the total crude oil input into the refinery.

During the site visit, we observed areas where wastewater arises. One of the largest sources of wastewater is associated with crude oil processing. Water from desalting, and watery tank bottoms from the crude oil storage tanks, comprise a large

source of the wastewater. Other than typical other sources in a refinery or chemical plant, an unknown, but what appeared to be an unnecessarily large quantity of wastewater results from water leaks at fittings and valves for both water and steam lines throughout the complex.

Oil in the wastewater results from the normal operations of desalting and crude oil tanks drainage as mentioned above, but the quantities lost to the wastewater treatment system may be larger than necessary because of two notable conditions. On the electrodesalters, two out of four of the electrode systems were not operating. This would be expected to impair the oil water separation and result in excess amounts of oil being released with the water stream.

The other condition was the method and equipment for draining the crude oil storage tanks. This is done manually from a valve near the bottom of each tank. There is a catch-box at the valve opening which feeds by gravity into pipeline to the wastewater system. An operator controls the amount of tank bottoms that is drained by visual observation of the passage of the interface between the water and oil layers. The valve is closed when the water layer has passed as the first signs of oil appear. The problem with this system is that emulsions are often present which make detection of a precise demarcation between the water and oil phases difficult. There is also the possibility of the operator not being present at the exact moment for optimal shut-off. This latter prospect is likely from time to time because the drain period can last from perhaps ten minutes to three hours depending on the specific crude in the tank. Since this is reported to be highly variable, in terms of water content, it is difficult for an operator to estimate exactly how long draining will take and, therefore, the possibility of leaving the work area for a time and then returning increases, and the optimal shut-off period might be missed.

As just discussed, oily wastewater results from the many normal refinery or petrochemical plant operations. In waste minimization, the goal is to reduce excessive discharges of oil or hydrocarbons into the wastewater system. Therefore, we observed potential sources of such excesses.

Oily wastewater flows in numerous drains in the refinery and chemical plant complex. Some of these drains have trash in them which trap oil puddles. These continually bleed to the wastewater system. These and unrecovered hydrocarbon spills create excessive oil in the wastewater treatment system. Oil spillage continues from numerous leaks in piping in different areas of the refinery. These "excess sources" could be dealt with to reduce oil in the wastewater.

One way that the problem areas could be identified would be to clean up the

existing spill areas and remove debris from the drains. Then future leakage could be easily observed and the source of the leakage or spill readily located for corrective action.

Another factor contributing to excessive oily wastewater is the relatively large number of water and steam condensate leaks, primarily from valves, around the complex. These create unnecessary loadings on the wastewater treatment plant. In addition, steam and condensate leaks are costly and savings that could be achieved by improved maintenance to reduce these leaks could save money that could be applied to other pressing improvement needs.

Oil has previously been reported in cooling tower basins. We looked at the cooling water discharging from the cooling tower system of the fluid catalytic cracking unit but saw no evidence of visible oil pollution in this water. Refinery personnel did not believe that there was a problem in this or the other cooling tower water areas.

One of the biggest problems with oil in the wastewater seems to derive from the electrodesalters at the atmospheric crude distillation unit. Four electrodesalter units operate in series. On two of these, the electrode assemblies were not functioning at the time of our visit and had apparently been out of service for some extended period of time. It is likely that with these units out of order, oil water separation in the desalters is below design efficiency and excess oil is entrained with the water discharge to the wastewater treatment plant. While considered as a candidate for this program, the cost of repairs was believed to exceed the money available.

## 4.4 Solid Wastes

Dominant solid wastes at the complex are waste oily sludge and solid plastic and rubber wastes.

There are two large sludge holding ponds near the wastewater plant. We did not obtain the exact dimensions, but these ponds appeared to be at about 1600 square meters each in surface area. The strong hydrocarbon odor indicated that VOC emissions from the surface of these ponds was substantial.

At this time there is some treatment of waste sludge. Some is dewatered by centrifuge and the oily phase is recycled to the refinery. The wastewater phase recycles to the wastewater treatment plant. Some of the sludge is burned along with some of the plastic wastes in a rotary kiln incinerator. Attempts are also being made to use the sludge as a supplementary boiler fuel, to be sent to a local power plant, by mixing it with sawdust from a nearby furniture factory. At this time, the capacity of these processes for disposal is not sufficient to consume the accumulated sludge and continuing sludge

production.

The rubber and plastic wastes are accumulated and some are burned in a rotary kiln incinerator.

Waste minimization for the sludge depends first on reducing the quantity of oils and other organic materials in the wastewater. Then, means must be found to further treat the remaining sludge for recovery of hydrocarbon value. Finally, the residual will require disposal by incineration, or secure land filling.

Waste minimization for the plastic wastes depends first on process improvements to reduce the quantity of waste generated in the first place. A second step would be to find uses opportunities for the remaining waste. Finally, incineration or secure land filling would be required for ultimate disposal.

It was observed that in both the SBR process and in the styrene process that many of the losses of material occur in the solids-liquid separation step. And, in the case of the styrene, final separation of styrene in the wastewater treatment system appears to be amenable to improvement. At this time, it is not known whether any systematic attempts have been made to reexamine the design and operation of these units. For example, in the styrene settlers, periodic cleaning of the bottoms sludge would be necessary in order to maintain low enough velocities through the settlers to maintain separation efficiency.

## 4.5 Other Issues

There were other issues regarding refinery operations that may contribute generally to environmental impacts through product loss and inefficient energy use, but which were beyond the scope and resources of the present program. Some of these are discussed for documentation purposes for future reference.

An area of special concern is in the cracking units. There are concerns in both the fluid catalytic cracking (FCC) unit and the thermal cracking unit. There are also concerns in the catalytic reforming unit. A detailed discussion of these issues is outside the scope of this program, but for the FCC unit, the primary issue is the lack of sufficient automation and resultant operating difficulties. Leaks were also mentioned as an issue here, but this is included in considerations of fugitive VOC emissions. Problems with catalyst regeneration apparently cause excessive upset discharges of process gases vented directly to the atmosphere. The same problem was mentioned to occur with the hydrotreating unit. Excessive water in the crude column feed requires that part of the middle cut on the vacuum distillation unit be sent to dewatering.

In the thermal cracking unit, for the vacuum residual fraction, there are problems with excessive coking in the tubes and in the coking drums. The very heavy crudes and high throughputs aggravate these problems. Accumulations of high sulfur coke in the furnaces must be burned off which necessitates frequent startups and shutdowns of the unit. Product losses result. These difficulties may contribute to wastewater or air emissions problems with the unit.

## 5.0 SUMMARY OF MAJOR POLLUTION ISSUES

In preparation for final selection of a waste minimization demonstration project, the major issues were summarized as described below.

### 5.1 Air

The major air pollution issues related to waste and product loss are:

- Emissions of VOC from equipment component leaks;
- Emissions of VOC from process vents; and
- Emissions of VOC from wastewater treatment operations and sludge holding ponds.

### 5.2 Wastewater

The main water pollution issues related to waste and product loss are:

- Insufficient oil/water separation in the crude storage tanks;
- Non-functioning electrode systems in two of the electrodesalters; and
- Excessive leakage and unremediated spills of hydrocarbons.

### 5.3 Solid and Sludge Wastes

The main issues for these wastes are:

- Continuing accumulations of oily sludges from wastewater treatment and other sources, and inadequate treatment, recovery, and recycle capacity for hydrocarbons;
- Solid rubber residue wastes in the styrene-butadiene rubber plant; and
- Solid polystyrene waste from the process wastewater separators in the polystyrene plant.

## 6.0 SELECTION OF WASTE MINIMIZATION DEMONSTRATION PROJECT

For all of the above waste categories, the wastes themselves also represent lost product value. While all wastes cannot be feasibly eliminated, the goal of waste minimization is to minimize both the generation of waste and recover what can be done.

After considering the possibilities for a waste minimization demonstration project within the financial and time constraints of the present program, it appeared to us that a formal program to control equipment leak VOC emissions offered the most effective use of the project funds at this time. It was estimated that the value of recovered hydrocarbon would save the complex at least 7,000,000 leva ($270,000) per year. These savings, if applied to further waste reduction opportunities would generate additional savings to further conserve resources and reduce environmental pollution at the same time. This estimate is based on only a 25% reduction in equipment leak emissions using Neftochim estimates of VOC emissions from this source category, and a hydrocarbon value of 3,825 leva per tonne ($150 per tonne).

The WEC program funds would be used to purchase an Organic Vapor Analyzer (OVA) that would be used to detect equipment leaks and allow a formal Leak Detection and Repair (LDAR) maintenance program to correct those leaks in an efficient and effective manner. Further, the instrument would provide verification that the leaks had been corrected and an means to assist in quantitatively estimating the resultant savings.

The success of such a program depends very much on management's actions and on development and enforcement of appropriate operating and maintenance procedures on the various process units throughout the plant.

A fundamental aspect of this program will be accounting for the savings. For this purpose, agreements must be reached between production units, the environmental department, and accounting. These entities as well as representatives of the workers, who will be directly involved in the program, must be established. In addition, management should consent that an amount of the initial savings be applied to additional waste minimization activities in order for the program to have long-term impact on improving waste management at the plant. Ultimately, the savings will contribute directly to plant profit. Initially, the savings from the first program, if spent for additional waste management improvements, can be seen as funds for investment to produce more savings, which eventually will end up as improved profits.

WEC will provide the tools and create the opportunity for Neftochim to begin an effective waste minimization program. The success of a waste minimization program will depend on the commitment of the Neftochim management, technical staff, and workers. The cooperation received during this initial visit indicated a strong commitment from the Neftochim management.

## 7.0 PROGRAM PLAN

At this time, details of the program plan will be developed by Radian, WEC, and Neftochim. Communications will occur between Mr. Glenn DeWolf of Radian and Mr. Ivan Marek of Neftochim by fax, telephone and letter. Radian will obtain the necessary equipment and provide Neftochim with a description of the procedures in advance of the on-site implementation of the program. It is expected that sometime in the October-November time frame, Mr. DeWolf and WEC will return to Neftochim to assist them in beginning the program, and will be available subsequent to that time to respond to questions. The project was selected to be within Neftochim's capabilities to execute by themselves after an initial start-up with outside assistance.

Initially, Radian will require some additional information from Neftochim which will be obtained by questions submitted by Mr. DeWolf to Mr. Marek, and Mr. Marek's corresponding responses. This can be handled through faxes and DHL shipments of written materials. Verbal communications by telephone can occur as required. This may require the use of an interpreter at Neftochim so that such telephone calls will have to be scheduled in advance.

During August and September, Radian will be preparing the necessary equipment list and ordering the necessary equipment. The use of the OVA will require that there are certain quantities of standard gases for instrument calibration. At this time, it is anticipated that the instrument and standard gases required for calibrations will be purchased in Europe. The OVA of choice will be one of the models manufactured by Foxboro Corporation, an American company. The OVA and the standards will be shipped from the location of origin to Neftochim. Neftochim will assist in making customs or trans-shipment arrangements.

A more detailed plan and schedule will be provided as a separate document from this report.

## 8.0 OTHER ISSUES

Several other issues arose which can be accommodated within the program.

Radian will provide Neftochim with information on the availability and appropriateness of various air dispersion models for modeling air pollutant emissions from the complex.

Radian will also provide Neftochim with lists of certain technical references related to some of the waste issues observed at the plant.

Mr. Samuel Weiss will provide Neftochim with information related to protective equipment for workers, specifically breathing masks for use of workers in areas of high VOC concentrations such as the wastewater treatment plant. Such equipment may be necessary to allow the workers to effectively maintain the system by allowing them to work in areas that otherwise would be uninhabitable for sustained periods.

These other items will contribute to the success of the overall program by providing supplementary support to the program staff.

At this time, the issue of plastics wastes is clearly outside the scope of the present program. It was also apparent that there were consultants from great Britain working on resolving operating problems with SBR unit that should also result in waste reduction through process improvements.

Further information will be provided through various memoranda as the program progresses and the need arises.

# Table 1

## Air Emissions Estimates Summary

| Emissions | |
|---|---|
| **Species** | **Tonnes/Year** |
| Hydrocarbons (VOC) | 237,000 |
| Hydrogen Sulfide ($H_2S$) | 200 |
| Carbon Monoxide (CO) | 13,000 |
| Nitrogen Oxides ($NO_x$) | 6,000 |
| Sulfur Dioxide ($SO_2$) | 38,000 |
| **Distribution of VOC Emissions** | |
| **Source** | **Percentage of Total** |
| Tank Farms | 65 |
| WWTP | 25 |
| Leaks | 6 |
| Cooling Towers | 3 |
| Other | 1 |
| Total | 100 |

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