PN-ABP-533
ISN 8320

WORLD ENVIRONMENT CENTER

ENVIRONMENTAL AND WASTE MINIMIZATION ASSESSMENT

ARO MANUFACTURING COMPLEX

CIMULUNG-MUSCEL, ROMANIA

JUNE 21 TO JUNE 28, 1993

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JULY 1993

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EXECUTIVE SUMMARY

Under the sponsorship of the World Environmental Center, Stuart H. Vaughn, visited the ARO manufacturing facilities in Cimulung-Muscel, Romania between June 21 and June 28, 1993 to preform an environmental assessment and waste minimization study for the industrial complex.

ARO manufactures various components and assembles a series of 4 wheel drive, jeep-type vehicles on a 60.5 hectares site. Approximately 11,500 workers are employed and production is about 1,300 vehicles/month. ARO requested the report be divided into 3 phases: organization/administrative, environmental assessment, and waste minimization. Overall findings and recommendations are outlined below and explained in more detail in the main report.

Organization/Administrative

Consideration should be given to form an environmental/waste minimization committee of the various plants to coordinate activities, make special studies, evaluate proposals including new programs and materials, exchange information on environmental and waste minimization issues, and periodically prepare reports and make presentations to the senior operating management at ARO.

Individual plant teams should be formed to consider and evaluate Waste Minimization (WM) programs. These teams would consist of representatives from manufacturing, maintenance, design, quality, environmental, accounting, and purchasing to insure all the potential factors involved in WM are considered and project priorities and schedules are adopted.

A Spill Plan for the ARO site should be developed. The plan would include description and sketches of the overall site and sewer systems, manufacturing plants and processes, chemical and oil storage systems, etc. The Spill Plan would identify required containment systems, potential sewer cross connections, and emergency response procedures.

A Long Range Pollution Control Master Plan would assist ARO to insure that common environmental objectives, goals, and planning are accomplished when various facilities are rearranged or constructed, as opposed to making costly revisions at later times.

Although regulations and effluent limits are necessary, ARO should establish a close relationship with the public treatment system personnel since ARO is a major contributor of the flow to their system. Communications of spills and related operational problems at ARO can alert local treatment officials and ARO will have advance notice to respond to more stringent future requirements and/or controls of the public treatment system.

Environmental Assessment

There are many favorable environmental conditions and systems at ARO that should be recognized. These include; the new zinc platter and treatment, the program to eliminate

cadmium plating, no chlorinated solvent use, discharge of sewage and process waste water to the public sewer, treatment of heavy metals, paint, and skimming of free oil, and sludge storage in a protected area.

Certain short term actions can be considered to improve the operation of the present pollution control systems. These include; installation of composite samplers, improving oil controls, minimizing the effects of concentrated solution dumps, and elimination of a sewer cross connection.
Long term environmental recommended actions include the following; (1) cover open oily areas, (2) isolate and treat emulsified oil discharged to the public sewer system, (3) improve the treatment of paint and phosphate waste waters, (4) construct an industrial sludge landfill with secondary containment and monitoring for leakage, (5) provide secondary containment for all oil and chemical storage tanks, (6) review paint systems to reduce solvents and recognize the possible need to incinerate of paint oven emissions, and (7) consider improving employee work conditions such as ventilation, use of safety glasses, hearing protection, and masks, and reducing asbestos exposure.

Waste Minimization (WM)

Waste in material and manpower occurs in the Paint Shop. The problem includes rusted sheet steel, damaged stamped parts, and absence of a pacification chemical to prevent rust. Sheet metal must be repaired and phosphated again or scrapped. A study would identify what actions could be considered to reduce waste and improve product quality.

It is suspected that considerable losses of compressed air and steam are occurring in the distribution system. A study by energy experts is recommended to identify the magnitude of these losses and corrective actions.

Hydraulic oil losses occur because of the aging equipment. A study comparing machine operation with the hydraulic oil consumption would identify the need for improved maintenance efforts and machine replacement. In a related matter, centralized soluble oil coolants may be more economical than the present system of individual machine soluble oil reservoirs.

Excessive electroplating solution losses were observed from parts dripping solution to the next tank; resulting in wasted chemicals and unnecessary contamination of the next tank. Longer drainage time, vibration, and air jets would reduce such losses.

Excessive primer paint is lost at the immersion tank. Paint is apparently trapped in tubular sections. Longer drainage time and placement of drainage holes in trapped sections would reduce paint losses.

Hoppers of salvageable material (i.e. metal chips) were found mixed with ordinary trash. Better waste separation is necessary.

Improved placement of small parts on racks can reduce paint over spray.

Many open, unlabeled drums contained residuals of virgin material. Drums need to be labeled, better labeled, and emptied of their contents.

Chemical solutions and soluble oils are replaced on a schedule basis. Sampling and analysis of solutions may prolong the use of these materials.

Installation and/or repair of shutoff valves would reduce water and chemical consumption. Chemical additions to recirculated cooling water would also reduce waste.

In the treatment of electroplating treated cyanide waste water is combined with untreated chromium and the combined volume is then treated for chromium removal. This practice results in an unnecessary waste of chemicals. The two waste streams should not be combined until the hexavalent chromium is first reduced.

INTRODUCTION

Under the sponsorship of the World Environmental Center, the undersigned, Stuart H. Vaughn, retired, visited the ARO manufacturing facilities in Cimulung-Muscel, Romania between June 21 and June 28, 1993 to preform an environmental assessment and waste minimization study for the industrial complex. A personal resume is included as Appendix A. of this report. Business Cards of many of the persons listed below are copied in Appendix B.

Contacts and persons directly involved at ARO were as follows:

Mr. Mario Milata	ARO Technical Manager
Mrs. Olga Moiceanu	ARO Environmental Representative
Mr.Geoprge Aldea	ARO Engineer
Mrs. Marga Popescu	ARO Translator
Mr. Emil Bajenaru	Local Environmental Protection Agency (6/21)

In addition Mr. Liviu Ionescu, WEC Coordinator for Romania Technical Programs, was available several days to inspect facilities, translate, and provide much needed assistance.

On June 28, 1993. the final day at ARO, the following persons attended the summary meeting to discuss preliminary findings:

Mr. Mario Milata	ARO Technical Manager (at conclusion)
Mrs. Olga Moiceanu	ARO Environmental Representative
Mr.Geoprge Aldea	ARO Engineer
Mr. Victor Savu	ACO Investment Department Manager
Mr. Gheorghe Algu	ACO Maintenance Manager
Mr. Aurel Voicu	ACO Metallurgical Department Manager
Mr. Gobriel Bulugea	ACO Welding and Painting Manager
Mr. Mircea Ioan	IPCM - S.A. Project Director
Mrs. Rodica Grumeza	IPCM - S.A. Design Manager
Mr. Liviu Ionescu	WEC Coordinator
Mr. Stuart H. Vaughn	WEC Environmental Specialist

On June 29, 1993, Mr. Liviu Ionescu, WEC Coordinator, and the undersigned met with the following organizations and persons and outlined the overall findings of the visit.

Engineering and Consulting Organization

Mrs. Rodica Grumeza	IPCM - S.A. Design Manager
Mr. Mircea Ioan	IPCM - S.A. Project Director
Mr. Nicolau	IPCM - S.A. Hydraulic Specialist

United States Agency for International Development

Mr. Richard J. Hough	USAID Representative to Romania
Ms. Gianina Moncea	USAID Program Management Assistant

Ministry of Industry

Mr. Alexandru Georgeescu	Ministry of Industry Director
Ms. Cristiana Ion	Ministry of Interior Research & Ecology
Mr. Radu Paul Paunescu	Ministry of Interior

FINDINGS

DESCRIPTION OF MANUFACTURING FACILITIES

ARO S.A. Car Manufacturing Company is a Romanian Government-owned automobile manufacturing complex manufacturing a series of 4 wheel drive, jeep-type vehicles in Cimpulung-Muscel, Romania. The ARO site is 60.5 hectares in size and employs 11,500 workers. Manufacturing operations include dies, stamping, forging, engines, gear boxes, transaxles, plating, painting and assembly. See Appendix C for a sketch of the site. The manufacturing operation is supported by centralized utilities for distribution of power, steam, compressed air, natural gas and water. Production is about 1,300 vehicles/month. Process waste water and sanitary sewage are discharged at two points into a pipeline that discharges into the public collection sewerage system. Storm water is discharged through four (4) sewers into the river east of the plant.

The ARO site has been used for a variety of manufacturing activities for 108 years, beginning for the first 59 years for pulp and paper followed by airplane propellers during World War II, hardware, textile machines, and motor bicycles. In 1953 the complex began manufacturing motor bicycles and automobile parts.In 1955, gasoline engines were produced which was then followed by automobile manufacturing in 1957.

This report of the ARO site at Cimpulung-Muscel, Romania has been broken down into three broad phases: organization/administrative, environmental assessment, and waste minimization.

ORGANIZATION/ADMINISTRATIVE

Plant Environmental/Waste Minimization (WM) Committee - Consideration should be given to form an environmental/waste minimization committee with engineers or technicians from each of the manufacturing plants and utility services. This committee would coordinate activities, make special studies, evaluate proposals, and exchange information on environmental and waste minimization issues. This committee should be advised of new manufacturing programs, equipment and the composition of materials used in manufacturing and maintenance to insure that the environmental issues are addressed.

Periodically this committee would prepare reports and make presentations to the senior operating management at ARO. In the United States (USA), it has been found that it is best to not place the more senior managers on such a committee because their time is often limited and they are unable to attend scheduled meetings, and instead send substitutes. This causes loss of continuity in the committee. By utilizing working engineers and technicians, a more coherent group is formed and responsibilities and initiatives are "pushed downward" in the organization. Senior management, however, must strongly support the operation and vitality of the committee.

Plant Waste Minimization (WM) Teams - Consideration should be given to forming an inter discipline team within each manufacturing plant to consider and evaluate WM programs. Please refer to Appendix D for additional information on Ford Motor Company brochure on their WM approach. Although the team composition can vary, depending

on the issues and plant, typical representatives are from manufacturing, maintenance, design, quality, environmental, accounting, and purchasing. Such a group composition insures all the potential factors involved in WM are considered. High priority can be established on the projects that seem to be most beneficial to achieve the most efficient cost reductions as quickly as possible with the least negative impact.
After selection of a WM project, the WM teams can set the objectives and goals, develop the schedule and plan, and measure the results of WM. Success on projects can then be communicated to other plants through the Plant Environmental/Waste Minimization Committee. A booklet prepared by Ford for establishing a WM program is included in the Appendix of this report.

Spill Plan - Under USA environmental regulations, each industrial complex is required to have an engineer prepare and certify a formal site environmental spill plan that are numbered and distributed to key personnel on the site. Periodically these plans are reviewed and updated. A model Spill Plan is included as Appendix E.

These spill plans depict the overall site and sewer systems, identify the manufacturing plants and processes and the sewer systems in which they discharge, location of chemical and oil storage systems, etc. The spill plans identify potential sources of spills (i.e. oil storage tanks) that may require the construction of secondary containment, additional investigations to determine any sewer cross connections, emergency response procedures and equipment, and the names and telephone numbers (including home telephone) of persons and agencies that require notification during a spill.

Because of the numerous plants, size, age and complexity of the ARO complex, a spill plan is recommended. A model spill plan is included as Appendix E.

Long Range Pollution Control Master Plan - Clearly, as witnessed in the USA and western Europe, in the future, environmental regulations will continually to become more stringent. Consequently, ARO should consider the adoption of a long range pollution control master plan which looks out over the next 15-20 years. Obviously, over time, conditions, new facility construction, and regulations will change, so the master plan is not constructed to be a rigid document, but instead an overall plan that provides continuity of planning over time. Items to be considered in the development of such a master plan are included in the second section of this report - ENVIRONMENTAL ASSESSMENT. The advantage of such a master plan is that common environmental objectives, goals, and planning are accomplished when various facilities are rearranged, or are constructed as opposed to making costly revisions at later times.

Cooperation with Public Treatment Organization - Presently all treated and untreated wastewater, including sewage, is directed into a public sewage system through a pipeline. Presumably, the ARO wastewater, together with residential, commercial, and other industrial wastewater is further treated in a public treatment. It is understood, but not positively confirmed, that this public treatment consists of sedimentation and some sort of biological oxidation. Irrespective of what the present public treatment facilities may presently consist of, inevitably, over time, environmental regulations will require such facilities to operate at a high level of efficiency.

Because ARO is a major contributor of the flow to such a system, and therefore can adversely influence its successful operation, and irrespective of more formal rules and regulations governing the effluent to the system, it is important to establish some sort of informal communication and understanding between the operations. Such communications allow for notification of spills or shock discharges and related operational problems. Furthermore, it provides longer sufficient advance notice of more stringent requirements and/or controls of the public treatment system to allow ARO to plan and install control facilities to maintain compliance and minimize operational problems. The informal relationship recommended is meant to supplement, not replace, more formal contracts or limitations.

ENVIRONMENTAL ASSESSMENT

Assessment of Existing Systems - There are many vary favorable environmental conditions and systems at ARO that should be recognized as excellent. The list below represent the major items.

1. The new zinc plater and heavy metal treatment system are excellent designs and should preform well.

2. The present ARO program of eliminating cadmium plating and reducing the amount of cyanide solutions is highly encouraging. Cadmium is a very toxic heavy metal and efforts are underway worldwide to eliminate cadmium in products and processes. In fact, Sweden prohibits any products to be sold that contain cadmium.

3. ARO apparantly has not used any chlorinated solvents in its manufacturing or maintenance processes. Chlorinated solvents have been utilized at many USA locations as fireproof cleaning agents, however, some chlorinated solvents have been found to be suspected carcinogens. Chlorinated solvent spillage and storage tank leakage on the ground has frequently resulted in contaminated groundwater that is very costly to cleanup.

4. All sewage and treated and untreated industrial wastewater is directed to the public sewer system and only selected cooling water and storm drainage are discharged into the storm sewer system.

5. Major sources of heavy metals from manufacturing processes are treated before discharging into the process sewer system. Heavy metal sludges are concentrated in sludge presses and stored on site in a protected area.

6. Facilities are installed and efforts are made to skim free oil from wastewater and storm sewer runoff.

7. A new paint shop is being completed which should improve product quality and possibly the character of discharge from the painting operations.

Recommended Short Term Efforts

Certain actions can be considered to improve the operation of the present pollution control systems. These are outlined below.

1. Sampling - Presently waste water sampling consists of obtaining a couple of "grab samples" each day. While this procedure provides a glimpse of the situation, it will not identify major losses of pollutants which may occur from periodic system dumping. For this reason, one action which should be considered in the near future, is to install automatic composite samplers on the effluent sewers to better identify the character of discharge. Most important would be the samplers on the two (2) points where ARO discharges into the public sewer system. Ideally, at these points, Venturi Parshall Flume flow measurement devices should be installed which can then be interconnected with the samplers to provide weighted composite samples. Parshall flumes eliminate the problem with the backup of sediments in the public sewer. Flows from storm sewer outlets can be measured with small "V" notched weirs.

2. Oil Control - At present there are several locations where there is a high probability of free oil loss to the storm system. This is very similar to what was experienced at USA manufacturing plants in the 1970's. These locations include the following:

   a. Waste oil collection tanks outside of the plants, both above grade and underground where it is evident that oil has been spilled. Better house-keeping and containment walls would prevent excessive oil losses.

   b. Metal chips are hauled to a storage area on plant roads, and there is evidence of oil drainage. Better drainage of oil from hoppers before removal from the plant would minimize this loss.

   c Oil drums are often left open and, in the event they fall over, the oil is lost. Screw caps on the openings will minimize this problem.

   d. The buried oil interceptor tank by the oil storage area, while perhaps effective in dry weather, probably doesn't function well in heavy runoff periods. In the USA, operations were improved by pumping off accumulated free oil more frequently and designing high flow bypasses to avoid oil washout in high flows.

   e. The storm water oil lagoon established at the outfall of two of the four storm sewers to intercept and inventory oil losses is somewhat similar to the oil interceptor outlined above. Access to the lagoon is difficult, so it is suspected that skimming and removal of accumulated free oil is not frequent. Besides any increased efforts which might be made to remove the accumulated oil, consideration be given to the USA practice of establishing high level bypass spillways at the storm sewers to avoid the washout of accumulated oil from the lagoon in high discharge periods.

3. Concentrated Solution Dumps - Until formalized treatment facilities are available for control of concentrated solution dumps (i.e. soluble oil used in machining, zinc phosphate from phosphating, and contaminated water from paint booths), the only approach to reduce their impact on the receiving sewer and public treatment system is to inventory these solution in a tank and bleed them into the sewer at a slow rate over a long period of time.

4. Interconnection of Sewer Systems - The storm and process sewer systems are presently interconnected at least at one location where a backup from an obstruction in the process sewer caused the water level to rise and overflow into the storm sewer system. It is not clear whether or not the absence of this overflow connection would cause upstream flooding damage. Consequently, some study is required to determine what actions would be needed to eliminate this cross connection.

Recommended Long Term Program Considerations - Undoubtedly, as in the North America and Western Europe, environmental will continue to become increasingly more stringent. As mentioned in the earlier "ORGANIZATION/ADMINISTRATIVE" portion of this report, it was recommended that a "Long Range Pollution Control Master Plan" be developed by ARO. This section of the report outlines the actions that should be evaluated in the development of such a master plan. Information on Ford waste water treatment design concepts is presented in Appendix F.

1. Cover Open Oily Areas - Open paved areas continually exposed to oil drainage, particularly the chip handling and oil storage slabs, can only be effectively controlled by constructing some sort of roof covering to divert precipitation from washing oil into the storm sewer system.

2. Isolate and Treat Emulsified Oil - Emulsified oil discharged to the public sewer system can interfere with effective biological treatment conducted in the public sewage treatment facility. These waste waters originate in machining operations as cutting fluids and overflows and dumps from industrial washers. Other sources of emulsified oil typically occur in the stamping plant, tool making, and from air compressors.

   Since treatment of emulsified oil is best accomplished by chemical additions with subsequent flotation of oil and contaminates broken from the emulsion, treatment is most effective if it is maintained separate from heavy metal and paint treatment systems which utilize sedimentation after chemical treatment. In the USA, it has been found most economical to place a single oily waste water treatment facility in a convenient location and pump various sources of oily waste to this single treatment system. In certain circumstances, where emulsified oil solutions are relatively low in volume, they can be hauled by vehicles to the treatment facility.

3. Paint and Phosphate Waste Water - Presently paint and phosphate waste waters are discharged into a tank system where the water is neutralized and heavy sediments and some precipitated heavy metals are allowed to settle. While such treatment is a good beginning, it is not effective in removing major amounts of paint and associated color. Periodically the zinc phosphate solution tank is

dumped and recharged, and the present treatment system is not effective in removing the extremely light weight zinc precipitates that are formed. Furthermore, with the introduction of a new paint shop, and related paint wastes from these sources, the situation will become exacerbated, particularly from the new electrocoat paint system.

In addition, the present phosphate process is not followed by any pacification chemicals to minimize corrosion before application of primer paint. Usually this pacification utilizes hexavalent chromium for this purpose, although there is a substitute, non-heavy metal pacification chemical manufactured which can be used. (See Appendix G). The use of chromium requires treatment of the rinses and solution dumps.

Colloidal suspensions of paint and heavy metal precipitates are best removed from waste water by batch treatment with chemical additions, including the use of organic polymers, with subsequent sedimentation. In the USA, it has been found most economical to provide a centralized location for treatment of these sources of waste waters rather than building and operating treatment at each location.

4. Sludge Disposal - Ironically, as waste water treatment efforts are intensified with new, more efficient systems, the volume of residuals (sludges) that are removed will increase. This includes the sludges from both the (1) treatment of heavy metals, paint processes, and oil and (2) paint sludges removed from pits. In the USA, environmental requirements have become quite strict and prohibit the mixing of such industrial sludges with domestic wastes in public landfills. Furthermore, industrial companies are being held accountable for the cost of cleanup of old public and commercial dumps in which the companies deposited such wastes in the past. For this reason, it is recommended that all industrial sludges from ARO be deposited in landfills specifically designed for such wastes. These landfills can either be regional to serve other industries or limited to ARO alone.

Because of the cost to construct and operate such industrial waste landfills, it becomes increasingly important to minimize the volume of sludges. ARO is already consolidating heavy metal sludges with filter presses. Further volume reduction can be considered, if economical, by removing additional water by drying sludges with commercial dryers, although such practices are just now being considered in the USA and experience is limited. Organic sludges from oil and paint processes can be incinerated in commercial rotary kilns if they are available. Normally, incineration is not economically justified at a single industrial site such as ARO.

Any industrial waste sludge storage system should be designed to be impervious and equipped with secondary containment and monitoring for leakage between the two layers of containment. Typically, in the US, open, double liner storage impoundments with leachate collection, are used for this purpose. Buried concrete structures have the advantage of limiting the accumulation of precipitation and withstanding earthquakes, however, they are difficult to design to be

waterproof and be contained with an underlying secondary plastic liner and leakage monitoring system.

5. Storage Tanks - As mentioned under the Spill Plan portion of the "ORGANIZATION/ADMINISTRATIVE" section of this report, all oil and chemical storage tanks will probably eventually require secondary containment. Tanks for chemicals and petroleum materials that are not flammable or explosive should be above grade and equipped with impervious slabs and walls or earth dikes. Any underground tanks that remain will need to have either a double wall with interior monitoring, or placed in vaults to allow periodic inspection.

6. Air Pollution Controls - Since the plant utilizes natural gas and oil for heat and industrial processes, air pollution sources are minor except for the solvents in the paint process. Ultimately, environmental requirements may require reduction of the volume of solvents lost to the atmosphere. This can be accomplished by reformation of solvent-based paints or increasing the use of water and powder based paints. The design of paint ovens for curing solvent paints should include elements to allow the addition of incinerators in the future.

7. Other Issues - Presently, there is little evidence that employee protection equipment is being used. This includes safety glasses, hearing protection, and the use of breathing masks in paint booths. In some situations, the plant interior air is poor and improved plant ventilation would be beneficial. Finally, it appears that asbestos wrapping has been commonly used to insulate steam lines and, in one pit, the asbestos wrapping had been damaged. A survey of the extent of asbestos use and potential exposure to employees is probably warranted.

Additional Long Term Program Issues - Although the purpose of this report is to address present day issues, it is clear that future improvements in product quality and additions of processes will impact the environment. For this reason, the following additional comments are included.

1. Electrocoat Primer Painting - The new paint shop will include electrocoat painting. It is understood that the proposed paint will be anionic and the system will use ultrafilters to separate the paint solids from the permeate and then use the permeate in counterflow rinsing. In the USA, no major problems developed from the use of anionic electrocoat paint, however, subsequent conversion to cathodic electrocoat paint created major problems with sewer plugging when excess paint was lost to the sewer. For this reason, any future program which utilizes cathodic paint should be carefully reviewed to benefit from the experience of USA companies to avoid repetition of this problem. Additional comments about excessive paint loss are included in the "WASTE MINIMIZATION" portion of this report.

2. Demineralizers - The acid utilized in the regeneration of demineralizers can severely damage the receiving sewers and for this reason, the flows from the acid and alkaline regeneration should be collected and combined to neutralize the acid in a suitably lined-tank before discharge to the sewer.

3. Paint Systems - As automatic paint systems and more varied colors are utilized on vehicles, the amount of solvent cleaning will increase. This will result in increased use of solvents with the attendant issues of handling, storage and disposal. It is important to prevent solvents from being lost to the ground or disposed of in unprotected landfills where they can leach down and contaminate the groundwater.

4. Sheet Metal and Steel Protection - Much of the sheet metal and steel parts being received is not adequately coated with oil to prevent rust. It is expected that this will improve in the future and this, in turn, will increase the amount of oil which will need to be removed in cleaning and preparation for painting. This will require additional volumes of cleaners, increased rinse flows, and more frequent dumps of cleaning and rinse systems. Such increases may adversely impact treatment systems.

5. Building Ventilation - Improved building ventilation to remove fume, oil mist, and paint over spray can result in condensation and accumulation on the plant roofs. This can result in damage to the roof covering and losses to the storm sewer system.

6. Product Quality Improvements - As mentioned earlier under the issues which should be addressed by the Plant Environmental/Waste Minimization Committee in the "ORGANIZATION/ADMINISTRATIVE" portion of this report, careful review should be made of all new processes and materials introduced into manufacturing and maintenance activities to insure proper environmental controls are installed.

WASTE MINIMIZATION (WM)

One of the major objectives of the visit to ARO and this report was to identify those WM opportunities and to single out those major WM efforts which seemed to warrant further study. This section of the report addresses WM. While the thrust of WM is primarily based on environmental considerations, two (2) of the more major and complex items requiring further study, are related more to manufacturing and energy. Many of the other WM efforts can be quickly implemented by the ARO management with very little study, effort, or cost. Undoubtedly, some WM recommended efforts will suggest other similar actions not specifically mentioned. WM opportunities are outlined below.

1. Paint Shop Fabrication - The most obvious opportunity to reduce waste in material and manpower is in the Paint Shop where there appears to be a significant amount of damage and required repairs to stamped parts being placed on conveyors for phosphating. Because a new paint shop is being constructed, many of the observations outlined below may eventually be affected, however, it is believed that a significant WM issue will still remain after the new paint facilities are made operational.

   The problem of seems to have many elements. First, it was noted that the sheet steel received at the stamping plant is insufficiently oiled and is often badly rusted. Second, stamped parts are not placed in racked containers to protect them during storage, hauling and handling. Third, parts are placed so close on

the conveyor that they can swing and dent each other, and finally, there is no pacification after phosphating and there appears to be rusting occurring as a result.

As a consequence, many sheet metal parts were seen to have small dents and rust spots before they entered the phosphating and prime paint booth. Repairs, sanding, and reintroduction of the repaired stamped parts to the phosphate system certainly results in large manpower requirements and volumes of wasted materials plus causing a considerable amount of congestion in the work area. Painting over rusted areas may affect product quality. (Other rusted small parts were seen being painted in engine and transaxle operations).

An inspection of the scrap disposal yard confirmed that many stamped damaged parts were being thrown out. Since dies are outside and seemed to be subject to rust, part of the problem of scrap may be due to defects from stamping operations from rusted dies. It was also noted on the day of the visit that painted sheet metal headlight parts were being thrown out because they were evidently obsolete.

The full cost and amount of waste was impossible to determine, and although not an environmental issue, it would appear that consideration should be given to studying the problem in more detail to identify what actions could be considered to reduce waste and improve product quality.

2. Utility Services - As mentioned earlier, compressed air and steam are centrally produced and distributed throughout the ARO complex. Because of the site size, age of facilities, and significant use of air and steam, it is expected that there are considerable losses are occurring in their distribution. A similar issue may also exist for water and natural gas. It would require a specific field study by energy experts to identify more specifically the amount and location of any such losses and whether or not a WM project to reduce losses is justified. A quick confirmation of such losses can be made by determining losses in non production periods.

   In some circumstances, it may be found that local boilers and compressors may be found more efficient. In the northern USA, it has been found that the large steam boilers used for winter heating are not efficient to meet the smaller warm weather loadings and, in many cases, it is more efficient to consider the use of smaller boilers at specific processes.

3. Machine Oil Loss - Oil losses, particularly hydraulic oils, are a problem in the USA, both because of the high oil cost and the pollution potential that waste oils pose. The aged presses and machines at ARO would suggest similar problems. The WM approach is to develop a system which monitors machine operation with the volume of hydraulic oil added to replace oil leakage. Machines that show high oil leakage can then be more clearly identified and maintenance efforts aimed at correcting the causes of such excessive leakage. In severe cases, replacement of such machines may be economically warranted. It is recommended that a study of hydraulic oil losses be undertaken at ARO.

4. Centralized Oil Systems - Presently, soluble oil coolants in machining operations are pumped from individual reservoirs which are part of each machine. It would appear as rearrangements are made and new machines are purchased, there may be opportunities to consider central recirculation soluble oil systems. Such facilities allow better control over the quality of the soluble oil, filtration and removal of suspended solids and chips, and the skimming of free oil. This should result in reduced consumption of soluble oil and waste treatment requirements.

5. Electroplating Operations - In observing the manually-operated electroplating operations, it was noted that many of the parts were still dripping solution as they were being transferred to the next solution tank. Obviously, such drainage results in wasted chemical solutions and unnecessary contamination of the next solution/rinse tank. It would appear that longer drainage time and perhaps some vibration of the rack and use of an air jet stream on the part would reduce such drainage.

   It was also noted that the present, older plater doesn't take full advantage of counterflow rinsing. Part of the problem is the limited space which is available to introduce additional rinse tanks. The issue is further complicated because the demineralizers are inoperative in the basement of the electroplating shop and the full implication of the operation of the present rinses was not understood. It appeared that static rinses were being used and that would suggest that over the production period, the quality of rinsing was deteriorating as the rinse tanks became increasingly contaminated.

6. Immersion Painting - Similar to the above comments on electroplating, even though the car body is tilted after immersion in the paint tank, primer paint was taking an unusual amount of time to drain out of the car body. This was confirmed by the amount of paint on the grating following immersion. It is suspected that the paint is trapped in tubular sections. The above situation results in a significant loss of paint. This problem would be expected to be similar when the more expensive electrocoat paint is introduced in the future.

   The obvious solution is to allow more drainage time and perhaps to place a drainage hole in car body areas that are retaining the excess paint. Such holes may have an adverse affect on the vehicle quality, and therefore product engineers must evaluate the impact of such actions.

7. Chip and Trash Disposal - Some hoppers of metal chips contained ordinary trash. Similar situations were observed with other wastes that had salvage value. Separation of various classes of waste to maintain their integrity should be undertaken. In most cases the problem can be minimized by worker education, posted signs and labels, and convenient containers to receive ordinary trash. Also, a somewhat similar situation was noted where ordinary trash was mixed with paint and oily wastes. This results in the entire drum or hopper of one type of material being unnecessarily contaminated with another.

8. Parts Painting - Small parts are hung on racks, placed on an overhead conveyor and manually painted. In many cases, most of the rack is empty of parts and

consequently, considerable paint is over sprayed and wasted. The situation could be improved by hanging small parts in a dense configuration on the rack to reduce the open areas that presently exist.

9. Drum Storage - Various unlabeled drums are stored outside. Many are totally open or have their threaded caps missing. This can result in rainwater contamination, potential loss from spillage, and inadvertent mixing of dissimilar materials; all potential sources of waste.

10. Residual Materials - Many drums were observed with residuals of virgin material remaining in the bottom of the drum. This often results, as observed in the paint kitchen, from the use of small pumps mounted at the top of the drum which are used to dissimilate the contents of the drums. Typically these pumps can't pump the bottom layer of material and it is necessary to tip the drum upside down to fully drain out all of the material.

11. Solution Dumps - Maintenance practices typically empty chemical solution tanks and soluble oil reservoirs on a schedule basis. Often, for a variety of reasons, (i.e. reduced production schedules) these solutions may not yet need replacement. This results in unnecessary wasted material and the need to treat these solutions before disposal is really necessary. It may be advisable to establish a technical sampling basis as the criteria for such dumping rather than the present arbitrary system.

12. Installation & Maintenance of Shut Off Valves - Continuous running water was observed at several locations. Installation of shutoff valves would reduce water consumption. Although not observed, a common waste in the USA, is the failure of high level shut off valves on rinses and makeup of chemical solutions. Normally when a tank is full, the valve shuts off the supply of water or a chemical, however, often these valves are located in remote and concealed locations and not regularly checked. Sometimes they fail to properly function to shut off the make up solution; resulting in waste.

13. Recirculated Cooling Water - It didn't appear that any chemicals were being added to the recirculated cooling water used at the compressors. These chemicals usually include an organic phosphate, pH adjustment, and a biocide.

    Assuming that the general practice in all such cooling systems is not to add chemicals, a waste can occur because the recirculated cooling water can cause unwanted deposits and corrosion to cooling systems due to the buildup of dissolved solids and high oxygen levels from aeration. To avoid such problems in the absence of chemical treatment, reduced cycles of recirculation must be employed by increasing the rate of blow down to the sewer. It is recommended that the practices of handling recirculated cooling water be reviewed to determine if unnecessary waste is occurring.

14. Chromium Treatment - The present chemical treatment of electroplating waste water is to oxidize the cyanide solutions and then combine them with the hexavalent chromium-bearing solutions for chromium treatment. Since chromium

solutions must be reduced to a pH of 2 and reduced with sodium metabisulfite, combining and treating waste water not containing chromium results in an unnecessary waste of chemicals. It is recommended that the two waste streams not be combined until the hexavalent chromium is first reduced.

CONCLUSIONS

Overall, the present environmental awareness at ARO is excellent and responsible steps have been taken to insure that gross pollution is not occurring. There are no situations in crisis. Undoubtedly, in the future, environmental expectations and resulting regulations will become more stringent. Hopefully, the suggestions in this report will assist ARO in meeting these future environmental challenges.

WM is a rapidly development in the USA and has resulted in significant cost savings, improved product quality, and reduced environmental problems. Each manufacturing circumstance is different and requires somewhat different approaches. For example, in the USA, the disposal of cardboard boxes is a difficult and costly issue which is slowly being resolved by new improved packaging and development of an infrastructure to recycle cardboard. At ARO, there was very little cardboard seen, however, with improved packaging, more cardboard may be received at ARO.

In conclusion, it was a pleasure to visit ARO and hopefully to provide them with some assistance.

APPENDIX A - RESUME STUART H. VAUGHN

RESUME

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Manager, Facility Environmental Engineering
Plant Engineering Office
Environmental and Safety Engineering Staff
Ford Motor Company

DESCRIPTION OF RESPONSIBILITIES:

Department responsible for planning, design, and operational assistance of facility environmental control facilities for Ford worldwide operations. Major activities involve wastewater treatment, site remediation/groundwater cleanups, & related waste minimization. Negotiate with Governmental units on water/sewer infrastructure issues and planning. Direct and prepare necessary engineering evaluations related to Corporate manufacturing plant site selections.

PROFESSIONAL HISTORY: (Years, Titles, and Responsibilities)

1954-56	Detroit Department of Water Supply	Junior Engineer
1956-58	Giffels & Vallet - Consulting Engineers	Structural Engineer
1958-63	U.S. Army Corps of Engineers,	Senior Hydraulic Engineer
1963-66	Ford Plant Engineering Office,	Associate Civil Engineer
1966-73		Principal Facility Engineer
1973-83		Chief Environmental Engineer
1983-91	Manager, Facility Environmental Engineering	
1959-68	Lawrence Institute of Technology	Evening Instructor - Civil Engineering & Sanitary Engineering
1968-73	Wayne University College of Applied Management	Evening Instructor

LICENSES, DEGREES (years received):

BS Civil Engineering - Duke University 1954
Registered Professional Engineer - Michigan (1958), Ohio, Florida

Registered Professional Land Surveyor Michigan (1967)
Diplomate - American Academy of Environmental Engineers (1967)

PROFESSIONAL AND TECHNICAL ASSOCIATIONS

Water Pollution Control Federation
Engineering & Science Fair of Metropolitan Detroit - 1960-82
Director. Secretary, President, Board of Directors
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APPENDIX B - BUSINESS CARDS OF CONTACTS

APPENDIX B

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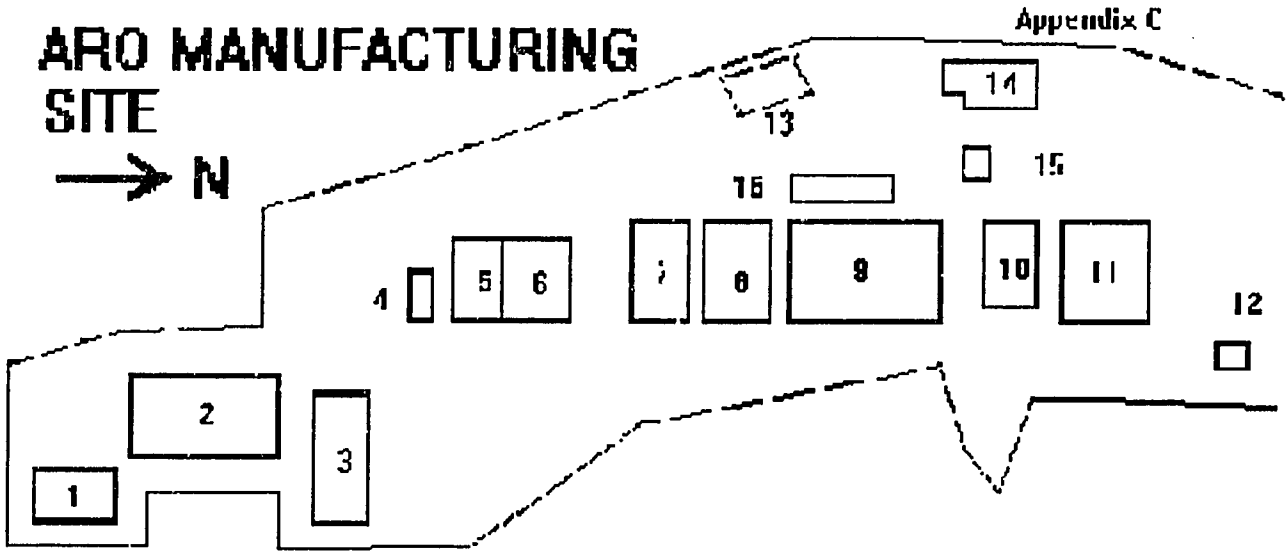
APPENDIX C - SKETCH OF ARO SITE

Appendix C

ARO MANUFACTURING SITE



1. Tool Shop
2. Die Manufacturing
3. New Zinc Plating Shop
4. Misc. Building
5. Final Inspection
6. Gear Box Manf.
7. Storage Building
8. Assembly Plant
9. Stamping & Painting
10. Engine Plant
11. Transmission Plt
12. Office Building
13. Sludge Storage
14. Oil Handling Area
15. Chip and Scrap Area
16. Outside Storage

APPENDIX D - A ROADMAP TO AN EFFECTIVE WASTE MINIMIZATION PROGRAM

APPENDIX D

A Roadmap to an Effective Waste Minimization Program

Your Guide to Developing A Local Waste Minimization Program

September, 1992

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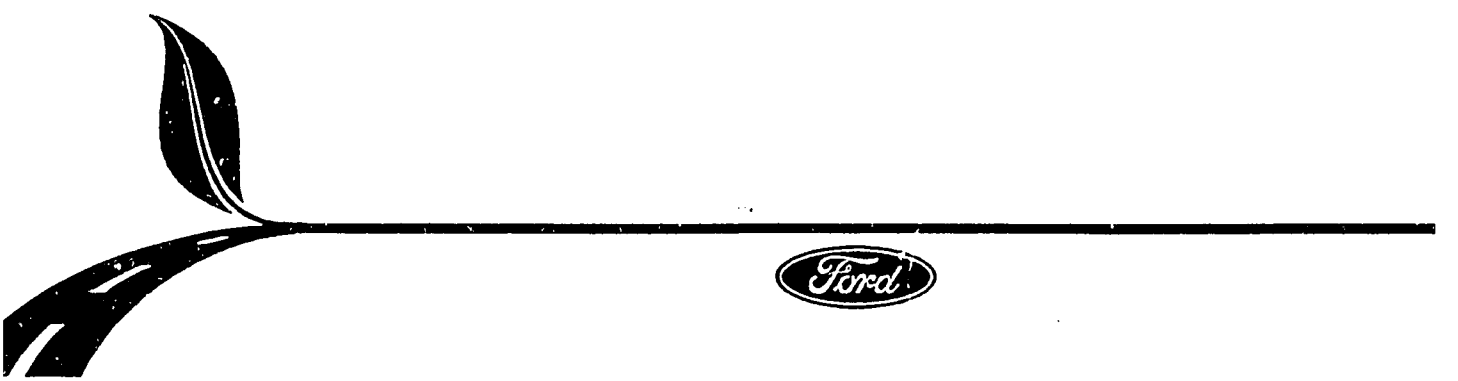
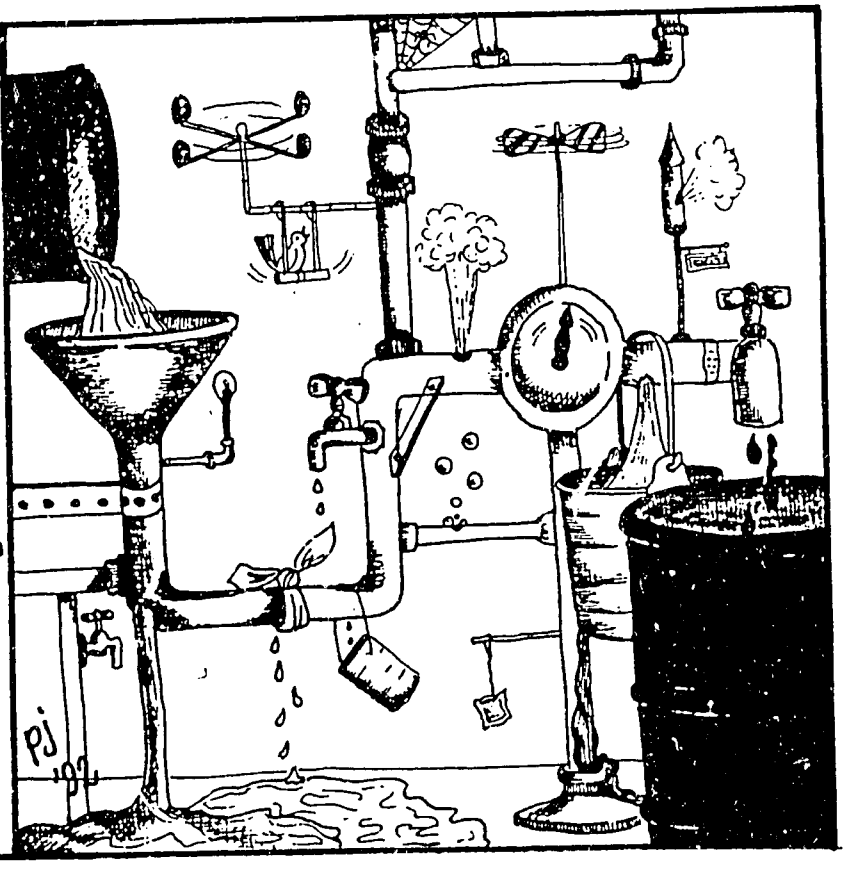


SOME PROCESSES ARE MORE WASTEFUL THAN OTHERS. TARGET YOUR EFFORTS!



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Patti Jamieson	graphics
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Overview

Purpose

This manual is a user-friendly guide to help you organize and maintain a Waste Minimization program at your location.

Organization of this book

This booklet is divided into 7 sections:

- Introduction
- Phase I: Waste Minimization Start-up
- Phase II: Know Your Waste Streams
- Phase III: Establish Priorities and Refine Goals
- Phase IV: Focus on Your Waste Sources
- Phase V: Develop Effective Waste Solutions
- Phase VI: Verify Results

Objectives

After reading this manual, you will be able to:

- Develop a local waste minimization program.
- Identify who should be on your local waste minimization team.
- Locate the major wastes in your facility.
- Implement methods to reduce your wastes.

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A Roadmap to an Effective Waste Minimization Program

Introduction

Basic Information

Here are some common questions and answers about waste minimization.

Q: What is waste?

A: Any material that is not used in a finished product is waste.

Q: Why is waste important?

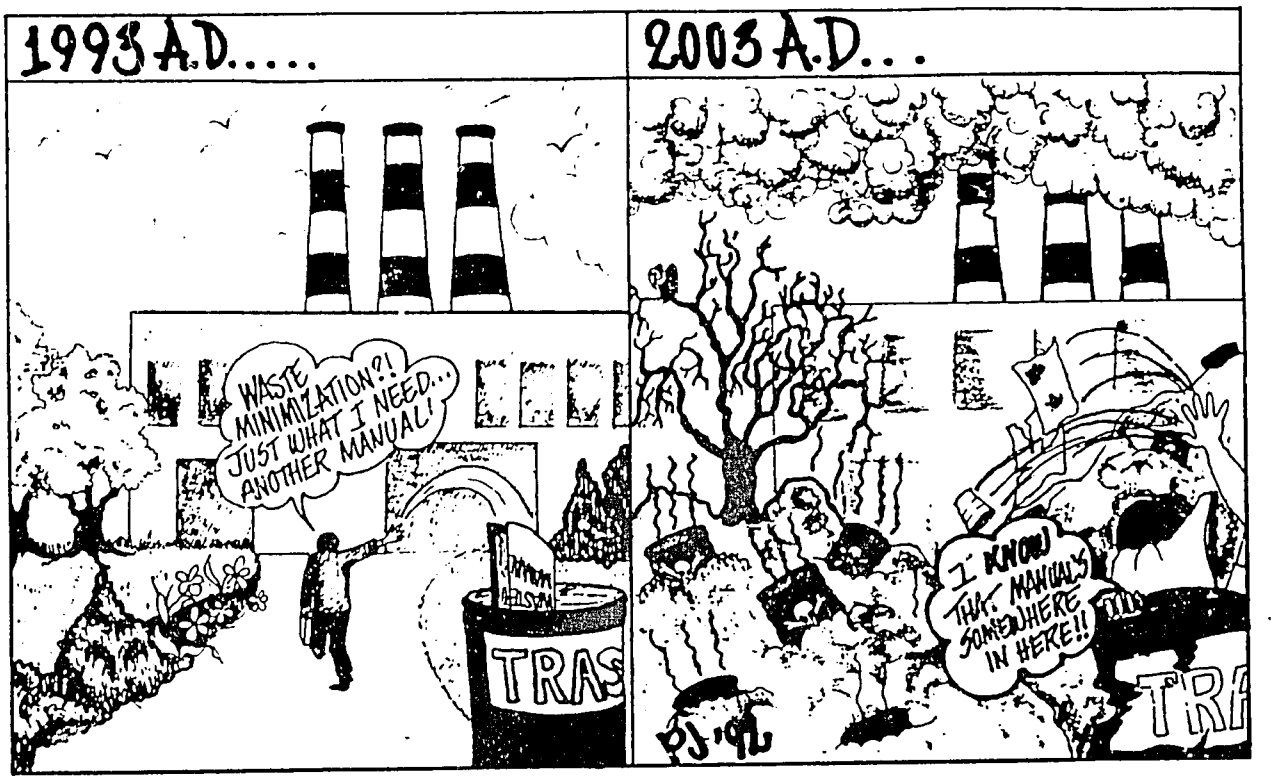
A: Because every waste represents an opportunity to reduce your facility's environmental impact and to save your facility money.

Q: What should I do about waste?

A: Everyone should work to find and reduce or eliminate waste to the greatest extent practical.

Q: How can I reduce waste?

A: This manual provides guidelines for identifying and acting on waste reduction opportunities.



Why Waste Minimization?

The goal of **waste minimization** is to improve our operations by minimizing the amount of waste materials that we produce. Practicing waste minimization is important for a number of reasons.

- **Reduced operating costs.** Raw material, waste handling, waste disposal, and maintenance costs can be greatly reduced when we make more efficient use of our materials.

- **Improved environment.** Reducing the amount of waste material that we produce improves the environment.

- **Improved quality.** Waste minimization forces us to take a fresh look at our production methods and to identify inefficient and wasteful processes and procedures. Waste minimization is a component of total quality. In fact, a sound waste minimization program is required to achieve Total Quality Excellence (TQE).

- **Safer workplace.** Waste minimization often leads to better housekeeping and fewer hazardous materials in the workplace. Worker safety is improved.

- **Regulatory compliance.** A variety of federal, state, and local regulations currently mandate pollution prevention programs at manufacturing facilities, and these regulations are likely to become increasingly strict. Waste minimization will reduce the impact of these regulations.

Waste minimization requires us to change the way we view our manufacturing processes. We can no longer afford to ignore the wastes produced by our facilities. Rather, we must learn to focus on the processes that create waste materials and to develop creative ways to reduce these wastes.

The Waste Minimization Hierarchy

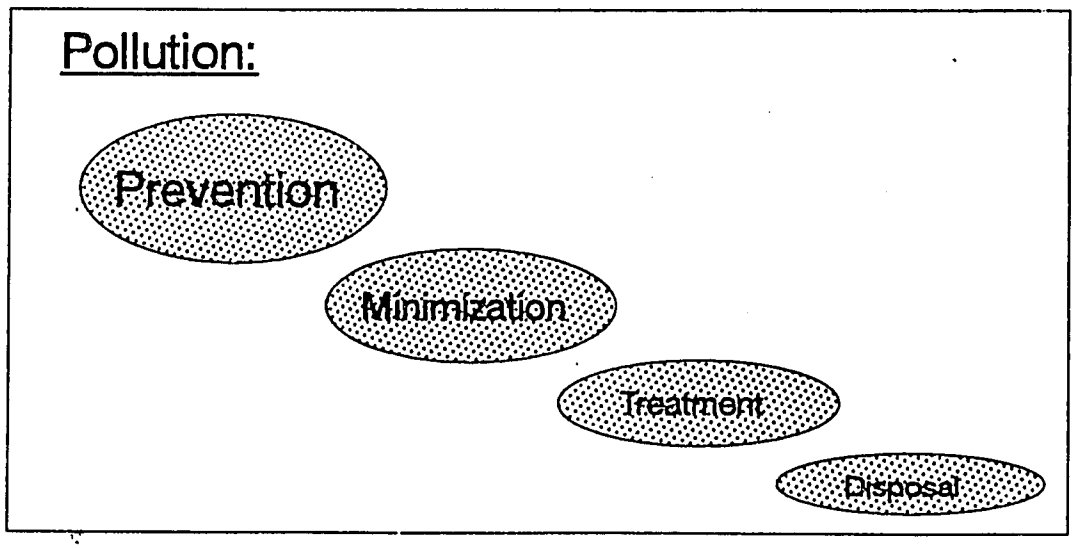
The term "waste minimization" encompasses a variety of strategies for dealing with wastes. Strategies that reduce or eliminate wastes before they are created are preferable to those that deal with treating or disposing of wastes that are already formed. The hierarchy of strategies that you should use include:

- **PREVENTION.** The best waste reduction idea is the one that keeps waste from being formed in the first place. Waste prevention may in some cases require significant changes to processes, but it provides the greatest environmental and economic rewards.

- **MINIMIZATION.** If waste generation is unavoidable in a process, then ideas that minimize that waste to the greatest extent possible should be pursued. Minimization can often be accomplished through relatively minor changes in our processes.

- **TREATMENT.** When wastes cannot be prevented or minimized through reuse or recycling, strategies to reduce their volume or toxicity through treatment can be pursued. While "end-of-pipe" treatment does in some cases reduce wastes, it is not as effective a strategy as preventing the waste in the first place.

- **DISPOSAL.** The last idea to consider in a waste minimization program is alternative disposal strategies. While proper disposal of wastes is an important component of a total waste program, waste disposal is the least effective element of a waste minimization program.



The Six Phase Process

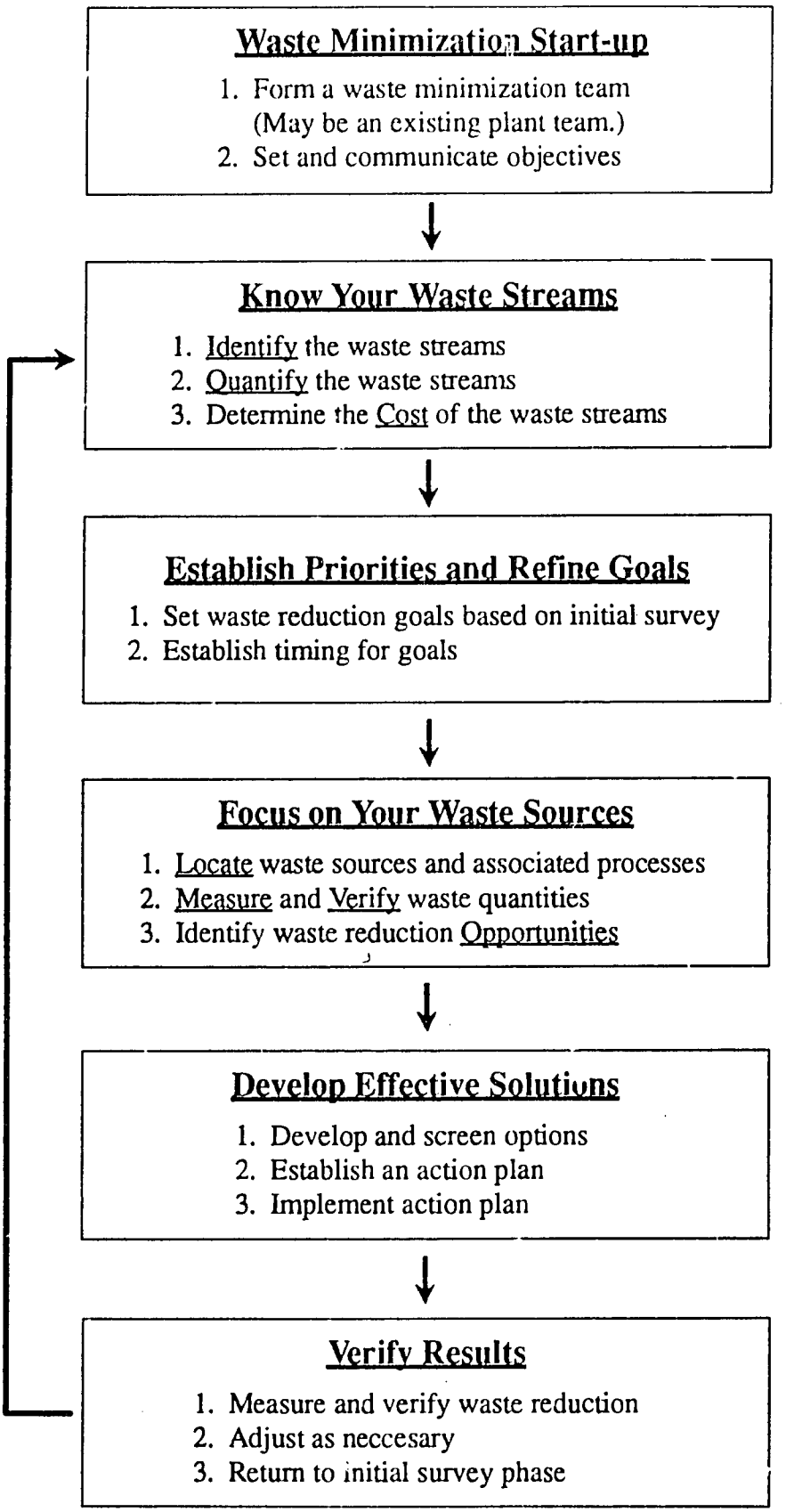
A successful waste minimization program requires an organized approach to identifying problems and developing solutions. This booklet is intended to be your guide to establishing such a program. It provides the framework for gathering information about your waste streams, for organizing that information, for identifying waste reduction opportunities, and for acting on those opportunities.

The waste minimization program is broken down into six phases, which are diagrammed on the following page. Each of these phases is presented in greater detail in the following sections of the manual. Each section includes:

- Steps to follow
- Example situations
- Sample forms for collecting and analyzing data

While the six phases are presented in sequence in this manual, you will find that once your program is underway, you may be using several phases simultaneously.

This guidebook is intended to assist you in establishing a formal waste minimization program. Because you know your own facility best, you should change the specifics of the book to fit your situation. Do not let the details hide the basic goal: to **find waste and eliminate it!**


Waste Minimization Start-up
1. Form a waste minimization team
(May be an existing plant team.)
2. Set and communicate objectives
Know Your Waste Streams
1. Identify the waste streams
2. Quantify the waste streams
3. Determine the Cost of the waste streams
Establish Priorities and Refine Goals
1. Set waste reduction goals based on initial survey
2. Establish timing for goals
Focus on Your Waste Sources
1. Locate waste sources and associated processes
2. Measure and Verify waste quantities
3. Identify waste reduction Opportunities
Develop Effective Solutions
1. Develop and screen options
2. Establish an action plan
3. Implement action plan
Verify Results
1. Measure and verify waste reduction
2. Adjust as neccesary
3. Return to initial survey phase

Phase I: Waste Minimization Start-up

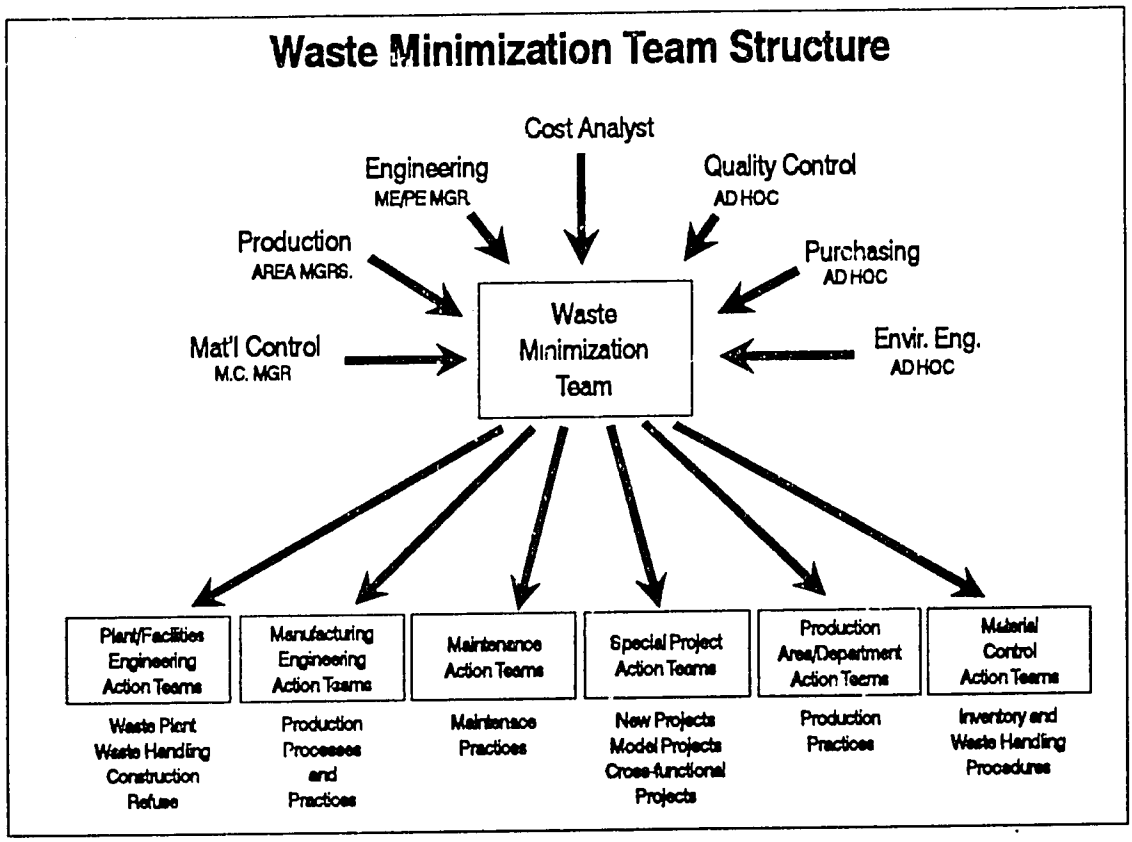
1. Form a waste minimization team
   (May be an existing plant team.)
2. Set and communicate objectives

The waste minimization program for each facility should be guided by a waste minimization team. Team members should come from all parts of the plant, including both hourly and salaried representatives. Your facility may already have a committee established with the necessary resources for directing the waste minimization program. This committee could take waste minimization as an additional responsibility. Alternatively, a new team can be formed.

Each team needs to have a champion. This individual should be a Manufacturing Engineering Manager, Facilities Engineering Manager, or individual with a similar level and background. Specifically, the team should include representatives from:

- Material control
- Controller's office
- Plant engineering
- Facilities engineering
- Maintenance
- All production areas
- Purchasing
- Environmental engineering

The demands on this team are great, which is why it must be composed of motivated people from all activities.



Team Responsibilities

The waste minimization team is responsible for:

- Coordinating the collection of data
- Analyzing the data
- Setting waste reduction goals and priorities
- Communicating goals and results
- Forming action teams to address specific issues
- Receiving and evaluating waste prevention ideas from other employees
- Developing their own waste prevention ideas
- Promoting and implementing programs

Involving Others

The waste minimization program will not be limited solely to the waste minimization team. The success of the program will depend on the cooperation and support of **all** facility personnel, from top management on down. As with other important programs, **everyone** should participate to gain the maximum benefit. Therefore, the goals, problems, and successes in waste minimization need to be communicated throughout the plant. A **facility-wide commitment** to waste reduction is the best insurance for a successful program.

In particular, the waste minimization team may find it necessary to form new action teams or to use existing ones to investigate specific waste issues. The action teams will be experts in particular areas, and will report their results to the main team.

Setting Objectives

The first task of the waste minimization team is to establish initial objectives for the program. Next, the team must communicate the objectives to the rest of the facility. The objectives clarify and focus the efforts of the facility. The objectives should be ambitious: ideally a facility shouldn't produce any waste. The objectives should include:

- the goal of minimizing the creation of wastes
- the expected benefits
- the boundaries on the program

Everyone in the facility should be informed about waste minimization and should be encouraged to look for waste prevention opportunities in their jobs.

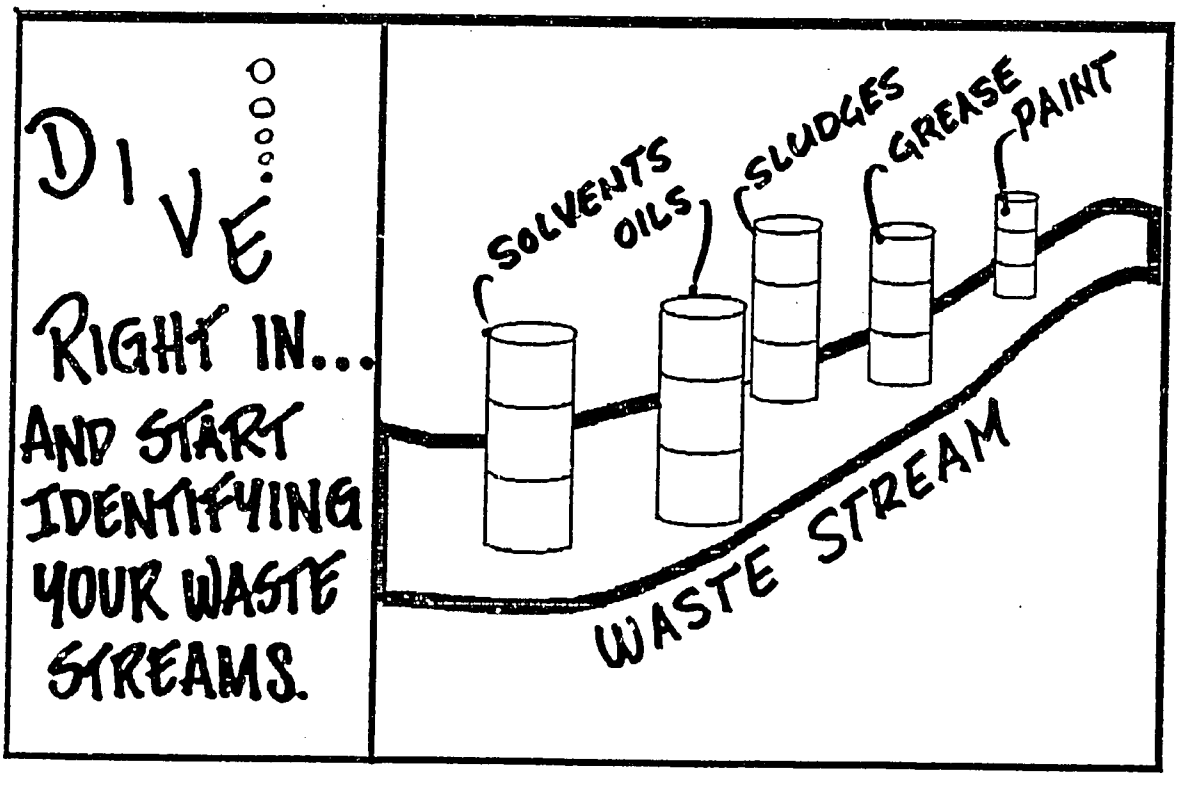
Phase II: Know Your Waste Streams

1. IDENTIFY the waste streams
2. QUANTIFY the waste streams
3. Determine the COST of the waste streams

Every process at your location is a potential candidate for waste reduction. To identify the greatest opportunities for waste reduction at your facility, you need to get three pieces of information.

- The SOURCES of your wastes
- The QUANTITY of waste material produced
- The real COSTS of these waste practices

These three pieces of information will point the way to your **OPPORTUNITIES** to reduce waste and conserve resources.

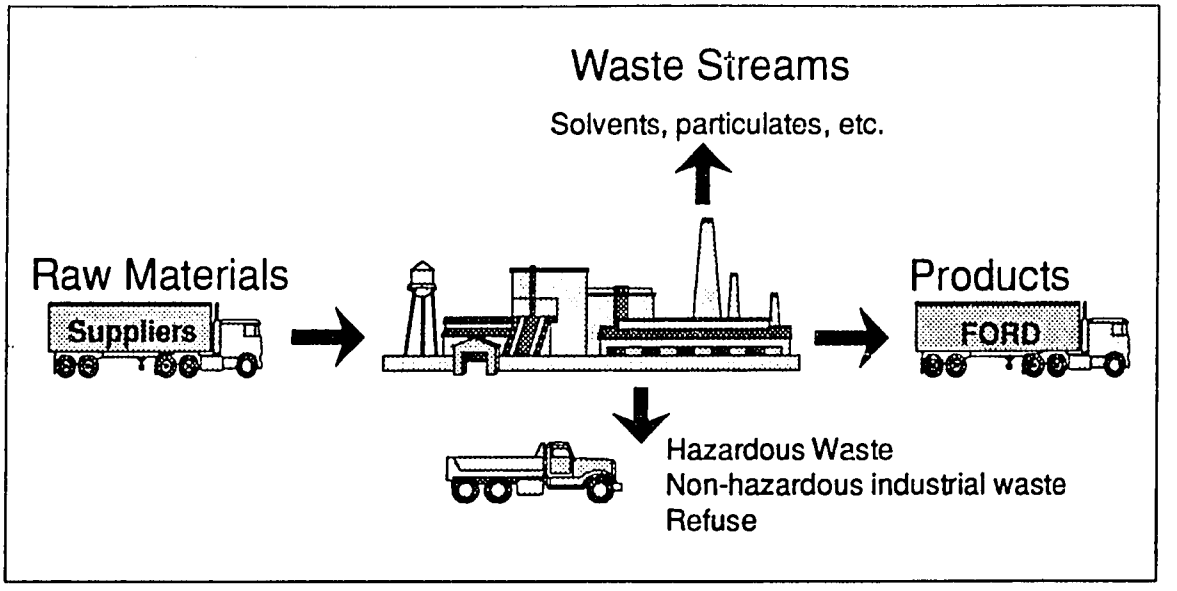


How to Begin

The first step in getting this information is to learn about your overall waste streams. At this early stage of the waste minimization process you will be taking a broad view of waste production, by looking at the total material entering and leaving your facility. You need to consider the composition, quantity, and overall cost of each waste stream in your facility. After you have this information, you can begin to discover the causes of waste production. You will be in a better position to prioritize your plant's needs for pollution prevention.

Plants are already required by the Company and by government regulations to report much of this information annually. The trend is toward increased reporting requirements. Plants must also demonstrate that they are reducing wastes. The most effective way to meet these requirements is to be proactive with waste reduction efforts.

The following pages contain suggestions for obtaining and organizing this information about your facility.



Identify the Waste Streams

Every plant works with raw materials, products, and wastes. Raw materials are all the things brought into the plant for manufacturing, such as parts, paint, and lubricants. They are used to make products. Waste is any material that enters the plant that does not become part of a product. The best place to start in a waste survey is to identify those materials that enter your facility that become wastes. You may already know exactly what your wastes are, but it is still important to write down that information in as much detail as possible.

Your facility may contain a variety of waste streams. Examples might include:

Waste Stream	Waste components
wastewater	water, various oils, cleaning agents, chemicals
paint shop stack	toluene, xylene, ethers
solid waste	packaging material, process scrap, debris, scrapped equipment
drummed waste	greases, oils, chemicals

A form like the one on the following page can be used to record your facility's waste streams, their compositions, the locations where they leave the facility, the methods of storage, shipment, and disposal, and the names of contractors who handle the wastes, if any. This information can be obtained from a number of sources, including:

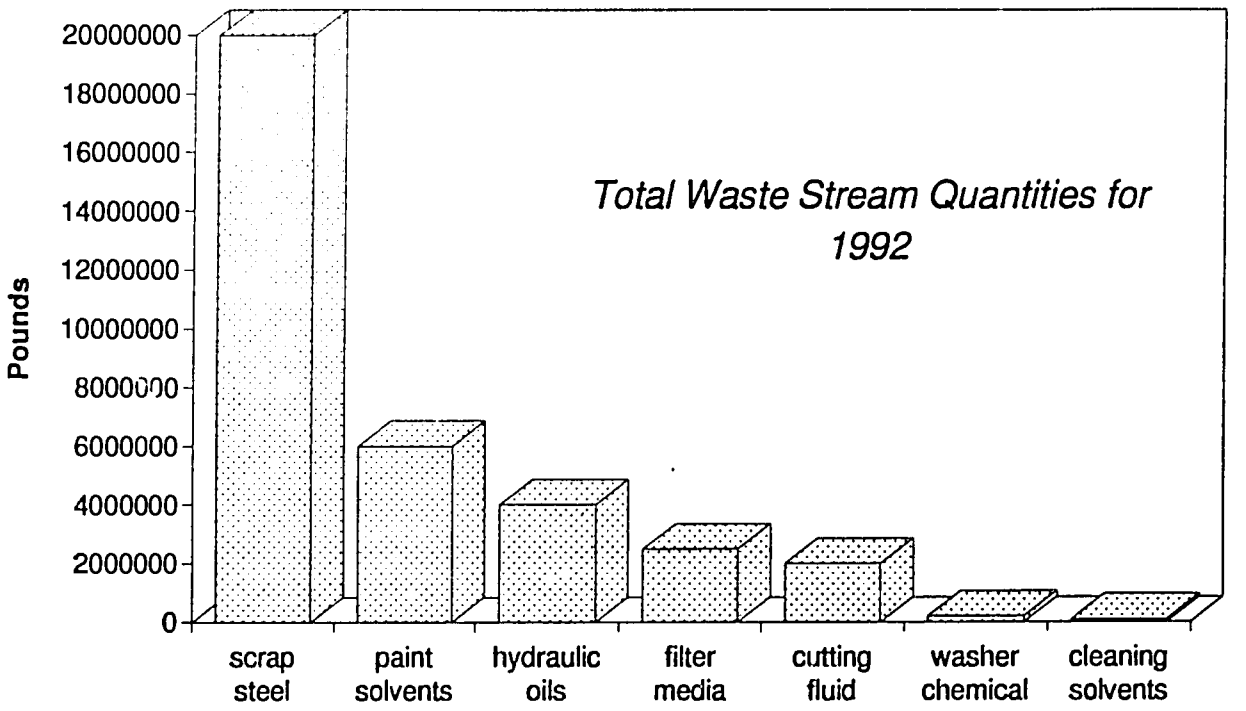
- work logs
- maintenance records
- manifests
- shippers
- treatment, storage, and disposal facility records
- environmental reports
- laboratory reports
- purchase records
- direct observation

Because the waste streams for a plant can be quite large and varied, you will want to draw on the knowledge of many different people. Use the resources of the team. Information you obtain now will be used throughout your waste program.

Example: Sample Waste Stream Identity Worksheet

A Company facility has decided to initiate a waste minimization program, and as a first step in the program has begun to collect information on the types of wastes it produces. Three major waste streams are identified, including wastewater, paint shop solvent emissions, and scrap steel. The relevant information about each stream is entered in the table below. (These waste streams are examples and are not necessarily representative of any Company facility.)

Facility: *XYZ Plant*		Time: *1992 waste streams*			
Waste Stream	Components	Disposal/Treatment Location	Storage Method	Method of Disposal	Source of Information
paint shop	*toluene*	*stack*	*none*	*air emission*	*VOC Report*
	toluene	*shipping dock*	*drum*	*recycler*	*manifest*
	xylene	*shipping dock*	*drum*	*recycler*	*manifest*
	xylene	*stack*	*none*	*air emission*	*VOC Report*
scrap steel	*steel*	*salvage area*	*railcar*	*sold for scrap*	*invoice*
	filter media	*salvage area*	*railcar*	*shipped with scrap steel*	*salvage personnel*
wastewater	*water*	*treatment plant*	*none*	*POTW*	*water bill*
	hydraulic oils	*treatment plant*	*tank*	*sent to oil reclaimer*	*manifest*
	cutting fluid	*treatment plant*	*tank*	*sent to oil reclaimer*	*manifest*
	washer chemical	*treatment plant*	*none*	*POTW*	*maintenance records*



Quantify the Waste Streams

Once you know what your waste streams and wastes are, the next step is to measure them. You will need to establish baseline waste data, track waste reduction, and determining waste costs. This process allows you to compare the quantities of waste produced (as in the chart above) and follow waste quantity trends over time.

Data on waste quantities will probably not be readily available. A primary task of the waste minimization team will be to establish methods for continuously monitoring the production of waste. Initially, information from a variety of sources will have to be combined to provide baseline data. Many of the sources of information listed above will be useful.

A good method to use to quantify wastes is to generate a material balance for your whole facility. This method compares the raw materials purchased with the products and wastes produced (assuming your facility does not accumulate material over time):

Raw Material In = Products Out + Waste

Because material purchase and production information is more readily available than disposal information, a material balance can help both verify and expand your waste data. In particular, most non-production materials end up in waste streams, and records for their use are generally accurate and readily available on the Corporate Procurement and Receiving System (CPARS).

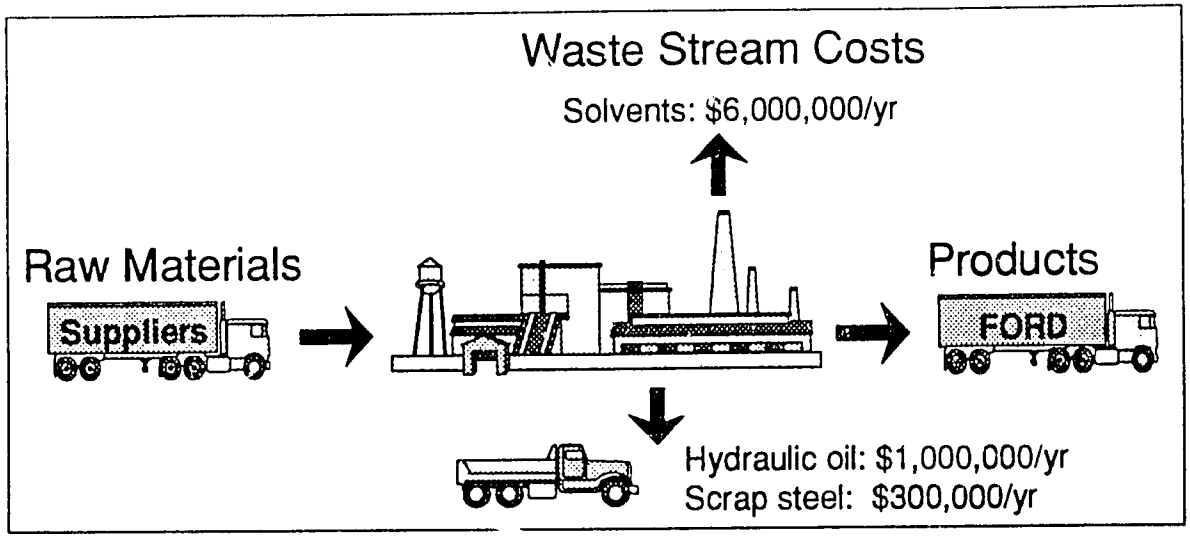
No matter what your source of information, it should be recorded in a spreadsheet like the one on the following page, using standard weight units. Weight is preferred because it does not depend on the way a material is packaged or stored and is less prone to inaccurate recording than is volume. Also, most regulatory and corporate reporting requirements specify weight measurements.

The amount of waste generated by your facility will vary because of changes in production level. To take this variation into account, the waste created per unit of production can be calculated. The best production unit to use will depend on your particular facility, and may even vary from process to process in your plant. Initially, gross measures of production, like "transmissions produced" or "hours of production time" might be appropriate. The waste minimization team will have to decide on the best units to use in a given situation.

Example: Sample Waste Stream Quantity Worksheet

After identifying the major waste streams, our sample facility decides to estimate the quantity of each waste material for 1992. Purchase records are used to obtain oil and solvent usage, wastewater treatment records provide additional data on oil and water waste, and salvage records are consulted for scrap metal production. Different units of production are decided to be appropriate for each waste stream (highly unlikely in reality, but done here for illustration's sake), and the pounds of waste produced per unit calculated.

Facility: *XYZ Plant*		Time: *Total waste production for 1992*			
Waste Stream	Components	Annual quantity (pounds)	Unit of production	Number of units produced	Pounds per unit of production
paint shop	*toluene (stack)*	*1,000,000*	*bodies painted*	*250,000*	*4.0*
	toluene (drum)	*1,000,000*	"	*250,000*	*4.0*
	xylene (stack)	*2,500,000*	"	*250,000*	*10.0*
	xylene (drum)	*1,500,000*	"	*250,000*	*6.0*
scrap steel	*steel*	*30,000,000*	*transmissions*	*1,000,000*	*30.0*
	filter media	*2,500,000*	"	*1,000,000*	*2.5*
wastewater	*water*	*250,000,000*	*engines*	*200,000*	*1250.0*
	hydraulic oils	*4,000,000*	"	*200,000*	*20.0*
	cutting fluid	*2,000,000*	"	*200,000*	*10.0*
	washer chemical	*200,000*	"	*200,000*	*1.0*



Assign a Cost to the Waste Streams

Once the waste streams have been identified and measured, you can begin to assign a cost to the wastes. The significance of waste minimization becomes very apparent when the true costs of wastes are calculated. These potential savings can be a powerful motivator to get people involved. Usually the costs of the wastes are great enough to justify the cost to reduce or eliminate their production.

Waste costs can include (but are not necessarily limited to) the following:

a. **wasted raw material**, including the cost of raw material to replace the disposed material

b. **waste handling**, including all labor costs involved in the removal, treatment, and disposal of waste materials. Labor costs are often difficult to quantify, but can represent a sizable portion of the cost savings in a waste minimization program.

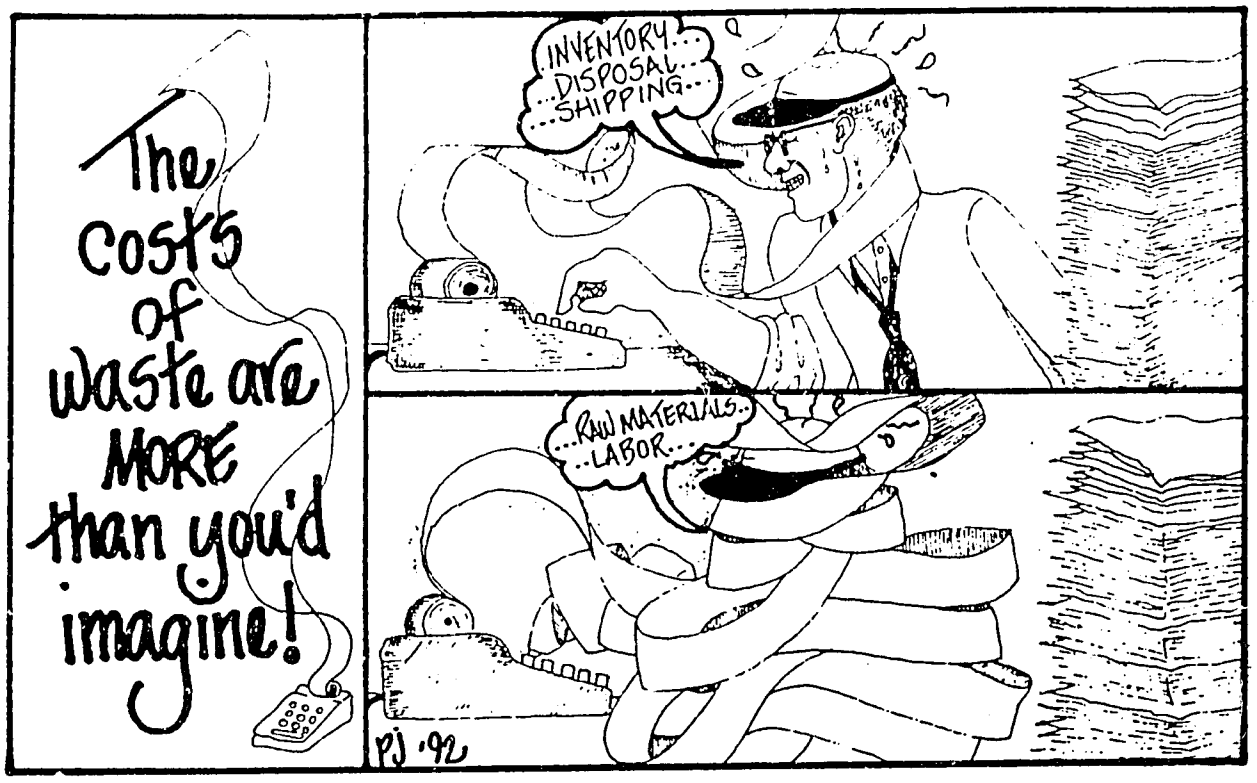
c. **waste storage**, including the cost to store waste materials at the site of generation, and to store in holding tanks or salvage areas within the plant, or to store in a drum area.

d. **waste transportation**, including the cost to haul materials from the generation location within the plant to a salvage area, and the cost to ship off site.

e. **waste treatment**, such as waste water treatment chemicals or detackifiers.

f. **waste disposal**, such as landfill costs, POTW charges, or incineration costs.

g. **intangibles**, including reduced environmental effects, reduced liability, reduced exposure to regulations, etc.



Wasted raw materials can amount to substantial cost. Every raw material that is disposed must be replaced with new, clean material, at considerable cost. The value of the solvents, oils, or chemicals that a plant disposes in a year can be many **millions of dollars**. This is a huge cost saving opportunity. Fortunately, this cost can be easily obtained from purchasing and accounting records. Similarly, treatment and disposal costs should be available. Labor costs will require some estimation of the time spent in waste-related work.

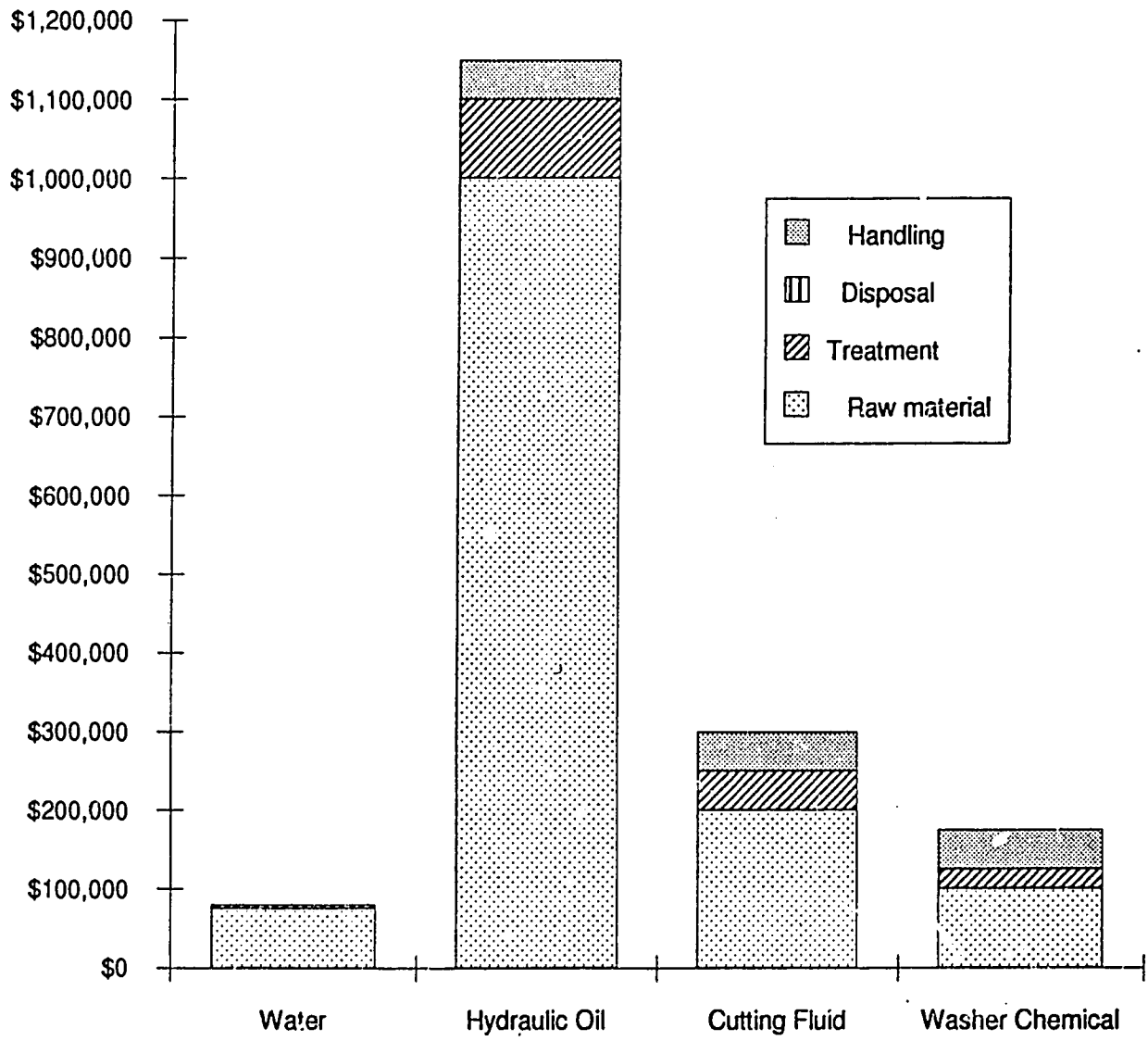
These costs can be recorded on a form like the one on the next page. If a waste stream has several components that are all handled together, then the cost for each component can be estimated from their relative masses, as illustrated in the example. The **total costs** at the bottom of the table reflect some of the **opportunities** that this plant has to reduce waste and save money. For added emphasis, the costs can be graphed out as in the figure following the example.

Example: Sample Waste Stream Cost Worksheet

Our facility decides to do a cost analysis of the wastewater stream. Last year the wastewater treatment plant used $150,000 worth of polymers to separate oily waste from the water. This cost is divided between the hydraulic oil and cutting fluid, based on their relative quantities. Another $25,000 worth of acid was used to lower the water's pH because of the alkaline washer chemicals. The oil was sent to a recycler at no net cost, and the water and chemicals sent to the public sewer, at a cost of $5000. Three people man the treatment plant, which at going labor rates costs the plant $150,000. These labor costs are evenly divided between the three non-water wastes. The hydraulic oil costs $0.25/lb new, the cutting fluid $0.10/lb, the washer chemicals $0.50/lb, and the water $0.0003/lb. Using these numbers, the following cost analysis is obtained.

Facility: *XYZ Plant*		Time: *Waste cost for 1992*		
Component:	*Water*	*Hydraulic Oil*	*Cutting Fluid*	*Washer Chemical*
Quantity (lbs.)	*250,000,000*	*4,000,000*	*2,000,000*	*200,000*
Costs: ($)				
Raw material	*$75,000*	*$1,000,000*	*$200,000*	*$100,000*
Treatment		*100,000*	*50,000*	*25,000*
Disposal	*5,000*			
Transportation				
Storage				
Handling		*50,000*	*50,000*	*50,000*
Total Cost:	*$80,000*	*$1,150,000*	*$300,000*	*$175,000*
Cost/lb.: ($)	*0.0003*	*0.2875*	*0.15*	*0.875*

Waste Cost Breakdown for 1992



Phase III: Establish Priorities and Refine Goals

1. Set waste reduction goals based on initial survey
2. Establish timing for goals

The initial survey has led you to discover what your plant's wastes are and what they cost. You may find the quantity of your waste to be many millions of pounds and the cost to be millions of dollars. These wastes are both an additional expense for your plant and a burden on the environment. You will want to minimize these wastes as much as possible.

The numbers you have collected so far will allow you to **prioritize** your waste problems and to set meaningful waste reduction **goals**.

Many factors can enter into your selection of waste reduction priorities. Some examples include:

- Volume Generated
- Disposal Method
- Disposal Cost
- Environmental Concern
- Raw Material Cost
- Handling Time
- Cost per Unit Produced
- Health and Safety Concerns
- Regulations
- Potential Liability
- Feasibility
- Impact on Product Quality

Each facility will have to decide for itself what the appropriate priorities are (bearing in mind that applicable regulations always must be obeyed). Whatever criteria you do choose, you will be able to make informed choices based on your analysis so far. For example, from the sample cost analysis on the previous page, hydraulic oils present a huge opportunity to the plant to save money, reduce the volume of waste, and eliminate a potentially hazardous waste, so it would be selected as a first priority material to investigate. The cutting fluid is the next greatest opportunity, and on a cost basis the water itself is a relatively low priority.

Set Waste Reduction Goals

As with any quality-driven improvement process, goal setting is an important part of waste minimization. Your goals will evolve as you gain more information about wastes, starting out as general but moving towards the specific. Clearly, your goals will be closely related to the priorities you establish. The goals must be built on readily available measurables, such as total waste quantity, percent of hazardous waste in the total waste stream, etc., so that you can chart your progress.

Establish Timing for Goals

A part of your goal setting must be the establishment of timing for their realization. The timing sets limits on efforts and motivates people to get tasks accomplished more quickly.

Example: Sample Waste Stream Priority and Goal Worksheet

Based on preliminary analysis of solvents from the paint shop, hydraulic oils, and waste steels, our sample facility establishes the following priorities. Volatile solvents are the highest priority because of their environmental impact. Hydraulic oils are chosen second both because of the anticipation of great cost savings and their environmental concern. Contaminated steel chips are made a third priority. For each material, a metric and goal is established, and a time to achieve the goal is set. The timings are chosen to be ambitious but also realistic.

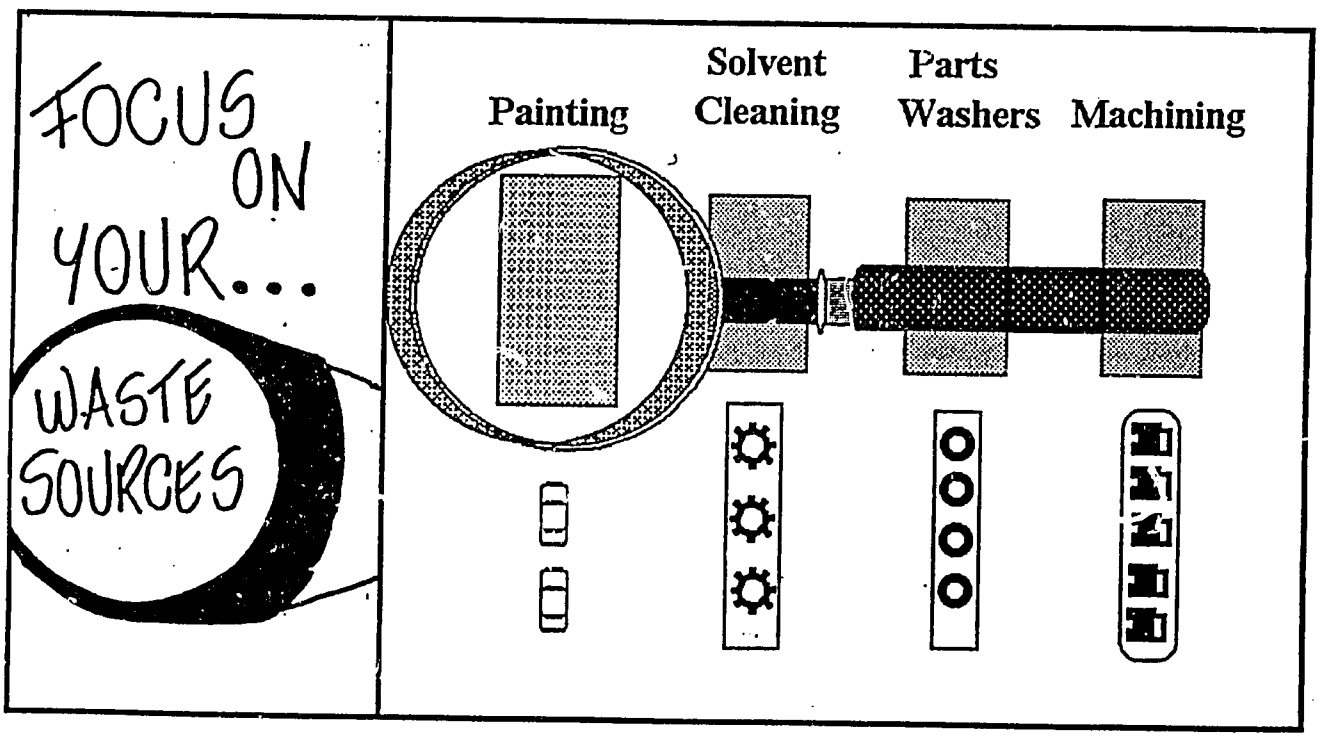
Priority	Waste	Metric	Current Value	Goal	Timing
1	*volatile solvents*	*pounds per vehicle painted*	*7 lbs.*	*4 lbs.*	*2 years*
2	*hydraulic oil*	*total pounds produced*	*4,000,000 lb/yr*	*50% reduction*	*2 years*
3	*steel chips contaminated with oil*	*percent of chips sold with contamination*	*75% by weight of steel*	*0% (eliminate all oil from chip waste)*	*Next year*

Phase IV: Focus on Your Waste Sources

1. LOCATE waste sources and associated processes
2. MEASURE and VERIFY waste quantities
3. Identify waste reduction OPPORTUNITIES

Knowing what you throw away and what it costs is a good start for a waste minimization program. However, it is not the entire program. In order to be effective, you must focus on the sources of your waste, to get to the root cause of its generation. If the previous phase was larger overview of waste, then this phase is the detailed, microscopic view.

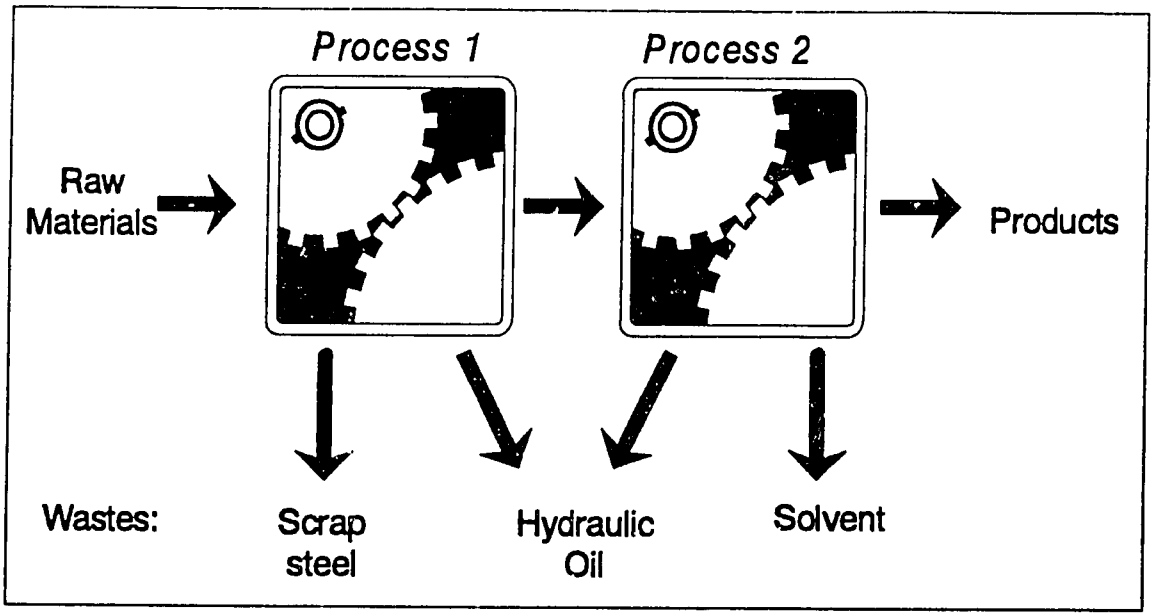
The methods you need to use are really quite similar to those already described, except that now the focus becomes more tightly defined—you will begin to "squeeze in" on the wastes by locating their sources in the plant and analyzing the amount of waste that comes from each source. This process will lead you to the processes and practices that are the primary sources of waste. The priorities and goals you have established should focus your efforts on the areas where the greatest opportunity for waste reduction exist.



This analysis process can occur in stages, each more focused than the previous: first you may break down a waste by areas in the plant, then by departments in a particular area, and then even by machines in a department. Again, as your analysis becomes more focused, your goals and priorities should be allowed to evolve. As with the large-scale measurements made above, a good ultimate goal is to monitor the generation and disposal of waste continuously.

A central aspect of the waste minimization program must be to communicate goals and results to all members of the plant, and to solicit their support and suggestions. The significance of the program and the importance of their contributions should be stressed. The more people that are actively looking for wasteful practices and offering solutions, the more successful the program will be. In particular, the program should not be presented as a threat to jobs or to individuals, but rather as an opportunity to increase productivity while at the same time reducing expenses and helping the environment.

In the following pages, techniques and tools to locate waste sources, to measure their volumes, and to assign costs, are presented. Armed with this information, you will know exactly where your opportunities for waste reduction are.



Locate Waste Sources and Associated Processes

The steps followed so far have shown you what your wastes are and what they are costing you. The next step, then, is to find out where these wastes come from, so that appropriate reduction measures can be put in place. This step involves focusing in on the specific production areas in the plant that produce waste.

The level of detail necessary will depend on the particular waste material under investigation. For some waste streams, the waste sources will be obvious. For instance, in an assembly plant paint solvents almost certainly come from the paint booths and the retouch areas. In other cases, the waste sources may not be obvious, or may be widely dispersed throughout the facility. You may need to identify waste sources by area, department, brass tag, or even workstation or component of a brass tag. Further, some wastes may not be associated with any machine or process in particular, but may result from general plant practices, such as cleaning or maintenance work. Whatever the waste, its entry into the waste stream must be found.

Since you are looking for the root causes of waste generation, you will want to identify these sources sufficiently to know not only where the waste comes from, but also why it is produced. A diagram of the process of interest, including material flows, will be very helpful. By understanding the current waste process, you will be able to think of ways to do things differently.

People throughout the facility should be encouraged to share information about sources of waste in their area. If the results of the earlier waste analysis steps are effectively

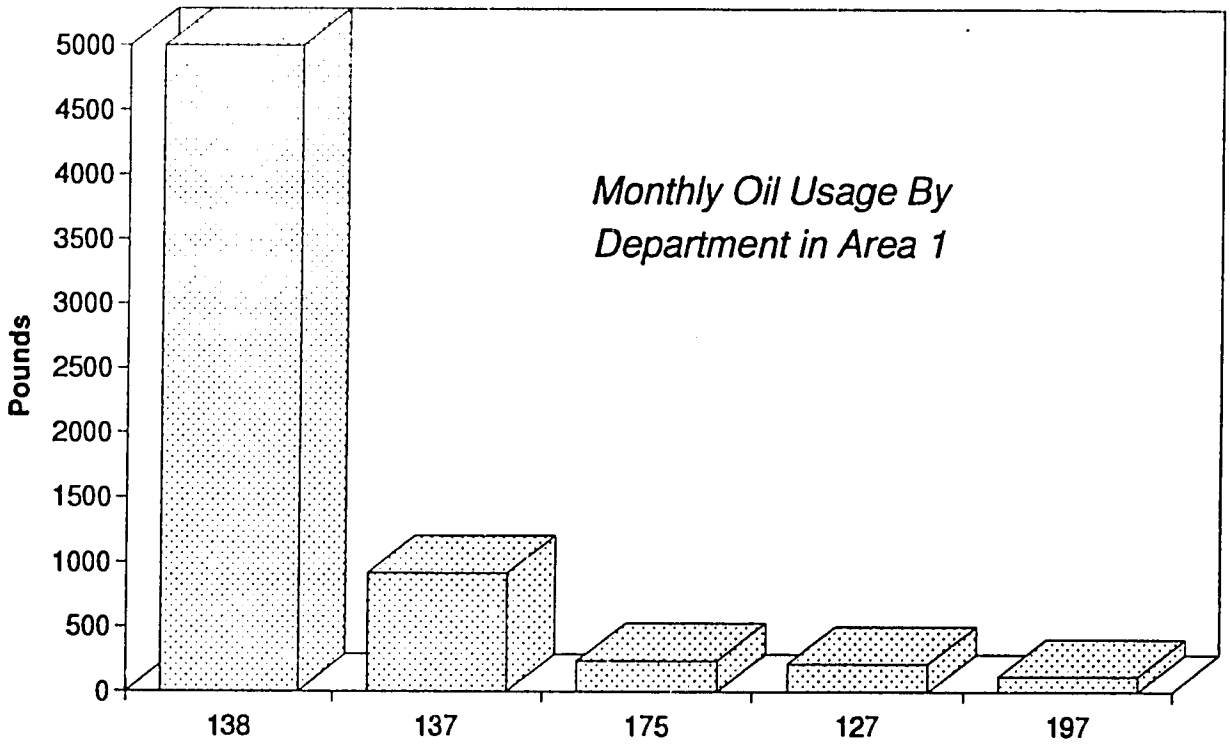
communicated, then many people will be motivated to provide information and suggestions. Action teams may be established to study particular waste streams.

The next task will then be to collect and tabulate the information. A spreadsheet like the one below can be helpful. Also helpful is a plant floor layout on which the sources of waste can be marked.

Example: Sample Waste Source Description Worksheet

Area 1 of a particular facility is using a large amount of hydraulic fluid. Questioning of the operators reveals that many of the machines have leaky hydraulic lines, and because of contamination some hydraulic fluid is being replaced regularly. To help identify the waste sources, a list is made of the known heavy users of hydraulic fluid, based on information from the operators.

Waste Type: hydraulic oil	Source			
Problem Description	Description	Area	Depart-ment	Brass Tag #'s
Make-up for leaks performed by operators	*lathes*	*1*	*127*	*123456* *987654* *456789*
	drill presses	*1*	*197*	*896547*
		1	*175*	*898773* *598741*
	grinder	*1*	*148*	*765432*
	stamping presses	*1*	*137*	*234567* *432109* *789012*
Routine fluid replacement performed every month because of contamination problems	*stamping presses*	*1*	*138*	*654321* *135791*



Measure and Verify Waste Quantities

As waste-producing processes and practices in your facility are identified, their contribution to total waste production must be measured. This measurement process is important for several reasons. It:

- **focuses attention** on large waste sources, where your resources can have the greatest impact.
- **facilitates comparison** of areas to identify efficient and inefficient processes.
- **generates measurables** that can be tracked as waste reduction efforts are put in place.
- helps in **assigning costs** and **justifying expenditures** to change processes.

The chart above shows the type of comparison that can be made when detailed waste quantity information is available. Clearly, department 138 should be investigated for waste reduction opportunities.

As with waste streams, waste sources are in general not accurately measured in most facilities. Measurement procedures will have to be established and implemented for the wastes of interest. Possible waste tracking procedures include employing checksheets that record when a material is disposed, or by recording waste disposal on maintenance tickets, or even by using an electronic data acquisition system. In some cases, maintenance and purchasing records may already be available to provide some information. For instance, the CPARS system records the purchasing department for non-production materials.

Material balances can be helpful in establishing and verifying waste measurables. As mentioned before, a material balance equates the amount of material entering a process with the amount leaving it. For example, the amount of material put into a waste stream by all plant processes must equal the total amount of material at the end of the stream. If the two are not equal, then a source of waste has been missed, or a measurement is incorrect. Similarly, the amount of raw material put into a specific process must equal the amount of finished product and waste taken out. Thus, if a press used 100,000 pounds of rolled steel, and 80,000 pounds of product were produced, then 20,000 pounds of steel became waste.

Identify Waste Reduction Opportunities

By locating and measuring the waste sources, your opportunities for reducing waste will become apparent. You will want to focus your efforts on areas that most impact the priorities you have established.

As the waste producing processes and opportunities are identified, a means of estimating the actual costs of the waste practices becomes necessary. This cost can be used to help prioritize problems and to determine if corrective measures will be cost effective. As process changes are investigated, predictions for the savings from a process change are important for justifying any necessary capital expenditures or other expenses from the modification.

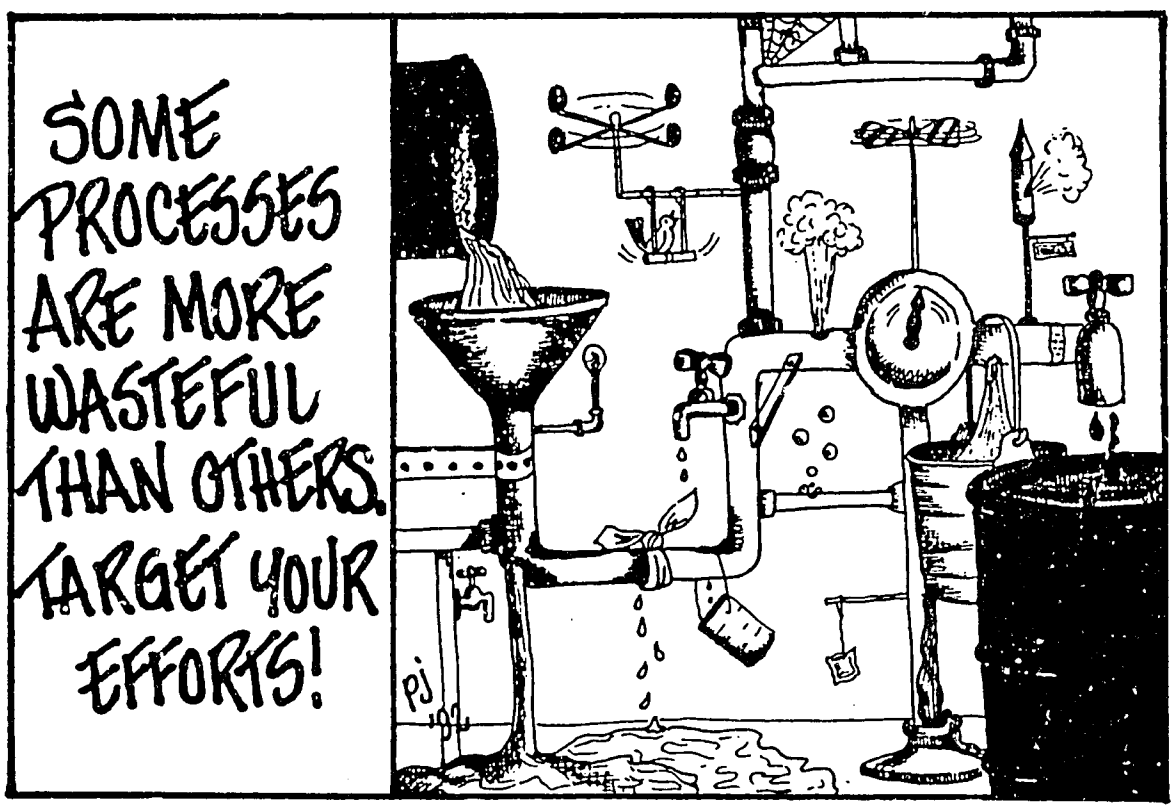
For each source, a detailed cost analysis could be applied like that described earlier, where all the costs of waste from a process, like raw material, disposal, etc., are calculated. This analysis can become complicated and time consuming, but for major process changes it will be necessary. When performing such an analysis, all the benefits of waste reduction need to be considered. For instance, if fluid from one process tends to overflow and contaminate parts in another process, the potential cost savings in eliminating the overflow includes not only a material savings in the first process, but also a quality improvement in the second. Only a detailed analysis of these processes would reveal the potential benefits. In general, the complete benefits of waste reduction

are often hidden. One of the jobs of the waste minimization team is to identify these benefits and work towards achieving them.

For small scale projects and preliminary work, a simple formula can be used to estimate the potential savings from waste reduction:

Cost of waste source = Pounds of waste × Cost per pound

The cost per pound can be taken from the cost for the whole waste stream. This method will give a rough estimate of the cost of the waste produced by a given process, but since it doesn't include overhead costs that do not scale with quantity, it should be used cautiously when calculating potential savings. Clearly, the sources of a given type that produce the most waste will be the ones with the highest waste cost. This cost can be used as a preliminary guide to what process changes are economically practical.



Example: Sample Waste Source Quantity and Cost Worksheet

After finding most of the sources of hydraulic fluid loss, Area 1 decides to measure the fluid lost from each source during one month. Control charts are put on the relevant equipment, and every time fluid is added, a record is made of the quantity used. A rough conversion factor of 8 lbs./gallon is used to convert to weight, and a cost factor of $0.2875/lb., (obtained earlier for the total hydraulic oil waste stream), is used to assign approximate waste costs. From the results, the total waste savings opportunity for these twelve machines is roughly $2,000 per month, or about $24,000 per year.

Waste Type: *hydraulic oil* Time period: *April 1992*	Source			Quantity		Cost
Problem Description	Descr-iption	Depart-ment	Brass Tag #'s	Gallons	Pounds	Dollars
Make-up for leaks performed by operators	*lathes*	*127*	*123456* *987654* *456789*	*5* *20* *2*	*40* *160* *16*	*11.50* *46.00* *4.60*
	drill p-resses	*197*	*896547*	*15*	*120*	*34.50*
		175	*898773* *598741*	*10* *20*	*80* *160*	*23.00* *46.00*
	grinder	*148*	*765432*	*30*	*240*	*69.00*
	stamp-ing presses	*137*	*234567* *432109* *789012*	*40* *30* *45*	*320* *240* *360*	*92.00* *69.00* *103.50*
Routine fluid replacement	*stamp-ing presses*	*138*	*654321* *135791*	*230* *400*	*1840* *3200*	*529.00* *920.00*
			TOTALS	*847*	*6776*	*$1948.10*

Phase V: Develop Effective Solutions

1. Develop and screen options
2. Establish an action plan
3. Implement action plan

The next part of the waste minimization process requires you to find and implement procedures that address your waste reduction procedures. You will use the same quality tools that are used to solve other types of problems at your facility, such as TOPS and PDCA. These tools will point you to the root cause of your waste generation, will help you identify the best corrective measure, and will help you verify that the corrective measure actually works. The detailed information you have collected about the **sources, quantities**, and **costs** of your waste practices will be the leverage you use to apply these techniques.

The preferred strategy for choosing and implementing waste reduction projects will be specific to each facility. This section provides only broad guidelines of the elements of this process that will apply to everyone.

Develop and Screen Options

Once you know where the opportunities to reduce waste are, ways of taking advantage of those opportunities have to be found. Options are needed that address the true causes of the waste generation and actually reduce the production of waste. Options that merely move waste around, such as alternate forms of disposal, do not really qualify as waste minimization techniques and should be avoided. The following two sections provide some guidelines for obtaining waste reduction options.

1. Take a systems view of waste generation.

Using the steps outlined above, the processes and practices that generate waste should be well known. The next step is to ask some basic questions about them:

1. What is the purpose of this process or practice?
2. Why is waste a part of that process or practice?
3. Can the present process or practice be modified to eliminate or reduce waste?
4. Can the present process or practice be replaced with a more efficient one?

Waste is always an unwanted by-product of a manufacturing process. In some cases it can be controlled or eliminated without fundamental changes to the process, and in other cases a process must be completely redesigned to eliminate waste. These questions help identify the best course to take by focusing on waste as it fits into the "big picture" of the manufacturing process. You need to determine whether waste is an integral part of the process being used or if it results from carelessness or inattention. If waste can be reduced with minimal effort and expense, it should be. If reducing waste requires longer term analysis and planning, then an action team should be formed to look at the process closely and identify alternate manufacturing strategies. This "big picture" viewpoint promotes discovery of creative methods for waste elimination rather than command and control strategies that do not really reduce waste.

2. Use tools already available to identify and evaluate solutions.

Many problem-solving tools are available to assist the waste minimization process. They include:

- brainstorming among team members
- employee suggestion programs
- benchmarking against similar internal and external processes
- Team-Oriented Problem Solving (TOPS) and the 8D method
- the Plan-Do-Check-Adjust (PDCA) cycle
- Statistical Process Control (SPC)

and others. These tools are not presented in any detail here, because they are thoroughly described in other resources, such as the Corporate *Planning for Quality* book. Rather, we emphasize that the goal is to identify many different options for eliminating waste and, using the data already obtained, to determine the best options for your situation. The criteria that you use to select a "best solution" to a waste problem will depend on your waste reduction priorities, but will probably involve to some extent safety issues, costs and benefits, volume or weight of waste reduced, labor required, capital expense, etc. These decisions are best made by the waste minimization committee, which has the broad knowledge necessary to consider all the relevant issues.

Your waste problems are probably similar to those of other people within the Company. A useful source of information is the "Best Practices" sheets on waste minimization maintained by the Plant Engineering Office. These sheets can be consulted to learn how other people deal with certain wastes. Also, when you

develop your own "Best Practice" you should submit it to be included in the PEO collection.

An equally valuable source of suggestions are the people that are involved directly in the day-to-day operations of your facility. Employee suggestion programs can provide many useful ideas for waste minimization. Employee involvement teams might want to tackle larger waste problems as part of an effort to improve the workplace.

Costs will obviously be a consideration in choosing and implementing process changes. The methods presented above provide a tool for assigning costs to current waste practices. These same tools can be used to predict the costs and benefits of proposed changes. For large-scale modification of processes, a TARR (time-adjusted rate of return) may be necessary to justify capital expenditures. People capable of performing such analyses must be a part of the waste minimization team.

Establish an Action Plan

Using the tools described above, one option should be chosen as the one to implement for waste reduction. The option should satisfy several criteria. It should:

- address the root cause of waste production.
- minimize the amount of waste produced to the greatest extent practical.
- not generate other equally undesirable materials.
- meet the financial constraints of your facility.
- not adversely effect the quality of products.
- comply with applicable laws, regulations, and company directives.

The waste minimization team should be able to verify that these criteria are met.

Once the appropriate option is decided upon, a plan to implement it must be established. If the proposed changes will effect product or the production process, the appropriate manufacturing and production engineers should be consulted. Similar, the production personnel who will be expected to implement modified procedures should also be consulted. In general, a consensus on the best way to implement the change should be reached among all effected individuals.

If the plan will involve capital expenditure, projects will have to be written and approved through your standard facility procedure. The detail with which you have performed your waste analysis and have screened your options should greatly aid approval of projects.

Implement Action Plan

After the action plan is fully agreed upon and approved, it must be implemented. A timetable should be established for the proposed change. If the change will effect a large portion of your facility, it may be appropriate to test it first in one department or area to verify that it will have the expected benefits. Again, everyone who will be effected needs to be made aware of the reasons for the change and the benefits that will arise from it. **Communication** is essential for success.

Phase VI. Verify Results

1. Measure and verify waste reduction
2. Adjust as necessary
3. Return to initial survey phase

After waste reduction efforts are put in place, it is essential to verify that they are working as expected. As emphasized before, measurables are necessary to track your progress in waste minimization, and continuous measurement is the ideal for waste minimization. Some method of tracking the improvements generated by the waste reduction procedures must be implemented to insure that the predicted waste reductions and savings are actually achieved. These numbers also provide motivation and justification for implementing other waste reduction efforts. The conspicuous success of one waste minimization project will be enough to inspire participation by many individuals.

New waste reduction programs should be flexible, so that if they don't work as anticipated, they can be adjusted. The manufacturing environment is always changing, and the facility must be ready to adapt to accommodate new waste problems.

Like all quality-driven programs, waste minimization should be a process of continual assessment and improvement. Once a waste has been identified and reduction efforts put in place, the waste should be periodically revisited to make sure that the reduction efforts are continuing to work. As one problem is solved, another should take its place. In essence, the entire process of waste stream analysis, prioritization, waste source location, and waste solution development should be continuously repeated. The task of waste minimization is not complete until all wastes have been eliminated from your facility.

Summary

To remain an economically competitive and environmentally sound company, we must learn to use our resources more efficiently. One part of this process is to focus more attention on the wastes that we produce. Everyone should look at the impact of their operations on waste production and should try to develop creative methods for reducing or eliminating those wastes.

This guidebook presents one approach to developing a formalized waste minimization program in you facility. It follows basic quality management principles: to search for the root cause of a problem, to implement the best possible correction, and to verify that the correction actually works. The approach is intended to be flexible and should be adapted to fit your particular needs. Just remember the basic goal: **Find waste and eliminate it!**

Contacts:
For further information about waste minimization programs, contact your plant or division waste minimization champion, or your plant Responsible Individual (RI).

Appendix: Sample Forms

The worksheets on the following pages can assist in identifying and acting on waste reduction opportunities. They are patterned after the sample worksheets given in the examples. You should adapt them to fit your particular waste minimization program.

Included in the Appendix are the following worksheets:

- **Waste Stream Identity Worksheet**
  For use in identifying and characterizing your facility's waste streams.

- **Waste Stream Quantity Worksheet**
  For use in recording your facility's annual waste production.

- **Waste Stream Cost Worksheet**
  For use in calculating the costs of your annual waste production.

- **Waste Stream Priority and Goal Worksheet**
  For recording your facility's priorities and goals.

- **Waste Source Description Worksheet**
  For use in locating the sources of your facility's wastes.

- **Waste Source Quantity Worksheet**
  For use in measuring waste production by waste source.

Waste Source Quantity Worksheet

Waste Type	Time period

	Source			Quantity		Cost
Problem Description	Description	Department	BT	Gallons	Pounds	Dollars
			Totals			

Waste Source Description Worksheet

Waste Type

	Source			
Problem Description	Description	Area	Department	BT

Waste Stream Priority and Goal Worksheet

Priority	Waste	Metric	Current Value	Goal

Waste Stream Cost Worksheet

Facility		Time period	

Component:				
Quantity (lbs):				
Costs ($):				
Raw Material				
Treatment				
Disposal				
Transportation				
Storage				
Handling				
Total Cost:				
Cost per lb. ($):				

Waste Stream Quantity Worksheet

Facility

Time period

Waste Stream	Components	Quantity (pounds)	Unit of Production	Units Produced	Pounds per Unit of Production

Waste Stream Identity Worksheet

Facility

Time period

Waste Stream	Components	Disposal/ Treatment Location	Storage Method	Disposal Method	Info Source

APPENDIX E - SPILL PLAN GUIDE

APPENDIX E

SALEM CONTINGENCY PLAN

Handbook and Model for:
Environmental Contingency
Planning and Preparation

November, 1987

CONTINGENCY PLAN HANDBOOK

Prepared by:
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November 1, 1987

CONTINGENCY PLAN HANDBOOK

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I. OVERVIEW

The "Salem" contingency (spill prevention) plan is a model for Ford plants to use in writing site specific contingency plans. Federal, state and local laws require facilities to develop such a document if they: store oils, generate hazardous wastes, and/or use other regulated materials (such as hazardous substances). The plan is to be implemented in case of an environmental emergency.

The attached plan was developed for a fictitious plant and covers a wide range of situations, from oil spills to the release of dangerous (toxic) gas. Presumably, not every plant will have to use everything in this plan. However, this plan does not cover every situation at every facility. With this in mind, it will be necessary to carefully edit and delete the sections that do not apply to your facility, as well as change the applicable sections to fit your situation. In some instances it may be possible to bring whole sections from your existing plan directly into the format provided here.

Sections of this plan have been taken from other contingency plans inside and outside the Company; they are intended to be used as a guideline and should be modified as needed. Although every effort has been made to make this plan as complete as possible, local requirements may override the federal and state regulations used in the development of this plan. Ordinances enforced by agencies other than environmental agencies may also affect contingency plan development. For example, in Michigan, State Police fire rules require spill protection at fill areas of tank farms that store flammable liquids. This kind of regulatory requirement should be included in the development of your plan.

<u>This handbook is not part of the contingency plan and should not be included in your plan or submitted outside the Company.</u> Although I have tried to be comprehensive in the development of both this handbook and the contingency plan, some areas may not be fully covered. If you are in doubt about a regulation and its impact on the plan for your facility, don't hesitate to call SSECO or go directly to the regulation. We do not encourage inviting regulatory people to assist in development of your plan, because they will be involved in the review of the finished document.

If you have any questions about the plan or its development please contact your division or SSECO for assistance.

John F. Van Dyke
8-32-25548

Note: This plan replaces the "Pollutant Spill Prevention Program" dated March, 1981.

II. PLAN PREPARATION

Who Must Prepare a Contingency Plan

Environmental emergency action plans come under a variety of names depending on the agency requiring the plan. Federal oil pollution regulations call for a "Spill Prevention Control and Countermeasures Plan (SPCC)," Federal hazardous waste rules require a "Contingency Plan," in California it may be known as a "Hazardous Materials Business Plan," Michigan requires a "Pollution Incident Prevention Plan (PIPP)," etc. All of the above titles can apply to the same document provided that it meets the requirements of the individual agencies, and the proper titles are listed on the certification statement. In this handbook the phrase "contingency plan" refers to any and all of the above.

You must have a contingency plan for your facility if it has:

A. Storage of over 40,000 gallons of oil* in bulk tanks.

B. Any one above ground oil* storage tank of over 660 gallon capacity.

C. Over 1320 gallons of oil* (total) in containers of less than 660 gallons each.

D. "Generator" status under the Resource Conservation and Recovery Act (RCRA). Reference: 40 CFR 262.34 (a) (4).

E. "Treatment, Storage or Disposal" status under RCRA. Reference: 40 CFR 264.50 or 40 CFR 265.50.

F. Potential to release a reportable quantity of any of the "Extremely Hazardous Substances" cited in section 302 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund). Company Policy also.

G. Potential to release materials on state or local lists. For example - in Michigan, potential to release any amount of a Michigan "Critical Material" or salt. Reference Michigan Part 5 rules "Spillage of oil and polluting materials."

* Oil means any petroleum (or petroleum by-product or waste) including sludges and mixes with other materials. Reference: 40 CFR 112.2 (a).

Format

Because the final document must be submitted to agencies outside of the Company, it is imperative that it be presented in a professional manner (e.g. pages should be numbered and dated with the last revision date). It should be reviewed by both division and staff (SSECO) before being certified by a Registered Professional Engineer who is familiar with the facility. Certification is required under the oil spill regulations. However, the certifying engineer need not be registered in the state in which the facility is located.

Implementation

During the review of the current plan (or the development of a first time plan) inadequacies may be found that require additional facilities or equipment. These items must be included in the plan. One year is allowed for the completion of this kind of corrective action. When completed, the plan must be reviewed and recertified.

Revisions

Changes in regulations and facilities may necessitate modifications to the contingency plan. Some changes are required as the facility changes, others will be needed as regulations are amended and/or promulgated. SSECO will monitor regulatory requirements and will advise the plants accordingly.

Under 40 CFR 112 (oil pollution) the plan must be amended and recertified within 6 months if any of the following occur:

A. There is a change in the facility design, construction, operation or maintenance which materially affects the potential losses of oil.

B. Three years have passed since the last revision, and if new proven technology should be implemented at the facility to reduce spill potential. (Recertification required). If at the three year review, no new technologies need to be implemented (and there are no changes in the spill potential) a statement to that effect must be prepared by the plant environmental representative and signed by the plant manager (or equivalent) and attached to the plan. (No recertification).

C. The plan is found to be inadequate by an agency reviewing the plan.

Under 40 CFR 265.54 (RCRA) the contingency plan must be immediately amended if any of the following occur:

A. Applicable regulations are revised.

B. The plan fails in an emergency.

C. If there are changes in the design, construction, operation or maintenance of the facility which materially increase the potential for: a) losses to the environment, b) fire, c) explosion, or d) the response necessary in an emergency.

D. The list of emergency coordinators changes.

E. The list of emergency equipment changes.

F. Facilities that have a RCRA Part "B" permit must change the plan if there is a change in the RCRA permit.

Revisions (continued)

The amended plan (or at least the changed pages) must be submitted to all of the addressees listed in the plan. Minor changes to the plan (e.g.; names, phone numbers, revised equipment list, etc.) do not require recertification, but must be sent to addressees as needed.

Unusual Circumstances

Uncontrolled losses of materials may result from sabotage, earthquake, or other unusual circumstances. The results are very nearly the same as far as the potential effects on the environment are concerned. These types of releases are not specifically addressed in the Salem Contingency Plan, but should be a part of your thinking process in developing your own plan.

Facilities Outside the U.S.

Canadian environmental rules closely parallel U.S. requirements. Therefore only minor changes may be needed to comply in Canada. It is Company policy for Canadian facilities to follow this Plan in developing their own plans. Plants in Ontario should consult the most recent issue of the Ontario "Contingency Plan for Spills of Oil and Other Hazardous Materials."

Mexican plants are also expected to develop spill plans consistent with the Salem Contingency Plan. Mexican regulations are still in development but can be expected to follow U.S. and Canadian standards.

III. EMERGENCY RESPONSE

Action Plans

Action plans must be specific, response oriented, and concise. They should include such things as: layouts of piped flammable liquids, shutoff valves, locations of specific spill control items, compatible fire fighting materials, personal protection requirements (gloves, respirators, etc.), neutralizing agents, etc. If possible they should be one page (excluding drawings) with references to other parts of the plan for additional information (MSDS, phone numbers, etc.).

Equipment

There are two categories of equipment that can be used for spill containment and cleanup:

A. Common plant equipment:
Common equipment includes such things as: brooms, mops, shovels, front-end loaders, etc. things that might be found in every day use around the plant. The most familiar spill control material is absorbents (speedy dry, oil dry, vermiculite, kitty litter, corn cobs, etc.) These materials only absorb liquids, without doing anything to reduce acidity, alkalinity, or flammability. They are perfect for picking up oil spills. Spills of other materials may require specialized agents to neutralize the spilled material before disposal. The use of strong acids and bases (to naturalize bases and acids respectively) should be avoided because of the violent reactions that may occur.

B. Specialized equipment:
Booms, sorbent materials, neutralizers, etc. purchased specifically for spill containment and/or recovery. The following list is for those not familiar with some brand names and/or suppliers (listing here is not necessarily an endorsement of any product or supplier):

1) Imbiber Beads are aimed at picking up PCBs and other oil like products. Expensive, but available in pillows and good for PCBs. Selectively removes hydrocarbons from water.

2) Spill-X (from Ansul), three products aimed at neutralization and solidification of acids, caustics and solvents. They are safer and more effective than speedy dry, (available in packages from lab size to truck mounted units).

3) PIG (from New Pig Corporation) sorbent material in sock (tube) form. Does not neutralize, but is a handy package.

Many other products are available that may be as good or better than those listed. Specialized response items should be kept in restricted areas and inventoried frequently to insure their availability in an emergency. Preplan how (and with what) you will control the spillage of hazardous materials on your site.

Training

Training requirements vary depending on the environmental law being examined. Specific requirements are given below. However, they can be summarized as follows; hazardous waste handlers, spill response teams, and their supervisors must be trained annually in the prevention of spills and the response actions necessary in emergency situations. Keep in mind that prevention of spills is more favorable than allowing a situation to deteriorate to the point that an emergency response is necessary.

The general plant population does not necessarily need to be trained in emergency response (cleanup). Most likely, their actions in a spill situation will be limited to discovery, notification and evacuation.

A. Oil Pollution Prevention, 40 CFR 110-112. "Owners or operators are responsible for properly instructing their personnel in the operation and maintenance of equipment to prevent the discharges of oil and applicable pollution control laws, rules and regulations...conduct spill prevention briefings...(annually)...briefings should highlight and describe known spill events or failures, malfunctioning components, and recently developed precautionary measures."

B. RCRA requirements are more specific. Untrained workers must be closely supervised until they are trained. Training must be within 6 months of assignment. Annual reviews for all persons handling hazardous wastes are required. Trainers must be trained in hazardous waste management practices. Detailed job descriptions and records of the type and amount of training must be maintained. SSECO Bulletin 22 and Federal Regulation 40 CFR 265.16 contain more detailed information.

The Occupational Safety and Health Administration (OSHA) is proposing to amend its standard on: Hazardous Waste Operations and Emergency Response (29 CFR 1910.120). Under the proposed changes employers would be required to properly train employees who are involved in:

CERCLA cleanups
RCRA corrective actions, or
Emergency response

Most Company facilities are occasionally involved in small chemical emergency incidents. These hazardous material incidents can be handled at the location with simple containment procedures, speedy-dry applications, etc. These incidental situations not requiring a coordinate spill-control response are not considered OSHA-defined emergency response actions under this proposed regulation.

Training (Continued)

In cases where hazardous material incidents with coordinated spill response procedures are needed, only qualified personnel must be used. Frequently these situations are limited to on-site contamination and specialized contractors are brought in to handle the containment and cleanup. It is imperative that a line of authority be established so that consistent, coordinated emergency response is achieved.

To achieve this goal, all facilities must establish a hazardous materials response team, including but not limited to, the facility Safety and Environmental Engineers. These personnel must be properly trained and demonstrate proficiency in the following areas:

Hazard recognition - emergency recognition
Use of personnel protective equipment (PPE)
Facility contingency/spill plan - alerting employees/contacting contractors
Evacuation procedures
Site-specific control procedures
Decontamination procedures

In cases of large hazardous material incidents, the response team must evaluate the situation and take appropriate action.

Working with division level environmental and training personnel, each plant must designate a hazardous materials response team and develop appropriate training on an on-going basis (monthly, quarterly, yearly).

SSECO has developed a training video and management binder on Polychlorinated Biphenyls (PCBs) that was distributed to each Ford facility that has PCBs. In addition, SSECO maintains a library of training videos that are available for loan to plants. As with any training situation, these materials should be reviewed before use and additional material prepared to tailor the presentation to your facility.

Outside Contractors

It is advisable to use the services of a qualified outside contractor(s) for cleanup/recovery of large spills. This allows plant forces to return to their normal duties, after the initial containment of the spill, and assures that qualified personnel will perform the cleanup. Local plant supervision will be necessary. Union clearance should not be a problem, because the services of the contractor are very specialized.

Fire, Police, Hospitals

A. Fire:

The loss of most materials will not require assistance from local fire officials. However, it is important to have training exercises with the fire department so that they recognize the need to:

1. Control runoff from a fire or spill involving hazardous materials.

2. Use proper personal protection; breathing apparatus, skin protection, etc.

3. Use the proper (compatible) materials to extinguish a fire, or contain and/or neutralize a spill.

B. Police:

It is unlikely that any police involvement will be needed in a minor loss incident. However, the release of gases or other incidents that may require evacuation of local residents will probably be handled by or through the police department.

C. Hospitals:

Local hospitals must be kept apprised of the potential for injury associated with materials at the plant. Communications between the plant doctor and the hospital are important. Material Safety Data Sheets (MSDS) used in the employee hazardous communication program will help in this process.

The local fire, police, hospital and state and local emergency response teams that may be called upon in an emergency must be sent copies of the contingency plan (40 CFR 265.53). Any arrangements agreed to by any of the above, including contractors, must be part of the contingency plan (40 CFR 265.52). If any of the agencies refuse to accept copies of the plan, this refusal must be documented in the plan (40 CFR 265.37).

Declaring an End to an Incident

The start of an environmental incident is often easy to recognize: a tank bursts, a drum is spilled, a chlorine line ruptures, etc. The end of an emergency is not always so easy to define. Questions such as: how clean is clean, and when to send the fire trucks back, may not have clear-cut answers. Each case will have to be judged individually. Division and staff personnel may have to be consulted on this question as well. However there are some legal requirements that may have to be met:

A. RCRA material spills:

1) all contaminated areas must be cleaned and all wastes must be properly disposed of.

2) all equipment used to respond to the emergency must be readied for reuse.

3) if a portion of the facility stops operations as the result of a RCRA spill; the U.S. EPA Regional Administrator must be notified that the facility is ready to restart activities before that portion of the facility is restarted. Reference: 40 CFR 265.56.

B. PCB spills:

EPA has very specific standards on the level of PCB contamination that can remain after a PCB spill incident. These standards are too involved to summarize here. Contact SSECO or the regulation for details. Access to a PCB contaminated area should be restricted to essential personnel until the area has been cleaned to the proper level. Reference: 40 CFR 761.125.

Written reports are usually the final episode in a spill incident. The following section "Notification and Reporting" gives details on what to report and to whom.

Air Episode Plans

Air episode plans are not covered in the Salem contingency plan. Many plants have plans that call for reductions in production and/or other activities when an air pollution episode is declared by an agency. These plans are very plant specific and are sometimes coordinated between facilities. Implementation of an air episode plan is not considered a spill.

Sudden, unexpected releases of reportable quantities of air pollutants or air pollution control equipment malfunctions, must be reported to the appropriate agency. This type of release is not part of an episode plan and must be responded to just like any other kind of spill. Emergency releases to the air should be covered in your contingency plan.

IV. NOTIFICATION AND REPORTING

Immediate Notification

The problem of determining whether or not an incident is reportable is not a trivial issue. SSECO Bulletin 40 and Tables 1 through 7 below are designed to assist you in determining which agencies to call, and when to call. The actual phone numbers will be listed in your contingency plan

It is important to note that these are only tools to help you make the decision on whether or not to report an incident (and to whom it should be reported). You and your management, with assistance from SSECO and your Division staff, must make the actual decision. If you are unsure about a need for reporting, do not hesitate to call for assistance. Don't let an apparently minor incident be distorted by a lack of communication.

Table 1 - Oils

MATERIAL LOST/QUANTITY	RECEPTOR	NOTIFICATION/REPORTING
Oil/causing a sheen or discoloration. 40 CFR 110/112	Surface waters off plant property.	Oral: National Response Center (NRC) and State, also downstream users if any. Written: if over 1000 gal or second spill in 12 months. Due in 60 days.
Oil/causing a sheen or discoloration. Company Policy.	Surface waters on plant property.	No report required: cleanup necessary to prevent groundwater contamination.
Oil/over sewer limit; for oil and grease, explosive limit, etc. Local Sewer Ordinance.	Sanitary sewer.	Oral: local sewer authority. Written: as required.
Oil (volatile - gasoline etc.)/1000 lbs. per day.	To atmosphere.	Oral: NRC
Oil/any amount. MI part 5 rules	Soaking into ground or ground water.	Oral: State (MI). Written: State due in 10 days.

Immediate Notification (continued)

Table 2 - PCBs

PCB (over 50 ppm)/any amount. 40 CFR 761	Surface or drinking water, sewers, grazing land, vegetable garden.	Oral: NRC. Written: not required
PCB (over 50 ppm)/more than 10 lbs. 40 CFR 761	Any receptor, diked or not.	Oral: NRC. Written: not required

Table 3 - CERCLA

CERCLA or SARA materials/"reportable quantity".	Leaving the site; air, water, land.	Oral: NRC, State and Local Emergency Planning Commissions. Written: ASAP.

Table 4 - Criteria Air Pollutants

Particulate (PM 10), Carbon monoxide, Lead, Nitrogen & sulphur oxides, Volatile Organic Compounds/exceeding standards. 40 CFR 50	To atmosphere.	Oral: Immediate notification. Written: EPA & State. 30 days.

Table 5 - TSCA

Any chemical or mixture/posing a substantial risk to health or environment.	On- or off-site.	Oral: NRC, State and Local emergency Planning Commissions. Written: 15 days.

Immediate Notification (continued)

Table 6 - RCRA

RCRA "hazardous waste"/any amount, threatening health & environment. 40 CFR 262.34	On- or off-site.	Oral: NRC. Written: EPA, 15 days.
RCRA contingency plan incident/any amount. 40 CFR 265.56	On- or off-site.	Oral: N/A. Written: EPA region, 15 days.
RCRA lagoon leak/any amount.	On- or off-site.	Oral: N/A. Written: EPA region, 15 days.

Table 7 - NPDES

NPDES permit/non-compliance, threat to health or environment.	NPDES outfall.	Oral: EPA region. Written: EPA, 5 days.
NPDES permit/toxic pollutant not in permit.	NPDES outfall.	Oral: EPA region. Written: N/A.

The above listing is for the major laws that require notification in spill incidents. State and local laws may require additional notification and reporting.

Written Reports

In addition to the immediate telephone notifications mentioned earlier every release incident requires a written report. Some reports must be submitted to agencies, others are for Company use in managing future incident responses and/or documenting what took place (useful as a training aid and/or in case of legal inquiry in the future). All written reports that are destined for non Company recipients must be reviewed by local management as well as division and SSECO prior to submittal.

A. Federal requirements:

Oil spills:

A written Pollution Incident Report and the submittal of the Spill Prevention Control and Countermeasure Plan (contingency plan) are required within 60 days of the spill event if:

1) The spilled quantity exceeds 1000 gallons.

2) This is the second spill of any quantity of oil within any 12-month period. Reference: 40 CFR 112.4.

Hazardous (RCRA) Materials:

If the contingency plan is activated because of the release of a RCRA material, a written report must be sent to the Regional Administrator within 15 days of the incident. Reference: 40 CFR 265.56.

Extremely Hazardous Substance/CERCLA Hazardous Substance:

A written report(s) must be submitted as soon as practicable to the local and/or State emergency planning commission(s). Reference: 40 CFR 300.94.

B. State/local requirements:

State and local requirements for written reports will have to be verified by each facility. As an example; Michigan requires a written report within 10 days of the loss of oil, salt or other listed polluting (critical) material.

News Media/Public Affairs

Some environmental incidents may result in queries from the news media. If at all possible, these questions should be forwarded to Public Relations at World Headquarters. They will work with the plant and SSECO in developing a news release for the incident.

If you are unable to avoid making a statement, try to refrain from over reacting. Stick to the facts as you best know them, use the names of materials without adjectives (e.g.; PCBs, not "Toxic" PCBs). Don't exaggerate, or under estimate the problem, work from your knowledge of the material(s) lost. Use information from the Material Safety Data Sheets that are available under the employee hazardous materials communication program.

News Media/Public Affairs (Continued)

Five important points to keep in mind:

1) Always write (or speak) with an awareness that what you write might ultimately be read by persons outside the Company; that it could appear on the front page of a newspaper or on the evening news broadcast.

2) Be accurate in your statements. Do not speculate or exaggerate, and avoid ambiguity.

3) Avoid unnecessary negative connotations.

4) Fully state reasons for your conclusions; don't make unsupported statements.

5) Close all loops in writing. Don't leave cited problem areas unresolved or unanswered. Tell an interviewer that a written report will be submitted to the appropriate agencies.

V. COMPANY POLICIES

Delegation of Responsibility

Plant: The individual plants are charged with the front-line responsibility of preventing (and responding to) the uncontrolled loss of contaminating materials to the environment. This is accomplished by extensive training, good maintenance, and inventory practices, as well as, sound judgement in the selection of materials purchased. In addition, Company and federally mandated job descriptions must be filled by competent personnel.

A. "Designated Environmental Representative": This is a Company job description outlining the duties and responsibilities of the person at the plant who has front-line, hands-on, day-to-day environmental involvement. This job description fulfills the requirements of 40 CFR 112 for "...a designated person who is accountable for oil spill prevention and who reports to line management." Every Ford facility should have someone to fulfill this function.

B. "Emergency Coordinator": RCRA regulations require that every facility that is involved in the generation, transportation, treatment, storage, or disposal of hazardous (RCRA) wastes have at least a primary Emergency Coordinator. Alternate Coordinators may be listed also. The coordinator must be "...thoroughly familiar with...the facility...[and] the contingency plan.... In addition, this person must have the authority to commit the resources needed to carry out the contingency plan."

C. "Emergency Response Coordinator": An Emergency Response Coordinator must be named by any facility that exceeds the daily threshold planning quantity of "Extremely Hazardous Substances" identified in the Superfund Amendments and Reauthorization Act of 1986 (SARA). This person "...will participate in the local emergency planning process as a facility emergency response coordinator." This person will be called upon to attend public meetings as the local Ford plant representative. (SSECO recommends that this responsibility be taken by the IR manager at the facility.)

The above titles may be held by the same person (some small facilities) or by as many as three separate individuals (larger plants). Management at each facility will have to make the decision as to who is best suited for each position.

Division and Staff: Additional support is available from Division staffs and from World Headquarters staffs. These include SSECO, Plant Engineering Office (PEO), Industrial Health and Toxicology (IH&T), Industrial Relations (IR), etc. Newsletters, Bulletins, Mailgrams, and Guidelines are published by these offices to assist operations personnel in complying with Company policies and government regulations.

V. COMPANY POLICIES

Materials Management

A. Tank containment:

Consistent with State and Federal regulations, all above ground tanks (inside or outside the plant) should be diked or otherwise contained to prevent the loss of stored materials. The capacity of the secondary containment will depend on local regulations and conditions but should never be less than 100% of the largest container within the area. Note that some states (e.g.; Michigan) require containment of up 150% of all the material stored in all of the tanks. Reference: PEO Design Standard #22, August, 1986.

B. Underground tanks:

New installations of underground tanks should be avoided. When underground tanks must be installed for compelling reasons (fire protection, etc.) SSECO and PEO should be consulted. At the time of this writing, Federal underground tank rules have not been completely finalized and are expected to change. Reference: PEO Design Standard #20, September, 1983.

C. PCB containment:

All U.S. and Canadian plants that have PCB transformers should have diking or other equivalent secondary containment in place for the transformers. In most cases it will be prudent to provide secondary containment for other PCB items (switchgear, capacitors, etc.). These items should be reviewed on a case-by-case basis and containment provided if conditions warrant. Reference: Manufacturing Guideline G3-7, April, 1983, and the SSECO PCB video training tape and handbook.

D. Management of tanks and containers (drums):

It is Company policy to manage all tanks and drums so as to prevent losses to the environment. This includes new and waste materials. Even though present laws do not regulate some aspects of the handling of these containers it is in the Company's best interest to prevent any losses to the environment. Proper training, inventory control, regular inspections, and thorough maintenance are the best ways to prevent losses from these sources. Tank loading and unloading must be monitored by competent personnel at all times.

Legal Review

This handbook and the Salem contingency plan have been reviewed by the Office of the General Counsel and Plant Engineering Office.

VI. REFERENCES

Federal Requirements

Control of oil and oil spillage is covered under Federal Regulation 40 CFR 110 & 112. This regulation covers the need for impervious dikes, valves, inspections, maintenance, cathodic protection, etc.

Hazardous waste spill preparedness and prevention and recovery is covered by 40 CFR 265 Subparts C and D. These sections give requirements for such things as: maintenance of equipment, aisle space, arrangements with local authorities, spill plan requirements, spill response, etc.

Reportable quantities under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) are listed in 40 CFR 302.

Asbestos is covered by 40 CFR 61 (EPA) and 29 CFR 1910 (OSHA).

State/Local Requirements

Some states and local governing bodies have developed special lists of regulated materials. Minnesota has special regulations for PCBs. Michigan Part 5 spill rules require the reporting and cleanup of spills involving oil, salt or listed critical materials within the state.

Potential Penalties

Civil and criminal penalties can range up to $100,000/day/item and include jail terms for individuals who flagrantly violate the law.

SSECO Bulletins

SSECO publishes Bulletins and Newsletters on environmental policies and regulations. Bulletin #40 addresses spills and reporting requirements.

SALEM MANUFACTURING PLANT, FORD MOTOR CO.
RCRA CONTINGENCY PLAN
SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN
POLLUTION INCIDENT PREVENTION PLAN

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INTRODUCTION

A. Introduction

B. How to use this plan

C. Certification statement

FORD SALEM MANUFACTURING PLANT
9571 JOY ROAD
SALEM, MICHIGAN 48170
(313) 322-5548

INTRODUCTION

The information provided in this plan is for use in responding to unusual or sudden releases affecting the environment (e.g. gases, fumes, smoke, chemical releases, oil spills). These releases may be single incidents or the result of a more complex emergency (fire, tank leakage, injury accident, etc.). In the case of a complex incident other emergency response plans may have to be consulted to provide a comprehensive well balanced plan of action.

This plan contains the chemical description, location, and distribution information for new and waste materials at this plant. Wherever releases can be anticipated (e.g. tank farm unloading stations) specific action plans are provided. A list of plant equipment available for spill response is also included. Phone numbers for plant personnel, governmental agencies, and offsite contractors are provided as well.

Appropriate portions of this plan will be implemented by the facility Emergency Coordinator or a designated alternate in the case of sudden and/or unusual releases of contaminates to the environment. Plant personnel and local agencies listed in the addressees section of the plan have been furnished copies of this plan. The plant security office and the designated Emergency Coordinator maintain the most current copies of the plan and are responsible for updating the information.

Editorial comment:

The above language is only suggested, feel free to change it as necessary. Also keep in mind that federal law requires modification and recertification of the plan whenever there are changes in the spill potential (new tanks, etc.) or every three years. Only the affected pages must be changed.

HOW TO USE THIS PLAN

Anyone who may be involved in responding to an environmental emergency or release at the Ford Salem Plant must be familiar with this plan before it is needed in an emergency. We suggest the following sequence:

Become familiar with the plan by reading it and noting passages that apply to your area of responsibilities.

2. Keep the plan updated by replacing outdated material as new pages are supplied.

3. Know how to use each section in relation to other sections.

4. Copy and post important pages such as phone lists.

5. Use the plan as a springboard for developing training programs and drills on such things as containment, evacuation and cleanup.

CERTIFICATION STATEMENT

I have reviewed the Contingency Plan for the Ford Salem Manufacturing Plant dated June 31, 1986. I am familiar with the plant and its operations. I hereby certify that this plan has been prepared in accordance with good engineering practices and that it meets the requirements of 40 CFR 112 for a "Spill Prevention Control and Countermeasure Plan".

_____(Signature)

_____(Typed/Printed Name)

_____(Date Plan Certified)

(-----SEAL-----) _____(Professional Engineer Certification No.)

_____(Date of P.E. Certification)

_____(State of Certification)

Plan Prepared By:_____

Plant Engineering Department, Salem Manufacturing Plant

Date of Original Plan:_____

Date of this Revision:_____

EPA ID Number:_____

Michigan PIPP Number:_____

Editorial comment:
As shown this statement is set up for the state of Michigan. Other states or localities may have additional requirements. These other requirements must be included in the plan.

It is not necessary to certify that the plan also meets the criteria of a RCRA or Michigan part 5 spill plan.

FACILITY DESCRIPTION

A. A description of the facility and the products produced.

B. Security at the facility including fire and rescue capabilities.

C. Drawings showing the locations of items discussed in this plan.
   1). Site Plan; roads, fences, gates, building locations, ditches, streams, outfalls, etc.
   2). Building Plan; PCB's, haz. materials, extinguishers, etc.
   3). Hazardous Waste Storage and Tank Farm details.
   4). Boiler House

D. Utility (Power) Failure

E. Flood Potential

Editorial comment:
The drawings could be attached to the plan as appendices.

SALEM MANUFACTURING
FORD MOTOR CO.
SALEM MICHIGAN

The Ford Salem plant produces variable pitch, left and right handed, widgets for use in the assembly of Ford and other competitive brands of window lifts. The operations at the plant include; Plastic Molding, Aluminum Casting, Machining (Aluminum and Steel), Welding, Phosphating, Painting, Shipping/Receiving, Wastewater Treatment, and Boiler House operations. The plant has 250,000 square feet of manufacturing and office space in four buildings on the 68 acre site.

Plastic Molding department:

Granular plastic pellets are heated in the molding machine and formed into parts. All waste plastic is reground and reused. Waste hydraulic oil from the machines is accumulated in 55 gallon drums in a contained area on the loading dock. It is shipped as non hazardous wastes for recycling.

Aluminum Casting department:

Molten aluminum is received on a daily basis by 20 ton truck loads. The aluminum is held in a reheat furnace until needed at the casting machines. Scrap aluminum is cleaned and remelted. Waste oils are shipped with the oil from the Plastic Molding department. This department operates 24 Hours a day 5 days a week.

Machining department:

Purchased materials are machined to sizes required in the assembly of widgets. Scrap metals are segregated and sold. Waste oil is Hazardous because of contamination with trichlorethylene and is segregated.

Phosphating/ Painting/Shipping:

Etc...

Wastewater Treatment:

The wastewater treatment facility uses ferric chloride, lime and a polymer to remove heavy metals from the process wastewater stream. Oily wastes are collected separately and treated with heat and chemicals to break the emulsion, these oils are shipped off site for recycle as a non hazardous waste.

Boiler House Operations:

The boiler house has two coal fired boilers, one #6 oil fired boiler, and one natural gas fired boiler. It is manned 24 hours a day 365 days a year. Boiler house personnel operate the on site waste water treatment plant and are trained in hazardous waste handling. They assist the fire brigade and cleaners as part of the "first response" team in case of an environmental emergency.

SECURITY

The plant security office [phone No. (123) 456-1234] is manned 24 hours a day 365 days a year. A copy of this contingency plan is available in the security office; all security personnel are familiar with the plan and its requirements. The office is located at Gate 3 on Main road. The other gates are opened only for construction or emergencies. A chain link fence encloses 29 acres of the 68 acre plant site. Remote TV cameras are used to assist periodic patrols in providing surveillance of the site.

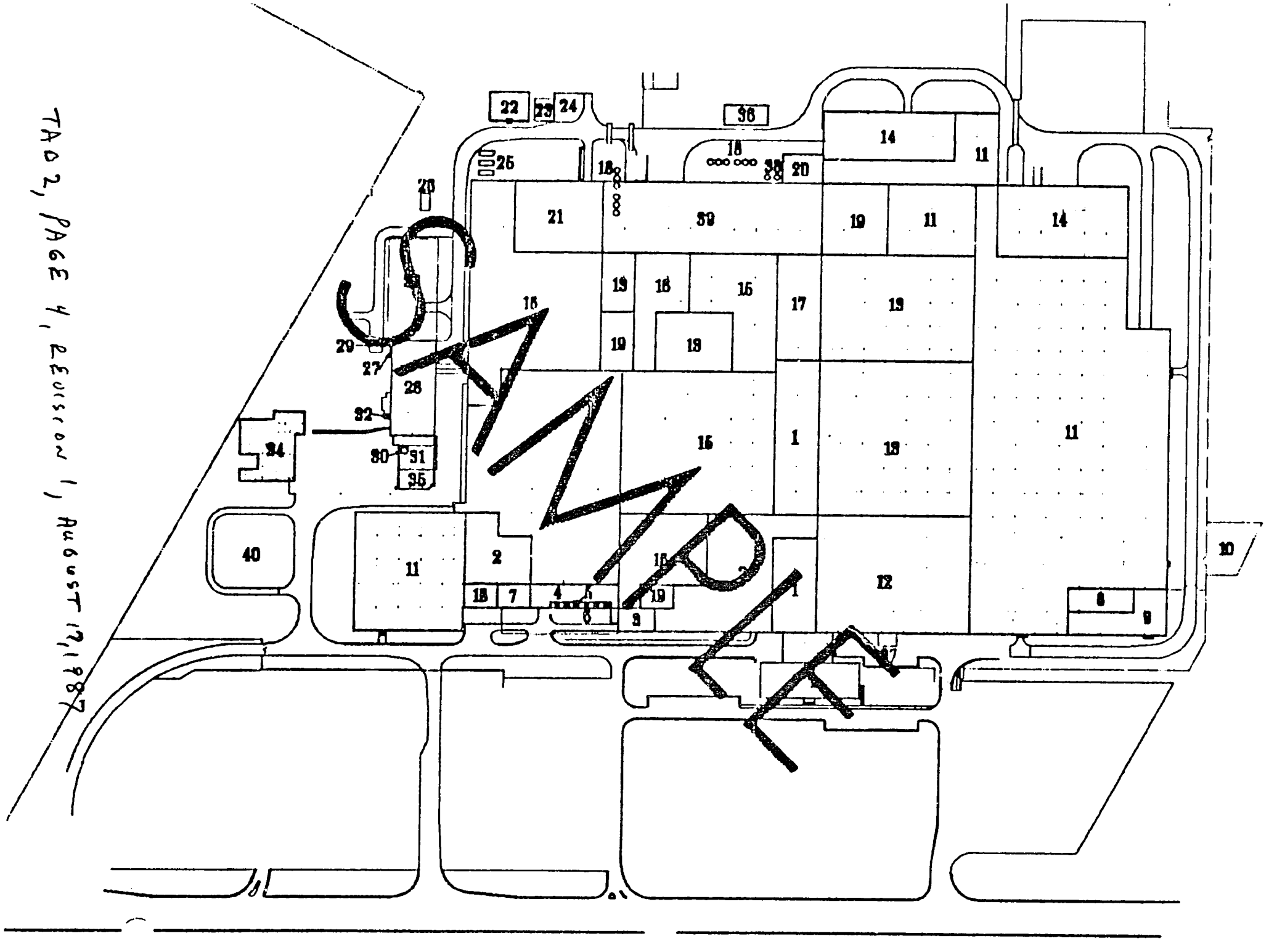
FIRE BRIGADE

The plant fire brigade has two vehicles, a 1984 Ford pumper and an inplant Kalamazoo utility vehicle. The brigade consists of volunteers from both hourly and salary employees. The plant safety engineer is the brigade chief. Most brigade members are at the plant during the day shift, and are on call during the off shifts and on weekends. The fire brigade has a mutual assistance agreement with the Salem City Fire Department. The city and plant fire fighting units hold joint training sessions at the plant annually.

RESCUE/MEDICAL

The plant doctor and nurses provide rescue and medical assistance to the fire brigade on the day shift. They respond to all fire and medical emergencies. Off shift medical assistance (first aid) and rescue assistance is provided by security and/or the fire brigade. The Salem General Hospital has been given a copy of this plan and is prepared to receive emergency medical cases.

TA02, PAGE 4, REVISION 1, AUGUST 12, 1987



LEGEND

1. Administration - Ammonia General Cleaning Supplies.

2. Decorating/painting operations- A full range of paints paint solvents and associated drying ovens are used throughout the area. All painting equipment is protected by CO2 systems.

3. Paint mix rooms - A full range of paint and paint solvents are mixed in this area. The rooms are protected by a flooding Co2 System.

4. Paint Warehouse - A storage area containing 55 gallon drums 5 gallon pails, 16 oz spray cans, of paints and thinners, and drums of corrosive materials.

5. MDI/Polyol bulk storage room -

6. Paint solvents tank farm -

7. Hot kolene salt stripper -

8. Battery crib -

9. Garage -

10. Fire Pump Site - includes diesel fuel storage tank.

11. Warehousing -

12. Electronic Assembly - etc includes hot solder and flux operations, and a acid etch tank for etching metal parts.

13. Assembly - assembly operations for dash clusters and dash panels.

14. Shipping/Receiving docks - May contain any material that is used throughout the site.

15. Injection Molding -

16. Reaction Molding -

17. Non Production Stores

18. Bulk storage plastic pellets/regrind

19. Maintenance area -

20. Trash dock - contains high temperature steam and a trash incinerator.

21. Tool Room -

22. Hazardous Waste Accumulation Pad -

23. Compressed gas storage [illegible]

24. Empty Drum Accumulation pad -

25. Hydraulic oil storage [illegible] -

26. Waste Oil Accumulation tanks -

27. Fuel Oil Storage Tanks -

28. Power Sub Stations -

29. Road Salt Storage Shed -

30. Salt Brine Tank -

31. Outside Drum Storage -

32. Acid Storage Tank -

33. Electric power Sub Stations -

34. Waste Treatment Building - Contains Hazardous chemicals, acids, caustic materials, and petroleum materials.

35. Fixture Storage Building -

36. Equipment Storage Pole Barn -

37. Gasoline Storage Tanks -

38. Nitrogen storage tanks -

39. Plastic reprocessing(regrind)

40. Storm Water retention pond waste treatment

SAMPLE

UTILITY FAILURE

It is unlikely that a utility (electrical) failure will cause a spill incident. All solenoid valves used in the liquid handling systems are normally closed when deenergized. All bulk material unloading facilities for liquid products are equipped with gear pumps and blocking valves to minimize the possibility or siphoning during a power loss. We are not aware of any increase in spill potential due to a power failure.

FLOOD POTENTIAL

With the exception of approximately 12 acres along the Salem River the plant site is above the 100 year flood plain. The low land near the river is not used for production or equipment storage. Only recreational activities (softball, picnicking, etc.) are allowed in the flood plain area.

MATERIALS

A. New material data sheets

B. Waste material data sheets

C. Waste analysis plan/waste characterization

D. PCB quantities and locations

Editorial comment:

Some facilities may want to use health and safety data sheets provided by the supplier in place of the "Condensed Material Data Sheets" included with this plan. However, a sheet like these will be needed for waste materials.

Information may not be available or required for each line on the data sheet. The information submitted to your local fire department in December of 1985 may be sufficient for use in locating and identifying PCB containing items.

New Material

CONDENSED MATERIAL DATA SHEET*

Common Name(s) :_____
Vendor(s) :_____
Scientific Name :_____
CAS Number :_____
Ford "M" Number :_____
Ford Toxicology (TOX) Number :_____
Reportable Quantity (RQ) lbs. :_____Local _____State _____ Federal
Hazard Category (new material):_____
Extremely Hazardous (SARA) :_____
United Nations (UN)/NA Number :UN _____ NA _____
State/Local Waste Number :_____
State/Local Critical Material :_____
Proper DOT Shipping Name :_____
Waste Classification :_____Hazardous _____Non-Hazardous
Reason for Classification :____Listed _____Tested _____Knowledge
Hazardous Characteristic :_____
Flash Point :_____F _____C
RCRA Waste ID Number :_____
Hazard Class :_____
Disposal/Recycle Facility :_____
:_____
Material is Normally :____Solid ____Liquid ___Compressed Gas
Specific Gravity :_____
Daily Inventory :_____
Average Inventory :_____
Maximum Inventory :_____
Method of Inventory :_____
Containment Provisions :_____
:_____
Shipment Container :___Bulk _____ Size ____Drum_____Size

Storage Location:	Type of storage	Quantity:
1)	1)	1)
2)	2)	2)
3)	3)	3)

Usage/Pick-up Location:	Distribution:	Quantity:
1)	1)	1)
2)	2)	2)
3)	3)	3)

Health and Safety Bulletins:

*Note: See plant Environmental Representative for complete Material Health and Safety Data Sheet.

New Material

CONDENSED MATERIAL DATA SHEET*

Common Name(s)	: Perchlor, PCE
Vendor(s)	: ABC Chemical
Scientific Name	: Tetrachloroethylene/Perchloroethylene
CAS Number	: 127-18-4
Ford "M" Number	:
Ford Toxicology (TOX) Number	: 23434
Reportable Quantity (RQ) lbs.	: ____Local _any_State _1 lb._ Federal
Hazard Category (new material)	: Priority toxic Pollutant
Extremely Hazardous (SARA)	: no
United Nations (UN)/NA Number	: UN 1897 NA
State/Local Waste Number	:
State/Local Critical Material	: 00127-18-4
Proper DOT Shipping Name	: ORM-A
Waste Classification	: _X_Hazardous ____Non-Hazardous
Reason for Classification	: _X_Listed ____Tested ____Knowledge
Hazardous Characteristic	: Toxic
Flash Point	: none F ____C
RCRA Waste ID Number	: F001
Hazard Class	:
Disposal/Recycle Facility	: ABC Chemical
	:
Material is Normally	: ____Solid _X_Liquid ____Compressed Gas
Specific Gravity	: 1.625
Daily Inventory	: 2356 lbs in tank
Average Inventory	: 10 drums in stores
Maximum Inventory	: 25 drum shipment
Method of Inventory	: tank-gage daily, drum count-stores
Containment Provisions	: tank is curbed to 150% capacity,
	: no containment for drums in stores.
Shipment Container	: ____Bulk ____Size _X_Drum 35 galSize

Storage Location:	Type of storage	Quantity:
1)General stores	1)drum	1)10
2)	2)	2)
3)	3)	3)

Usage/Pick-up Location:	Distribution:	Quantity:
1)stores to B-14	1)as needed	1)1 drum
2)B-14 to haz. pad	2)6 months	2)2356 lbs.
3)	3)	3)

Health and Safety Bulletins:

*Note: See plant Environmental Representative for complete Material Health and Safety Data Sheet.

SAMPLE

Waste Material

CONDENSED MATERIAL DATA SHEET*

Common Name(s) :_____
Vendor(s) :_____
Scientific Name :_____
CAS Number :_____
Ford "M" Number :_____
Ford Toxicology (TOX) Number :_____
Reportable Quantity (RQ) lbs. :_____Local _____State _____ Federal
Hazard Category (new material):_____
Extremely Hazardous (SARA) :_____
United Nations (UN)/NA Number :UN _____ NA _____
State/Local Waste Number :_____
State/Local Critical Material :_____
Proper DOT Shipping Name :_____
Waste Classification :_____Hazardous _____Non-Hazardous
Reason for Classification :____Listed _____Tested _____Knowledge
Hazardous Characteristic :_____
Flash Point :_____F _____C
RCRA Waste ID Number :_____
Hazard Class :_____
Disposal/Recycle Facility :_____
:_____
Material is Normally :____Solid ____Liquid ____Compressed Gas
Specific Gravity :_____
Daily Inventory :_____
Average Inventory :_____
Maximum Inventory :_____
Method of Inventory :_____
Containment Provisions :_____
:_____
Shipment Container :___Bulk _____ Size ____Drum_____Size

Storage Location:	Type of storage	Quantity:
1)	1)	1)
2)	2)	2)
3)	3)	3)

Usage/Pick-up Location:	Distribution:	Quantity:
1)	1)	1)
2)	2)	2)
3)	3)	3)

Health and Safety Bulletins:

*Note: See plant Environmental Representative for complete Material Health and Safety Data Sheet.

Waste Material

CONDENSED MATERIAL DATA SHEET*

Common Name(s) : PCB's
Vendor(s) :
Scientific Name : Polychlorinated Biphenyls
CAS Number : 1336363
Ford "M" Number :
Ford Toxicology (TOX) Number :
Reportable Quantity (RQ) lbs. : ____Local ____State 10 Federal
Hazard Category (new material):
Extremely Hazardous (SARA) :
United Nations (UN)/NA Number :UN ____ NA ____
State/Local Waste Number :
State/Local Critical Material : Yes
Proper DOT Shipping Name :
Waste Classification : ____Hazardous ____Non-Hazardous
Reason for Classification : ____Listed ____Tested ____Knowledge
Hazardous Characteristic :
Flash Point : ____F ____C non flammable
RCRA Waste ID Number :
Hazard Class :
Disposal/Recycle Facility :
:
Material is Normally : ____Solid ____Liquid ____Compressed Gas
Specific Gravity :
Daily Inventory :
Average Inventory :
Maximum Inventory :
Method of Inventory :
Containment Provisions : All transformers are diked to hold
: 150% of contents.
Shipment Container : ____Bulk ____Size X Drum 55 galSize

Storage Location:	Type of storage	Quantity:
1) Transformers	1) Transformer tank	1) Varies per trans.
2) Capacitors	2) Self contained	2) Varies per cap.
3)	3)	3)

Usage/Pick-up Location:	Distribution:	Quantity:
1) Substations	1) N/A	1) Per each trans/cap.
2)	2)	2)
3)	3)	3)

Health and Safety Bulletins:

*Note: See plant Environmental Representative for complete Material Health and Safety Data Sheet.

SAMPLE

NOTIFICATION

A. Notification procedure
   1. Notification requirements
   2. Information required for notification

B. Phone lists
   1. Plant personnel
   2. Local emergency response units
   3. Ford Corporate contacts
   4. Governmental contacts
   5. Emergency information services
   6. Emergency assistance contractors

C. Training/mutual aid/agreements with local emergency response units
   1. Fire
   2. Police
   3. Medical
   4. Disaster/emergency control coordinator.

D. Agreements with nearby Ford plants.
   1. Newburgh Assembly Plant
   2. Huron Parts Plant

NOTIFICATION REQUIREMENTS

The release of oils or hazardous substances in reportable or harmful quantities to the environment (air, land, water) requires the immediate notification of federal, state, and/or local agencies. Written reports are also required and are not covered by this emergency plan.

Before reporting any of the following situations be sure to obtain as much of the information asked for on tab four, page four, as possible.

COUNTY EMERGENCY COORDINATOR'S OFFICE

Any of the following situations must be reported to the County Emergency Coordinator's Office (123-4567).

OILS

If a petroleum product (oil) "of any kind or in any form" has been released to the waters of the U.S. (i.e. to surface waters or to a storm sewer) a report to the U.S. Coast Guard National Response Center (toll free 800/424-8802, or 202/426-2675). The Michigan State Department Of Natural Resources, Pollution Emergency Alerting System (PEAS) must also be notified (toll free 800/292-4706, or 517/373-7660). If the release is to the sanitary sewer, and causes an excursion of the oil and grease limit and/or could adversely affect treatment, the Salem Sanitary Sewer District (123-4567) must be notified as well.

CERCLA - HAZARDOUS SUBSTANCES
and
CERCLA - EXTREMELY HAZARDOUS SUBSTANCES

If a reportable quantity (RQ) of a hazardous substance (other than oil) is released to the environment, notifications must be made to 1) the U.S. Coast Guard National Response Center 2) the local emergency planning coordinator and 3) the State emergency planning commission. The RQ for a material can be found on the appropriate data sheet behind Tab 3.

SALT OR MICHIGAN CRITICAL MATERIAL

The spilling of oil, salt or a Michigan Critical Material to either surface (storm sewer, river, etc.) or ground water must be reported to the PEAS operator (800/292-4706 or 517/373-7660). There is no lower limit as to the quantity of salt or Critical Material spilled. If the salt or critical material is released to the sanitary sewer system, the Salem Sanitary District must be notified if it is believed that the release will interfere with or disrupt the City Treatment Plant. The data sheets behind Tab 3 indicate which materials are on the Michigan Critical Materials list.

FLAMMABLE MATERIALS

By agreement with the Salem Fire Department, the spilling of Flammable Materials will be reported to them on 123-4567. If the spill is to the city sewer, and exceeds the ordinance limit,the Salem Sanitary Sewer District must be notified as well. Note: the loss of volatile (flammable) materials to a hard surface and the subsequent evaporation of these materials may be a release to the atmosphere and thereby require additional reporting.

SMOKE/TOXIC GASES

The City Manager's Office (123-4567) and the Superintendent of Schools (123-4567) must be notified in the case of the release of gases that may effect the general population. Also; the State Air Pollution Control Agency, (555-123-4567), and the EPA Regional Office, Division of Air Pollution Control and Radiation, (555-123-4567) must be notified.

POLYCHLORINATED BIPHENYLS

Any fire related incident in which Polychlorinated Biphenyls (PCB's) are released must be reported to the National Response Center (800/424-8802). See tab 3 for the locations of PCB items and tab 5 for the PCB action plan.

INFORMATION FOR NOTIFICATION

Every effort should be made to obtain the following information before placing a call to an agency. However, in the interest of a speedy notification some things (e.g. quantity spilled) may have to be estimated. Note: Containment of the spill/release is of the utmost importance. Containment should be implemented immediately, before notification. Do not indiscriminately flush spilled materials down the drain.

1. Name of facility: _____
2. Name of person Reporting: _____
3. Address of facility: _____
4. Phone number of person reporting: _____
5. Exact location of spill/release: _____
6. Type (name) of material released: _____
7. Oil____, Salt____, Flammable____, Hazardous____, PCB____, Extremely Hazardous____, State/Local Critical Material____.
8. Quantity of material released: _____
9. Source of the released material: _____
10. Cause of the release (fire, spill, etc.): _____
11. Name of the body of water involved, or the nearest body of water: _____
12. Action(s) taken for containment and/or cleanup: _____
13. Estimate of quantity recovered: _____
13. The extent of injuries, if any: _____
14. Time and date of the incident: _____
15. The possible hazards to human health, or the environment, outside the facility: _____
16. Medical Precautions/Advice _____

Notes: _____

Agencies contacted:

AGENCY	NAME, OR NUMBER, OF OPERATOR	TIME OF CALL

Plant Personnel Listing

Name :_____

Ford Job Title :_____

Emergency Response Function/Title :_____

In Plant/Ford Net Phone Number :_____

Home Phone Number :_____

Normal Shift :___Day___Afternoon___Midnight

Office Location :_____

Beeper/Radio Number :_____

Editorial comment:

1) Federal regulations (RCRA) require that each facility designate an "Emergency Coordinator" who is familiar with the facility, the contingency plan, and has "...the authority to commit the resources needed to carry out the plan." 2) Federal regulations (SARA) require an "Emergency Response Coordinator", with similar authority. 3) Company policy is for each plant to have a "Designated Environmental Representative", these three jobs may be held by the same or different people.

The above (and following formats) are only suggested and should be modified to suit local conditions.

Phone listings for similar groups (eg. Plant, Agencies) should be on grouped together on separate pages to avoid confusion.

Some states (Indiana) require home addresses also.

Local Agency Emergency Response Units Listing

Agency :_____

Contact Name/Job Title :_____

Emergency Number :_____

Business/Non-Emergency Number :_____

Editorial comment;

It may be desireable to put all federal agencies on one page, all state agencies on another, etc.

Ford Corporate Contacts

Name :_____

Ford Job Title :_____

Emergency Response Function/Title :_____

Ford Dial Net Number :_____

Complete Work Number :_____

Home Phone Number :_____

Government Agency Contact Listing

Agency :_____

Contact Name/Job Title :_____

Toll Free Emergency Number :(800) _____

Business/Non-Emergency Number :_____

Editorial comment:

It may be desireable to put all federal agencies on one page, all state agencies on another, etc.

Additional Information Sources

CHEMTREC, Chemical Transportation Emergency Center
Manufacturing Chemists Association, Washington, D.C.

24 hour/emergency 800-424-9300
Administrative 202-483-6126

Editorial comment:
Include additional non agency, non company assistance groups under this heading.

EMERGENCY ASSISTANCE CONTRACTORS

Company Name :_____

Service(s) Provided :_____

:_____

Contact Person(s) :_____

Business Phone Number :_____

Home Phone Number :_____

Comments (equipment, experience, blanket order, etc):

AGREEMENTS WITH LOCAL AGENCIES

Washtenaw County Emergency Coordinator/Local Emergency Planning Commission

The Washtenaw County Emergency Coordinator is the head of the local Emergency Planning Commission and will organize the efforts of local fire, police, rescue, traffic control, evacuations etc. (see letter attached). The Coordinators office [(313) 112-2334] is to be notified by the plant in these situations:

- Fire requiring outside assistance.
- Accident or injury requiring outside assistance other than transportation.
- Rescue operations requiring outside assistance.
- Traffic control in case of riot or other civil disorder.
- Disaster such as tornado, downed electrical lines, flood, etc. that may impact the local community.
- Releases affecting the environment outside the plant.

Salem City Police Department

In addition to the usual police functions involving crimes the City Police will assist the plant in crowd control, rescue operations, escort etc. A letter describing these activities is attached. Most of these activities are handled through the Washtenaw Co. Emergency Coordinators office.

Salem City Fire Department

The City Fire Department will be called upon to fight fires and assist in rescue operations that are beyond the capacity of the plant fire brigade and/or at times when the plant is unoccupied. The Salem Fire Department has yearly training sessions with the plant forces. They have been trained on the location of hazardous substances (including; PCBs, flammable liquids, tank farm, hazardous wastes, etc.) as well as precautions necessary in controlling fires/releases and excess water in these areas. Attached is a copy of the agreement with the Salem Fire Department.

Salem State University Hospital

The University Hospital emergency admitting department has agreed to accept patients from the plant. The attached letter provides details of this agreement. Hospital personnel have held training sessions with our plant doctor (Dr. Van Dyke) on the types of chemicals present at our plant. The hospital provides helicopter as well as regular ambulance services if the plant ambulance is not available.

All of the above organizations are on the distribution list for this contingency plan and will be sent revisions as necessary.

AGREEMENTS WITH LOCAL FORD PLANTS

Newburgh Assembly

A reciprocal agreement has been arranged with the Newburgh Assembly Plant to assist each other in an environmental emergency. The Newburgh Plant is located three miles Southeast of the Salem Plant on Highway 23, and four miles downstream on the Salem River.

In case of an oil spill on the Salem River the Newburgh Assembly plant has agreed to launch their power boat and deploy booms to stop the advancement of oils. In the case of a major spill they have agreed to loan sorbents, power and hand tools, etc. on an as needed basis.

The Salem plant has agreed to loan small tools and equipment as needed and to provide the use of our Ford pumper truck in the case of a major fire or release.

Huron Parts Plant

The Huron Parts Plant has a similar agreement, and is located eight miles North on Highway 18 from the Salem Plant. The Huron plant has a highly skilled spill control and transportation crew. They have agreed to respond to major spills and provide overpack drums and transportation on an as needed basis.

ACTION PLANS

A. Smoke/fire/dangerous gas releases

B. PCB incident fire/spill

C. Oil spill

D. Liquid material spill

E. Hot metal truck spill

F. Evacuation plan

G. Asbestos

H. Emergency equipment listing/location

Editorial comment:

Action plans should be short, and action oriented, and should include maps or diagrams. Each diagram should have locations for pipes, pumps, shutoff valves, etc. for the material under consideration.

Access roads should be well marked on maps. Where important, clearances to overhead utilities should be shown.

FIRE INVOLVING POLYCHLORINATED BIPHENYLS (PCBs)

Fire related incidents involving PCBs can result in the generation of PCB laden smoke. Even though the PCBs may not burn they can be released into the smoke stream. Perhaps even more importantly, the decomposition products from hot PCB solutions are potentially toxic gases. Therefore, when a piece of PCB equipment (transformer, capacitor, switch etc.) is involved in a fire, response personnel must:

WEAR SELF CONTAINED BREATHING APPARATUS (SCBA)

SCBA are kept on the fire trucks, and in cabinets in other strategic locations (see attached diagram).

If the smoke plume is impacting a ground level area (on or off Ford property) an evacuation may be necessary. Plant personnel will decide the extent of any on site evacuation. The Washtenaw County Emergency Coordinators office, as well as any on scene emergency crews will be notified. Evacuation of off site properties is the responsibility of the County Coordinators office.

Special precautions will be taken to see that PCB laden water does not leave the site. This will include the blocking of storm and sanitary drains in the area near the fire, and other drains that could allow PCBs to escape. Depending on the nature of the incident the accumulated water may have to be tested for PCB content before it can be treated or released.

In accordance with 40 CFR 761.30 the National Response Center (1-800-424-8802) must be notified of fire incidents that involve PCB transformers in which PCBs are released. Any PCBs escaping the transformer case as a result of a fire trigger this reporting requirement.

PCB SPILL

All PCB transformers are within diked areas which will contain any small leakage. Regular inspections of all PCB equipment may reveal small leaks which are handled by outside maintenance crews.

Major leaks, spills or catastrophic losses outside the diked areas will require special precautions. Do not flush PCB containing liquids down storm or sanitary drains. To prevent this kind of loss it may be necessary to plug floor drains in the vicinity of a fire involving PCB equipment. Any material that is in contact with PCBs will have to be decontaminated or disposed of as PCBs or PCB contaminated. This includes; walls, floors, equipment, machines, fire fighting materials (water), clothing etc. The most recent EPA guidelines on PCB cleanup will be consulted to insure proper decontamination.

OIL SPILL ACTION PLAN

All petroleum products are stored in underground tanks (gasoline) or in tanks within contained (diked) areas. The unloading stations at each tank farm drain to 500 gallon blind sumps that are emptied as needed. All deliveries are monitored, during the entire process, by both the truck driver and general stores personnel.

A large oil release would probably be the result of a traffic accident or the spillage of more material than the 500 gallon sump could hold. In either of the incidents, the material would most likely flow toward the nearest storm sewer. Once in the storm sewer the oil would flow directly to the Salem river.

If the oil is flowing toward a storm sewer catch basin the catch basin must be blocked to prevent oil from entering the sewer. The basin must be blocked even if some oil has entered the sewer, this will prevent additional material from reaching the river. Recovering oil from the river is more difficult than picking up oil on the ground.

In case of an oil spill follow this action sequence:

1. Summon assistance, Radio, Telephone, etc.
2. Block the flow of material, shut off valve or pump etc. Block drains, use plastic sheet and sand, and/or sand bags as needed. Sewer plugs are available in the spill crib for sewers up to 12" diameter.
3. If the oil has reached the river; curtain and/or sorbent booms must be deployed to contain the oil.
4. Once the material has been contained, cleanup can be started.
5. In addition to the usual spill notification, some additional outside agencies may have to be called in the early stages of the incident if: a) outside assistance is needed or b) the material has spread down the river far enough to be a hazard to down stream interests such as water intakes or swimming areas.
6. Disposal or recycle of sorbents and/or recovered product will depend on the flash point and purity of the recovered material. Once the material has been accumulated an evaluation can be made as to its disposition.

EMERGENCY EQUIPMENT

Most of the spill equipment is located in the boiler house spill crib. Additional equipment is located throughout the plant as noted.

Boiler House Spill Crib

6	steel overpack drums
2	poly overpack drums
50	bags oil adsorbent (Speedy Dry)
9	bags sorbent pads
150'	sorbent boom
75'	floating boom
2	non sparking shovels
1	non sparking tool kit
2	drum repair kits
14	brooms
8	rolls barricade tape
4	portable lamps
3	boxes heavy duty plastic bags
22	traffic cones
1	box labels
1	acid neutralization kit
3	caustic neutralization kits
25	sets; face shield, protective coveralls, boots, hats, gloves

Additional Equipment

2	Ford backhoe/end loaders
1	3 yard Ford dump truck
3	floor sweepers
2	"Sludge King" vacuum trailers
3	portable gasoline driven pumps and hoses

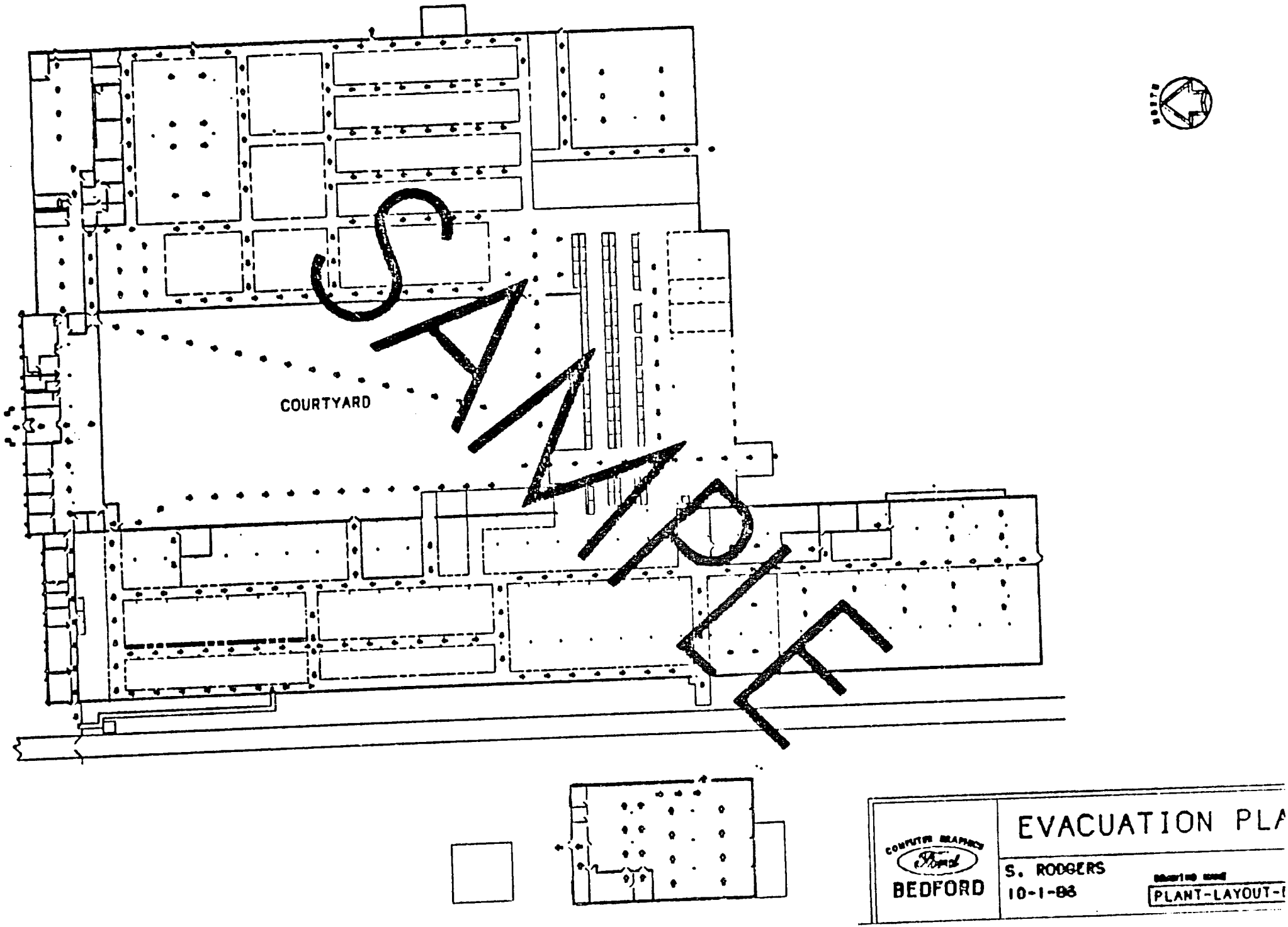
This equipment is in daily use at the plant and is available on an as needed basis.

Additional Supplies

Empty drums are available in the paint and oil house.
Sand and sand bags are kept in the salt storage shed.

Equipment Maintenance

All mechanical equipment that is not in daily use is checked monthly (see inspection section). Every effort is made to keep the inventory of spill response materials at the above levels.



TAB 5, PAGE 5, REVISION 1, OCTOBER 19, 1987

HISTORICAL INFORMATION

Behind this tab is a history of pollution incidents at the Salem plant, and the corrective actions taken to prevent a similar incident in the future.

Editorial Comment:

Company records retention procedures require that spill records be kept for at least five years. For preparation of spill incident reports SSECO recommends that at least the last two incident reports be kept.

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES

REPORT OF OIL, SALT OR POLLUTING MATERIAL LOSSES

nt to the provisions of Act 245 of the Public Acts of Michigan 1929 as amended, regulations have been issued require that all owners, managers or operators of vessels, oil storage or on land facilities shall notify the Water Resources Commission or his authorized representative of oil, salt and polluting material losses. This notification shall be made promptly by telephone or telegraph, giving briefly the particulars, and by mail giving a detailed account of events and conditions.

Date: 7/14/83	Company Name: Ford Motor Company
Location of Loss (Be Specific): 128 Factory Street Ypsilanti, Michigan 48197	
Material Lost: Mixed Oils	Amount: Less than 1 gal. (est).
Name of Surface Water Involved: Huron River	
Date Loss was Discovered: 7/14/83	Time of Discovery: 12:00 noon
Name of Department of Natural Resources Representative Contacted: State Response Center - 1:12pm - Operator #20	National Response Center - 1:17pm - Lt. Gass
Telephoned or Telegraphed to Whom: R. A. Worcheck (Plant Environmental Engineer)	Time: See Above

Cause of Loss (Include Type of Equipment and Other Details):

A contractor, working for Ford, was extending an existing 12" storm sewer through new shoreline sheet piling. This sewer had a plug installed during construction due to a temporary condition which can allow oil into this sewer. While the contractor was connecting a new section of pipe to the last existing section (which contained the plug), the joint between the pipe and a manhole (located approx. 6 ft. from the river) cracked, allowing some of the oil contaminated water it contained to seep through to the river.

Nature of Loss: mixed oils to Huron River surface water which caused an oil sheen and the smell of diesel fuel.

Actions Taken (Include Method of Containment, Clean Up, Restoration, etc.):

) Oil absorbent boom was placed around point where oil was entering river.
) Cracked sewer joint was patched.
) Oily water was pumped out of manhole and sewer.
) Contaminated gravel and dirt near the water was excavated and removed.

Company Name: Ford Motor Company	By Signature: R. A. Worcheck 7/18/83 R. A. Worcheck

m this form to:

Department of Natural Resources
Bureau of Water Management
8th Floor Stevens T. Mason Bldg.
Lansing, Michigan 48926

24 hr. Emergency Notification Number
517 — 373-7860
800-292-4706

SAMPLE

ADDRESSEES

Behind this tab is a list of addressees who are to receive this plan. Copies for Ford personal should be sent to their office/department. Non Ford addressees should be sent copies via U.S. Mail with "Return Receipt Requested."

Editorial Comment:

Addressees should include anyone who is mentioned in the plan by name or by job title (eg." Bob Jones" or "Plant Manager"). However, some groups may be covered by a single copy such as boiler house personnel etc. Division and staff (SSECO) environmental offices should also have copies.

Addressees <u>must</u> include the local fire and police departments that would respond to an emergency at the plant, <u>and</u> the local hospital(s) that would receive patients from the plant. Some other local agencies (e.g.; the county emergency coordinators office) may also want copies, these requests should be in writing.

In the past some agencies have refused copies of spill plans. In cases like this be sure and obtain a written refusal.

INSPECTIONS

Behind this tab are the pollution prevention inspection sheets for the Salem Manufacturing plant. The inspection program is designed to provide a way to head off accidental releases of pollutants and to comply with governmental requirements for inspections of potential pollution sources. This program is not a substitute for regular preventative maintenance or day to day common sense operations.

The inspections are to be performed on the frequency listed in the headings. Personnel performing the inspections must date and sign the inspection sheets. A valid "signature" can be; printed name, signed name, initials, social security number, etc. Notations such as "third shift operator" are not acceptable. Inspections can be performed by any qualified, trained, responsible person, hourly or salary.

Regular inventory of tanks by comparing actual quantity on hand to amounts received and/or dispensed can provide a means of determining if underground tanks are leaking without physical inspections.

Saline Instrument and Plastic Plant
Environmental Control Engineering

Plant Engineering Office
October 24, 1986

DAILY
TANK FARM INSPECTION

ENTER YEAR AND MONTH

INSPECTION DAY	INSPECTION TIME	USED SOLVENT TANK LEVELS (DAILY)	EROSION OF SOIL COVER	LEAKS FROM PIPING	CORROSION TO PIPING	SETTLING TANK BELOW?	INSPECTORS NAME
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
19							
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21							
22							
23							
24							
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27							
28							
29							
30							
31							

SAMPLE

TAB 8, PAGE 2, REVISION 1, OCTOBER 19, 1987

Saline Instrument and Plastic Plant
Environmental Control Engineering

Plant Engineering Office
October 24, 1986

WEEKLY
HAZARDOUS WASTE ACCUMULATION PAD

INSPECTOR'S NAME:	DATE:	TIME OF INSPECTION:

XYLENE	SCRAP PAINT			POLYAL	MDI	FREON	NAME OF NEW MATERIAL				
	DRUMS	PAILS	SOLIDS								

SAMPLE

Saline Instrument and Plastic Plant
Environmental Control Engineering

Plant Engineering Office
October 30, 1986

MONTHLY
PCB INSPECTION CHECKLIST

INSPECTOR'S NAME:	DATE:	TIME OF INSPECTION:

Sub Station	Serial Number	Brass Tag No.	Quantity Of PCB	Inspection of Unit				Date Cleanup Completed	Date Repairs completed	Notes:
				Floor	Back	D-valve	S-valve			
1A	13574	478502	330.0							
1B	13580	499000	330.0							
2A	13576	498998	330.0							
2B	13579	498996	330.0							
3A	13575	478506	330.0							
3B	13582	478504	330.0							
4A	13577	478508	330.0							
4B	13583	478510	330.0							
5A	13578	478512	330.0							
5B	13581	478514	330.0							
	13584	478516	465.0							
	13585	478518	465.0							
	87157-1	---	282.0							
6D	87157	663394	282.0							
7A	5206822	584356	238.0							
7B	5206821	613773	238.0							
7C	C500937	663292	480.0*							
8A	16587	478522	465.0							
8B	16506	478520	465.0							
9A	5033172	613885	347.0							
9B	5079144	613886	[illegible]4.0							
10-	13858	478537	285.0							
11A	64440-3	614190	320.0							
11B	64440-0	614190	[illegible]							
11C	64440-2	614191	320.0							
11D	5574952	614735	365.0							
12A	64440-4	614197	320.0							
12B	64440-1	614196	320.0							
12C	5574953	614732	365.0							
13A	5574954	614733	365.0							
13B	5574951	614734	365.0							
13C	87157-2	663459	282.0							
13D	87157-3		282.0							
14A	62024		silicone							
14B	62024-1		silicone							

SAMPLE

TAB 8, PAGE 4, REVISION 1, OCTOBER 19, 1987

Saline Instrument and Plastic Plant
Environmental Control Engineering

Plant Engineering Office
October 24, 1986

MONTHLY
SALINE INSPECTION RECAPITULATION

MONTH	YEAR

AREA OF INSPECTION:	APPLICABLE INSP. SHEET	DESIGNATED INSPECTOR	SAT.	UNSAT
1. Gasoline Tank	Table L	ECE		
2. General Stores				
a. Tank Farm	Table [illegible]	OCA		
b. Drum Storage Pad	None	ECE		
c. Paint Storage Room	None			
d. Polyol/MDI Room	None	OCA		
3. Powerhouse				
a. Three 250 gallon diesel fuel tanks	Table J	ECE		
b. 1000 gallon Hydrochloric acid tank	Table A	ECE		
c. Vehicle Diesel Fuel Dispenser	Table A	ECE		
d. Salt Brine Storage Tank	Table A	ECE		
4. Waste Treatment Building	Table 16E	PHP		
a. Caustic, Ferric Chloride, Sulfuric and CO_2 Tanks	Table 16D	PHP		
b. Batch Tanks	Table 16B	PHP		
c. Waste Oil Decant Tanks	Table 16C	PHP		
d. 180 Gallon Diesel Fuel Tank	Table 16a	PHP		
5. Oil Storage Tank Farms	Table 16A	ECE		
a. Scrap oil Storage Area	Table 16A			
b. Virgin/Reclaim Oil Storage Area	Table 16A			
6. Storm Drains	Table 16A	ECE		
a. Storm Drain West				
b. Storm Drain East				
7. Sub Station Inspections (PCB)	Table 16G	ECE		
8. Hazardous Waste Storage Pad	Table 16H	PHP		
a. Hazardous Waste Inventory	Table 16I	PHP		
9. Emergency Containment Equipment/Supplies	Table 16F	PHP		

SAMPLE

TRAINING

A. Training requirements

B. Outline of training program(s)

C. Job descriptions

D. Records retention

PERSONNEL TRAINING

1. Spill Prevention Briefings
Plant Engineering, Security, Production and Production control personnel are annually instructed as to spill prevention control and countermeasure procedures. The Maintenance Department of the Plant Engineering Office, also occasionally publishes a "Maintenance Bulletin" for plant engineers regarding general preventive maintenance techniques such as the maintenance of pollution control and wastewater treatment systems.

2. Dissemination of Information
Stationary Source Environmental Control Office also periodically distributes, to affected company locations, information concerning Federal, State and local regulations, spill events, and recently developed precautionary measures.

3. Annual Training

Each employee that handles hazardous wastes must be trained on hazardous waste regulations once each year. Employees who cannot attend, or are subsequently transferred into an area that requires them to handle hazardous wastes, must be trained by their immediate supervisor prior to their handling any hazardous waste material.

4. Training Class Documentation

Each class conducted must have a lesson plan detailing subjects covered and a brief outline of each subject.

Records will be maintained by plant engineering of each session lesson plan, with every attendees: name, social security number, job title, and date and time of the training class.

Classes conducted by supervisors must be documented on a memo, or two way memo, providing the above information. The memo will be sent to plant Engineering office Saline where it will be maintained for review by: Ford Motor Co., Federal, and state auditors

SAMPLE

APPENDIX F - EVOLUTION OF DESIGN - FORD INDUSTRIAL WASTE TREATMENT FACILITIES

APPENDIX F

EVOLUTION OF DESIGN OF FORD MOTOR COMPANY INDUSTRIAL WASTE TREATMENT FACILITIES

Prepared By:

N. B. Silverson
Principal Environmental Control Engineer

and

D. L. Rueh
Environmental Control Engineer

Plant Engineering Office
Ford Motor Company
Dearborn, Michigan

Assisted By:

D. Kinnee/F. McAuliffe
Samborn, Steketee, Otis and Evans, Inc.
Toledo, Ohio

INTRODUCTION

In order to respond to changing Federal, State and Local regulations, Ford Motor Company industrial wastewater pretreatment facilities are planned and constructed by the Corporate Staff, Plant Engineering Office to meet the needs and requirements of each specific manufacturing plant. Detailed design is handled by well qualified consulting engineering firms, such as Samborn, Steketee, Otis and Evans, Toledo, Ohio, and Hubbell Roth and Clark, Inc., Bloomfield Hills, Michigan. Historically, the Ford Motor Company has included many diverse types of manufacturing facilities such as glass plants, steel mills, and plastics plants, each requiring specific wastewater treatment processes. The centralized responsibility of planning, engineering and construction has enabled the Ford Motor Company to install cost-efficient facilities available to meet these regulations. In general, however, the majority of Ford manufacturing plant treatment facilities may be grouped into three types of treatment facilities as shown in Table I.

Clearly the most serious pollutant in the manufacturing operations of the Ford Motor Company is oil because of its widespread use both directly in product manufacturing and indirectly, in hydraulic systems, etc. Paint wastewater found in assembly plants, typically, is of alkaline character with minimal amounts of oils present but with soluble and insoluble metals and BOD present. Overall, most heavy metals wastes, as discharged from plating operations, are acidic requiring upward pH adjustment to be settled as insoluble precipitates.

Since most manufacturing plant sites are located with access to adequately sized municipal or metropolitan sewerage systems, "pretreatment" facilities are provided to chemically treat and remove industrial pollutants such as oil, heavy metals, paints and suspended solids. The effluent is then discharged to the municipal system for final treatment to remove BOD and other organic materials. Where adequate municipal systems do not exist and wastewater must be discharged directly to public waters, a biological treatment system is provided in addition to the chemical pretreatment facilities.

TABLE I

FORD MOTOR COMPANY
BASIC TYPES OF TREATMENT FACILITIES
FOR
VARIOUS MANUFACTURING PLANTS

I. Oily Wastewater Treatment Facilities

- Engine Plants
- General Parts Plants
- Transmission & Chassis Plants
- Stamping Plants

II. Heavy Metals/Paint Wastewater Treatment Facilities

- Assembly Plants
- General Parts
- Plastic Plants
- Plating Plants

III. Organic Wastewater Treatment Facilities

- Assembly Plants
- Plastic Plants
- Radiator Plants

Since biological treatment is not a major concern in Ford treatment facilities, this paper will deal only with the innovative design approaches taken in the treatment of oily paint and heavy metal wastes.

PAST EXPERIENCES AND PROBLEMS

At the present time, Ford Motor Company has embarked on $50 million dollar industrial wastewater pretreatment program. The design of wastewater pretreatment facilities being constructed in the 1980's has evolved from years of practical operating experience gained from facilities built in the early 1950's until the present time. In order to understand the basis for many of the present facility design features, a brief discussion of the past experiences and problems is presented.

Experiences in Methods of Treatment

The basic chemical pretreatment processes, as practiced at Ford, are outlined in the block diagram of Figure I. Within these frameworks, various methods of handling and treating wastewater have been tried and evaluated. In the development of treatment facilities batch treatment was selected over continuous treatment. The reasons are as shown in Table II.

TABLE II

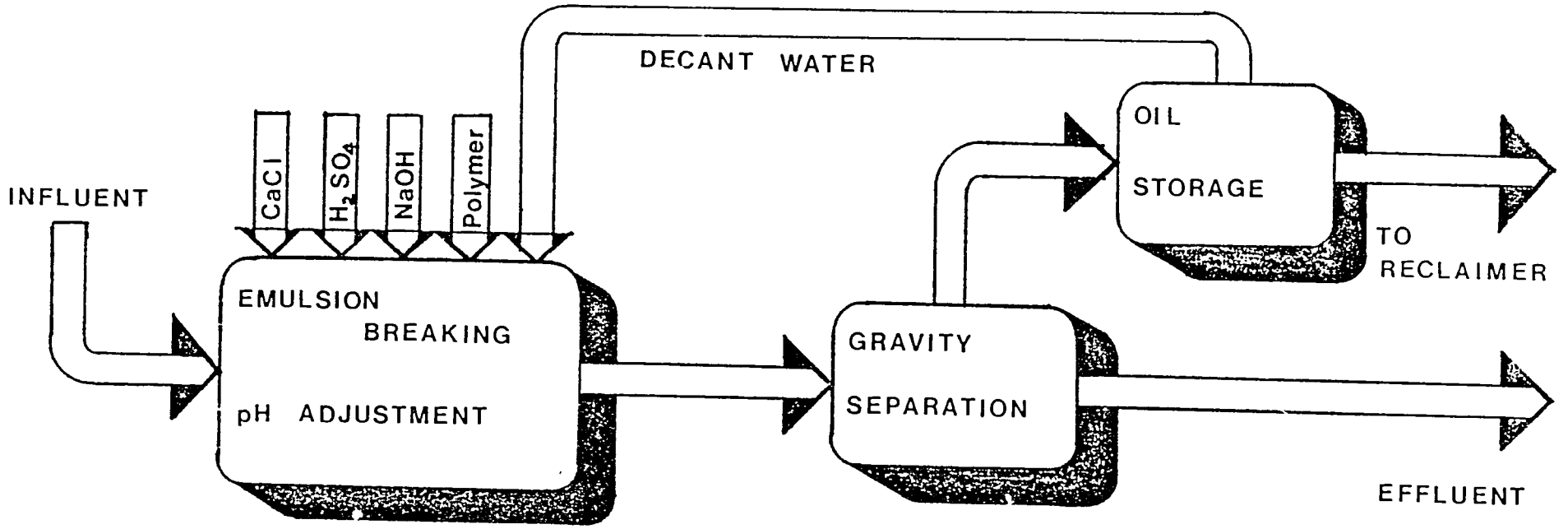
RATIONALE FOR BATCH TREATMENT

- Provides a uniform wastewater to be treated
- Provides flow averaging to reduce peaks
- Provides a more representative sample for chemical additions
- Provides a control for dumps or spills to process sewer
- Provides storage capability during nonproduction hours to reduce staffing levels
- Provides capacity for future expansion

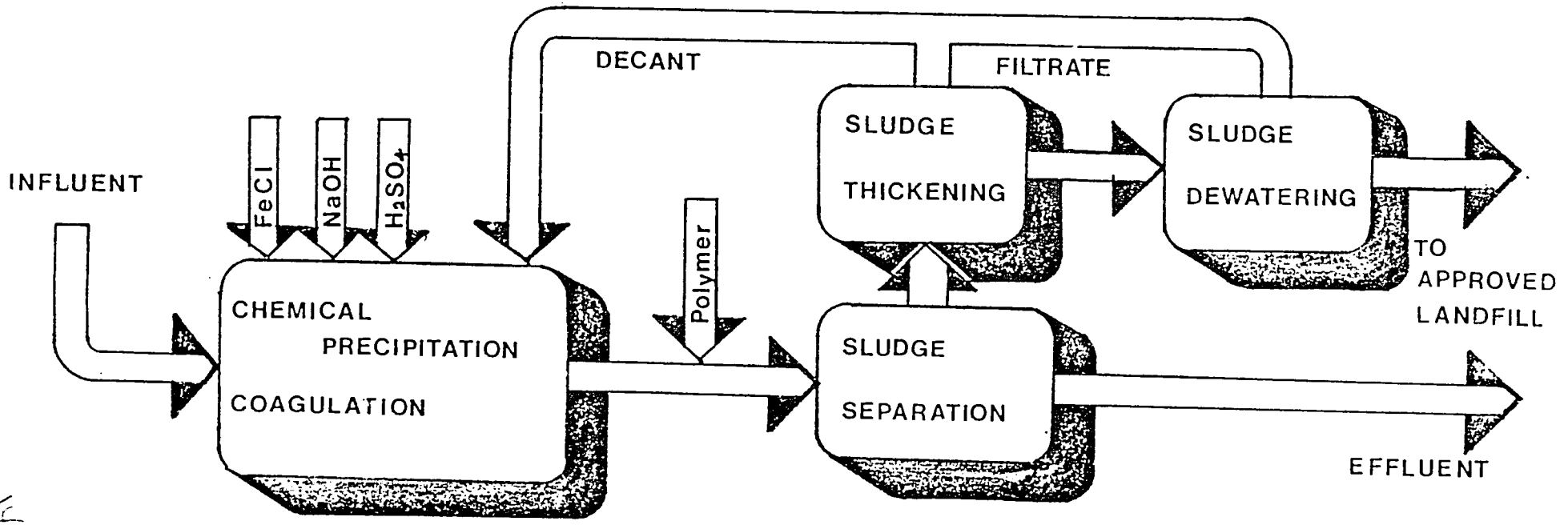
In the early 1970's concern increased over the disposal of oil-laden sludges from conventional ferric chloride oily waste treatment facilities. Extensive jar testing at the newly completed (May 1970) Windsor, Ontario Engine Plant, indicated that, by changing the treatment process, the formation of oil-laden hydroxide the sludges could be virtually eliminated. The process which became known as the "Windsor Process" utilized sulfuric acid for low acid digestion of the emulsifiers, calcium chloride and caustic for emulsion breaking and pH adjustment. Minor amounts of suspended solids were dissolved and flocculated as low volume, floating precipitates which were skimmed from the surface of the batch tank with the tramp oil to a skim oil storage tank. The waste oil was then shipped to a reclaimer for further processing thereby eliminating the cost of equipment to process the sludge and the costs of trucking the sludges to a land fill.

Weather-Related Problems

Wastewater pretreatment facilities of the earlier vintage were persistently plagued by weather-related problems. Although electric heat tracing and insulation were provided on exterior piping, freezing would occur when the heat tracing circuitry failed. Caustic chemical lines were particularly vulnerable due to the high freeze point of the 50% caustic solution utilized. Exposure to the elements of valves, pumps and other equipment, especially during cold weather, made observation, operation and maintenance of the treatment facilities more difficult.



OILY WASTEWATER PRETREATMENT



HEAVY METALS/PAINT WASTEWATER PRETREATMENT

- Process Equipment Experiences Affecting Design

Lagoons - To accomplish the sedimentation/separation phase of the heavy metal/paint pretreatment process, the earlier treatment facilities included two batch tanks followed by two settling lagoons. These systems were comparatively inexpensive to construct and maintain, but were an operating nightmare when it came time for lagoon cleaning. In addition, if the lagoons were not cleaned on schedule and/or adverse weather conditions existed, treatment efficiency was reduced due to the carryover of settled material. Lagoons also consumed large land areas on existing plant sites.

Second generation treatment facilities attempted to resolve these problems by incorporating clarifiers in lieu of settling lagoons as separation devices. This resolved the cleaning and, to a limited extent, the land problem.

While lagoons and clarifiers remain in service at some of the older facilities, the rising sludge disposal and maintenance costs, increased regulatory requirements and concern over groundwater contamination dictated that other means of sludge settling and separation and dewatering be considered in new facilities.

Oil Skimming - Early oily waste treatment plants were inefficient in skimming oil from the batch treatment tanks. This resulted in free oil often being lost with the wastewater as it was discharged from the treated batch tanks. The batch tanks were provided with fixed peripheral weirs, which required extra time to adjust water surface level. Often wind conditions prevented effective oil skimming.

Chemical Feed - Chemical systems for the measurement and feeding of the required chemicals into the batch treatment tanks has been an area of change. Initial pump systems were plagued both with difficulties in controlling chemical dosage and with very high maintenance. Eductor systems were installed with generally the same results. In addition, often eductors required large volumes of water to transport the chemicals which in some cases displaced needed treatment capacity in the batch tanks. While new generation corrosion resistent metering pumps became available maintenance of control systems for the feeding of the chemicals remained difficult. In view of rising treatment costs, a system was required which would closely control the quantities of chemicals being fed and while reducing maintenance costs.

Instrumentation and Automation - The utilization of instrumentation and automation has also had varied success. Generally, the problem has not been one of application but one of maintenance. Typically, industrial waste treatment facilities are under the umbrella of general maintenance from the manufacturing plant and, the skills necessary for maintenance of these systems often was difficult to obtain. The alternate, contracting the necessary maintenance to an outside supplier, was found to be too costly. Consequently, manual operation capabilities, were provided as backup to the automated systems were used, while the automated systems often remained out of service and unmaintained. This then led to the question: Why provide systems in future facilities that plant people are unable to operate and maintain.

Staffing

Historically, staffing of wastewater treatment facilities has been based on seniority and, in some cases, powerhouse operators would rotate shift time at the wastewater treatment facility. Experience has shown that a full time qualified staff is necessary in order to operate the treatment process and to deal with unusual circumstances which may arise.

As indicated, the maintenance of wastewater treatment facilities generally has been included under the overall manufacturing plant maintenance budgets, which normally assign first priority to production-related activities. The automated systems tended to create a feeling that the operators were not in control of the system and this, along with the lack of understanding of the treatment facilities, resulted in serious problems when automated systems malfunctioned and maintenance was not readily available.

Summary

In reviewing past operating maintenance and staffing practices, our present attitude is to require one or more full time operators to fulfill treatment duties and perform routine minor maintenance. Design and selection of equipment is keyed toward simplicity and durability and to avoid unnecessary automation and instrumentation.

RECENT TRENDS AND CHANGES

Prior to Amendment of the Federal Water Pollution Control Act in 1972, discharges to public waters were much less regulated. Ordinances covering discharges to municipal sewerage systems were often vague or were not strictly enforced. Now, much more stringent effluent limits exist due to the establishment of the NPDES permit program for discharges to streams and the promulgation of EPA categorical pretreatment guidelines for industrial discharges to publicly-owned treatment works.

Planning for design and construction of pretreatment facilities to meet EPA guideline limitations has, at best, been difficult during recent years. This has been primarily due to the proposed limits and the compliance dates being revised from of administrative and court related actions. The piece meal promulgation of standards for the various industrial categories has made overall planning for pollution compliance programs uncertain, particularly at integrated manufacturing plants, which have processes that will be subject to several sets of future EPA guidelines.

Furthermore, the Resource Conservation and Recovery Act (RCRA) regulations have mandated new concepts and procedures for handling sludges and other wastes and for protecting groundwaters. The impact is far reaching; affecting both design and operating costs.

Besides regulatory and economic factors due to the depressed automotive economy, changes in manufacturing processes, materials and practices also reflect on treatment facilities design. Recent trends toward the use of synthetic organic fluids instead of the oil for hydraulic fluids and cutting oils is an example of new materials requiring a re-evaluation of the impact on present treatment processes. Therefore, in tailoring a wastewater treatment facility to respond to these ever changing trends, it is imperative that the design consider the "worst case" situations.

NEW DESIGN DEVELOPMENTS

These past experiences have been translated them into "Design Objectives" (Table III). This has led to the implementation of several key design concepts developed with Samborn, Steketee, Otis & Evans into third generation treatment facilities.

TABLE II

DESIGN OBJECTIVES

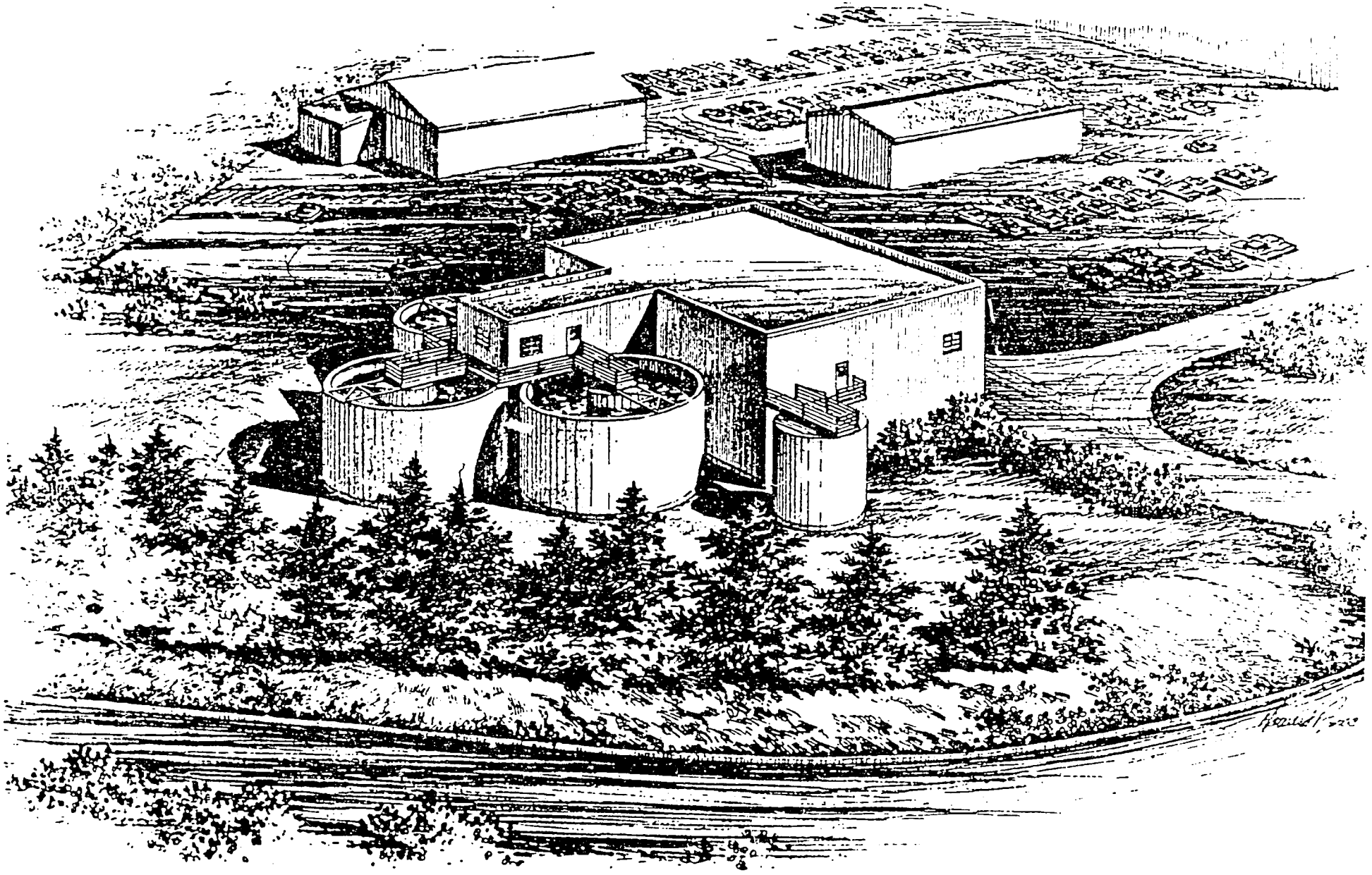
- Resolve weather-related problems
- Reduce maintenance costs
- Reduce operating cost and improve treatment efficiency
- Minimize capital expenditures while maintaining treatment efficiency
- Meet federal, state and local regulations
- Provide a facility which has total operator involvement and responsibility in the treatment process
- Improve the working environment of the treatment facility
- Respond to changing manufacturing processes

Building Configuration

The single item which responds to meeting the design objectives is a complete redesign of the waste treatment building configuration. Batch tank sizes have been chosen which nominally provide capacity for six batches a day under maximum operating conditions. The tanks are arranged in a totally enclosed triangular configuration with portions of the tank's walls becoming interior building walls (Figure 2). This enables all influent, effluent and chemical piping to be manifolded with all valves located for easy access for operation and maintenance. Motorizing remote valves, often required in the past, are no longer required. The operators only need to proceed to the temperature controlled area between the tanks to manually perform all valve operations. Frozen lines and valves during subzero weather are now totally eliminated and along with the need for costly automation.

By placing the batch tanks in the triangular configuration, another operating problem was resolved with oily waste treatment facilities. By providing an all weather penthouse enclosure above the tanks, the operator can easily view all tanks and perform the troublesome oil skimming operation during any weather condition. In conjunction with the penthouse, a low pressure air bubbler system, controlled in the penthouse, was installed in the center of each oily waste batch tank. By regulating the air, the operator can create a concentric wave pattern moving from the center of the tank to the oil skimming weir, thereby driving the oil over the weir.

With the development of the "Windsor Process," complete skimming of the oil from the surface of a treated batch is detrimental to the treatment process, as the oil, in fact, acts as a catalyst in the treatment process and effectively reduces the amount of chemicals required for treatment. With this de-emphasis on thorough skimming, controls are required to insure that oil cannot be accidently discharged from the facility. Incorporated on the discharge line from the batch tanks is a turbitity meter which automatically closes the effluent value of the tank being drained when oil is present.



Wastewater Pretreatment Facility

EDISON ASSEMBLY PLANT FIG. 2

The new building configuration also incorporates the interior storage of chemicals in order to avoid the chronic freezing of the chemical systems. The relocation of the storage tanks to the building interior has also enabled a re-evaluation of the chemical feed system which will be discussed later.

The standardization of the building layout and design featuring minimum areas, minimum exterior visible tankage, and clean architectural features, has enabled the facilities to be located in sensitive areas where exposure to the general public may be encountered.

The basic concept of compactness (Figures 3 and 4), but not overcrowding, is characterized in the building design. In order to minimize operator time in performing treatment operations, the design was continually checked by reviewing and understanding each step of the treatment process and locating equipment, valves, pushbutton stations, etc. accordingly.

Chemical Feed Systems

As previously noted, chemical feed systems had been plagued by both inaccuracies in chemical dosage and high maintenance. To reduce these problems, a day tank system for chemical feeding was incorporated into design. Again, the triangular tank configuration and the convenience of locating a common penthouse over the three tanks, which could house the day tanks, made the design feasible. The accuracy of day tanks to control chemical dosage has been clearly superior.

To reduce the maintenance problems, an air transfer system has been incorporated into the chemical feed design. A simple system has been developed, which incorporates small transfer tanks, which receive chemicals from the interior bulk storage tanks by gravity. When the transfer tanks are filled, the appropriate inlet, outlet and vent valves are opened/closed as required and the tanks individually pressurized to force the chemicals to the appropriate day tanks located in the penthouse. The transfer and day tanks are totally enclosed behind transparent safety curtains and the air solenoid valves for transfer tank pressurization are activated from the day tank area so the operator can observe that the transfer takes place.

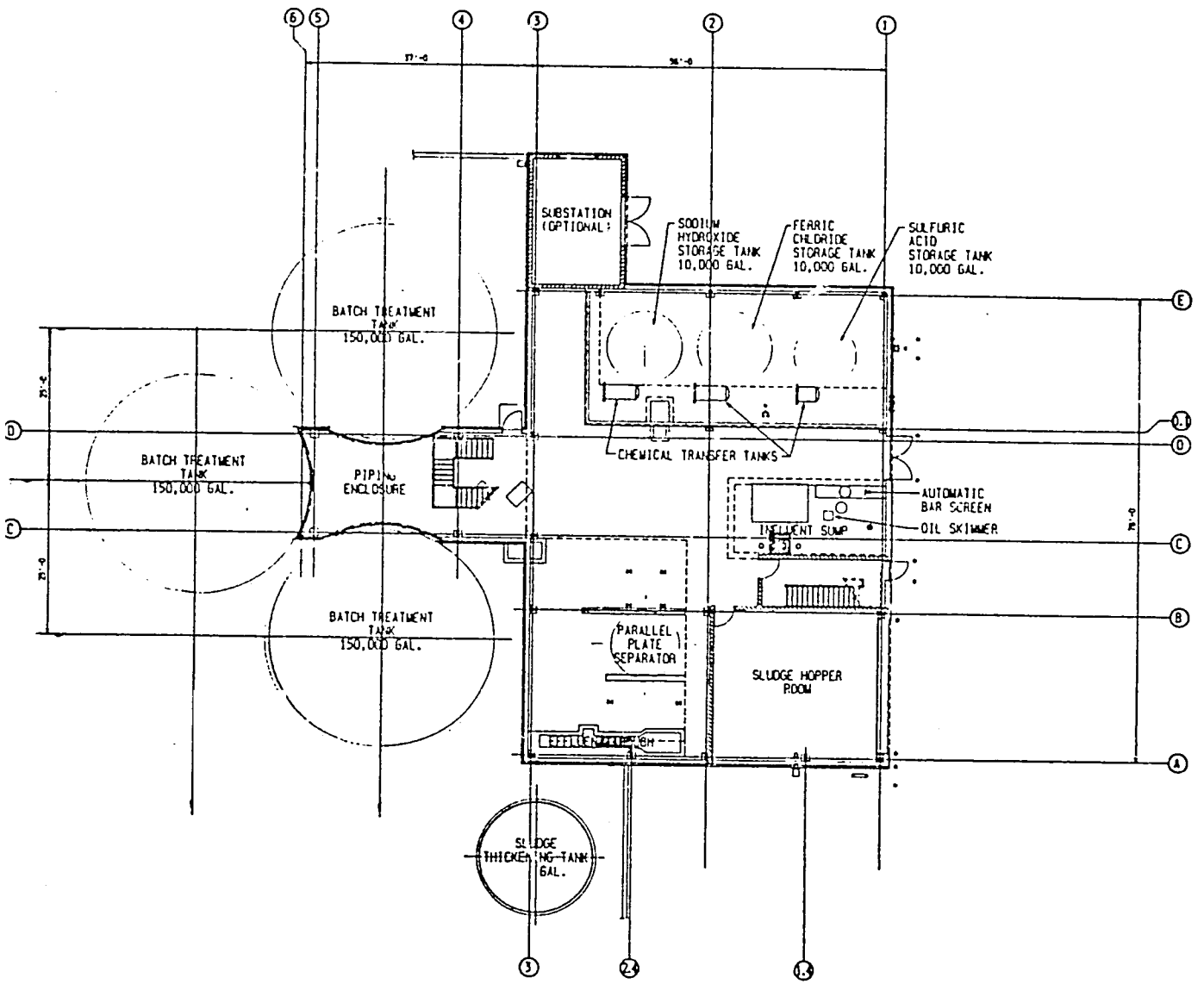
Instrumentation and Automation

With new building designs and equipment layouts improving the operational capability of the facility, the need for costly instrumentation and automation is minimized. The "hands-on" operating approach was adopted. The centralized control panel has been reduced from treatment control system to a monitoring system with local control of equipment provided. The operators now become totally involved with each step of treatment process and, therefore, have a more thorough understanding of the process and equipment. Also the operators are aware of the plants capabililties and can readily identify with the system.

Ford's experience of the simplified, nonautomated treatment facilities, coupled with efficient building and equipment layouts, has reduced facility and maintenance costs while increasing participation and responsibility of the operators.

Solids Separation and Dewatering

Parallel Plate Separators - In early 1973, a new concept in solids separation, was launched at the Green Island Radiator Plant. Two inclined parallel plate gravity separators, manufactured by the Parkson Corporation, were installed. The rationale for

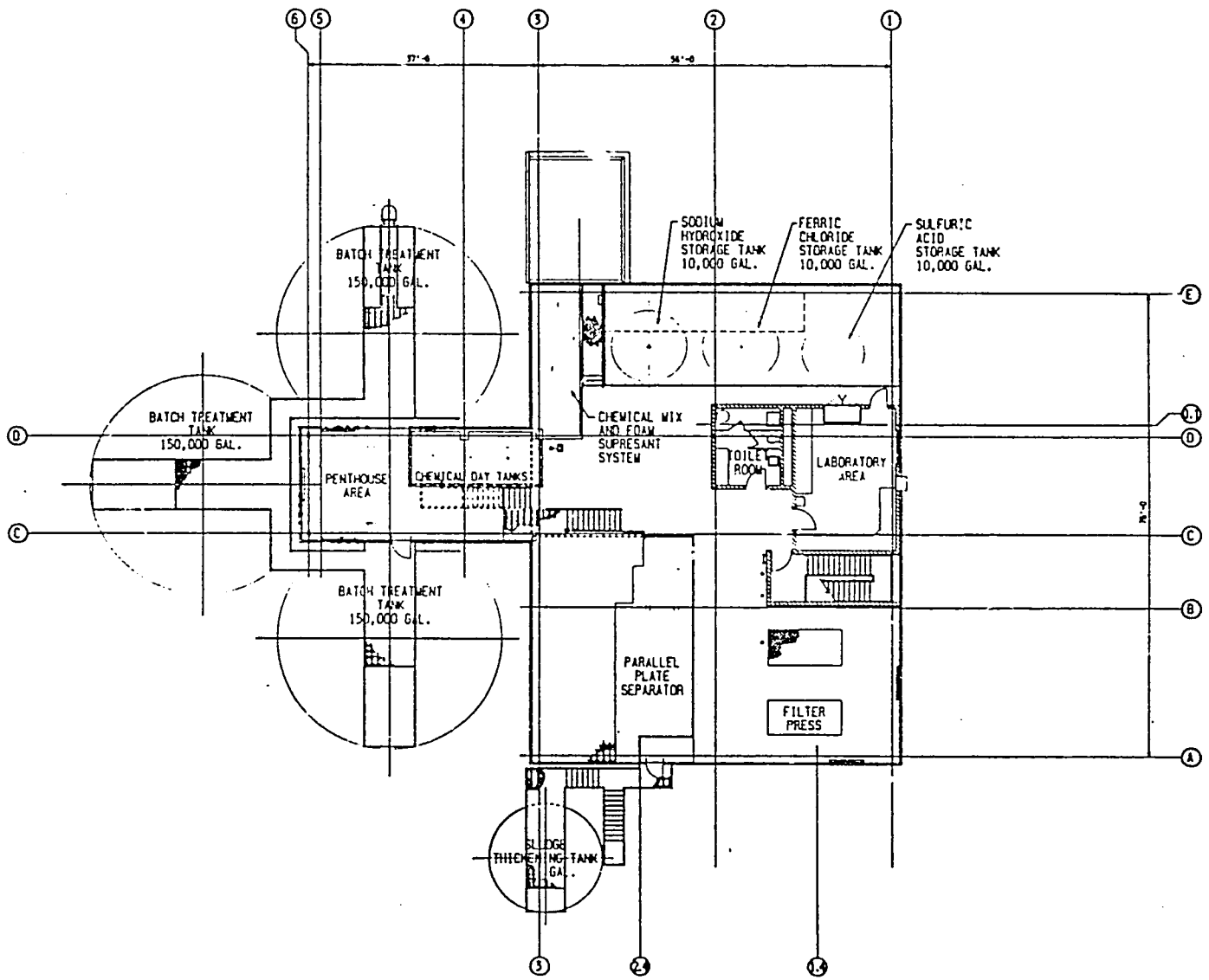


FIRST FLOOR PLAN
APPROX. SQUARE FEET: 5620

FIGURE 3

TYPICAL
TREATMENT PLANT LAYOUT

DESIGN CAPACITY
900,000 G.P.D.



SECOND FLOOR PLAN
APPROX. SQUARE FEET: 5490

FIGURE "4"

BANBURY, STEINTEE, OTIS & EVANS, INC.

TYPICAL
TREATMENT PLANT LAYOUT

DESIGN CAPACITY
900,000 G.P.D.

the selection of this equipment over conventional clarifiers was fourfold: 1) reduced capital costs, 2) reduced space requirements, 3) lower maintenance costs, and 4) advertised improved solids removal efficiency.

Based on the very successful operation of these units, seven additional systems are now operational with ten more installations to be installed by mid-1984.

The parallel plate gravity separator is the heart of Ford's heavy metals/paint wastewater treatment process (see Figure 5 for basic flow diagram). Because of this and the fact that the units are relatively small in size, they are being installed within the treatment building where they can be continually observed by the operating personnel. Such observations are essential because adjustments, such as reducing flow, adjusting polymer feed and sludge withdrawal rates may be required during any given treatment cycle.

The installation of parallel plate gravity separators has proven to be an extremely cost-effective means of providing a high quality of water. The effluent from a well designed and operated separators should not exceed 10-20 mg/l hydroxide type suspended solids.

The principle of parallel plate gravity separator is quite simple. The most significant feature in gravity settling is available surface area. To increase the settling area per unit volume, a series of parallel plates are installed in a settling device. Then by inclinding the plates, the effective area now becomes the horizontally projected area from each plate and as a result, increased settling area is now available for each square foot of surface area. In addition, by inclining the plates, a means of removing the settled sludge has been provided. (Figure 6)

Following chemical treatment of the wastewater in batch tanks, the waste is pumped to the flash or rapid mix tank where a polymer is usually injected reform the floc and act as a settling aid. From the flash mix tank, the flow enters the slow speed mix tank where a paddle wheel gently mixes the wastes forming a dense suspended material. The wastewater then enters the separator feed box flowing into the plate area from the sides and upward exiting at the top through a series of submerged distribution orifices into the discharge flume. From the discharge flume, the clarified water flows into the overflow box and out to the sewer.

As the flow proceeds upward between the plates, the dense suspended material that was formed in the slow speed mix tank begins to settle to the lower plate surfaces a distance of 2". The accumulated sludge, then slides down the plates to a thickening tank below the plate area. The sludge is continuously removed from the separator thickening tank to be inventoried in a larger thickening tank prior to dewatering.

<u>Sludge Dewatering Filter Presses</u> - As with the parallel plate separator, sludge dewatering filter presses were first installed at Ford's Green Island Plant. Filter presses were chosen over other sludge dewatering systems because of their simplicity and successfully operation in Ford facilities in Europe.

The installations have been 100 psi pressure systems yielding a cake of between 30%-40% solids. Typical feed concentrations of 1%-2% from the sludge thickening tank to the filter press are normal.

Various filter press feed systems have been tried with the hydraulic ram type pumps providing superior consistency of operation. The filter presses are typically installed on the second floor of the treatment building with a sludge container room located immediately below. Precoat systems have not been found too necessary even though many manufacturer's recommend their installation.

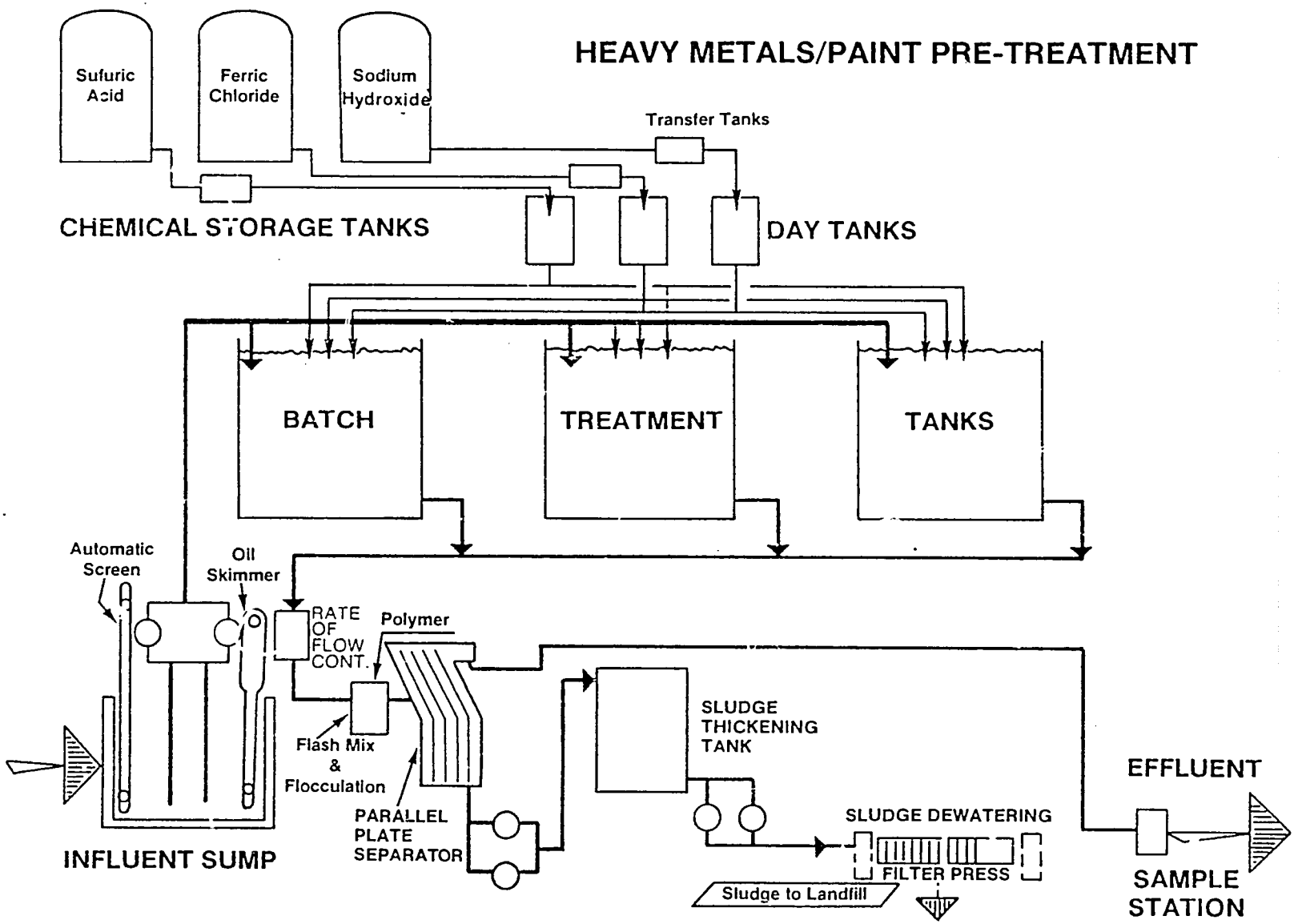
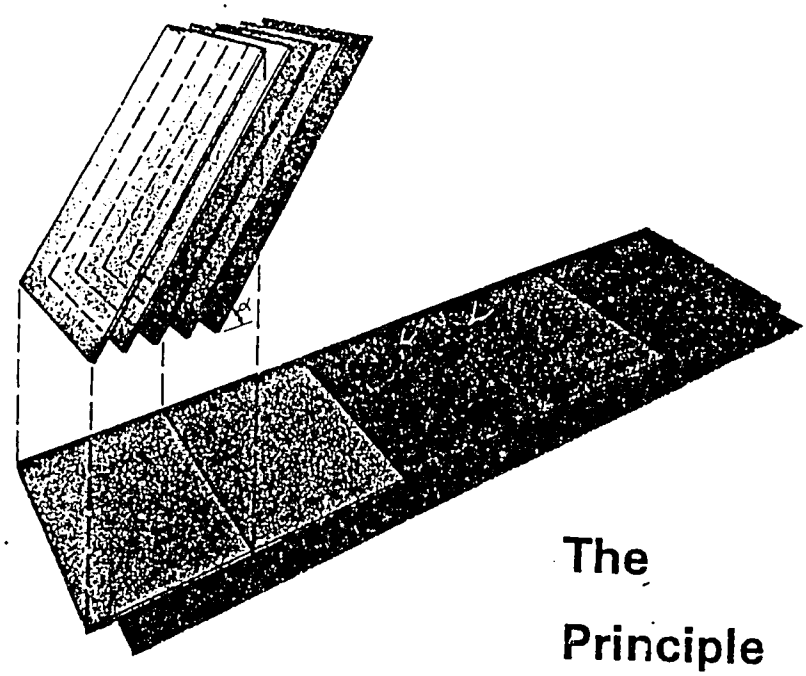
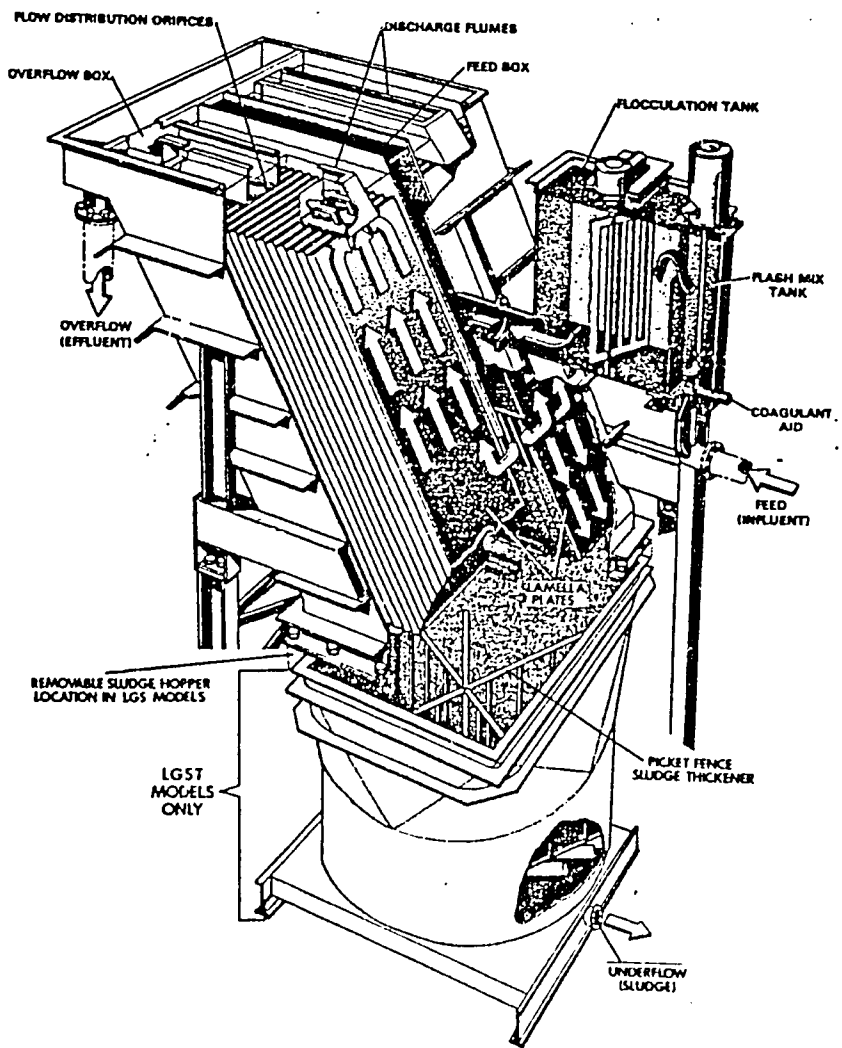

HEAVY METALS/PAINT PRE-TREATMENT
Sufuric Acid
Ferric Chloride
Sodium Hydroxide
Transfer Tanks
CHEMICAL STORAGE TANKS
DAY TANKS
BATCH
TREATMENT
TANKS
Automatic Screen
Oil Skimmer
RATE OF FLOW CONT.
Polymer
Flash Mix & Flocculation
PARALLEL PLATE SEPARATOR
SLUDGE THICKENING TANK
SLUDGE DEWATERING
FILTER PRESS
Sludge to Landfill
EFFLUENT
SAMPLE STATION
INFLUENT SUMP

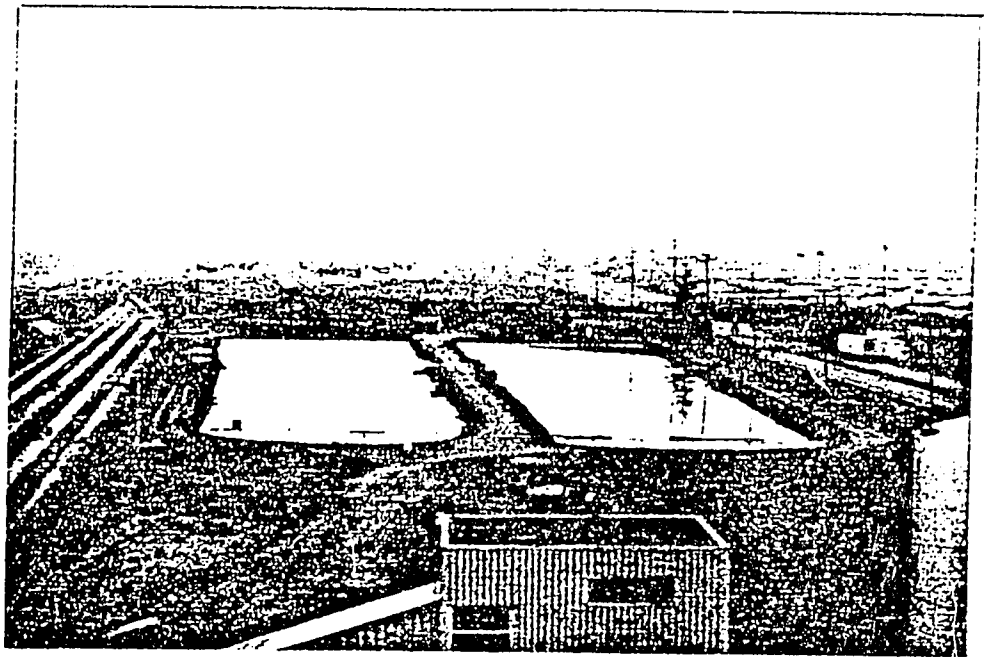
FIG. 5



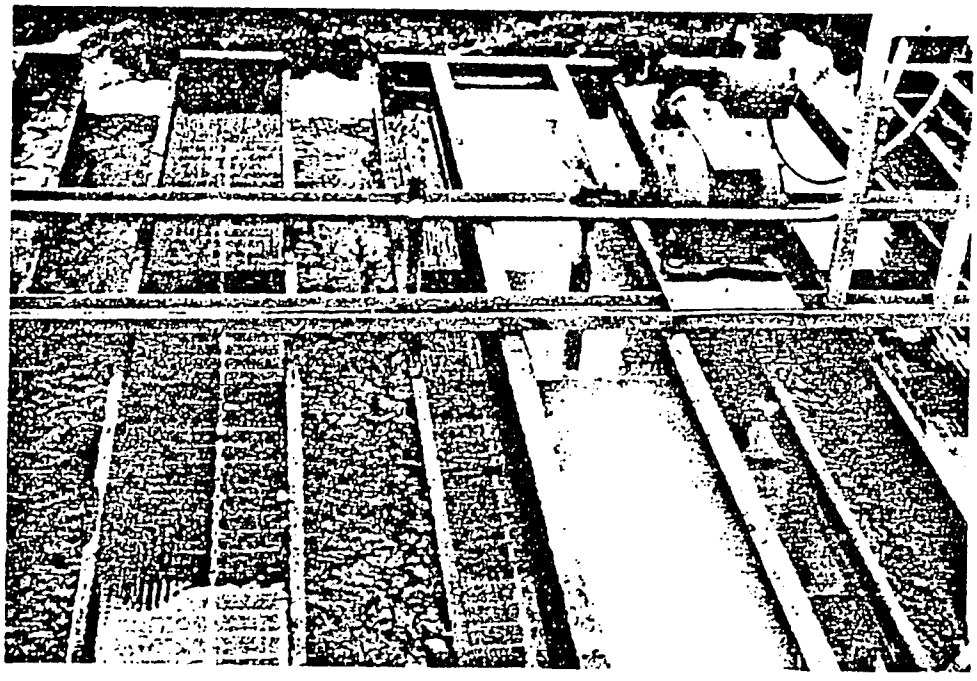
The Principle



LGST PACKAGE UNIT



SLUDGE SETTLING LAGOONS REQUIRE EXCESSIVE LAND, POSE RCRA PROBLEMS AND ARE COSTLY TO OPERATE



PARALLEL PLATE SEPARATOR SEPARATES THE SLUDGES WITHIN THE WASTE TREATMENT BUILDING

Clearly, the most cost-effective systems have been the parallel plate separators and filter presses. The simplicity, coupled with cost savings realized in sludge handling and disposal, have made these systems a unique development in the treating of industrial wastewater.

Summary

The batch treatment process has enabled the wastewater treatment operations to cope with change by providing a means of holding difficult to treat batches. For example, with the increased use of synthetic and semisynthetic fluids, oily wastes became almost impossible to treat. By utilizing the batch treatment process, it enabled Corporate Environmental Engineers to conduct extensive tests on individual batches to determine that the "Windsor Process" supplemented with both anionic and cationic polymers could treat the wastes without extensive facility modifications.

The new design industrial wastewater treatment facilities have emphasized simplicity, compactness, operator involvement, and improved efficiency along with reducing operating and maintenance costs. Basically through an evaluation of past experiences the objectives for the new facilities have been achieved.

FUTURE MANUFACTURING TRENDS

Manufacturing requirements and costs and environmental considerations are combining to change the character of wastewater which must be treated. Water soluble organic materials are being substituted for emulsified oils and traditional paint solvents to improve quality and reduce costs, and in the case of solvents, to comply with air emission requirements. Unless these materials are contained at the process or subjected to biological pretreatment, the wastewater will significantly increase in BOD/COD.

As water and sewer costs rise, and environmental discharge limits become more stringent, it will become more cost effective for industry to design processes that either utilize less water or allow various modes of recycling. The net result will often be lower volume, higher strength raw waste loadings to Company and municipal wastewater treatment facilities.

Finally, wherever practical, industry will substitute materials which have reduced toxicitity to heavy metals and chlorinated solvents. These substitute materials may require revisions to treatment facilities to insure economical efficient treatment.

Presented At:
38th Annual Purdue
Industrial Waste Conference
May 10, 1983

APPENDIX G - NON CHROMATE PACIFICATION CHEMICAL

APPENDIX 6.

PARCOLENE 80

AN ENVIRONMENTALLY SOUND POST-TREATMENT

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MADISON HEIGHTS, MICHIGAN

Since the initial commercial introduction of phosphate conversion coating processes to improve the durability of painted metal articles, there has been a continuous flow of significant improvement to the overall process. The details of these processes, as well as its history, can be obtained from one of several very good references (1-4). Recently, one significant improvement has been the development of a non-heavy metal (non-chromium) containing post-treatment (5) which has equivalent performance to a chromium containing post-treatment chemical. This post-treatment is based on a new organic modified polyhydroxystyrene polymer. The technology was introduced commercially in 1982. Since that time, it has received widespread success as a replacement for chromium-based post-treatments. In fact, currently there are over 200 applications of this technology in the United States. Experience gained at these numerous locations has been very important in developing application and operational data to obtain maximum performance from this reactive post-treatment.

INDUSTRIAL USAGE

This chromium-free post-treatment is currently being used with iron and zinc phosphates. Its use with iron phosphates includes both iron phosphates produced in cleaner coater process and high quality multi-stage processes. It is being applied by spray or immersion application methods on steel aluminum, and galvanized steel substrates. This post-treatment is used with a wide variety of paints including high solids, powder paints, and cathodic electrodeposited paints. It has shown equivalent performance to chromium post-treatments with all paints systems except for anodic electropaints, which requires a modification to the basic post-treatment to have equivalent performance to chromium post-treatments.

PERFORMANCE

Tables 1 through 4 display the performance of this chromium-free post-treatment compared to chromium based post-treatments. These tables clearly demonstrate the equivalent performance. To obtain optimum performance from this technology, it must be applied using certain operational parameters. Important factors are temperature, pH, concentration, and after-rinsing with water.

TEMPERATURE

This organic post-treatment requires an application temperature of at least 100°F to completely react with phosphate conversion coatings. If the application temperature is below this temperature, the resulting performance of painted surfaces is usually less than that observed with chromium post-treatment. While this technology can be operated at temperatures above 130°F, at these higher temperatures polymerization can occur causing difficulties in the operation. Therefore, an operating temperature range of 100-120°F is recommended.

Years of experience have shown that the heating surfaces used to elevate the temperature of the organic post-treatment will become scaled. The formation of this scale can simply be looked at as polymerization due to the contact with the high temperature heating surface. This scale formation can be minimized by keeping temperature of the heating surface as low as possible to maintain the operating temperature or maintain a high degree of solution agitation near the heating surface. The optimum method of heating has been determined to be an external plate and frame heat exchanger which is heated with hot water and has a solution flow velocity of at least three feet per second.

AND CONCENTRATION

ing the laboratory development and subsequent l testing several years ago, it was determined that pH and concentration of the operating solution of the organic post-treatment must be properly controlled to achieve maximum performance. The recommended ranges for pH and concentration are:

pH Range — 5.5-6.5
Concentration — 7.5-9.1 pounds per 100 gallons

If the pH is allowed to drift slightly lower than the recommended range, usually only a minimal fall off in performance is observed. If the pH is allowed to move above 6.5 and approach a pH in excess of 7.0, then the solubility of the organic post-treatment decreases and performance will be poor. Therefore, in cases where make-up water has a pH close to or above 7.0, it is recommended that the make-up bath be adjusted to a pH of approximately 5.5, with the recommended acidic adjustment chemical, to avoid any "kick-out" on make-up.

AFTER-RINSING

Experience has also revealed that to obtain maximum consistent quality, it is recommended that the post-tment be rinsed with deionized water to remove excess unreacted post-treatment. This will assure d quality of the painted surface. In certain situations, local make-up or tap water can be substituted for deionized water. This can only be determined by prior analysis of the tap water. With electropainting operations deionized water is strongly recommended.

One characteristic of the current organic post-treatment is that it will react with the resins which are used in deionizing columns. In fact it reacts to such an extent that it cannot be removed by "simple" or even "complex" regeneration techniques. Therefore, it is strongly recommended that this commercially available state-of-the-art non-chromium post-treatment not be used in closed loop deionizing operations.

OPERATIONAL COSTS

When this non-chromium post-treatment has been introduced in a commercial operation, there has been a noted cost reduction in the total operation cost of the plant. Due to the wide variation in plant design and operation, the potential cost savings attributed to the non-chromium post-treatment varies considerably. It has been observed that the cost of the equipment to remove chromium from an effluent has ranged from approximately $50,000 to $500,000 or more depending upon effluent volumes and local regulations. This equipment cost can be reduced or totally eliminated by use of the organic post-treatment. Additionally, it has been observed that the total cost to operate the disposal equipment can range from $3.00 to $60.00 per pound of dissolved total chromium present in the waste effluent. Also the cost of disposal of the sludge from the equipment can cost from $75.00 and $500.00 per drum.

Using a representative plant which has a 2,000 gallon tank that is dumped once a week and has an overflow in the rinse after a chromium post-treatment of three gallons per minute, it is estimated that the operational cost can be reduced by $5,000 to $70,000 dollars annually, with $20,000 to $30,000 being typical values when a non-chromium post-treatment is used.

CURRENT WORK

Laboratory developmental activity in the area of organic post-treatment has continued for the last several years during the commercialization of the current technology. In the future, a new post-treatment technology will be field tested which may eliminate several of the operational "annoyances" of the current technology.

SUMMARY

Clearly, it has been demonstrated that an environmentally acceptable alternative to chromium containing post-treatments is now available. This organic reactive post-treatment should be considered state-of-the-art. Presently, it is used with a wide variety of substrates, phosphates, and paints while demonstrating its equivalent performance to chromium-based post-treatments. As effluent regulations become more restrictive and the cost to meet these regulations increases dramatically, the use of an organic post-treatment should be considered as a cost-effective alternative with no decrease in the overall quality of the painted articles produced.