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TRIP REPORTS

HAZARDOUS WASTE MINIMIZATION AND CONTROL AT ARMY DEPOTS

Prepared by

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Process Development Branch
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HAZARDOUS WASTE MINIMIZATION AND CONTROL AT ARMY DEPOTS

SUMMARY AND CONCLUSIONS

USATHAMA and PEI personnel participated in meetings and facility tours at eight Army depots between April 5 and July 19, 1989. The purpose of these visits was to acquire comparable information on waste minimization at the depots. Information was collected both on tasks to be conducted in the near future under the current Task Order and potential research projects that USATHAMA may select for long-term effort. Projects that could be funded under PEI's current scope of work include those related to VOC emissions, abrasive blasting (including plastic media blasting), chemical paint strippers, degreasing, electroplating and generation of metals-contaminated sludges.

Craig MacPhee and Paul Lurk represented USATHAMA on the Army depot visits. PEI personnel present at various depots were Fred Hall, Bob Hoye, Jeff Davis, Dick Gerstle, and Bob Ressl.

Currently, depots are experiencing a wide range of problems with increasing environmental awareness and regulations. A list of hazardous waste generation rates are given in Table 1. All depots have given some consideration to hazardous waste minimization as a potential solution to these problems, but are constrained by budget and lack of sufficient technical personnel. At all depots, we encountered enthusiasm and willingness to cooperate and assist with USATHAMA's HAZMIN program. A brief list summarizing pertinent information for each depot is provided in Table 2.

The trip reports for the depot visits list 69 potential waste minimization projects, which range widely in technical effort and budget required. From these potential projects, PEI selected a shorter list of 24 projects based on the current scope of work, interest of depot personnel, the applicability of the projects at other depots, and the potential for waste or VOC reduction. These projects are listed in Table 3. Many of the projects are related, and information from one study could be transferred to the depot of interest in another related study. From these projects, USATHAMA and PEI have selected three tentative projects that will be implemented and one alternative project that may be implemented during the remainder of Task Order No. 0004. These projects are listed below:

- Conduct tests of paint application systems.
- Extend lives of process baths (e.g., NaOH) at Letterkenny.
- Implement chromium recovery units for rinse water at Corpus Christi.
- An alternative project is to evaluate the use of zirconia alumina as a blast media at Tobyhanna.

These projects are described in more detail in the conclusions section of this memo.

Subtask 1: VOC Emissions

Most depots are undertaking some form of action where required by state or federal regulations. These regulations are highly dependent on the state in which the depot is located. The four depots in California and Pennsylvania (Sharpe, Sacramento, Tobyhanna, and Letterkenny) are coming under the most regulatory pressure to reduce VOC emissions because these are nonattainment areas. Some depots, such as Anniston, have high limits set on VOC's, and Corpus Christi is exempt from VOC regulations because it processes aircraft. Most depot personnel expressed the belief that control technology is too expensive and may not be practicable because the sources of VOC's are spread throughout the depot. Most depot's are therefore focusing on reducing VOC emissions by switching to low-VOC paints and improving transfer efficiencies when applying paint.

Potential projects for this subtask include investigating the reduction of VOC emissions from paint operations by changing paint VOC content or method of application. A data base could be developed of low-VOC paints and vendors with efficient paint application systems. This information would allow depot personnel to compare available techniques for reducing VOC emissions. Demonstration tests could be conducted with one or more of these paint application systems to determine transfer efficiencies.

Subtask 2: Reduction in Waste Generation from Paint Removal and Degreasing Operations

As shown in Table 1, paint stripping and degreasing operations at depots generate large amounts of waste. These operations are also sources of VOC emissions.

The choice of a paint stripping method varies among depots, and depends on the parts processed. For example, heavily corroded parts at Sharpe are not amenable to plastic media blasting, whereas plastic media booths have been installed to process aluminum electronics shelters at Sacramento and aluminum helicopter frames at Corpus Christi. Sacramento is encountering contractor troubles in bringing its booth on line, and Corpus Christi is searching for the specific type of media appropriate for use on aircraft. Of those depots without PMB capabilities, Tooele expressed an interest in purchasing a blast facility, and would be interested in developing the information required to justify implementation of PMB. Assistance could be provided to either of these three depots.

A variety of abrasive blast media is used, including walnut shells, steel shot, aluminum oxide, peridot, glass beads, and plastic. A few depots still use some sand as a blasting media, but it is being phased out as a result of health concerns. A data base containing information on the advantages and disadvantages of these media (as well as chemical stripping) would be a useful tool to depot personnel.

Most depots have switched from phenol-based paint strippers to methylene chloride-based strippers. Alkaline strippers are also frequently used. Corpus Christi uses some ortho-dichlorobenzene. Sacramento and Red River are conducting studies on nonhazardous alternate chemical strippers. Some depots expressed an interest in minimizing chemical cleaning waste by extending the lives of stripping agents by filtration or other means. A filter press could also be used to minimize the sludge resulting from these operations; the liquid phase would require further treatment.

Most depots change process tanks as required, after the tank has stopped working or when laboratory tests indicate decreased chemical activity. Anniston, however, changes its process every six months without testing the solutions; changing this procedure may result in significant waste reduction.

Most depots use 1,1,1-trichloroethane as a solvent in vapor degreasers. Anniston still uses trichloroethylene. Several depots have experimented with recycling 1,1,1-trichloroethane, but have been plagued with a variety of problems, including acidification of the product and equipment failure. Potential projects include troubleshooting existing systems or purchasing a new system at interested depots such as Letterkenny and Red River.

DESCOM had indicated interest in evaluating the use of a product called Rust Eliminator to replace phosphoric acid baths for removing rust, and we acquired information on this product at several depots. Personnel at Tobyhanna had evaluated Rust Eliminator and concluded that it was not a promising alternative for phosphoric acid because the solubility of some metals in the product would create a hazardous waste, the product would need a large amount of agitation (during the demonstration, parts were scrubbed by hand), the action of the product on the part was slow, and the cost is approximately six times higher than the phosphoric acid solution. Finally, spent phosphoric acid and sludge from the bottom of the tank is a very small waste stream at Tobyhanna; therefore, even complete elimination of this waste stream would result in only a small reduction in hazardous waste generation.

Tooele performed several tests with Rust Eliminator on a variety of different parts. Personnel concluded that the product performed about as well as phosphoric acid, but that it was much more expensive. The manufacturer sold the material on the basis of its being a nonhazardous waste; however, after use, the product is a hazardous waste because of the solubility of some metals. Tooele also tested the product for long-term rust inhibition, but again the product fared no better than phosphoric acid. Personnel at Tooele ordered only one drum of the product, and have some left over. Reports that Tooele personnel are satisfied with Rust Eliminator and are planning to replace phosphoric acid solutions with this product are erroneous.

Subtask 3: User Interface, Support Studies

For this subtask, information was collected on a variety of areas, including electroplating operations and the generation of metals-contaminated sludges. Electroplating operations do not directly contribute much waste at most depots, since the plating tanks are rarely changed. The largest amount of waste resulting from these operations results from wastewater treatment, which generates sludges laden with heavy metals. Several depots generate large quantities of sludge; some are planning simple methods for waste minimization, including segregation of nonhazardous and hazardous sludges, recharacterization, and the purchase of filter presses that can produce a sludge with less water, and therefore less volume.

The metal concentrations in these sludges are usually low, and therefore metal recovery directly from the sludges may not be cost-effective. Many depot personnel, however, expressed interest in reducing the amount of metals that must be removed from the wastewater. Corpus Christi has been funded for two projects to recover chromium in the plating shop, but personnel do not have time to implement this technology. Letterkenny is interested in recycling chromium rinse water. These efforts are potential projects under the current Task Order.

Tobyhanna's electroplating shop is old and has experienced some problems because they have had to cut back on the amount of wastewater sent to the industrial wastewater treatment plant. In addition, the work load does not always allow personnel to follow the designed operating practices. Personnel expressed interest in investigating methods for plating waste reduction. Some simple housekeeping methods and small operational changes may also be useful in waste reduction. This plating waste includes pretreatment operations such as chemical stripping and degreasing.

Other Areas

Several other areas were identified by depot personnel and PEI for potential waste minimization efforts that are not covered under the scope of Task Order No. 0004. All depots use dry filters on at least some paint booths to trap paint particulates. Some depots dispose of these filters as hazardous waste, while other depots have shown their filters to be nonhazardous. All depots disposing of the filters as hazardous waste should conduct characterization studies.

Paint sludge resulting from water-wash paint booths is a major problem at several depots. A few depots are exploring the use of hydrocyclones combined with detackifying agents to remove sludge from the water and to minimize the volume of the sludge. Anniston has had problems with the cyclones gumming up, while Corpus Christi may have found an effective detackifying agent which they plan to implement to solve this problem. Red River is also interested in the use of detackifying agents. The existing systems could be evaluated and improved and the information transferred to other depots. Anniston personnel were requesting assistance from the manufacturer of the equipment. A demonstration test of hydrocyclones and detackifying agents could also be conducted at one of the depots. Finally, Letterkenny and Corpus Christi expressed interest in reducing paint sludge volume by filter presses or other means.

Several depots expressed interest in fluidized bed parts cleaning, which will be tested at Red River under Task Order No. 0005. Anniston and Letterkenny are planning to purchase systems, and Tooele is also interested. Corpus Christi has requested an aluminum ion vapor deposition system, which has not been funded. A demonstration test will be conducted at Anniston under Task Order No. 0006.

Conclusions

Following discussions between USATHAMA and PEI, three waste minimization projects plus an alternative were chosen for implementation at Army depots. The criteria used for selecting these projects were interest of depot personnel, applicability of the projects at a number of depots, potential for hazardous waste or VOC reductions, and agreement with the scope of work for the current Tank Order. The following projects were tentatively selected:

- Conduct tests of paint application systems. Several depots expressed interest in increasing the transfer efficiency of paint application, which would reduce both VOC emissions and paint sludge by reducing paint overspray. Tobyhanna has looked at several low-pressure, high-volume spray guns and plans to install one of these systems. This project will evaluate these and other systems for efficient paint application. This data can then be used by Tobyhanna and other depots searching for methods of reducing VOC emissions and paint sludge generation.

- Implement chromium recovery units for rinse water at Corpus Christi. Personnel at Corpus Christi are interested in a unit that can recover chromium from a chromic acid bath or chromium rinse water. By recovering chromium from rinse water, the amount of chromium treated at the wastewater treatment plant is reduced, thereby reducing sludge volume and potentially rendering the sludge nonhazardous. This project will entail evaluating available chromium recovery units for use on rinse waters. The data may be useful to other depots conducting chromium electroplating or applying chromate conversion coatings.

- Extend lives of process baths (e.g., NaOH) at Letterkenny. Letterkenny uses a large amount of alkaline paint-stripping tanks and methylene chloride paint stripping. Personnel are currently collecting information on extending the lives of these strippers by filtration or other means, thereby reducing how often these tanks must be changed. Several other depots also expressed interest in extending the lives of chemical stripping tanks. This project will entail exploring methods of extending the lives of these process baths, thereby reducing hazardous waste generation.

- Evaluate the use of zirconia alumina for use as a blast media at Tobyhanna. Personnel at Tobyhanna are evaluating the use of zirconia alumina as an alternative to aluminum oxide blasting. Zirconia alumina is reported to have a longer life than aluminum oxide, and will thus create less waste. Tobyhanna personnel are currently planning to test zirconia alumina, and this project would assist in evaluating its effectiveness.

TABLE 1. HAZARDOUS WASTE GENERATION RATES FOR ARMY DEPOTS
(Results in 1,000 kg per year)

	ANAD	OCAD	LEAD	RRAD	SAAD	SHAD	TOAD	TEAD
OFFICIAL BASELINE	3967	746	1066	2882	103	150	828	610
TOTAL 1986	4007		3136	1627	0	86	NA	478
TOTAL 1987	3683		3306	962	9	111	NA	2084 (1400 is demil)
ELECTROPLATING								
1985		102	34	5	69	0	55	
1986			72	0	-	0	61	
1987			268	5	2	0	35	
DEGREASING								
1985	150	265	71	218	-	13		15
1986	98		68	323	-	23		28
1987	165		186	352	-	12		32
METAL FINISHING								
1985	47			149				
1986	40			210				
1987	62			95				
SLUDGES								
1985	654	114	299	2499			583	
1986	1400		1865	891			235	
1987	1247		1703	301			199	
PAINT STRIPPING								
1985	294	109	408	37		22	86	232
1986	512		728	11		21	41	161
1987	453		580	24		21	153	154
PAINT								
1985	232	33	39	54	14	8	72	221
1986	299		281	63		10	119	233
1987	445		483	93	1	9	77	199

TABLE 2 SUMMARY OF INFORMATION COLLECTED FROM DEPOT VISISTS

ANNISTON

- No regulatory pressure to reduce VOC emissions.
- Hydrocyclones to reduce paint sludge volume are not working.
- Use all blast media except PMB, including Green Lightening.
- Change all tanks twice per year without testing.
- Only depot that uses trichloroethylene as a degreaser.
- Have a lot of sludge from steam cleaning.
- Use a lot of phosphoric acid, but it generates very little sludge.
- Wastewater streams will remain separate throughout the treatment process; hazardous and nonhazardous sludges will be disposed separately.
- Site of the USATHAMA aluminum ion vapor deposition test.
- Are purchasing a fluidized bed.

CORPUS CHRISTI

- Painting aircraft is exempt from VOC regulations.
- Have ordered hydrocyclone system, and will use a detackifying agent.
- Installed a large PMB booth that is not yet fully operational.
- Have identified a list of HAZMIN projects that they do no have manpower to implement.
- Use ortho-dichlorobenzene as paint stripper.
- Brush methylene chloride on aircraft to remove paint.
- Hired contractor to recover metals in plating shop.
- Interested in aluminum ion vapor deposition, but has not been funded.

LETTERKENNY

- Have submitted bubble plan for VOC emissions; implementing changes to a paint booth would exempt the booth from the bubble plan, thereby affecting the average paint VOC content of the booths still covered in the bubble plan.
- USATHAMA demonstration test of PMB was conducted here.
- Walnut shells are still most widely used media, followed by steel.
- Use methylene chloride and alkaline strippers; interest in life extension.
- Plan to install fluidized bed.

RED RIVER

- Use skimmers to remove sludge from water-wash paint booths.
- No current interest in PMB.
- CTX for nonchlorinated solvents; will try in new cleaning line.
- Have a lot of stockpiled chromate sludge.
- Site for the USATHAMA fluidized bed testing

SACRAMENTO

- California regulates transfer efficiency and VOC content for paints.
- Sacramento must prepare VOC inventory for "Hot Spot" regulations.
- Will use new plastic media blasting booth on electronics shelters; has some operational problems.
- Is evaluating alternate chemical stripper with USATHAMA and CERL.

SHARPE

- California regulates transfer efficiency and VOC content for paints.
- Sharpe must prepare VOC inventory for "Hot Spot" regulations.
- Parts are heavily rusted.
- Use garnet blast media.

TOBYHANNA

- Limited to 50 tons/yr for surface coating VOC emissions.
- Space for expansion or new equipment is restricted.
- A lot of sludge results from water-wash paint booths.
- Use some handsanding on shelters and vans. Also use steel and aluminum oxide.
- No current interest in PMB.
- Parts in plating shop are not adequately rinsed.
- Sewage sludge is largest hazardous waste stream; have taken steps to eliminate.
- Evaluated Rust Eliminator and determined that it was not cost-effective

TOOELE

- Purchases unspecified dewatering system. CARC sludge is costliest disposal problem.
- Interested in PMB, but do not have funds.
- Evaluated Rust Eliminator and determined that it was not cost-effective
- Use a lot of sodium hydroxide stripping.
- Interested in fluidized bed parts cleaning

TABLE 3. POTENTIAL PROJECTS FOR WASTE MINIMIZATION

RELEVANT SUBTASK	POTENTIAL PROJECT	DEMONSTRATION SITE
1	• Investigate reduction of VOC emissions from paint operations by changing paint VOC content or method of application. Develop data base of low-VOC paints, vendors of efficient paint application systems.	Sharpe, Sacramento
1	• Conduct tests with paint application systems to evaluate transfer efficiency.	Sharpe, Sacramento
2	• Conduct PMB testing on parts from Tooele.	Letterkenny
2	• Assist with optimization of plastic media operation.	Sacramento
2	• Evaluate the use of zirconia alumina as a replacement for aluminum oxide.	Tobyhanna
2	• Assist with evaluation of plastic media in new booth.	Corpus Christi
2	• Assist with purchasing a PMB booth or converting existing booth for use with plastic media. Conduct demonstration tests on parts.	Tooele
2	• Compile a data base on all stripping media, so that their applicability can be effectively compared.	Tobyhanna
2	• Evaluate methods to extend lives of alkaline and acid strip tanks.	Letterkenny
2	• Extend lives of phosphoric acid and nitric acid solutions.	Letterkenny
2	• Evaluate the use of filters to extend the lives of sodium hydroxide solutions.	Tooele
2	• Evaluate potential for recycling 1,1,1-trichloroethane. Purchase a distillation column.	Letterkenny
2	• Evaluate recycling of 1,1,1-trichloroethane.	Red River
2	• Evaluate the use of the nonhazardous stripper being tested.	Red River
2	• Purchase a filter press to reduce sludge from the caustic corrosion removal tanks.	Red River
3	• Conduct a study to identify plating waste reduction, including operating changes.	Tobyhanna
3	• Assist in implementing Flow-King filters in plating shop.	Corpus Christi
3	• Assist in implementing chromium recovery unit in plating shop or brush-on alodining booth.	Corpus Christi
3	• Investigate recycling of chromium rinse water.	Letterkenny
•	• Explore the use of detackifying agents to minimize paint sludge from water-wash paint booths.	Tobyhanna, Anniston, Red River
•	• Evaluate effectiveness of hydrocyclone sludge removal system.	Corpus Christi
•	• Determine the effectiveness of the new sludge dewatering systems.	Tooele
•	• Investigate using a filter press to dewater paint booth sludge.	Letterkenny
-	• Minimize paint sludge volume in pit below building 1808.	Corpus Christi

PEI ASSOCIATES, INC.

MEMORANDUM

TO: Craig MacPhee

DATE: 7/12/89
Revised: 8/14/89

SUBJECT: Trip report: Anniston Army Depot
Contract No. DAAA15-88-D-0001
Task Order No. 0004

FROM: Jeff Davis
Fred Hall
Bob Hoye

FILE: 3769-4

CC: Dick Gerstle

USATHAMA and PEI personnel participated in meetings and a tour of the facilities at the Anniston Army Depot (ANAD) on May 31 and June 1, 1989. The purpose of this visit was to acquire information on the operations at ANAD that are relevant to the referenced task order. Specifically, information on VOC emissions, plastic media blasting (PMB), chemical paint strippers, degreasing, and generation of metals-contaminated sludges was sought. This is one of a series of visits to eight depots being made to acquire comparable data on these topics. In the near future, USATHAMA will use this information to select and define research projects that will be conducted by PEI under this task.

ANAD is located in northeast Alabama, approximately 110 miles west of Atlanta, Georgia, 50 miles east of Birmingham, Alabama, and 10 miles west of Anniston and Fort McClellan. Craig MacPhee represented the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). PEI personnel present were Fred Hall, Bob Hoye, and Jeff Davis.

Our primary contacts at ANAD were Tim Garrett and Ron Grant. In addition, we met with Tony Montoya and Steve Guthrie of Production Engineering, Directorate of Maintenance; Elvin Hansen, Branch Chief, Building 114; Major Robert Ronne; and Ken Rollins, Section Chief, Building 409.

The purpose of this trip report is to document the information obtained during the site visit. The trip report is presented in eight sections to address pertinent topics included in the scope of work of Task Order No. 0004. These sections are: Background, VOC Emissions and Paint Operations, Blasting Operations, Alternate Chemical Strippers, Alternate Degreasers, Electroplating Operations and Metal-Contaminated Sludges, Other Areas of Interest, and Conclusions/Recommendations.

BACKGROUND

ANAD's primary mission is to maintain and supply combat vehicles (primarily tanks), missiles, small arms, munitions, subassemblies, and other commodities, as well as spare parts. ANAD employs almost 4,400 people. The depot covers 18,080 acres and contains 89 maintenance buildings and 78 shops. At peak operation, ANAD has rebuilt 700 tanks in a year, along with 2 or 3 engines per tank.

Building 466 and 512 are used for hazardous waste storage. Bulk hazardous wastes (i.e., abrasive media) are disposed at the Emil, Alabama, facility of Chemical Waste Management for 0.195 ¢/lb. Wastes are disposed in 55-gallon drums or in bulk (roll-off containers). All waste disposal is currently handled by the Defense Reutilization and Marketing Office (DRMO). Although DRMO now pays for waste disposal, the procedure is being revised so that each depot will pay for its own waste disposal in the near future. This action will make waste reduction more visible and critical as the amount of waste disposed will directly impact each individual depot's budget.

Most degreasing and chemical stripping tanks (phosphoric, nitric, hydrochloric, sulfuric, and chromic acids, methylene chloride and caustic paint strippers, etc.) are changed two times per year during scheduled operations shut-downs (Christmas and the Fourth of July). This change-out occurs whether the process chemicals are spent or not (the tanks are not tested before they are changed). Thus, the results of any projects focused on extending the lives of these chemicals would have to be implemented in conjunction with a change in operational philosophy.

An EPA waste minimization study published in March 1988 focused on opportunities for reducing waste generation at ANAD, especially in the electroplating operations. A copy of a report summary is provided as an attachment to this trip report. The study also considered options for extending the lives of paint stripping solvents; however, as discussed previously, this is not an option that would result in waste reduction at ANAD under current methods of operations.

The following is a summary of the buildings visited and a brief overview of the processes conducted in each building.

- Industrial Waste Treatment Plant

- Building 114
  - Chemical stripping (Penstrip NPX)
  - Phosphoric acid
  - Hydrochloric acid
  - Vapor degreasing (1,1,1-trichloroethane)
  - Alkaline dip
  - Chromic acid conversion coating
  - Chromium stripping
  - Chromium plating
  - Cadmium plating
  - Blasting (aluminum oxide, steel, Green Lightening, glass beads)
  - Proposed site for AIVD equipment

- Building 409
  - Steam Cleaning
  - Vapor degreasing
  - Paint stripping (Penstrip NPX, caustic)
  - Phosphoric acid
  - Hydrochloric acid
  - Aluminum stripping
  - Painting (4 water-wall paint booths)
  - Blasting (Green Lightening, walnut shells)

- Building 130: transmission housings, crankcases
  - Steam cleaning
  - Vapor degreasing
  - Phosphoric acid
  - Chemical stripping (Penstrip NPX)
  - Blasting (walnut shells
  - Painting (water-wall paint booths)

- Building 128 West: Engines
  - Degreasing (Stoddard solvent)
- Building 433
  - Blasting (Black Beauty)
  - Painting (large drive-in booths with dry filters)

VOC EMISSIONS AND PAINT OPERATIONS

Current Alabama state regulations limit VOC emissions at ANAD to 100 tons per year per stationary source. Each source (e.g., paint booths and degreasers) at ANAD is allowed to emit up to 100 tons per year. As a comparison, Letterkenny and Tobyhanna Army Depots are required to meet Pennsylvania regulations, which specify that no more than 50 tons per year may be emitted from the entire depot for surface coating operations. As a result, there is no regulatory incentive for ANAD to use high-solids paints or to improve transfer efficiencies because the depot is well below the VOC limits.

Operators will frequently increase the pressure and use a wide angle of spray in order to paint parts quicker. Transfer efficiencies are therefore low, and heavy overspray is produced in the painting operations. Many small parts are painted, which decreases the transfer efficiencies even more. The regulations will probably become more stringent in the future, and ANAD has been asked by the state to prepare a VOC inventory. In addition, ADHA has conducted a study on ANAD's VOC emissions (we are waiting for the results of this report from ANAD).

ANAD currently uses the two-component CARC system (which has a higher VOC content than the single component CARC). Air-assisted Binks paint spray guns are used. Personnel are considering buying high-volume, low-pressure guns to improve the transfer efficiency. We provided a list of manufacturers of such equipment.

Water-wall paint booths are used at ANAD. In these booths, water flows down a wall at the rear of the paint booth, over an air vent through which the booth exhaust flows, and then into a trough. The paint particulates are trapped in the water as they pass through the vent. The water and paint mixture (sludge) collects in a trough at the base of the water wall. Disposal of the sludge resulting when these booths are cleaned out is one of ANAD's biggest problems. The paint sludge is manifested for incineration as a hazardous waste because it is ignitable (EPA Waste No. D001). An estimated 7 to 8 drums of sludge are disposed per week per booth. An estimated 1600 drums of sludge are disposed (incinerated) per year at a cost of $8 per gallon. (These figures will be confirmed upon receipt of hazardous waste generation data from ANAD.)

ANAD purchased 16 cyclone separators to reduce hazardous waste generated by the water-wall paint booths by separating paint solids from the liquid that then would be recycled. Only two of these units have been installed, and ANAD plans to eventually install a cyclone on each of these booths if they can be made to function properly. Figure 1 presents a diagram of the cyclone configuration. Water from the trough is sent to the top of the cyclone, in which liquid and solids are separated because of their different densities. Liquid is recycled to the paint booth and the solids are emptied into a 55-gallon drum. The liquid from the top of the drum is also recycled to the paint booth. Approximately one drum per week of sludge is generated from a booth with a properly operating cyclone separator.

ANAD has experienced several problems with the installed cyclone separators. Because of the low transfer efficiencies achieved, a high volume of paint is trapped by the falling water, causing the cyclone to gum up. Also, CARC is a problem because of its viscosity. When the booth is shut down because of problems with the cyclone, the water jet used for agitation becomes clogged. Once the water jets become clogged, the booth is no longer operable and must be shut down and cleaned out. The cyclone vendor (Rave) was scheduled to visit the depot on June 12 to look at the system and offer suggestions to improve the operation.

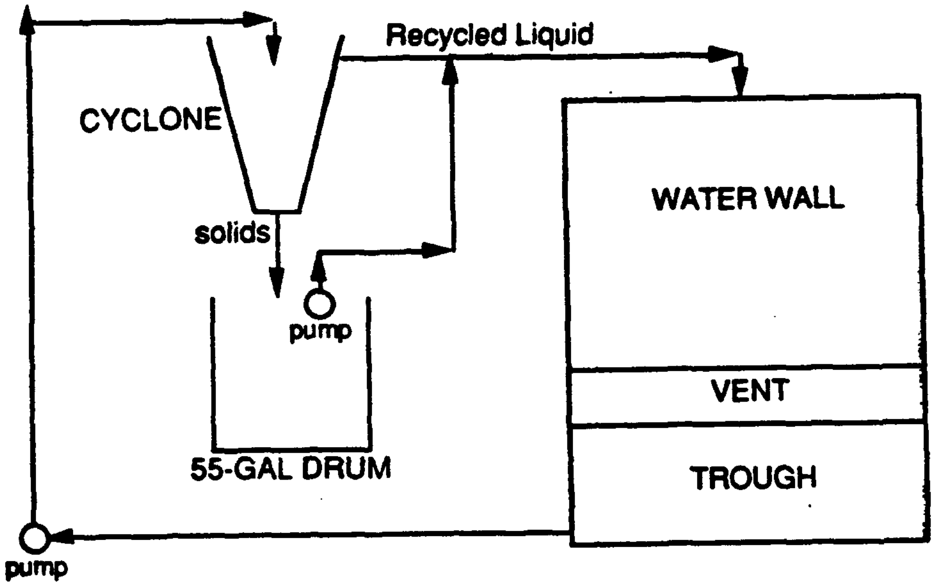

Figure 1. Water-wash booth with cyclone separator

ANAD personnel expressed interest in using filters to reduce the volume of the paint booth sludge. Tim Garrett successfully used a filter press (JWI plate and frame unit) to reduce the volume of 3 small batches of paint booth sludge. ANAD has tried pumping the sludge to the IWTP for treatment, but encountered problems with pumping and maintaining line pressure because the paint settles in the pipe.

Spent Green Lightening blasting material was used as a detackifying agent, but personnel experienced difficulty in cleaning out the booths. In addition, the Green Lightening increased the total volume of sludge that had to be disposed. This technique is no longer used.

In a recent visit to Corpus Christi Army Depot (CCAD) in Texas by PEI and USATHAMA staff, CCAD personnel reported that they had solved the problems with detackifying agents and cyclones. Essentially, their solution was in finding a detackifying agent that precipitated the paint as a powdery solid, which could then be separated with a cyclone. CCAD is in the process of purchasing cyclones for their water-wall paint booths. Additional details are contained in the CCAD trip report prepared by PEI under this Task Order.

Two large drive-in booths in Building 433 use dry filters to collect paint particulates. These filters are changed two times per year and are disposed as non-hazardous wastes without rinsing or other preparation before disposal.

The floors and walls of the water-wall paint booths are covered with a removable plastic coating. This coating is occasionally removed and disposed as a hazardous waste.

BLASTING OPERATIONS

Numerous blasting booths are located throughout the depot, and several types of blasting media are used, including walnut shells, aluminum oxide, steel shot, glass beads, and peridot. The spent media are not separated by type prior to disposal. Building 409 contains a large walnut shell booth that is used for both aluminum and ferrous parts. Some personnel would like to retrofit their walnut shell booths and add cyclones to obtain better recycle rates; the expected installed capital cost would be $600,000 per year.

ANAD uses a peridot material called Green Lightening. Most hardware is blasted (at 120 psi) in a barrel blasting machine. Personnel would like to phase out the use of Green Lightening because of its silica content; however, they have not found a suitable replacement. Although previous reports indicated that the spent media was not hazardous, recent tests showed it to be EP Toxic in 10 out of 12 sampling locations. The hazardous metals present were cadmium and in some cases chromium. The reason for the change in test results is not clear, since the recycle rates are about the same as previously. The only spent media used at the depot that is not hazardous is "Black Beauty", a copper slag material. Black Beauty is the bulk of the abrasive media used in Building 433.

ANAD uses both aluminum oxide and steel shot blasting. Building 114 contains a walk-in aluminum oxide blasting booth that does not have a cyclone separator. The building also contains a barrel blaster and three Wheelabrator rotary blast machines that use Green Lightening. The spent media are collected in a roll-off box and emptied once a day. A plant in Michigan will accept spent steel shot for recycling. Sharpe Army Depot is currently investigating this option.

Maintenance personnel believe that PMB may be good for non-ferrous metals, but not for ferrous metals. Elvin Hansen indicated that he had tried PMB on their equipment but it did not work.

ANAD personnel are interested in carbon dioxide (CO2) blasting. Tinker Air Force Base is doing some work in this area, and a company called Cold Jet, based in Cincinnati, is currently marketing this technology.

ALTERNATE CHEMICAL STRIPPERS

Numerous stripping operations are used throughout the depot. ANAD uses a large quantity of methylene chloride-based paint strippers (Penstrip NPX), which contains formic acid as a major component. Previously, phenolic strippers were used. The Fine Organics alternative stripper to begin Phase 3 testing at Sacramento Army Depot in July requires a stripping time of two hours. Because of the production rate that ANAD must meet, personnel indicated that a two-hour stripping time would be unacceptable.

The stripper rinse waters are treated in the Industrial Waste Treatment Plant (IWTP). However, this stream is not monitored for Total Toxic Organics.

The cleaning area in Building 114 contains several 2,000-gallon stripping tanks containing Penstrip NPX and alkaline solutions. Building 409 contains a caustic paint stripper; we observed a thick layer of sludge floating on top. Building 409 also has 3 phosphoric acid tanks to remove stains from aluminum parts, a hydrochloric acid tank, a Penstrip NPX tank for steel, and an aluminum strip tank.

As indicated previously, most process tanks are changed two times per year regardless of the remaining usefulness of the chemicals. The depot laboratory tests the hydrochloric and phosphoric acid tanks every week and specifies make-up. During one of the twice-per-year cleanings, only the sludge is pumped out of the hydrochloric, alkali, and Penstrip NPX tanks, and the liquid returned for further use. The entire tank is dumped once per year. The hydrochloric and phosphoric acid tanks generate very little sludge, perhaps 1/2 a drum per cleaning.

DRMO has discussed the use of waste acids in fertilizer manufacture with the Tennessee Valley Authority (TVA).

ALTERNATE DEGREASERS

Most of the buildings on the depot contain large (e.g., 2000-gallon capacity) vapor degreasers using trichloroethylene. For example, the cleaning area in Building 114 contains several 2,000-gallon trichloroethylene degreasing tanks and Building 409 contains two 2,000-gallon degreasers. All vapor degreasers have batch distillation columns that are operated continuously. Testing of the still product by Auburn University has indicated a low acid content. The stills are emptied of sludge about once per week, generating 20 to 55 gallons of hazardous waste per still. In addition, the stills are cleaned out two times per year, yielding about 10 drums of hazardous waste per still.

Building 128 West (engines) contains many small cleaning tanks using stoddard solvent. ANAD has written a specification to replace stoddard solvent with Safety-Kleen. Under this service, Safety-Kleen will remove and recycle the spent degreaser. No Freon is used.

Engines and transmissions are steam-cleaned before being processed. The majority of the oil and grease is manually knocked off when a part comes in to Building 409. The sludge (grease, rags, dirt) is collected in a separator drum and pit under the floor, while the liquid flows to the IWTP. The 55-gallon drum is emptied every 6 weeks. In addition, a total of approximately 1,000 drums is pumped from the pit and disposed two times per year. This material goes off site because wastes have >100 ppm TTO and cannot be disposed in an on-site sanitary landfill. ANAD owns three trucks costing $150,000 each to pump out the oily sludge but personnel are uncertain about what to do with it.

The remaining oil and grease are removed with steam cleaning. The wastewater is processed in an API separator and then treated in the IWTP. The resulting sludge is difficult to dry and cannot be landfilled because of the free liquid and hydrocarbon content, even though the waste is not regulated as hazardous. The steam cleaning waste is a large problem at ANAD.

ELECTROPLATING OPERATIONS AND METAL-CONTAMINATED SLUDGES

ANAD conducts both cadmium and chromium electroplating in Building 114. This building contains an automatic barrel coating line that plates a lot of small hardware (bolts and brackets) with cadmium. The cadmium solution is cyanide based. By paying careful attention to make-up requirements, the cadmium solution was used for 5 years. The chromium plating solution is recycled in a unit below ground and is never dumped. Personnel indicated a potential interest in recycling chromium rinse waters by removing the chromium. ANAD personnel have instituted several process changes to their plating lines to reduce wastes. These changes are described in an article published in the Journal of the Air Pollution Control Association, which is provided as an attachment to this report.

Building 114 also contains 2,000-gallon phosphoric acid tanks that are used on all types of parts, a hydrochloric acid tank, chromic acid conversion coating, phosphating, chromium stripping, and associated rinses. All tanks in the electroplating area except the plating tanks themselves are emptied and changed two times per year, including phosphoric acid, nitric acid, hydrochloric acid, and sulfuric acid tanks. Phosphoric acid is used for rust removal and personnel are investigating selling or giving the spent acid to a fertilizer plant. Building 114 has eight 2,500-gallon tanks, and additional tanks are located in Buildings 130, 409, and 129.

The industrial waste treatment plant (IWTP) receives all rinse waters from the process operations. Four types of wastewater are treated separately: chromium, cadmium/cyanide, steam cleaning, and general wastewater (all wastewater except steam cleaning, cadmium/cyanide, and chromium). Approximately 26,000 gallons per day of chromium wastewater are treated with sulfuric acid and sodium metabisulfite for chromium reduction after exiting equalization tanks. The water is then neutralized with lime, after which it enters separate flocculation and clarification operations. The 6,000 gallons per day of cadmium/ cyanide wastewater enters equalization tanks, then is treated with lime to a pH greater than 11 to precipitate cadmium. The rinse waters contain approximately 20 - 30 ppm cyanide. Very little sludge is generated from the treatment of the chromium and cadmium/cyanide wastewaters. Both of these streams are pretreated with activated carbon to remove chlorine, and the cadmium/cyanide stream is polished with ion exchange. An activated sludge operation is used to treat a small flow containing phenol, which is used in one vat for aluminum stripping.

Most sludge generated at the IWTP results from steam cleaning. The steam cleaning water is processed in equalization and flocculation tanks, then batch treated for pH adjustment. The sludge contains greater than 100 ppm hydrocarbons and cannot be landfilled.

The general wastewater stream consists of overflow from caustic soda, hydrochloric acid and other tanks, and all rinse waters except those containing chromium, cadmium or cyanide.

All sludges are currently combined and sent to a filter press. As a result, the entire sludge volume contains chromium and cadmium and is a listed hazardous waste (F006). New tanks are scheduled to be installed this summer that will keep the sludges separate. All sludges will still be disposed as hazardous wastes except for the sludge resulting from steam cleaning, which is a major portion of the sludge. Personnel expect that this action alone will reduce the sludge disposed as a hazardous waste by half.

The filter press is old and requires a large amount of maintenance. The filter press achieves a filter cake with 27 - 30 percent solids. A new press made by LeRox, a Swedish company, is scheduled to be installed in FY-89. The press can produce a filter cake with 45 percent solids and costs approximately $225,000. These units have been frequently used in the mining industry. Based on the solids content of the cakes produced by each filter press, the new filter press will reduce the generation of hazardous wastes by an additional 33 percent over that of segregating the sludge.

The general waste stream (which is contaminated with methylene chloride) is not monitored for Total Toxic Organics (TTO). However, biomonitoring of the IWTP effluent last year indicated no problems.

OTHER AREAS OF INTEREST

ANAD is the site for demonstration testing of aluminum ion vapor deposition (AIVD) to be conducted under Task 006 of this contract. During this trip, we visited the proposed site for location of the equipment and met with several of the personnel who will be involved.

The proposed location for the AIVD unit is on the second floor of Building 114 in place of an automatic phosphating bath. The floor consists of a steel grate; ANAD structural engineers will determine if the floor is sufficient to bear the weight of the AIVD unit. Site support to be provided by ANAD includes preparation of the facilities (including providing an air-conditioned room and utilities), engineering support (including identifying what criteria must be met to justify the use of AIVD instead of cadmium electroplating), use of their salt spray equipment for corrosion testing, and operation of the equipment. Building 114 has its own millwright and plumber, thus preventing delays due to filling out work orders when repairs are needed. Sufficient power is not readily available in the immediate vicinity of the proposed location, and ANAD will provide for the electrical hook-ups. ANAD has a lot of noise on the power lines, so a power line conditioner may need to be supplied. USATHAMA has allocated $100,000 for site support.

In general, all equipment associated with the AIVD process should be dedicated to the process so that it will always be available during the demonstration testing. Also, if cadmium parts are blasted in the precleaning stage, all of the spent media will be a hazardous waste; spent media from blasting of aluminum parts will not be hazardous. Building 114 contains a chromate conversion line for aluminum that could potentially be used for the AIVD testing.

One issue identified during our meetings is whether AIVD is able to coat the inside of holes. Several parts at ANAD that personnel want to see tested with AIVD have holes for screws, pins, etc., that were as small as ~1/8-inch. This issue will require exploration during demonstration testing.

During our visit, we met with Colonel McGill, head of the Directorate of Maintenance. A total of 18 ANAD personnel were present at this meeting. Colonel McGill fully supports the AIVD initiative, but pointed out that the biggest stumbling block was getting the approval of the Army Materiel Command (AMC) and users such as Detroit. He would also like a 6-month maintenance contract on the system.

Abar Ipsen, a potential vendor of the equipment, will visit ANAD to specify what utilities are needed. ANAD may need to prepare a permit-to-construct form before beginning site support preparations. Tim Garrett said he would check into the need for permits.

ANAD personnel will test some parts on the AIVD system at Warner Robbins Air Force Base near Macon, Georgia. Reject parts will be set aside for testing to ensure a sufficient supply once demonstration testing begins.

ANAD is currently preparing specifications to buy a fluidized bed parts cleaner to replace degreasing and chemical stripping operations.

Oil generated on depot is currently burned in boilers, sold to Auburn University, or sold through DRMO. All vehicles and tanks must leave the depot with new oil, so all vehicles must receive an oil change even if they have only been driven on the test track once.

A chemical demilitarization facility is located on the depot. This incinerator may be useful as a paint waste incinerator. However, current regulations dictate that these facilities be decommissioned.

CONCLUSIONS/RECOMMENDATIONS

The largest hazardous waste streams to date have been the wastewater treatment sludge and the paint booth sludge. ANAD personnel have undertaken efforts to solve both of these problems. Segregation of the wastewater treatment sludges and installation of a new filter press will result in a large reduction of hazardous waste. In addition, the AIVD unit will eventually decrease the amount of cadmium sludge generated. Cyclones have been purchased to decrease the sludge generated from paint booths, but these cyclones are currently experiencing operational problems. The vendor of this equipment will attempt to solve some of these problems.

Because of the high limit set for VOC emissions in Alabama, ANAD personnel are not currently interested in the control of VOC emissions. In addition, because process tanks are changed two times per year regardless of the condition of the remaining chemicals, extending the lives of these baths would not result in the reduction of hazardous waste.

We are currently awaiting information from ANAD regarding actual hazardous waste generation rates and some process flow diagrams. This report may be revised upon receipt of this information.

The following list presents some potential HAZMIN projects on which USATHAMA could provide assistance to ANAD.

- Explore the use of detackifiers to increase the effectiveness of the cyclone separators. Transfer the information learned at Corpus Christi Army Depot to ANAD.
- Investigate the use of a filter press for further dewatering paint booth sludge (past studies indicated this is worth further evaluation).
- Identify the kind of cyclone needed for walnut shell recycling and identify the operational parameters needed for waste reduction.
- Conduct a comparison test of walnut shells versus plastic media for abrasive blasting for the particular parts processed at ANAD.
- Identify options for disposal of the steam cleaning sludge.
- Investigate recycling of the chromium rinse water by removing chromium.
- Identify a fertilizer company willing to accept spent phosphoric acid solutions.

ANAD's interests and needs will be compared to those of other depots that will be visited in the near future. ANAD personnel should be kept informed of the results of any testing relevant to their needs conducted under the current HAZMIN effort.

ATTACHMENTS

United States
Environmental Protection
Agency

Research and Development

Hazardous Waste Engineering
Research Laboratory
Cincinnati OH 45268

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EPA

Project Summary

Waste Minimization Audit Report: Case Studies of Minimization of Solvent Wastes and Electroplating Wastes at a DOD Installation

Marvin Drabkin and Paul Sylvestri

The U.S. Environmental Protection Agency (EPA) is encouraging hazardous waste generators to develop programs to reduce the generation of hazardous waste. To foster such programs, the Agency's Office of Research and Development Hazardous Waste Engineering Research Laboratory (ORD/HWERL) is supporting the development and evaluation of a model hazardous waste minimization audit (WMA) procedure using the EPA hierarchy of waste minimization (WM) options, with source reduction being more desirable and recycle/reuse less desirable. Treatment options, although not considered WM, are evaluated if neither of the former alternatives is available. The WMA procedure was tested initially in several facilities in 1986. WMAs were conducted at generators of a number of generic hazardous wastes, including corrosives, heavy metals, spent solvents, and cyanides.

In 1987, the HWERL WMA program concentrated on ORD's top priority RCRA K and F waste list. Audits were conducted at generators of K071 and K106 wastes (mercury cell chloralkali plants), K048-K052 wastes (sludges and solids from petroleum refining), F002-F004 wastes (spent solvents), and F006 wastes (wastewater treatment sludges from electroplating operations). This Project Summary covers a WMA carried out at a DOD installation responsible for the rehabilitation of worn Army tanks. This audit was aimed at developing WM options for F002, F004, and F006 wastes.

The WMA carried out at the DOD installation's electroplating facility resulted in the development of three source reduction options and two recycle/reuse options for cadmium cyanide waste as well as two source reduction options for chromium waste. Successful implementation of appropriate combinations of these options could result in the DOD installation being able to achieve EPA delisting of the F006 wastewater treated sludge. Payback period for the incremental investment needed to achieve these WM results, could range from four months to 1.9 years depending on the choice of options. Savings in present F006 waste disposal costs could amount to $120,000 annually.

The WMA carried out at the DOD installation's paint stripping solvent facilities resulted in two alternative source reduction options being developed by the audit team. Implementation of either of these two options could result in payback period for the incremental investment involved ranging from 6 to 8 months with savings in waste solvent disposal costs of $53,000 annually.

This Project Summary was developed by EPA's Hazardous Waste Engineering Research Laboratory, Cincinnati, OH, to announce key findings of the

research project that is fully documented in a separate report of the same title (see Project Report ordering information at back)

Introduction

The national policy objectives established under the 1984 Hazardous and Solid Waste Amendments to the Resource Conservation and Recovery Act of 1976 include the goal of reducing or eliminating hazardous waste as expeditiously as possible. To promote waste minimization activities, the Hazardous Waste Engineering Research Laboratory (HWERL) of the U.S. Environmental Protection Agency (EPA), Office of Research and Development, has undertaken a project to develop and test a waste minimization audit (WMA) procedure. It is envisioned that such a procedure would be useful to generators of hazardous waste as they search for waste minimization alternatives. The present HWERL project expands on an audit procedure developed and tested in 1986 by conducting additional WMAs in cooperating industrial and government facilities. This project is one of several current audit efforts being supported by HWERL.

This study presents the elements of a WM program, of which the audit procedure is a central component and includes details of the WMA procedure, its development, and its final recommended form. A case study is presented using this WMA procedure, and covers audits performed at a DOD installation that includes facilities which generate listed wastes F002 and F004 as well as a facility which generates listed waste F006. Findings and conclusions resulting from these audits are presented below.

Description of the WMA Procedure

The function of the WMA procedure is to force the use of an orderly step-by-step procedure for conducting an audit at a host site. The initial WMA procedure was developed in earlier work, and was further refined during the course of the present EPA-sponsored audit effort. This procedure is applicable to the development of both categories of WM options (source reduction and recycling/reuse) as well as to the development of treatment options.

The team employed in carrying out the audit described in the full report was composed entirely of employees of an outside consulting/engineering firm. Following selection of the host facility there were eight sequential steps executed by the audit team:

1. Preparation for the audit.
2. Host site pre-audit visit.
3. Waste stream selection.
4. Host site waste minimization audit visit.
5. Generation of WM options.
6. Preliminary WM options evaluation (including preparation of preliminary cost estimates) and ranking of options in three categories (effectiveness, extent of current use, and potential for future application).
7. Presentation, discussion, and joint review of options with plant personnel.
8. Final report preparation and presentation to host site managmeent.

This procedure was followed in carrying out the WMAs summarized below.

Results of the WMA Conducted at a Generator of F002 and F004 Waste: Audit at a DOD Installation Paint Stripping Facility

A DOD installation in the South, a portion of whose facilities is devoted to the rehabilitation of worn Army tanks was studied in a WMA for the reduction of F002 and F004 wastes. These listed F wastes are partially defined in 40 CFK 261.32 as follows:

- F002: Spent halogenated solvents including methylene chloride.
- F004: Spent non-halogenated solvents including cresols and cresylic acid.

At three buildings in the DOD installation, tank part paint stripping facilities using methylene chloride solvent formulations (containing phenolic-type constituents to enhance solvent action), generate F002 and F004 wastes. F002 and F004 wastes include:

- Approximately 20,000 gallons per year of spent methylene chloride-based paint stripping solvent and about sixty, 55-gallon drums of paint sludge are generated in the paint stripping operations and sent offsite for hazardous waste disposal. Spent solvents are presently disposed of in bulk approximately every 6 months. Drummed hazardous paint sludges are shipped offsite within 90 days of accumulation.
- Wastewaters from stripped parts rinsing operations are sent to the onsite wastewater treatment plant where biological treatment is used to reduce phenol level to meet NPDES permit requirements prior to discharge.

The audit team studied possible source reduction and recycle/reuse options for these wastes. The focus of this effort was primarily on ways to prolong the life of the paint stripping solvents as the most effective short-term options. The long-term waste reduction options, i.e. development of non-solvent formulations and other paint removal techniques, could not be meaningfully addressed in this study.

The most promising source reduction options for paint stripping solvent waste reduction were:

- Continuous centrifugation of the paint stripping solvent to remove paint sludge as it is generated thus preventing buildup of this sludge in the stripping tanks and significantly extending the life of the solvent.
- As an alternative to continuous centrifugation of the solvent, continuous 2-stage basket/cartridge filtration of the solvent to prevent paint sludge buildup.

In summary, it is believed that successful implementation of either of these options could result in solvent life being extended to at least one year prior to replacement. In this regard, a small scale test by a centrifuge vendor on a sample of spent solvent heavily loaded with paint sludge, indicated that clear solvent could be produced by this technique. Each of the six main paint stripping solvent tanks at the facility would be equipped with either a solid-bowl type centrifuge or a basket/cartridge type 2-stage filter. Table 1 summarizes the results of the preliminary technical and economic feasibility study of these two options. Annual waste solvent disposal cost would be cut in half (approximately $50,000 per year savings) if either of these two options were adopted, with

Table 1. Tabulated Projected Costs and Required Site Modifications: WM Options for DOD Installation F002 and F004 Wastes

WM Option[1]	Waste Source	Option Description	Proposed Equipment Modifications	Estimated Installed Cost ($)	Estimated Annual Direct Operating Cost[2] ($/yr)	Required Site Modifications	Payback Period (years)
(1)	Waste paint stripping solvent disposal	Continuous removal of paint sludge from solvent (using a solid bowl centrifuge) Solvent replaced annually	Add a pump and solid bowl centrifuge to each of the six paint stripping solvent tanks; unit operates at about 5 gpm flow rate	50,000	5,000	Adequate floor space is available in front of each of these stripping tanks to permit installation without major existing equipment relocation	0.5
(2)	Waste paint stripping solvent disposal	Continuous removal of paint sludge from solvent (using a two-stage filtration unit) Solvent replaced annually	Add a pump and two-stage filtration unit to each of the six paint stripping solvent tanks (first stage is basket type filter for large pieces and second stage is a porous metal filtration cartridge for micron-size particles)	60,000	9,000	Adequate floor space is available in front of each of these stripping tanks to permit installation without major existing equipment relocation	0.67

[1] All options shown are source reduction options

[2] Other than the cost of replacing spent paint stripping solvent, which is estimated separately

payback periods ranging from 0.5 to 0.7 year.

Results of the WMA Conducted at a Generator of F006 Waste: Audit at the DOD Installation Electroplating Facilities

Electroplating operations at the DOD installation are conducted in one building and include cadmium plating of miscellaneous cleaned and/or remachined tank parts using cadmium/cyanide (Cd/CN) solutions in either an automatic barrel plating line or a manual rack plating line. Chromium (Cr) plating of appropriately prepared tank parts is conducted in a rack plating line. Both plating operations are fairly standardized.

The facility has been experiencing significant problems in meeting NPDES permit limitations for Cd and CN in the treated wastewater discharge. Thus, the audit team focused primarily on waste reduction options which could reduce or eliminate Cd and CN levels in the raw waste (principally rinsewaters from both Cd plating lines). Approximately 2,000 gallons per day of these wastewaters typically containing 20 mg/l of Cd and 25 mg/l CN are discharged from the electroplating facility. About 35,000 gallons per day of Cr-bearing waste averaging 110 to 120 mg/l Cr are also discharged from this facility.

A study of the electroplating operations that generate F006 waste (including discussions between the audit team and plant personnel), led the audit team to develop a total of five WM options for Cd/CN plating-related waste and two WM options for Cr plating-related waste. These options include commercially demonstrated processing techniques designed to minimize or eliminate Cd, Cr, and CN levels in the rinsewater wastes as well as reducing the amounts of wastewater. These options together with their estimated capital and operating costs are summarized in Table 2. One proposed source reduction option: electrolytic reverse current destruction of CN (both simple and complexed) in the still rinse tanks of the two Cd plating lines during the plant downtime period, is currently being evaluated at the facility. One proposed recycle/reuse option: recovery of Cd from the two plating lines' still rinse tanks, has since been implemented and appears to have resulted in the facility being able to consistently meet the Cd limit in their NPDES permit.

It is believed that successful implementation of appropriate combinations of these WM options could result in the DOD installation being able to achieve EPA delisting of the F006 wastewater treatment sludge as well as meeting Cd and CN permit limits in the NPDES discharge. Payback periods for the incremental investment involved range from 6 months to 1.9 years. Savings in the present F006 waste disposal costs could amount to $120,000 annually if the F006 waste can be delisted.

Table 2 Tabulated Projected Costs WM Options for DOD Installation F006 Wastes[1]

WM Option	Waste Source	Option Type	Option Description	Proposed Equipment Modifications	Estimated Installed Cost ($)[1]	Estimated Annual Operating Cost ($/yr)
(a)(1)	Cd/CN Barrel Plating Line	Source reduction	Use of electroclean rinse waters as feed to pickling rinse water tank	Water piping and pump	$ 1,000	$ 500
(a)(2)	Cd/CN Manual Plating Line	Source reduction	Use of electroclean rinse waters as feed to pickling rinse water tank	Water piping and pump	1,000	500
(b)(1)	Cd/CN Barrel Plating Line	Source reduction	Destruction of cyanides in still rinse tank	Insertion of SS cathodes and anodes in still rinse tank and operation in a CN destruction mode during plating line downtime	2,000	10,000
(b)(2)	Cd/CN Manual Plating Line	Source reduction	Destruction of cyanides in still rinse tank	Insertion of SS cathodes and anodes in still rinse tank and operation in a CN destruction mode during plating line downtime	2,000	10,000
(c)(1)	Cd/CN Manual Plating Line	Source reduction	Improved dragout recovery, drain board, spray/fog rinsing nozzles over plating tank	Add drain board between Cd plating tank and still rinse tank; install spray/fog rinse	1,600	1,000
(c)(2)	Chromium Manual Plating Line	Source reduction	Improved dragout recovery, drain board, spray/fog rinsing	Add drain board between Cr plating tank and still rinse tank; install spray/fog rinse nozzles over plating tank	1,500	1,000
(d)	Both Cd/CN Plating Lines	Recycle reuse	Evaporation of Cd/CN rinse water discharge and recycle to both plating lines in appropriate quantities to maintain individual plating bath water balances	Install evaporation unit and auxiliaries in Building 114 basement near Cd/CN waste sump	79,000	27,000
(e)(1)	Cd/CN Barrel Plating Line	Recycle reuse	Plating out of cadmium in still rinse tank	Insertion of SS cathodes and anodes in still rinse tank to operate in a Cd plating mode during plating line downtime	Use the same equipment as in (b)	20,000
(e)(2)	Cd/CN Manual Plating Line	Recycle reuse	Plating out of cadmium in still rinse tank	Insertion of SS cathodes and anodes in still rinse tank to operate in a Cd plating mode during plating line downtime	Use the same equipment as in (b)	20,000
(f)	Chromium Manual Plating Line	Source reduction	Improved dragout recovery; replacement of running rinse tank with spray chamber	Install suitable banks of spray nozzles in empty running rinse tank	5,000	2,000
(g)	Chromium Manual Plating line	Source reduction	Reduction of chromium metal losses from hood vents over plating tanks	Add layer of plastic balls on surface of chromium plating tanks	Nil	Nil

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[1] Order of magnitude costs (± 50 percent accuracy)

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Harry F. Freeman is the EPA Project Officer (see below).

The complete report, entitled "Waste Minimization Audit Report: Case Studies of Minimization of Solvent Wastes and Electroplating Wastes at a DOD Installation," (Order No. PB 88-166 780/AS; Cost: $14.95, subject to change) will be available only from:

National Technical Information Service
5285 Port Royal Road
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WASTE MANAGEMENT

HAZARDOUS WASTE MINIMIZATION: PART VII (A)

Hazardous Waste Minimization within the Department of Defense

Joseph A. Kaminski, Editor
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This article is a series of representative case studies of Department of Defense hazardous waste minimization. Each Military Department and the Defense Logistics Agency describe actual accomplishments. Areas covered range from production line modification to product specification change. These efforts are part of a Department of Defense plan composed of individual programs executed independently by each military service and defense agency.

Part VII of the hazardous waste minimization series appears in two separate installments: this installment, Part VII (A), deals with Department of Defense waste minimization efforts in vehicle repair operations, explosives manufacturing, and abrasive blasting processes; Part VII (B) will cover shipboard mercury wastes, industrial chemical control, solvent reclamation, and hazardous property sales efforts.

The Department of Defense is a cabinet-level organization of the Executive Branch of the Federal Government. Its components are the Office of the Secretary of Defense, the Organization of the Joint Chiefs of Staff, the Military Departments and the Defense Agencies. The 1988 defense budget is 283 billion dollars. Over 1,100 installations worldwide support the defense mission. Major repair of weapons systems is accomplished at 40 maintenance depots. Propellent and ordnance associated with weapons systems is produced at another 20 ammunition plants. Together these industrial installations generate about 80 percent of DoD hazardous waste.

Hazardous Waste Minimzation Policy and Implementation

A hazardous waste minimization policy has been issued by the Deputy Assistant Secretary of Defense (Environment). Program guidance stresses source reduction but also urges actions that reduce hazardous waste disposal. Implementation of hazardous waste minimization is delegated to the Military Departments and Defense Agencies who assign execution responsibilities to various subordinate commands. The Military Departments have all adopted goals of 50 percent reduction in hazardous waste disposal by 1992. To achieve this, extensive programs are in place.

Introduction to Case Studies

The following cases cover a variety of waste minimization topics from Department of Defense organizations with different missions. Case 1, from the Anniston Army Depot, describes plating waste reduction. Case 2, from the Holston Army Ammunition Plant focuses on delisting. Case 3, from Headquarters, Naval Sea Systems Command is on a product specification change. Case 4, from the Navy's David Taylor Research Center is on the development of a shipboard mercury ion filter that reduces waste volume. Case 5, from the San Antonio Air Logistics Center describes a comprehensive hazardous material control program. Case 6, from the Warner Robins Air Logistics center is on solvent and product recovery. Case 7 from the Defense Logistics Agency is on recycling hazardous materials.

1. Plating and Painting Line Modifications for a Large Vehicle Repair Operation

Tim Garrett and Tony Pollard
Anniston Army Depot
Anniston, Alabama

The Anniston Army Depot is a major rework facility of the U.S. Army located in Calhoun County, Alabama. The facility occupies 15,000 acres and is a major employer of skilled and semi-skilled workers in northeastern Alabama. Often referred to as the Tank Rebuild Center of the Free World, Anniston Army Depot repairs, overhauls and converts combat vehicles. The largest share of its maintenance workload is concentrated on the M60 tank and the Army's new M1 Abrams main battle tank.

Other Depot missions include storage and renovation of ammunition, storage of all the Army's small arms, repair of mortars and recoil rifles, repair of optical and electronic fire control items, repair of milvan shipping containers, and storage and maintenance of several missile systems including Shillelagh, TOW and DRAGON.

Hazardous Waste Generation

Each year industrial operations at the Depot generate hazardous waste including paint sludge, obsolete ammunition, ash residue from demilitarization processes, sludge from the Industrial Waste Treatment Plant, and spent solutions from chemical cleaning and finishing operations. Table 1-1 shows hazardous waste generated by the major industrial operations. The Anniston Army Depot is constantly pursuing the reduction of hazardous waste volumes and toxicities by implementing new techniques for minimization in the industrial processes. These ongoing techniques include recycling/reusing spent solvents and cutting oils, filtration and subsequent reuse of chemical paint stripping compounds, metal plating/finishing process modifications, spray painting sludge reductions, new paint formulations, and segregation of industrial waste treatment plant sludges with subsequent delisting actions.

Metal Plating/Finishing

The metal plating/finishing operations at Anniston Army Depot include an automatic barrel plating line and a manual plating line. The automatic barrel plating process (Figure 1-1) consists of cleaning, pickling, plating and dichromating. Rinsing is performed after each process step with a two stage rinse after cadmium plating. Originally all rinses were countercurrent, overflow systems controlled by conductivity meters. The automatic line is nearly

Table 1-1. Anniston Army Depot hazardous waste generations (kilogram).

Waste	1985	1986	1987
Painting	231,965	299,266	444,860
Stripping/nonsolvent metal cleaning	294,229	511,514	453,265
Clean/degreasing	150,263	98,391	164,661
IWTP sludge	653,846	1,400,386	1,246,951
Munitions	2,210,837	1,596,064	1,248,761

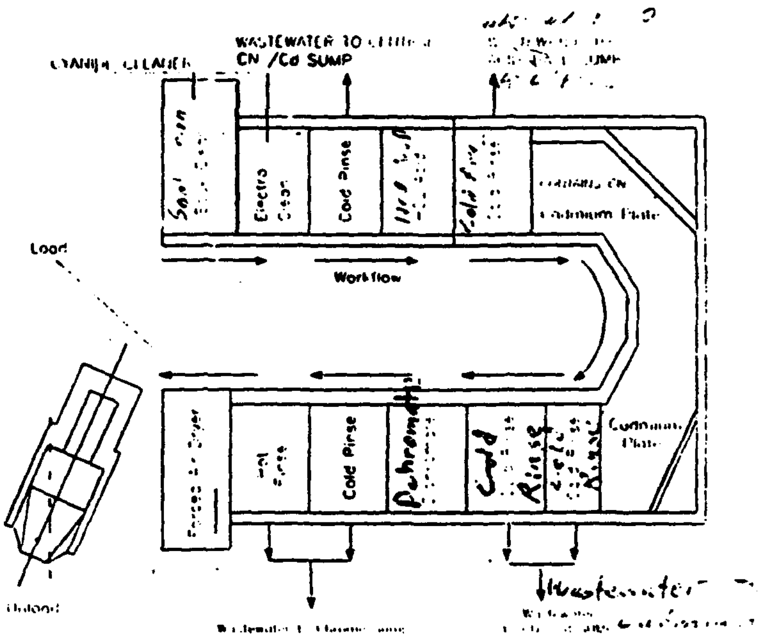

Figure 1-1. Original configuration of automatic barrel cadmium plating machine.

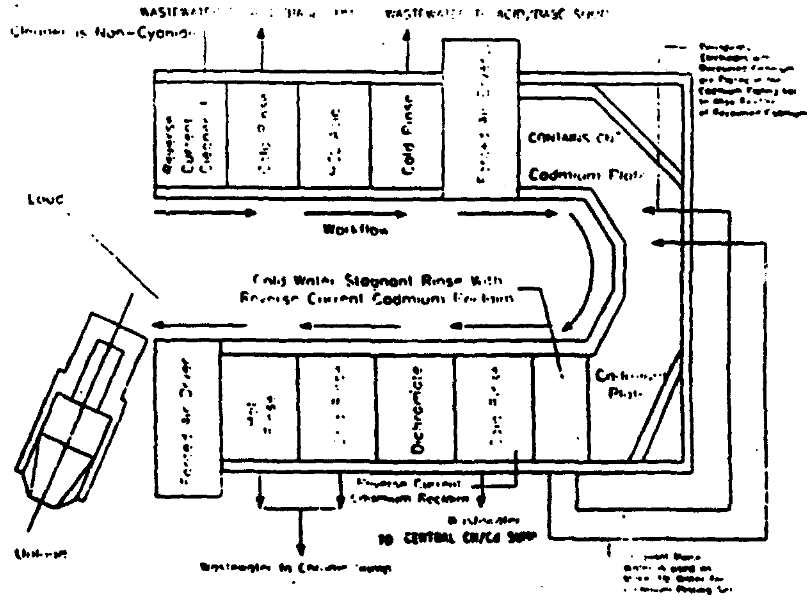

Figure 1-2. Modified configuration of automatic barrel cadmium plating machine.

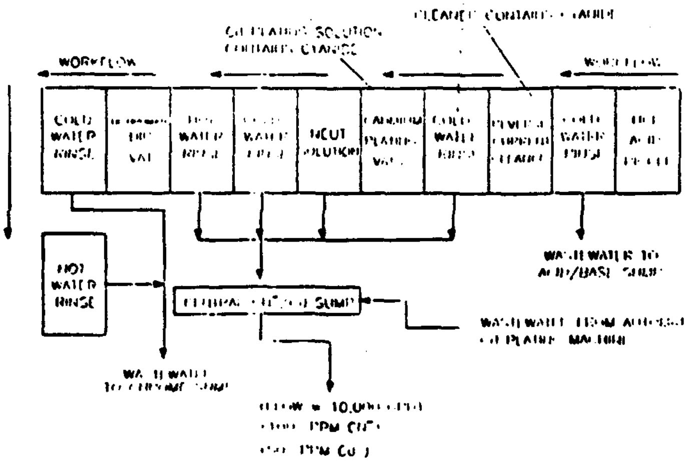

Figure 1-3. Original configuration of manual cadmium plating line.

continuously in operation for one to three eight-hour shifts per day at a parts load of 1200 pounds per hour.

Tests indicated that approximately 0.12 gallon of dragout was carried by each barrel resulting in 2.5 pounds of cadmium and 10 pounds of cyanide per eight-hour shift to the rinse waters. The cadmium and cyanide laden rinse waters were fed to a central sump and then to a cyanide destruction unit prior to being discharged to the industrial waste treatment plant. The central sump serves both the automatic and manual plating lines. Total flow, cadmium and cyanide concentrations for the central sump were 10,000 gal/day, 50 ppm, and 100 ppm respectively.

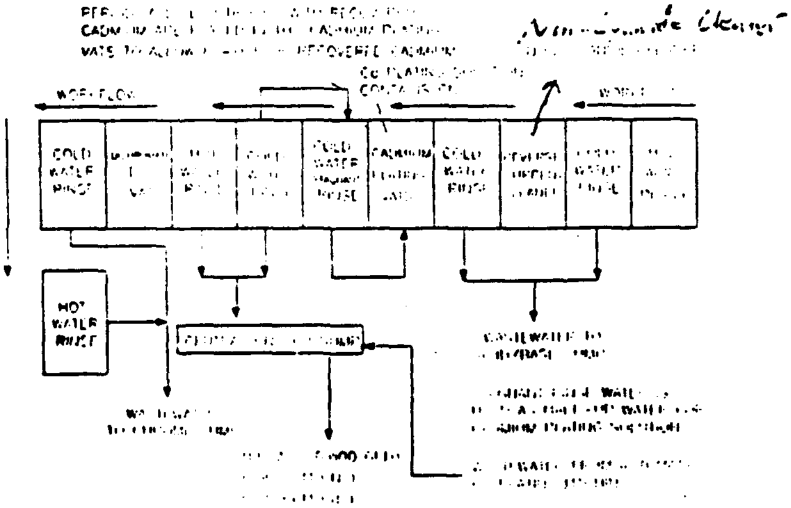

Figure 1-4. Modified configuration of manual plating line.

Modifications to the automatic plating line are shown in Figure 1-2.

1. The cyanide based soak clean tank was converted to a reverse current, non-cyanide based cleaner.
2. The initial rinse station after plating was changed to a stagnant rinse. Once the stagnant rinse becomes saturated with cyanide and cadmium, the water is used for make-up in the plating vats.
3. The second rinse station was changed to overflow rinse controlled by a conductivity meter.
4. The stagnant rinse was equipped with a reverse current process enabling plating the cadmium in solution onto stainless steel cathodes to be reused in the primary plating process.

Similar changes were made in the manual line as indicated in Figures 1-3 and 1-4. The manual line operates at a parts load of approximately 800 pounds per hour.

These changes in the cadmium plating process have resulted in a recovery of an average of 5 pounds of cadmium per day and, more importantly, have reduced the cadmium concentrations by 30 percent, the cyanide concentration by 70 percent and the flow rate by 40 percent from the central sump. This has reduced waste load, treatment cost and sludge generation at the industrial waste treatment plant.

Painting Wastes

Another area in which the depot is making great strides in the reduction of hazardous waste is in paint sludge generation. In 1986, Anniston switched to a urethane based camouflage paint of higher solids content. This resulted in a significant increase in paint sludges. Annually, Anniston Army Depot generates approximately 1900 drums of paint sludge at a disposal cost of $330.00 per drum resulting in an annual disposal cost of $627,000.

Currently, the Directorate of Maintenance is piloting a system on one of the eight waterfall type spray paint booths that reduces this volume by 67 percent. The system utilizes a cyclone separator and a paint detackifying compound to dewater and concentrate the solids fraction of the paint sludge, thus reducing the volume. The detackifier provides a nucleus for overspray particles. A loose suspension is formed facilitating particle removal by the cyclone. A number of commercial detackifying compounds were tested; however, the most effective compounds was a clay based dust from an on-base paint stripping/blasting operation. The Depot has procured and is currently in the process of installing this system on the seven remaining paint booths in the maintenance operation.

Conclusions

These actions, along with others, have been effective in lowering waste stream toxicity concentrations and reducing hazardous waste. Anniston Army Depot is committed to even further reductions.

PEI ASSOCIATES, INC.

MEMORANDUM

TO: Craig MacPhee

DATE: 8/4/89
Revised: 8/14/89

SUBJECT: Trip report: Corpus Christi Army Depot
Contract No. DAAA15-88-D-0001
Task Order No. 0004

FROM: Jeff Davis
Fred Hall
Bob Ressl

FILE: 3769-4

CC: Bob Hoye
Dick Gerstle

PEI personnel participated in meetings and a tour of the facilities at the Corpus Christi Army Depot (CCAD) on July 15 - 16, 1989. CCAD is located in the city of Corpus Christi, Texas, on the Gulf of Mexico. PEI personnel present were Fred Hall, Bob Ressl, and Jeff Davis.

The purpose of this visit was to acquire information on the operations at CCAD that are relevant to the referenced task order. Specifically, information on VOC emissions, plastic media blasting (PMB), chemical paint strippers, degreasing, and generation of metals-contaminated sludges was sought. This is one of a series of visits to eight depots being made to acquire comparable data on these topics. In the near future, USATHAMA will use this information to select and define research projects that will be conducted by PEI under this task.

Our primary contact at CCAD was Jim Holiday. In addition, we met with Raphael Leal, Onecimo Vilarreal, and Vic Verma. At each of the various buildings and areas inspected, we also met with the manager or supervisor of those areas.

The purpose of this trip report is to document the information obtained during the site visit. The trip report is presented in eight sections to address pertinent topics included in the scope of work of Task Order No. 0004. These sections are: Background, VOC Emissions and Paint Operations, Blasting Operations, Alternate Chemical Strippers, Alternate Degreasers, Electroplating Operations and Metal-Contaminated Sludges, Other Areas of Interest, and Conclusions/Recommendations.

BACKGROUND

CCAD employs approximately 4,100 people, and its primary mission is to repair, overhaul, and maintain helicopters. The work load at the depot is approximately 45 helicopters a month. CCAD is the only Army aeronautical overhaul and repair facility. The depot occupies 188 acres of the Corpus Christi Naval Air Station. CCAD is a tenant, and the Navy communicates with all outside agencies, including environmental agencies such as EPA and the Texas Air Control Board (TACB). The Navy possesses all permits (RCRA, NPDES) and prepares all hazardous waste manifests.

The Army operates the hazardous waste storage area; approximately 95 percent of the hazardous waste results from CCAD operations. Waste disposal is through DRMO; CCAD prepares an internal tracking form for hazardous waste and the Navy prepares the required permits. CCAD does not currently pay for waste disposal, but will in the near future. The baseline data for hazardous waste generation rates are provided in the attachments to this trip report.

CCAD personnel are very interested in opportunities for hazardous waste minimization. A recent HAZMIN study lists several potential projects that personnel believe would result in waste reduction. Sections of this plan, which includes hazardous waste generation rates, have been included in the attachments to this report. Some of these projects have been funded, but CCAD personnel do not have the time to implement them by preparing the required economic analyses, writing specifications, and obtaining bids.

The following is a summary of the buildings visited and a brief overview of the processes conducted in each building.

- Building 315: Machine Shop
- Building 104: Engine Cleaning Shop
    - — Paint stripping (ortho-dichlorobenzene)
    - — Carbon removal, descaling (potassium permanganate, alkaline cleaners)
    - — Vapor degreasing
    - — PMB in glove boxes
- Plating shop
- General cleaning shop
    - — paint stripping
    - — alodining
    - — vapor degreasing
    - — 4 new booths for steam cleaning, paint stripping, and brush-on alodining
- Building 44
    - — New PMB booth
- National Chemical on-site trailer
    - — Testing detackifying agents

VOC EMISSIONS AND PAINTING OPERATIONS

Coating aircraft is exempt from current VOC regulations, and therefore CCAD personnel are not under regulatory pressure to reduce VOC emissions. Sources of VOCs include 6 paint shops, vapor degreasers using 1,1,1-trichloroethane and PD-680, and methylene chloride stripping operations. The largest source of VOCs is the methylene chloride stripping operations, which will be largely replaced by a new plastic media blasting booth.

CCAD uses two-component CARC and epoxy paints. CARC is lead and chromium free, but the epoxy primers, which are mandated by AVSCOM, contain both of these metals. All paint sludge and dust from painting operations is therefore hazardous waste.

Most painting is conducted in water-wash booths although some dry filters are also used. The water-wash booths are shut down periodically to clean out the sludge. The paint booths themselves are cleaned out once a quarter.

CCAD personnel are in the process of purchasing 14 hydrocyclone separators for $210,000. These units will separate the paint sludge from the water in the paint booths, thus decreasing the sludge volume and allowing reuse of the water. An economic analysis showed that the booths will pay for themselves in about 4 months. A detackifying agent from National Chemical will be used in conjunction with the cyclones to improve water/solids separation by precipitation and further reduce sludge volume. National Chemical has an on-site trailer because they have been contracted to treat cooling water. Several chemicals were tested for their effectiveness as detackifying agents. The one selected contains two chemicals, one that kills the paint and one that flocculates paint particles. Upon addition of some paint to a solution of this agent, the paint immediately turns to a powdery substance and settles. CCAD personnel are confident that the cyclone system and detackifying agent will work, and thus they will not conduct any pilot-scale testing before installation.

CCAD personnel have been in contact with Anniston Army Depot, which has been having troubles with its hydrocyclone systems. At Anniston, the paint has been plugging the cyclone orifices. Use of the agent developed by National Chemical may be able to solve this problem.

Paint booths are currently treated with caustic to maintain the pH at 9 - 11. Other additives are then added to make the paint either sink or float. In cases where the sludge is skimmed off the top, additives are added to float the paint. In cases where the paint sludge is collected in pits under paint booths, additives are added to sink the paint.

Building 1808 contains four down-draft, water-wash paint booths. The paint sludge is collected in a 7,500-gallon pit under the building and the water is recirculated. The sludge is cleaned from the pit once a year and is an expensive disposal problem. Personnel expressed interest in reducing the volume of the sludge that must be disposed.

BLASTING OPERATIONS

CCAD conducts abrasive blasting operations with aluminum oxide, glass beads, and Starbright, a synthetic low-silica media. In addition, a new plastic media blasting (PMB) booth has been installed in Building 44. All blast residue is a hazardous waste because some paints contain lead and chromium, and because some engine parts are plated with cadmium.

The new PMB booth in Building 44 was scheduled to be in full production by July, 1989. The booth will be used to blast thin aluminum, Kevlar, and fiberglass parts and personnel estimate that PMB will replace 70 percent of the methylene chloride operations. Methylene chloride will still be used because the blasting operation cannot reach all areas of a part. Blasting an aircraft door requires about 15 minutes while stripping with chemicals requires about 2 - 3 hours. After blasting, the parts are treated with phosphoric acid and a chromate conversion coating, so corrosion removal during blasting is not an issue

The new PMB booth in Building 44 was manufactured by Maltby Tank and Barge, located in Everett, Washington, and measures 30 feet wide, 65 feet long, and 24 feet high. Up to 4 blasters can work in the booth simultaneously. The booth contains a cartridge type reverse pulse collection system that is computer controlled so that the recovery system can be activated on only one part of the booth. The screen size on the floor was designed too small, and CCAD personnel plan to replace it with a larger screen. The air circulation rate is designed at 125 linear feet per minute, and the nozzle pressure is designed at 30 psi. The media that has been used in the booth recycles about 10 times.

Overhead media is collected in a dust collector. Media on the bottom of the booth is sent to a cyclone separator. The fine media is transported to the dust collector, and the coarser media enters a magnetic seperator and a sequence of sieves. The spent media is collected in a drum for disposal and the reusable media is sent to the feed hopper.

CCAD personnel have had some difficulty in selecting an appropriate type of plastic media. They have tried several different media, and each time they have had to go through procurement. Each time a different media is selected, the entire system must be emptied of the old media. They have recently tried a Type 2 media, but are concerned that this may not meet the structural requirements for aircraft. They are purchasing 9,000 pounds of DuPont Type 5 to test. This media is thermoplastic, which the vendor reports can be remelted and recycled; however, this claim has not been demonstrated. Issues concerning media selection are addressed in the USATHAMA report titled "Demonstration Testing of Plastic Media Blasting at Letterkenny Army Depot," Arthur D. Little, Inc. December, 1988. Additional development may be required by CCAD to select a media that meets the depot's criteria. The Air Force has also studied the selection of media for use on aircraft; this information may be useful to CCAD personnel.

PMB in currently used in Building 104 in a glove box. The media is reused until it is pulverized, and is changed every day or two at the operator's discretion.

Some DOD agencies have been concerned that plastic media blasting could damage sensitive surfaces. CCAD personnel noted that in current chemical stripping, the paint is scraped off the aircraft after the chemical has been applied.. This scraping could potentially cause more damage to a surface than PMB, yet PMB is usually compared with stripping operations that use rinsing, which is much less aggressive than stripping followed by scraping.

ALTERNATE CHEMICAL STRIPPERS

Methylene chloride is widely used at CCAD to to remove paint. Dip tanks are used for small parts, and manual application is used for air frames. The dip tanks also contain isopropyl alcohol, and the solution that is brushed on consists of 70 percent methylene chloride, 15 percent acetic acid, and 15 percent formic acid. A new building has been constructed and contains two airframe stripping operations, a booth for brush-on alodining, and a booth for steam cleaning. The stripping booths are fitted with scrubbers having 22,000 cfm capacities.

The new PMB booth will replace approximately 70 percent of the methylene chloride operations. Some chemical stripping will still be used because the blasting operation cannot reach all areas of some parts.

Ortho-dichlorobenzene is also used in paint stripping tanks. These baths are contained in heated tanks approximately 6 x 6 x 7 feet, and are disposed every year and a half at a cost of approximately $0.5 million.

CCAD personnel are experimenting with an alternate paint stripper in a 50-gallon tank in the plating shop (details regarding this product will be ascertained later). This stripper could replace some ortho-dichlorobenzene and methylene chloride, thus reducing VOC emissions and improving worker safety.

Phosphoric acid is used for corrosion removal. Nitric acid and caustic are used as cleaning agents and are disposed after use as hazardous wastes. If in-tank neutralization is not considered treatment, then these two waste streams could be mixed. However, some personnel thought that in-tank neutralization would be considered treatment and would require a treatment permit. Any permits for this activity would be obtained through the Navy.

ALTERNATE DEGREASERS

CCAD conducts a lot of vapor degreasing with 1,1,1-trichloroethane and PD-680. A couple of distillation units on the depot have design and operating problems, and personnel are interested in the purchase of a new still. One still does not have a reboiler and recovers 10 percent of the solvent at best.

ELECTROPLATING OPERATIONS AND METAL-CONTAMINATED SLUDGES

A wide variety of cleaning and plating operations are conducted in the plating shop. Electroplating operations include the plating of cadmium, chromium, copper, silver, nickel, and tin. A cadmium line is maintained for large parts. Chromic acid tanks are used to apply a chromate conversion coating; these tanks are changed every 10 to 14 days. In addition to these plating operations, the plating shop uses vapor degreasing, a plastic coating compound, pumice followed by acid for cleaning, sulfuric acid as a metal activator, a chromium stripping operation, alkaline cleaning, phosphoric acid for corrosion removal, and potassium permanganate. Lines are segregated for aluminum, steel, and magnesium parts.

Drainage boards are placed between tanks, and parts are rinsed over process tanks. These two steps reduce the amount of drag-out carried to the next tank in line.

CCAD personnel have undertaken several efforts identified in the HAZMIN plan to minimize waste from electroplating operations. During our visit, ENCYCLE, a contractor, was sampling metal solutions to assess which can be taken off site and processed for metal reclamation. Personnel are interested in obtaining a chromium recovery unit for the alodining or plating rinses that removes impurities and oxidizes the trivalent chromium to hexavalent chromium, which can then be reused in the plating bath. CCAD also plans to install Flow-king filters, which uses a resin to remove organic and inorganic impurities. These latter two projects have been funded, but personnel do not have time to prepare the economic analysis, prepare specifications, and obtain bids. Personnel are also interested in nickel recovery. Some personnel suggested that using a tougher primer would eliminate the need for alodining for corrosion protection. About 500 gallons of rinse water per day are treated.

The treatment plant treats chromium and cyanide wastewater separately. The chromium wastewater is treated with sodium bisulfite, lime to precipitate metal hydroxides, flocculation, settling, and clarification. The cyanide wastewater is treated with chlorine oxidation of the cyanide, followed by precipitation of cadmium. The cadmium and chromium sludge are mixed in a sludge thickener tank, and then filter pressed as one sludge.

The Navy operates the pretreatment and treatment facilities on a 100 percent reimbursible basis, and the Army cannot change operations in the treatment system. The Navy charges $0.26 per pound for sludge disposal. CCAD personnel hope to get a new package pretreatment facility because the current plant is old. In 1987, a consultant hired to review the plant design and operation concluded that there were safety violations and recommended that the plant be repaired immediately. These repairs have not yet been implemented, and personnel indicated that the preferred short-term solution is the purchase of a new package unit. Personnel hope to achieve zero discharge of chromium and cadmium by 1995.

OTHER AREAS OF INTEREST

Personnel indicated an interest in aluminum ion vapor deposition as part of their continuing effort to reduce concentrations of cadmium sent to their wastewater treatment plant. They are also interested in sodium bicarbonate blasting.

CONCLUSIONS/RECOMMENDATIONS

The following list presents some potential HAZMIN projects on which USATHAMA could provide assistance to CCAD.

- Evaluate effectiveness of hydrocyclone paint removal system for potential technology transfer to other depots.
- Determine ways to minimize paint sludge in building 1808.
- Assist with evaluation of plastic media in the new PMB booth.
- Assess combining nitric acid and caustic tanks for neutralization.
- Evaluate substitutes for ortho-dichlorobenzene paint stripper.
- Assist in troubleshooting solvent distillation unit or purchasing new unit.
- Assist in implementing Flow-king filters in plating shop.

- Assist in implementing chromium recovery unit in plating shop or brush-on alodining booth.

- Evaluate whether alodining is necessary for sufficient corrosion protection.

- Transfer results of aluminum ion vapor deposition demonstration tests to CCAD. Assist with meeting requirements to obtain a unit.

CCAD's interests and needs will be compared to those of other depots that have been visited. CCAD personnel should be kept informed of the results of any testing relevant to their needs conducted under the current HAZMIN effort.

ATTACHMENTS

Documents obtained from CCAD

Hazardous Waste Minimization (HAZMIN) Plan, 1989 (Sections are attached)

Starblast Abrasive Sand Data Sheet

Diagram of the Pretreatment Plant (not attached)

1980 VOC Emission Inventory (not attached)

EPA Survey of Chlorinated Solvents Used at CCAD (not attached)

Evaluation of Airframes Stripping and Material Disposal Operation Under Mixture Rule (not attached)

MINERAL PRODUCTS

DATA SHEET

STARBLAST® ABRASIVE SAND

STARBLAST abrasive sand is a premium loose abrasive made from a blend of coarse and fine staurolite sands mined from Du Pont's Starke, Florida mineral deposits. The material is scrubbed and chemically washed to insure freedom from dirt, dust, and ultrafines. Staurolite grains are uniformly sized and have clean, rounded surfaces.

For abrasive blasting, *STARBLAST* offers:

- Lower labor costs
- Less dusting
- Better visibility
- Faster cleaning rates
- Uniform blast pattern
- Reusability

PHYSICAL AND CHEMICAL PROPERTIES

TABLE I
***STARBLAST* Abrasive Sand**

Typical Screen Analysis

U.S.A. Sieve No.*	Sieve Opening (µm)	% Retained on Sieve
40	420	3
50	300	11
70	212	19
100	150	45
140	106	17
200	75	3
270	53	< 1
PAN	< 53	< 1

Mineral Composition

	Typical %**
Staurolite Minerals	85
Titanium Minerals ($Fe_2Ti_2O_7$)	6
Kyanite (AL_2SiO_5)	2
Zircon ($ZrSiO_4$)	3
Quartz (Free Silica)	4***

Physical Properties

	Range
Bulk Density (Compacted)	143-148 lb/ft³ (2290-2370 kg/m³)
Bulk Density (Loose)	128 lb/ft³ (2080 kg/m³)
Specific Gravity	3.10-3.84
Hardness (MOHS)	6.5-7.0

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*U.S.A. Sieve Series according to ASTM E-11-70

**This column gives typical analyses based on historical production performance. Du Pont does not make any express or implied warranty that future production will demonstrate or continue to possess these typical properties.

***Guaranteed to contain less than 5.0% free silica.

®Reg. U.S. Pat. & T.M. Off., Du Pont Co

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DU PONT

TABLE III
Abrasive/Air Mixture*

	Test 1	Test 2
STARBLAST Used, lb (kg)	200 (90)	100 (45)
Blasting Time, min	6	6
Area Cleaned, ft^2 (m^2)	22.5 (2.1)	29 (2.7)
Cleaning Rate, ft^2/min (m^2/min)	3.75 (0.35)	4.8 (0.45)

In Test 2 the correct abrasive/air mixture was used as compared to Test 1 where the mixture valve was moved only slightly. Notice that 22% less area was cleaned while abrasive consumption doubled.

*Tests conducted at Du Pont Repauno Works, 8/1/71 using ¼" nozzle, and 70-80 p.s.i. nozzle pressure. However, use experience shows that *STARBLAST* is more efficient at nozzle pressures above 70-80 p.s.i.

- A superior uniform blast pattern, free from oily residue, free iron or significant amounts of silica dust can be achieved.
- Low dusting, which allows good visibility (especially in enclosed areas) and faster blasting.
- All of the reasons for choosing *STARBLAST* add up to a high value-in-use which means lower total blasting costs.

Table IV explains how to calculate value-in-use for your blast cleaning operations.

PERSONAL SAFETY

Du Pont *STARBLAST* abrasive sand, as shipped, does not pose any inhalation health hazard because it contains essentially no particles in the respirable size range. However, if during handling or use, the *STARBLAST* particles are broken down to a size that can be inhaled, the dusts may be harmful to the respiratory system.

Du Pont staurolite sand products may contain up to 5% crystalline silica (quartz). Long-term overexposure to respirable crystalline silica may cause silicosis.

The U.S. Department of Labor (OSHA) has ruled (29 CFR 1910.1000 air contaminants)* that an employee's exposure to mineral dusts containing quartz shall not exceed limits calculated by the following formulas:

$$\text{Respirable dust} = \frac{10\ mg/m^3}{\%\ quartz + 2} \text{ or total dust} = \frac{30\ mg/m^3}{\%\ quartz + 2}$$

When these limits might be exceeded, employees should wear dust masks or respirators approved by NIOSH for such dusts.

PACKAGES

STARBLAST abrasive sand is available in 100-lb (45.4-kg) multiwall paper bags and in bulk carloads and truckloads. Department of Transportation (DOT) Hazard Classification: Not Regulated.

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*Due to changing governmental regulations such as those of the Department of Transportation, Department of Labor, U.S. Environmental Protection Agency and the Food and Drug Administration, references herein to governmental requirements may be superseded. Each user should consult and follow the current governmental regulations, such as Hazard Classifications, Labeling, Food Use Clearances, Worker Exposure Limitations and Waste Disposal Procedures for the products described in this literature.

TABLE IV
How to Calculate Value-In-Use

The blast cleaning cost per square foot (sq. meter) is defined by the following equation:

$$\text{Cleaning Costs } (\$/ft^2 \text{ or } m^2) = \frac{(AX + B + C)}{YR}$$

where

A = Abrasive flow rate, ton/hr (metric ton/hr)

B = Compressor costs, $/hr

C = Labor costs, $/hr

X = Delivered price of abrasive, $/ton ($/metric ton)

Y = Abrasive cleaning rate, ft^2/hr (m^2/hr)

R = Adjustment for degree of cleaning

Based on approximate relative cleaning rates, the adjustment for degree of cleaning is as follows:

	R
white metal	1.00
near-white metal	1.75
commercial	3.70
brush-off	8.70

E. I. du Pont de Nemours & Co. (Inc.)
Wilmington, Delaware 19898

U.S. Sales and Services

For placing orders or requesting additional product information, please use our convenient 24-hour toll-free telephone number. If you prefer, you can write to us.

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In Delaware
(302) 774-2099

By Mail

E. I. du Pont de Nemours & Co. (Inc.)
Chemicals and Pigments Dept.
Customer Service Center
Wilmington, DE 19898

New Downflo™ Cartridge Collector

Unique design permits high filter rates at reduced pressure drop.

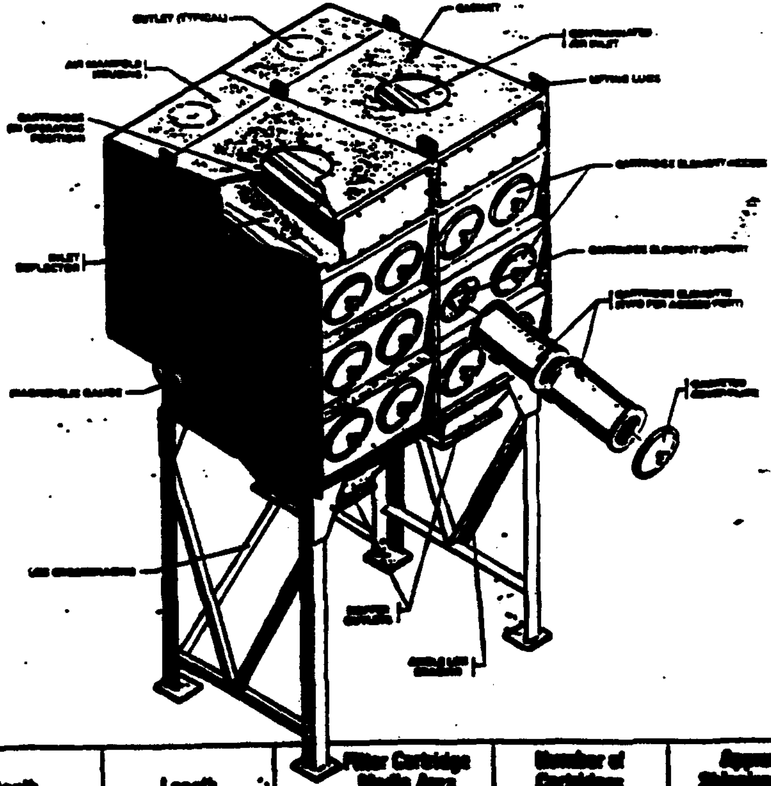
In normal reverse pulse jet collector operation, air enters the hopper at the base and flows upward. When bags or cartridges are pulse jet cleaned, some of the dislodged dust is re-entrained resulting in reduced cleaning and filtering efficiency. New Downflo design, however, reverses the direction of airflow. The air inlet is located at the top of the unit, taking advantage of airflow direction and gravity to assist in forcing dislodged dust directly into the collector hopper below. Those applications having high filtration velocity and fine particulate will be especially benefited by lower operating pressure drop and much cleaner filters without sacrificing efficiency.

Compact, modular design

Torit has available a number of factory-assembled modules to meet varying space and filter capacity requirements. For those areas with low headroom, specify modules two elements high (8 elements/module). Where floor space is at a premium and headroom is not a consideration, specify modules either three high (12 elements/module) or four high (16 elements/module). A typical Downflo unit can save as much as 40 percent in valuable floor space and from one to three feet in height when compared to standard collectors of the same capacity.

Easy to maintain

Personnel can service two-element high modules without the need for walkways or platforms—a benefit of Downflo's unique front cartridge removal design. Three- and four-high units are easily accessible from a short platform or scaffold. Access to cartridges is gained through access portholes. To expose the cartridges, simply unscrew the knob/handle and remove the door. Personnel can slide cartridges directly into plastic bags as they are removed from the collector, providing additional protection for maintenance personnel. Workers are always on the exterior in uncontaminated air and away from possible hazardous conditions. Units employing exterior walkways can be supplied with a weather enclosure as an option.



Model*	Height	Depth	Length	Filter Cartridge Media Area	Number of Cartridges	Approx. Shipping Wt.
2DF8	124⅞"	85¼"	40"	1808 sq. ft.	8	[illegible] lbs.
2DF12	124⅞"	85¼"	58⅝"	2712 sq. ft.	12	[illegible] lbs.
2DF16	124⅞"	85¼"	80"	3616 sq. ft.	16	[illegible] lbs.
✱ 3DF24	143½"	85¼"	80"	5424 sq. ft.	✱ 24	3730 lbs.
4DF32	162⅛"	85¼"	80"	7232 sq. ft.	32	4470 lbs.
3DF36	143½"	85¼"	120"	8136 sq. ft.	36	[illegible] lbs.
4DF48	162⅛"	85¼"	120"	10848 sq. ft.	48	[illegible] lbs.
3DF60	143½"	85¼"	200"	13560 sq. ft.	60	[illegible] lbs.
3DF72	143½"	85¼"	240"	16272 sq. ft.	72	[illegible] lbs.
4DF80	162⅛"	85¼"	200"	18080 sq. ft.	80	10170 lbs.

Larger units available. Consult your sales representative.

*First part of model number indicates number of vertical rows of filter cartridges. [illegible]

WHERE TO USE *STARBLAST*

This unique mineral abrasive is especially valuable in removing mill scale and light rust from metal, paint films, and for cleaning dirt and stains from masonry surfaces.

White metal finish, which is difficult to achieve with many abrasives, is readily achieved with *STARBLAST*. Near white, commercial, or brush-off finishes are also easily achieved by working faster or using a greater nozzle-to-work distance.

STARBLAST is often chosen to clean critical equipment such as pipe destined for hydraulic use. Here the rounded grains of the product eliminate the problem of abrasive embedding in the metal and later coming loose and creating problems. It is also chosen by some power companies for maintenance work where critical equipment such as electric motors cannot tolerate exposure to large volumes of dust.

HOW TO USE *STARBLAST*

STARBLAST will work in all air-blast equipment designed for loose abrasives, but generally at a much leaner abrasive/air ratio. Normally, it is better to feed too little *STARBLAST* than too much. The correct amount of feed can be obtained by starting the blasting operation with the abrasive feed valve in the closed position then slowly opening until the abrasive stream is just visible. At this point, the feed valve is slowly closed until the abrasive stream can no longer be seen. The proper abrasive/air mixture has now been obtained and blasting can begin *(Table II shows the relationship of air volume to nozzle diameter.)*

TABLE II
Relationship of Air Volume to Nozzle Diameter
CFM (ft³/min) as a Function of Nozzle Diameter and Nozzle Pressure

Nozzle Diameter (Inches)	Nozzle Pressure (psi) 30 CFM	40 CFM	50 CFM	60 CFM	70 CFM	80 CFM	90 CFM	100 CFM
1/8	8	10	11	13	15	17	18.5	20
3/16	18	22	26	30	33	38	41	45
1/4	34	41	47	54	61	68	74	81
5/16	53	65	77	89	101	113	126	137
3/8	76	91	108	126	143	161	173	196
7/16	100	124	147	170	194	217	240	254
1/2	137	165	195	224	252	280	309	338
5/8	212	250	308	356	404	452	504	548
3/4	304	364	432	504	572	644	712	784

1 To protect the compressor, allow intermittent operation by using only 70% to 80% of its rated output.

2 Pressure drops as hose length increases, and more air volume is needed to run a given nozzle at a desired pressure. Use hypodermic gauges to find nozzle pressures.

STARBLAST can make a good blast operation even better but cannot produce maximum value if poor blasting practices such as low air pressure, incorrectly sized *or worn nozzles are used, or if the proper abrasive feed* rate cannot be maintained. The correct abrasive/air mixture is always important when using any loose abrasive but is extremely so when using premium abrasives such as *STARBLAST*.

Table III shows the results of a test where *STARBLAST* was used to clean rust from a steel pressure vessel using two different abrasive/air mixtures. The cleaning rate was measured at each setting, and, the feed valve *was moved only slightly* to cause the large change in abrasive consumption.

WHY CHOOSE *STARBLAST*

There are many good reasons for selecting *STARBLAST*:

- Blasting time is reduced because its clean, dense, rounded grains give fast cleaning action.
- Handling costs are lower because its high bulk density permits the equipment to be loaded with more abrasive.
- Clean-up time is reduced due to low dusting, minimum ricochet, and less material to pickup because less is required to do the job.
- Flow properties are good, as it contains no lumps or slivers commonly found in boiler slags and low priced silica sands.

CORPUS CHRISTI ARMY DEPOT

AIR QUALITY MANAGEMENT AND CONTROL PLAN

PHASE II

REPORT OF FINDINGS

15-05-3751

VOLUME 2 OF 4

APPENDIX A-B

PERFORMED THROUGH CONTRACT DAAA 21-87-R-160

WITH PLANT BASE MODERNIZATION ACTIVITY (PBMA)

OF THE ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER (ARDEC)

CORPUS CHRISTI ARMY DEPOT
HAZARDOUS WASTE MINIMIZATION
(HAZMIN)
PLAN

1989

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APPENDIX A
CCAD HW GENERATION BASELINE DATA

PROCESS OR OPERATION	HAZARDOUS WASTE TYPE			HAZARDOUS WASTE GENERATED	
	TWC	TYPE	EPA CODE	KG/YR	KG/YR/UNIT
CLEANING					
TRICHLOROETHANE	012	4,5,8	D006,7 F001,3	67,466	.64
ALKALINE PERMANGANATE	019	2	D002	15,824	.15
SODIUM HYDROXIDE	027	2	D002,7	38,856	.37
DRY CLEANING SOLVENT	033	1,5	D001, F002,3	96,909	.92
DRY CLEANING SOLVENT (N-R)	060	N/A	N/A	45,922	.44
CLEANING TOTAL				264,977	2.53
PAINT STRIPPING					
PAINT THINNER SLUDGE	035	2,4,5	D002,6,7,8,10,F002	17,716	.17
GLASS BEADS	051	4	D006,7	52,122	.49
PAINT RMVR STRIP	054	4	D002,6,7,8	36,058	.34
CAD STRIP SOL	061	4	D006,7,8	3,157	.03
PAINT STRIPPING, TOTAL				**109,053**	**1.04**
PLATING					
CHROMIC ACID	018	2	D002,6,7	92,078	.88
CYANIDE BEARING WASTES	021	3	D003,F007	(NPDES)	
POTASSIUM CYANIDE	022	3	F007,D068	(NPDES)	
COPPER CYANIDE	023	3	F007,D029	(NPDES)	

APPENDIX H
CCAD HW GENERATION BASELINE DATA (continued)

PROCESS OR OPERATION	HAZARDOUS WASTE TYPE			HAZARDOUS WASTE GENERATED	
	TWC	TYPE	EPA CODE	KG/YR	KG/YR/UNIT
ALODINE	028	2	D002	(NPDES)	
ACIDS, SPENT	048	2	D002	472	.005
PLATING BATH SOLUTIONS	062	4,5	D004,6,8,9 10,F006	2,681	.03
CHROMIUM CONT. SOLIDS (Fume Scrubber)	036	3,4	D007,F007	6,811	.07
PLATING, TOTAL				102,042	.97
EQUIPMENT MAINTENANCE					
OIL WASTE PETROLEUM	008	N/A	N/A	26,600	.25
OIL WASTE SYNTHETIC	016	N/A	N/A	46,374	.44
EQUIPMENT MAINTENANCE, TOTAL				72,974	.696
I.W. TREATMENT					
HEAVY METAL BEARING SLUDGE	002	4	D006,7,8, 11	107,708	1.02
CHROMATE BEARING SLUDGE	009	4	D006,7,8, 11	6,551	.06
		8,5	F006,9		
CYANIDE SLUDGE, ALKALINE	010	8,5	F007,8, P030	NPDES	
TREATMENT, TOTAL				114,259	1.09

APPENDIX B
CCAD HW GENERATION BASELINE DATA (continued)

PROCESS OR OPERATION	HAZARDOUS WASTE TYPE			HAZARDOUS WASTE GENERATED	
	TWC	TYPE	EPA CODE	KG/YR	KG/YR/UNIT
PAINTING					
PAINT WASTES, LIQUID	005	4,5 8	D007,8,9, 10,11 F003	N/A	.31
PAINT WASTE, SOLID	038	4 8,5	D007,8,9, 10,11 F003,D001	32,807	
PAINT, TOTAL				32,807	.313
OTHER					
PASSIVATION					
ACID, NITRIC HNO3	045	2	D002,6,7,8	6,242	.06
ANALYTICAL					
DIESTER SYNTHETIC	037	4	D006,7,8	6,020	.06
METAL WORKING					
CUTTING OIL/EMULSION COOLANT	044	4	D006	21,499	.20
OTHER, TOTAL				33,761	.322
DEFUELING, TOTAL				16,253	.15
HAZARDOUS WASTE, TOTAL				746,099	7.12

CCAD HAZARDOUS WASTE GENERATED IN CALENDAR YEAR 1988

WASTE DESCRIPTION	PERCENT REDUCTION	QUANTITY GENERATED IN CY	
		1988	1985
		(IN KILOGRAMS PER YEAR)	
PAINTING			
Paint Waste Liquid		113,092	0
Paint Waste Solid		6,220	32,807
TOTAL	-263.7	119,312	32,807
OTHER			
Passivation (Nitric Acid)		6,054	6,242
Analytical (Diester Synthetic)		786	6,020
TOTAL	44.2	6,840	12,262
METAL WORKING			
Coolant		11,817	21,499
TOTAL	45.0	11,817	21,499
DEFUELING			
Fuel		291	16,253
TOTAL	98.2	291	16,253
TOTALS	-7.6	803,073	746,099

APPENDIX H

CCAD HAZARDOUS WASTE GENERATED IN CALENDAR YEAR 1988

WASTE DESCRIPTION	PERCENT REDUCTION	QUANTITY GENERATED IN CY 1988	1985
		(IN KILOGRAMS PER YEAR)	
CLEANING			
Trichloroethane		38,550	67,466
Alkaline Permanganate		0	15,824
Sodium Hydroxide		14,724	38,856
Dry Cleaning Solvent		18,684	96,909
Freon		8,256	0
Chlorinated Solvent Bottoms		0	0
TOTAL	69.7	80,214	264,977
PAINT STRIPPING			
Paint Thinner Sludge		47,436	17,716
Glass Beads		107,371	52,122
Paint Remover Stripper		472	36,058
Cadmium Stripper Solution		3,438	3,157
TOTAL	-45.5	158,717	109,053
PLATING			
Chromic Acid		53,017	92,078
Cyanide Waste		1,028	0
Potassium Cyanide		0	0
Copper Cyanide		0	0
Alodine		183,998	0
Spent Acid		9,512	472
Plating Bath Solution		16,123	2,681
Chrome Containing Solids		182	6,811
TOTAL	-158.6	263,860	102,042
EQUIPMENT MAINTENANCE			
Petroleum Oil		5,552	26,600
Synthetic Oil		29,164	46,374
TOTAL	52.4	34,716	72,974
INDUSTRIAL WASTE TREATMENT			
Heavy Metal Sludge		0	107,708
Chrome Sludge		127,306	6,551
Alkaline Cyanide Sludge		0	0
TOTAL	-11.4	127,306	114,259

HAZMIN PLAN 1989

1. PURPOSE

The purpose of the Corpus christi Army Depot (CCAD) HAZMIN plan is to provide a plan of action to reduce the quantity and toxicity of Hazardous Waste (HW) generated at CCAD.

2. SCOPE

This plan covers all Resource Conservation and Recovery Act (RCRA) regulated HW which are generated at CCAD. Quantities of hazardous waste generated in calendar year 1985, provided at appendix A, are used as the baseline. Generation of zero hazardous waste is the ultimate objective.

3. BACKGROUND

a. History: CCAD opened in 1961 as the U.S. Army Aeronautical Depot Maintenance Center (ARADMAC) with a mission of fixed wing aircraft overhaul. ARADMAC became CCAD in 1974. Employee strengths as of January 1989 were about 4060 civilian and 29 military personnel.

b. Mission: CCAD's mission is to perform overhaul, repair, modification, retrofit, and modernization of aircraft systems and other systems as assigned; to maintain a mobilization and training base to provide capability for mission support during any contingency; to perform receipt, storage inventory, preservation/packaging, issue, and shipping of depot (retail) and mission (wholesale) supplies associated with the total CCAD aeronautical depot maintenance mission; to provide maintenance support services for aeronautical equipment worldwide; to provide project development and design service for special projects as assigned and to exercise command and control over assigned activities; to provide for worldwide telephone hotline and on-site technical assistance in the inspection, maintenance, and repair of customer aircraft and engines; and to provide for integrated logistics support for aeronautical weapon systems through the development and maintenance of technical publications.

c. Industrial Waste Generation, Collection, and Control: The primary waste generating industrial processes include electroplating, paint stripping, painting, defueling, solvent cleaning, and metal working operations. An Industrial Waste Collection System collects and transports nonhazardous rinse water and diluted water to the Industrial Wastewater Treatment Plant (IWTP). The Industrial Wastewater Pretreatment (IWPTP) accomplishes cyanide destruction, heavy metal reduction, and some acid/caustic neutralization of plating waste water prior to discharge to the main IWTP. Since hazardous wastes can not be treated on the base because of the RCRA permit issued to the host Navy, these are either reclaimed or turned in to DRMO for off-site disposal. The Industrial Waste Management Section (IWMS), Depot Equipment Division, Directorate of Engineering and Logistics collects and stores wastes in either conforming or temporary storage sites and operates a conforming waste conformance. Careful control of the type and quantity of hazardous materials introduced into the production processes at CCAD is an essential element of minimizing the volume and toxicity of hazardous waste generated. CCAD Regulation 700-16, Control of Chemicals and Process Solutions, is the local mechanism for controlling chemical purchase and use. Accumulation, labelling, and disposal of industrial wastes are accomplished in accordance with the host Navy's instructions and the Hazardous Waste Management Plan (HWMP), which is prepared by the host Navy and supplemented by the depot's Joint Production Instruction 88-016, Satellite Waste Accumulation Area Management. Chemicals and processess at CCAD are continuously evaluated to enhance production, improve quality, encourage safety, and minimize CCAD's impact on the environment.

4. GOALS

The depot initiated intensive waste minimization efforts on or about 1985 and established CCAD hazardous waste baseline data, provided at appendix A. The listed goals for 1992 meet or exceed those directed by HQ, Army Materiel Command (AMC). Interim annual goals are listed belo

ANNUAL HAZARDOUS WASTE MINIMIZATION GOALS

	% HW REDUCTION FROM BASELINE IN CY			
PROCESS	1989	1990	1991	1992
ELECTROPLATING	30	40	50	50
PAINT STRIPPING	50	60	60	60
PAINTING	5	15	25	50
CLEANING/DEGREASING	20	40	40	40
METAL WORKING	20	25	35	70
FUELING OPERATION	80	80	85	85

WASTE TREATMENT SLUDGE	20	20	25	70
PRODUCTION EQUIP MAINT	25	30	30	75
TOTALS	26.8	38.6	41.1	53.9

5. PROGRAM MANAGEMENT

a. **The Host Installation's Responsibilities:** Appendix B shows the host Navy's current environment program organization. The Naval Air Station Public Works Department is responsible for overall program management. Navy's significant responsibilities as related with the hazardous waste management program are as follows:

(1) Obtain permit(s) as required. The host installation is a permit holder.

(2) Define roles and responsibilities for program management, establish procedures, and administer overall hazardous waste management program.

(3) Update hazardous waste management plan, and issue supplemental instructions and guidance for proper program management.

(4) Communicate with regulatory agencies and apprise CCAD of changes in regulatory requirements.

(6) Operate and maintain the industrial waste treatment plant (IWTP), the industrial wastewater pretreatment plant (IWPTP), and the industrial waste collection system which includes industrial waste drains, sanitary drains, storm water drains, lift stations, and grease traps.

(7) Accomplish waste analyses and maintain an Approved Waste List (AWL). The Navy accomplishes waste analyses through contractor services. No waste is processed or disposed off unless it is included in the AWL.

b. **CCAD's Responsibilities:** Appendix C shows depot's current environment program organization. As a tenant of the Naval Air Station Corpus Christi (NASCORPC), CCAD manages its hazardous waste (HW) program in accordance with the NASCORPC HWMP, and it is a participating member of the NASCORPC Environmental Task Force. Because of a tenant status, depot does not have the installation hazardous waste management board. However, the depot has established an Environmental Committee whose organization and responsibilities are shown in appendix D. The Chief, Facilities Engineering Division, Directorate of Engineering and Logistics, is responsible for administering the environmental program management. The Engineering Plans and Services Branch, Facilities Engineering Division, serves as a focal point of contact for the depot, interprets instructions and guidance from the host installation and the Army's higher headquarters, and administers the Hazardous Waste Minimization (HAZMIN) program. The Industrial Waste Management Section (IWMS), Building, Grounds, Utilities, and Industrial Waste Branch, Facilities Engineering Division, is responsible for resource conservation, spill response, collection of, handling, storage, and on-site transfer of hazardous waste.

c. Waste Generating Activities. Waste generating activities at CCAD are listed below:

ELECTROPLATING - Directorate of Maintenance

PAINT STRIPPING - Directorate of Maintenance

PAINTING - Directorates of Maintenance and Supply

CLEANING/DEGREASING - Directorates of Maintenance and Supply

DEFUELING/FUELING - Directorates of Maintenance and Supply

Metal Working - Directorates of Maintenance

WASTE TREATMENT - Directorate of Engineering and Logistics

EQUIPMENT MAINTENANCE - Directorate of Engineering and Logistics

ANALYTICAL SAMPLES - Directorate of Quality Assurance

6. TRAINING

Formal and on-the job training is a method of ensuring that personnel at the various levels of hazardous materials and waste management are provided the opportunity to become proficient and to perform assigned duties in a safe and environmentally sound manner. CCAD Regulation 200-1 is being revised. The draft revision, provided at appendix E, prescribes roles and responsibilities for the CCAD Environmental Training Program.

7. HAZMIN ACTIONS

a. HAZMIN Accomplishments: CCAD has taken several waste minimization initiatives which are described in the CCAD Plan of

Action toward "0" Generation of Hazardous Waste, provided at appendix F. Significant accomplishments at CCAD are listed below:

(1) Developed Approved Chemical List.

(2) Source segregation at defueling operations.

(3) Discontinued use of phenolic solvents.

(4) Plastic media bead blasting operations (Estimated date of completion is July 1989).

(5) Prolonged shelf-life of orthodichlorobenzene.

(6) On-site solvent recovery units. However, these units are not operational due to technical difficulties.

(7) Cadmium purification (Completed in 1987).

(8) Phase I of waste characterization study (Completed in 1988).

(9) Developed Approved Waste List (AWL). Waste must be included in AWL before it can be picked up, accumulated, processed or disposed of.

(10) Positive actions to improve visibility of the HAZMIN program at the depot are proposed through a draft revision to CCAD Regulation 200-1.

b. Current HAZMIN Projects: A list of current HAZMIN projects is provided below:

PROJECT	COST, $ (Thousands)	FUNDED/ UNFUNDED	BUDGET YEAR
PLATING			
Chromium oxidation and recovery	110.0	u	1989
High speed chrome plating	18.0	u	1989
Flowking Filter System	20.0	u	1989
Ion vapor deposition of aluminium	900.0	u	1989
PAINTING			
Paint booth sludge removal system	195.0	u	1989

Paint solvent recovery system	80.0	u	1989
PAINT STRIPPING			
Plastic media bead blasting	804.0	f	1987
CLEANING/DEGREASING			
Ultrasonic cleaning for generators/ alternators	23.0	u	1989
METAL WORKING			
Oil reclamation	24.0	u	1989
waste compacter	10.0	u	1989
MISCELLANEOUS			
Waste characterization study, phase II	626.0	f	1989
Waste Characterization study, phase III	100.0	u	1990
Hazardous material/waste software	20.0	u	1989

B. HAZMIN REPORTS

a. Baseline Data. Quantities of hazardous waste generated at CCAD in calendar year 1985, appendix A, are used as the baseline. Generation of zero hazardous waste is the ultimate objective.

b. HAZMIN Report for Calendar Year 1988: Information on quantities of hazardous waste generated at CCAD in calendar year 1989 is provided at appendix H.

c. Semiannual HAZMIN Report: The next report will be filed in July 1989.

APPENDIX F

CCAD Plan of Action Toward "O" Generation of Hazardous Waste

1.0 PURPOSE

The purpose of the Corpus Christi Army Depot (CCAD) Plan of Action Toward "O" Generation of hazardous Waste is to outline goal-directed efforts to achieve a 50 percent source reduction of the quantity of hazardous wastes generated at CCAD by 31 December 1992. Quantities of hazardous waste generated in calendar year 1985 are used as the baseline. Generation of zero hazardous waste is the ultimate objective.

2.0 SCOPE

This plan compliments the CCAD Hazardous Waste Minimization (HAZMIN) plan. It identifies targets of opportunities such as source reduction and end-of-the pipe treatment which are being and will be pursued to achieve program objectives. The principal focus will be to reduce hazardous waste before it is generated.

3.0 GENERAL

The Naval Air Station Corpus Christi (NASCORPC) serves as the host installation and manages permitting, communication with regulatory agencies, and overall management of hazardous material/waste disposal actions. CCAD is a tenant and, therefore, must comply with requirements and instructions issued by the host installation. CCAD prepares the HAZMIN plan in accordance with criteria set by Army headquarters and submits it to the host Navy for inclusion in the NASCORPC Installation Hazardous Waste Minimization Plan.

4.0 ARMY POLICY

It is the Army's policy that the generation of hazardous waste by Army activities is a short-term and long-term liability in terms of costs, environmental damage and mission performance. Accordingly, the Army shall act to reduce the quantity or volume and toxicity of hazardous wastes generated by Army operations and activities wherever it is economically practicable. Emphasis will be placed on source reduction methods. When source reduction is not feasible or economically practicable, the Army shall promote recycling, on-site treatment and other alternatives to reduce the quantity or volume and toxicity of hazardous wastes requiring land disposal.

5.0 CCAD HAZMIN STRATEGIES

a. Support to the host Navy. CCAD will continue to support the host Navy's hazardous waste management program. Specifically, CCAD will manage its hazardous waste operations in accordance with the NASCORPC Hazardous Waste Management Plan, comply with all instructions from the base Commander to the depot Commander, provide requested input to Navy's reports, participate in the NASCORPC Environmental Task Force, and utilize Navy environmental training services.

ENCLOSURE 2

b. Existing efforts.

CCAD's HAZMIN effort can be grouped in the following strategies:

(1) **Proper hazardous waste identification.** Improving our knowledge of the composition of our wastes at the point of generation will allow us to separate hazardous wastes from non-hazardous wastes. CCAD procured consultant services through the Production Base Modernization Activity to fingerprint all waste streams. Phase I, successfully completed in September 1988 provided a qualitative characterization, identified location, and discussed the current disposition of all the waste streams emanating from approximately 100 operations. Phase II, a quantitative assessment of all waste streams, will be completed in March 1989. Finally, Phase III, which is currently unfunded, will result in the depot's Hazardous Waste Management Plan and identification of HAZMIN opportunities.

(2) **Hazardous material/waste tracking system.** By tracking hazardous materials and wastes (HM/W), we will be able to avoid hazardous wastes and manage hazardous wastes from "conception-to-grave" in lieu of "cradle-to-grave". Avoidance of hazardous waste is based on the principle that hazardous wastes come from the use of hazardous materials, and that this use - where vital to the continued performance of the installation mission - may be continued, but reduced greatly without compromising that mission. CCAD became a "pilot" facility in September 88 for the development and implementation of a HM/W Tracking System Using Bar Code Technology managed by the U. S. Army Corps of Engineers' Coastal Engineering Research Laboratory.

(3) **Off-site reclamation.** We are pursuing a joint venture with Encycle/Texas, Inc., who has a local waste storage and processing facility recently permitted by the State of Texas for resource recovery, to recycle metal plating solutions, waste treatment plant sludges, and other wastes. Our wastes are raw materials for Encycle/Texas, Inc.

(4) **Hazardous materials control.** CCAD Regulation 700-16 is the local mechanism for controlling chemical purchase and use. Shops can use only those chemicals which are authorized and listed in the Approved Chemical List.

(5) **Technology transfer.** We are implementing Plastic Media Bead Blasting (PMBB) which is the state-of-the-art technology for substitution for chemical stripping of paint. Depot is modernizing itself under the "READY 2000" program.

(6) **Recycle and reuse.** Two distillation units for versol and 1,1,1 - trichloroethane were constructed in FY 88 but are not fully operational due to several technical difficulties. Once the stills are operational, versol and trichloroethane will be distilled and reused on-site; only the still bottoms will be disposed off-site. Recycle in this manner not only minimizes waste, but also reduces the quantity of raw materials purchased.

(7) **Extend shelf-life of chemicals.** Process Standards are evaluated and chemical analysis of solution performed to lengthen the lives of process solutions. Increase in life of orthodichlorobenzene solution in 1982 resulted in substantial savings by not generating waste.

(8) **Delisting.** Sludge in industrial sludge drying beds in the industrial wastewater treatment plant (IWTP) is non-hazardous and delisting of this waste should significantly improve our HAZMIN program. The host installation has responsibility for delisting.

(9) **Segregation of hazardous wastes.** Enforcement of source segregation prevents commingling of hazardous wastes with non-hazardous waste This minimizes quantity of hazardous wastes generated, avoids unnecessary analysis of commingled wastes before disposal, and improves quality of oils and solvents for recycling and reuse.

(10) **Onsite treatment of hazardous wastes.** A sludge filter press in the Industrial Wastewater Pretreatment Plant (IWPT) reduces the volume of hazardous waste sludge tremendously by squeezing out excess water. The IWPTF is being upgraded to improve efficiency and capacity and to allow on-site neutralization.

(11) **Hazardous material substitution.** We replaced phenolic solvents by less hazardous methylene chloride based strippers. Our goal is to balance the degree of health and environmental hazard, the volume required, and the quantity and treatability of any wastes produced.

(12) **Containment of hazardous materials/wastes.** A 250,000 gallons spill containment tank at IWTP is installed to isolate high and low pH and toxic waste flows, and feed back to the biological plant at acceptable rates. Shops have spill kits for containment of spills.

(13) **Employee suggestions.** Employees are encouraged to suggest hazardous waste minimization projects. An employee suggestion on waste compactor is being implemented.

(14) **Employee training.** Formal and on-the-job training ensures that personnel at the various levels of hazardous material and waste management become aware of the HAZMIN program and perform assigned duties in a safe and environmentally sound manner. A one hour awareness training was given to shop personnel in the last year and, as a result of this training, fewer spills and better source segregation were accomplished.

c. **Near-term effort.**

Near-term effort refers to those efforts which will result in achieving a 50 percent source reduction of the quantity of hazardous wastes generated by 31 December 1992, when compared to a baseline of calendar year 1985. In addition to the ongoing efforts listed in paragraph 5b above, our plan is to take the following steps:

(1) **Approval of hazardous materials.** New chemicals will be tested on a limited basis to determine their suitability to CCAD processes and to determine environmental impact. Procurement process will include consideration of economic analysis that adds the cost of disposal to the cost

of purchase at the time of procurement and an environmental impact assessment. Changes in chemical brands or vendors will not be permitted during a fiscal year unless such a change improves HAZMIN program. Testing will be completed by 31 May to allow time for finalizing procurement process to receive shipment in the new fiscal year.

(2) Implement HQDESCOM's essential strategies for success of the HAZMIN program. We concur with HQDESCOM's new program approach to HAZMIN, provided in MG McGrath's memorandum dated 17 Oct 88. As indicated in paragraph 5c above, we are in the process of implementing the following HQDESCOM's essential strategies to enforce the HAZMIN program.

(a) Utilize DESCOM's industrial base support to maximize a healthy infra-structure;

(b) Total quality management by continuous process improvement;

(c) Life-cycle cost management for new processes;

(d) Conception-to-grave hazardous material management in lieu of cradle-to-grave hazardous waste management; and

(e) Cost savings through the reduction of environmental and health effects from the use of hazardous materials.

d. Long-range effort.

Long-range effort refers to those efforts which will ultimately result in "0" generation of hazardous waste. Our long-range effort is to upgrade our process, equipment, infra-structure, and facilities. We are making a significant progress in this direction by implementing the "READY 2000" program.

6.0 CLEANING AND DEGREASING

a. EXISTING EFFORT

(1) Varsol and trichloroethane stills were installed in 1988. However, the trichloroethane still is not operational due to various technical difficulties.

(2) Spent solvent from the Bearing shop is used in other shops before recycling/disposal.

(3) Source segregation is enforced to improve quality of solvent for recycling.

(4) Solvent is procured in bulk to the extent feasible. This avoids disposal of drums.

(5) Shops which use varsol are under surveillance to prevent waste varsol contamination with halogenated solvents such as methylene chloride and trichloroethane.

CCAD Plan of Action Toward "0" Generation of Hazardous Waste

b. NEAR-TERM EFFORT

(1) Make trichloroethane still fully operational.

(2) Pursue off-site reclamation of freon and other solvents.

c. LONG-RANGE EFFORT

(1) New, continuous vapor degreasers.

(2) Nonhazardous solvents and cleaning agents.

7.0 PAINT STRIPPING

a. EXISTING EFFORT

(1) Plastic media bead blasting operation is being implemented. Estimated date of complewhile the CDC tank(s) are de-sludged and cleaned to extend life of CDC stripper.

(2) Blasting operations are in place to the extent feasible in lieu of the chemical paint stripping.

b. NEAR-TERM EFFORT

(1) Enforce source segregation to assure that nonhazardous blast residue is not co-mingled with hazardous constituents.

(2) Pursue the feasibility of packaging blast residue into absorbent pillows for use at hazardous spills.

c. LONG-RANGE EFFORT

(1) Since the Army is now converting to nontoxic paints, most of the blast residue should eventually be nonhazardous.

(2) Find less hazardous chemical strippers.

8.0 ELECTROPLATING

a. EXISTING EFFORT

(1) Cadmium purification system was implemented in January 1987. This process utilizes an existing 20 ton chiller to cool cyanide plating solution to remove sodium carbonate, an impurity which causes burning and hydrogen embrittlement of steel parts. Sodium carbonate thus removed is disposed of through the pretreatment plant as a nonhazardous waste.

(2) We are pursuing a venture with Encycle/Texas, Inc., for recycling of metal plating solutions.

b. NEAR-TERM EFFORT

(1) Chromium oxidation recovery. This process may eliminate the requirement to replace the chrome plating solutions. The equipment will remove cations from the plating bath while it oxidizes the chromium oxide from the trivalent to the hexavalent state, which is desirable for plating operations. The same system can be installed on chrome rinse baths to reclaim chrome before it goes down the drain.

(2) High speed chrome plating. This process applies a better coating of chrome which minimizes reworks.

(3) Flowking filter system. The filter system is totally self-contained inside the plating tank. There is no chance of a chemical spill from a broken line or leaking pump seal. Filters are reusable, eliminating generation and disposal problems.

(4) Ion vapor deposition of aluminium. This process deposits a thin coating of aluminium on the surface of steel parts to provide corrosion protection. It is an authorized substitute for cadmium plating. This process, when implemented, will nearly eliminate the requirement for cyanide based cadmium plating solutions. It also eliminates the risk of hydrogen embrittlement and the required baking associated with cadmium plating.

c. LONG-RANGE EFFORT

A replacement facility for the existing plating shop is being programmed for mid 90's.

9.0 EQUIPMENT MAINTENANCE

a. EXISTING EFFORT

(1) Source segregation has increased resaleability of oils.

(2) Samples of oils (petroleum and synthetic) have been taken from the point of generation and each waste stream has been analyzed to separate hazardous waste from nonhazardous wastes.

b. NEAR-TERM EFFORT

Pursue oil reclamation system.

c. LONG-RANGE EFFORT

Pursue off-site reclamation.

10.0 WASTE WATER TREATMENT

a. EXISTING EFFORT

(1) A filter press is used in IWTP to remove excessive water from sludge.

(2) Industrial sludge drying beds using state-of-the-art technology were constructed in 1988.

(3) IWTP has been separated from the domestic treatment plant.

b. NEAR-TERM EFFORT

An evaluation will be made to determine the feasibility of replacing the existing IWTP with a new packaged unit using state-of-the-art technology.

c. LONG-RANGE EFFORT

A new plating shop with zero discharge is being planned.

11.0 PAINTING

a. EXISTING EFFORT

(1) Fingerprint analysis of paint spray booths show that all waste streams in painting operations are not hazardous. Source segregation is being enforced.

(2) Operators involved with the preventive maintenance (PM) of paint booths are being given the initial training (24 hours training) required by the Resource Recovery and Conservation Act (RCRA). This will enhance operators' awareness on hazardous wastes. Proper PM of paint booths should minimize generation of hazardous waste.

b. NEAR-TERM EFFORT

(1) Paint booth sludge removal system. The system will effectively remove all paint sludge from waterwash paint booths by using a cyclone separator. This system will extend the life of the paint booth by keeping it clean.

(2) Paint solvent recovery system. This system will reclaim paint solvents used during clean-up operations by batch distillation, This will also reduce the volume of actual waste which must be disposed off.

(3) Paint pot liners. Plastic liners will be used to line the 2 and 5 gallons paint spray pots. At tble areas. Corrective actions will then be taken to prevent excessive wastes.

c. LONG-RANGE EFFORT

DOD is taking initiatives in the areas of across-the-board nontoxic paints and powder coating technology.

12.0 PASSIVATION

a. EXISTING EFFORT

Neutralization of nitric acid at IWPTF was initiated in 1986. Disposal of waste after neutralization is accomplished yjrough IWPTF.

b. NEAR-TERM EFFORT

IWPTF is being upgraded to meet with the depot's current work load. The upgraded IWPTF will be used for HAZMIN actions such as neutralization. Feasibility of a packaged unit is being investigated.

c. LONG-RANGE EFFORT

Off-site reclamation is possible and will be pursued.

13.0 ANALYTICAL

a. EXISTING EFFORT

Source segregation is enforced.

b. NEAR-TERM EFFORT

Off-site reclamation is possible and will be pursued.

c. LONG-RANGE EFFORT

None planned at this time.

14.0 METAL WORKING

a. EXISTING EFFORT

(1) Source segregation is enforced.

(2) Neutralization of cutting oil and emulsion coolant in IWPTF was initiated in 1986.

(3) Fingerprint analyses of waste cutting oil and emulsion coolant is completed. This avoids disposal of nonhazardous waste as hazardous.

b. NEAR-TERM EFFORT

Feasibility of a suitable pretreatment of waste cutting oil and emulsion coolant (such as filtration to remove metals, removal of halogenated solvents by boiling, and neutralization and disposal through IWTP, etc.) is being planned.

c. LONG-RANGE EFFORT

Modify equipment to render waste cutting oil and emulsion coolant non-hazardous at the point of generation.

15.0 DEFUELING

a. EXISTING EFFORT

Enforced source segregation. Fuel from the defueling operation is no longer waste.

b. NEAR-TERM EFFORT

None planned at this time.

c. LONG-RANGE EFFORT

Comprehensive review of defueling operations should be planned from HAZMIN point of view.

HAZMIN PROJECT

1. PROJECT TITLE: Paint Booth Sludge Removal System

2. DESCRIPTION OF PROJECTS HAZMIN APPLICABILITY:

   Minimizes the volume of paint booth sludge.

   A. DESCRIPTION OF PROJECT:

      The system will effectively remove all paint sludge from waterwash paint booths by using a cyclone separator. The separator is shaped like a cone. The paint-water mixture enters at the side and swirls around the cone. The centrifugal action throws the solids to the side and they exit out the bottom. Clean liquid is drawn from the center of the cone and exits through the top. See enclosed brochure.

   B. PROJECTED WASTE REDUCTION: Reduces sludge volume by 30 percent

   C. SOURCE REDUCTION: No

   D. END OF PIPE TREATMENT: Yes

3. ESTIMATED COST: 13 @ $15,000.00 each

4. TYPE OF FUNDS: ACP

5. LOCATION: 9 booths, Bldg 8; 4 booths, Bldg 1808

6. MISSION SUPPORTED: CCAD, Dir/Maintenance

7. ESTIMATED COST SAVINGS PER YEAR:

8. FISCAL YEAR FUNDING REQUIRED: unfunded

9. PRIORITY RANKING:

10. REMARKS:

    Personnel will no longer be required to physically enter the paint booth with shovels to clean out the sludge. The equipment will extend the life of the paint booth by keeping it clean. There will be less nozzle clogging and less wear & tear on the pumps. Many times, the encapsulating agent will reduce the paint sludge from the hazardous to the non-hazardous category.

11. POINT OF CONTACT: Jim Holiday, Engineering Branch, ext. 4449

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(312) 587-1071
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Roy M. Beaver
President

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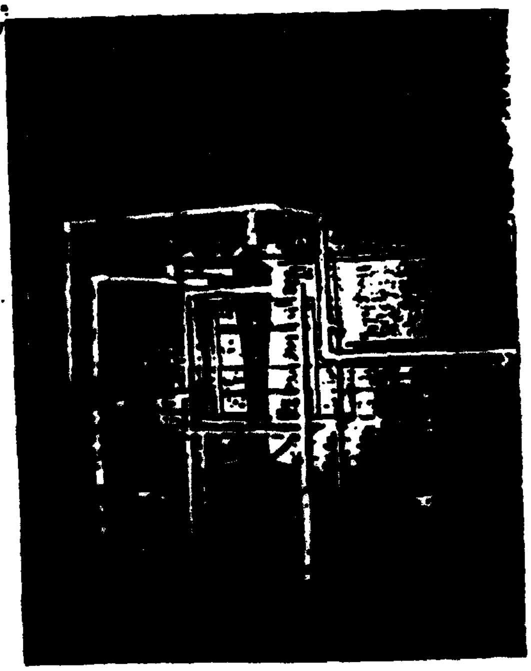

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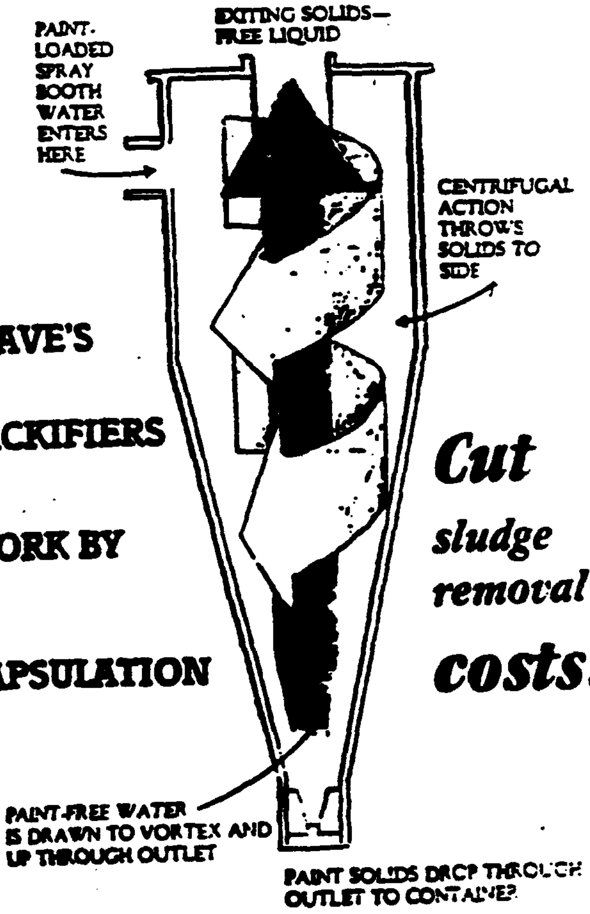

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APPENDIX G
HAZMIN PROJECT

1. Project Title: Plastic Media Bead Blasting Operation (PMBB)

2. Description of Projects HAZMIN Applicability:

   a. Description of Project:
   This project will substitute chemical stripping of paint with mechanical stripping of paint.

   b. Projected waste reduction: 195,000 gallons per day waste water.

   c. Source Reduction: Yes

   d. End of Pipe Treatment: No

3. Estimated cost: $800,000

4. Type of Funds: ACP

5. Location: Bldg 44

6. Mission Supported: CCAD, Directorate of Maintenance

7. Estimated cost savings per year: $400,000

8. Fiscal year funding required: 1987

9. Priority Ranking: High

10. Remarks: Contractor has been delinquent for one year. Implementation of project is not expected until July 1988.

[illegible]
[illegible] ENVIRONMENTAL [illegible]
[illegible] TO [illegible]

DATE PREPARED: [illegible] SEP 92

*1. PROJECT NARRATIVE/DESCRIPTION (Short Statement of Work):
Project consists of the installation of a Plastic Media Blast Booth to reduce the emission of volatile organics into the atmosphere, and comply with noise levels set by OSHA.

FUNDING TYPE: IF(M) INSTALLATION STATUS: Active/Inactive
REQUIRED FOR MOBILIZATION: Yes/No

2. SPECIFIC TYPE OF POLLUTION/CONTAMINATION:

3. AMOUNT OF POLLUTION/CONTAMINATION:

4. POLLUTION SOURCE AND DISCHARGE, EMISSION OR DEPOSIT POINT (Facility Description):

5. EXISTING TREATMENT AND OTHER CONTROL MEASURES (Existing Conditions):

6. EFFECTIVENESS OF EXISTING TREATMENT AND CONTROL:

7. REMEDIAL MEASURES PROPOSED AND ESTIMATED EFFECT IN CORRECTING PROBLEMS:

8. APPLICABLE STANDARD (State and Federal): OSHA, TACB

9. OTHER RELEVANT INFORMATION:

* If project is a study, etc., and not one installation specific, fill in only applicable numbered section and expand this project description section.

HAZMIN PROJECT

1. PROJECT TITLE: Paint Solvent Recovery System

2. DESCRIPTION OF PROJECTS HAZMIN APPLICABILITY:

   Reduction of paint solvents

   A. DESCRIPTION OF PROJECT:

      Reclaim paint solvents used during clean-up operations by batch distillation. This will also concentrate the volume of actual waste which must be disposed of.

   B. PROJECTED WASTE REDUCTION: Waste paint solvent

   C. SOURCE REDUCTION: No

   D. END OF PIPE TREATMENT: Yes

3. ESTIMATED COST:

4. TYPE OF FUNDS: ACP

. LOCATION: Bldg 1808; General & Engine Paint Unit, Bldg 8

6. MISSION SUPPORTED: CCAD, Dir/Maintenance

7. ESTIMATED COST SAVINGS PER YEAR:

8. FISCAL YEAR FUNDING REQUIRED: unfunded

9. PRIORITY RANKING:

10. REMARKS:

    This unit will allow the recycling of paint cleaning solvent.

11. POINT OF CONTACT: Jim Holiday, Engineering Branch, ext. 4449

APPENDIX G
HAZMIN PROJECT

1. Project Title: Varsol and 1,1,1 Trichloroethane Recovery Unit

2. Description of Project HAZMIN Applicability:

   a. Description of Project: CCAD purchases about 50,000 gallons per year of varsol and 1,1,1 Trichloroethane. Waste solvent should be reclaimed for waste minimization.

   b. Projected Waste Reduction: 40,000 gallons per year of solvent

   c. Source Reduction: No

   d. End of Pipe Treatment: Yes

3. Estimated Cost: $200,000

4. Type of Funds: ACP

5. Location: Outside Bldg. 1828

6. Mission Supported: CCAD, Directorate of Maintenance

7. Estimated Cost Savings Per Year: $350,000

8. Fiscal Year Funding Required: 1986

9. Priority Ranking: High

10. Remarks: Unit is installed but not operational due to various technical difficulties. Estimated operational date is May 88.

DRAFT EXHIBIT 1
ENVIRONMENTAL INFORMATION SHEET
(ATTACH [illegible] DA FORM 3500-7)

DATE PREPARED: 19 SEP 88

*1. PROJECT NARRATIVE/DESCRIPTION (Short Statement of Work):
Project is to troubleshoot the Varsol/Trichloroethane distillation units to enhance the quality of the recycled product obtained.

FUNDING TYPE: IF(M) INSTALLATION STATUS: Active/Inactive
REQUIRED FOR MOBILIZATION: Yes/No

2. SPECIFIC TYPE OF POLLUTION/CONTAMINATION:

3. AMOUNT OF POLLUTION/CONTAMINATION:

4. POLLUTION SOURCE AND DISCHARGE, EMISSION OR DEPOSIT POINT (Facility Description):

5. EXISTING TREATMENT AND OTHER CONTROL MEASURES (Existing Conditions):

6. EFFECTIVENESS OF EXISTING TREATMENT AND CONTROL:

7. REMEDIAL MEASURES PROPOSED AND ESTIMATED EFFECT IN CORRECTING PROBLEMS:

8. APPLICABLE STANDARD (State and Federal): RCRA

9. OTHER RELEVANT INFORMATION:
Varsol and trichloroethane wastes would have to be disposed off-site at a high cost if distillation stills fail to provide a quality product meeting process specifications.

* If project is a study, etc., and not one installation specific, fill in only applicable numbered section and expand this project description section.

HAZMIN PROJECT

1. PROJECT TITLE: Paint Pot Liners

2. DESCRIPTION OF PROJECTS HAZMIN APPLICABILITY:

   Reduction of thinner required for clean-up

   A. DESCRIPTION OF PROJECT:

      Plastic liners will be used to line the 2 and 5 gallon paint spray pots. At the end of the day, the liner is removed and discarded.

   B. PROJECTED WASTE REDUCTION: Waste paint solvent

   C. SOURCE REDUCTION: Yes

   D. END OF PIPE TREATMENT: No

3. ESTIMATED COST: +/- 2.00 each

4. TYPE OF FUNDS:

5. LOCATION: All paint shops, Bldg 8 & 1808

6. MISSION SUPPORTED: CCAD, Dir/Maintenance

7. ESTIMATED COST SAVINGS PER YEAR:

8. FISCAL YEAR FUNDING REQUIRED:

9. PRIORITY RANKING:

10. REMARKS:

    The liners will practically eliminate the need to clean out the spray pots with thinner. All paint waste will be discarded in the liner. A minimal amount of thinner will be required to clean mixing paddle, hoses, and spray gun. Additionally, the liners will also decrease the amount of clean-up time for the painter, allowing him to paint longer each day.

11. POINT OF CONTACT: Jim Holiday, Engineering Branch, ext. 4449

APPENDIX G
HAZMIN PROJECT

1. **Project Title:** Ultrasonic Cleaning for Generators/Alternators.

2. **Description of Projects HAZMIN Applicability:**

   a. **Description of Project:** Providing an efficient and safe way of cleaning generator and alternator housings, brush riggings and armatures.

   b. **Projected Waste Reduction:** 12 gallons of 1,1,1 Trichloroethane

   c. **Source Reduction:** Yes

   d. **End of Pipe Treatment:** No

3. **Estimated Cost:** $23,000

4. **Type of Funds:** ACP

5. **Location:** SEC3A, Rotating Electric Shop

6. **Mission Supported:** CCAD, Directorate of Maintenance

7. **Estimated Cost Savings Per Year:** $5,000

8. **Fiscal Year Funding Required:** 1987

9. **Priority Ranking:** High

10. **Remarks:**

HAZMIN PROJECT

1. PROJECT TITLE: Chromium Oxidation and Recovery System

2. DESCRIPTION OF PROJECTS HAZMIN APPLICABILITY:

   Reclamation of Chromium Plating Solutions

   A. DESCRIPTION OF PROJECT:

      Equipment reclaims chromium from rinse tanks and plating baths. It removes impurities and oxidizes trivalent chromium to hexavalent chromium.

   B. PROJECTED WASTE REDUCTION: Chromium

   C. SOURCE REDUCTION: Yes

   D. END OF PIPE TREATMENT: No

3. ESTIMATED COST: $15K each - plating tanks; 25K each - rinse water

4. TYPE OF FUNDS: ACP

5. LOCATION: Plating Shop, Bldg 8

6. MISSION SUPPORTED: CCAD, Dir/Maintenance

7. ESTIMATED COST SAVINGS PER YEAR:

8. FISCAL YEAR FUNDING REQUIRED: Unfunded

9. PRIORITY RANKING:

10. REMARKS:

    This process may eliminate the requirement to replace the chrome plating solutions. The equipment will remove metal cations from the plating bath while it oxidizes the chromium oxide from the trivalent to the hexavalent state, which is desirable for plating operations. This same system can be installed on chrome rinse baths to reclaim chrome before it goes down the drain.

11. POINT OF CONTACT: Jim Holiday, Engineering Branch, ext. 4449

TELEPHONE CONVERSATION RECORD

COMPANY: IONSEP CORPORATION
DR VOHN (302) 764-7849
PATENT # 4626288

SUBJECT: CHROMIUM RECOVERY UNIT

1. Dr. Vohn said that the process will reclaim chromium form any chromic acid bath, with one limitation: trivalent chromium in the presence of hydrofluoric acid can not be oxidized to the hexavalent state, but it can be reclaimed.

2. Chrome Plating Baths

   A. IONSEP's equipment is designed to be placed inside the tank. The dialysis machine measures 5 1/2 inches in diameter and varies in length.

   B. The IONSEP 6001 system produces 250 amps continuous at 5 to 6 volts. Installed and operating cost: $15,000.00 each. The membrane requires changing each year and the anode requires changing every other year.

3. Chrome Rinse Waters

   Dr. Vohn felt that all of the chrome plating rinse waters could be handled by one piece of equipment. Rinse waters also require an additional ion filter and pumps. IONSEP can provide a system to handle rinse water flows to 6 gpm for an installed cost of $25,000.00 each. This would effectively close the loop on rinse water in the chrome unit - no rinse water going to the drain! Dr. Vohn said that a pretreatment system would not be required for chrome if this system were in place!

4. Other applications for this process in the Plating Shop are as follows:

   A. Chromic acid strip tanks on the Magnesium line (I-line)

   B. A's rinse water

   C. Chromate conversion coating for Cadmium - system will remove cadmium and oxidize chromium.

   D. C's rinse water

   E. Chromate conversion coating for aluminum

   F. E's rinse water

   G. Chromate conversion coating for Stainless Steel

   H. G's rinse water

I. Dichromate conversion coating for magnesium - this tank would require batch treatment since the process would convert the dichromate to chromic acid

J. I's rinse water

5. Dr. Vohn requested that bath samples be forwarded to IONSEP for analysis at no cost to the Government.

Address: IONSEP Corporation
32 nd Street & Miller
Wilmington, DE 19802

He also requested that the following data be provided:

A. How much metal (iron) goes in the tank?

B. How long does a tank's solution last?

C. Total estimated surface area processed?

This data should be forwarded to IONSEP for analysis at no cost to the Government.

Address: IONSEP Corporation
P. O. Box 258
Rockland, DE 19732

After analysis of the data and solutions, IONSEP will prepare an unsolicited proposal outlining the equipment required to reclaim CCAD's chrome containing solutions.

Jim Holiday
Jim Holiday

HAZMIN PROJECT

1. PROJECT TITLE: Flowking Filter System

2. DESCRIPTION OF PROJECTS HAZMIN APPLICABILITY:

   The filter system can filter out solids and chemically treat the plating bath to extend it's life.

   A. DESCRIPTION OF PROJECT:

      The filter system is totally self-contained inside the plating tank. There is no chance of a chemical spill from a broken line or leaking pump seal. The filters are reusable, eliminating the generation and disposal of hazardous filters. The system also has accessories which may be attached to remove organics and heavy metals from the plating solution.

   B. PROJECTED WASTE REDUCTION: Plating Solutions

   C. SOURCE REDUCTION: Yes

   D. END OF PIPE TREATMENT: No

`. ESTIMATED COST: $ 1000.00 each

4. TYPE OF FUNDS: ACP

5. LOCATION: Plating Shop, Bldg 8

6. MISSION SUPPORTED: CCAD, Dir/Maintenance

7. ESTIMATED COST SAVINGS PER YEAR:

8. FISCAL YEAR FUNDING REQUIRED: FY88 and FY89 (implementing)

9. PRIORITY RANKING:

10. REMARKS:

    The first Flowking filter system was installed on a silver plating bath. The bath was not suitable for use because of the large amount of particulate matter suspended in the solution. After installation of the filter, the tank was approved for production, thus reclaiming the solution.

11. POINT OF CONTACT: Jim Holiday, Engineering Branch, ext. 4449

HAZMIN PROJECT

1. PROJECT TITLE: High Speed Chrome Plating

2. DESCRIPTION OF PROJECTS HAZMIN APPLICABILITY:

This process applies a better coating of chrome with fewer reworks. Approximately one half of the chrome plating workload is rework parts - chrome did not stick the first time.

A. DESCRIPTION OF PROJECT:

This process uses conforming anodes which are contoured around the part being plated. current is evenly distributed along the surface to be plated maximizing the plating efficiency. Parts are plated quicker and require less rework.

B. PROJECTED WASTE REDUCTION: Chrome Rinse Water

C. SOURCE REDUCTION: Yes

D. END OF PIPE TREATMENT: No

3. ESTIMATED COST: $20,000.00

4. TYPE OF FUNDS: ACP Equipment

5. LOCATION: Plating Shop, Building 8

6. MISSION SUPPORTED: CCAD, Dir/Maintenance

7. ESTIMATED COST SAVINGS PER YEAR: Unknown

8. FISCAL YEAR FUNDING REQUIRED: FY-89

9. PRIORITY RANKING: None

10. REMARKS:

This project is more production orientated than hazardous waste minimization. The increased plating rate and adhesion reduces the manhours required to plate. The hazmin applibility comes from the reduction (or elimination) of the rework rinse water.

11. POINT OF CONTACT: Jim Holiday, Engineering Branch, ext. 4449

1383 R[illegible]
SUPPLEMENTAL [illegible] SHEET
(ATTACH TO [illegible])

DATE PREPARED: 19 SEP 8[illegible]

*1. PROJECT NARRATIVE/DESCRIPTION (Short Statement of Work):
Project consists of installing a five thousand ampere, twelve volt rectifier to supply high current levels, evenly distributed, to conforming anodes contoured around the part being processed.

FUNDING TYPE: DERA-OPA INSTALLATION STATUS: Active/Inactive
REQUIRED FOR MOBILIZATION: Yes/No

2. SPECIFIC TYPE OF POLLUTION/CONTAMINATION:
Chrome rinse waste water

3. AMOUNT OF POLLUTION/CONTAMINATION:

4. POLLUTION SOURCE AND DISCHARGE, EMISSION OR DEPOSIT POINT (Facility Description):
Plating shop chrome rinse water vats

5. EXISTING TREATMENT AND OTHER CONTROL MEASURES (Existing Conditions):
Chrome rinse waters are treated at the Industrial Pretreatment Plant chrome reduction unit.

6. EFFECTIVENESS OF EXISTING TREATMENT AND CONTROL:
Existing Industrial Wastewater Pretreatment Plant is effective in the treatment of diluted rinse waters. However, hazardous waste minimization will be accomplished through this project.

7. REMEDIAL MEASURES PROPOSED AND ESTIMATED EFFECT IN CORRECTING PROBLEMS:

8. APPLICABLE STANDARD (State and Federal): NPDES

9. OTHER RELEVANT INFORMATION:
Better adhesion of chrome metal to the surface of the part is expected with the installation of this equipment. Better chrome adhesion means less replating done, less chrome solution and rinse water used in the process requiring disposal.

* If project is a study, etc., and not one installation specific, fill in only applicable numbered section and expand this project description section.

HAZMIN PROJECT

1. PROJECT TITLE: Cadmium Purification System

2. DESCRIPTION OF PROJECTS HAZMIN APPLICABILITY:

   This system shall reclaim cyanide plating solutions by removing sodium carbonate, an impurity which causes burning and hydrogen embrittlement of steel parts.

   A. DESCRIPTION OF PROJECT:

   This process will utilize an existing 20 ton chiller to remove sodium carbonate from cyanide plating solutions by reducing the liquid temperature to +/- 28 degrees F. The plating solutions are processed in 300 gallon batches. When the desired temperature is obtained, the clean liquid is removed, and the sodium carbonate is disposed of through the pretreatment plant.

   B. PROJECTED WASTE REDUCTION: Cadmium/cyanide plating solutions

   C. SOURCE REDUCTION: yes

   D. END OF PIPE TREATMENT: no

. ESTIMATED COST: $7,000.00

4. TYPE OF FUNDS: Maintenance and Repair

5. LOCATION: Plating Shop, Building 8

6. MISSION SUPPORTED: CCAD, Dir/Maintenance

7. ESTIMATED COST SAVINGS PER YEAR: Pending Value Engineering Study

8. FISCAL YEAR FUNDING REQUIRED: Implemented

9. PRIORITY RANKING: N/A

10. REMARKS:

    This system was implemented in January 1987. Approximately 2600 gallons of cadmium plating solution was processed removing 1800 lbs of sodium carbonate. The remaining liquid was returned to the plating tank. The sodium carbonate could then be disposed of through the pretreatment system as a non hazardous waste.

11. POINT OF CONTACT: Jim Holiday, Engineering Branch, ext. 4449

SUPPLEMENT [illegible] SHEET
(ATTACH TO [illegible] FORM [illegible]-7)

DATE PREPARED: 15 SEP 92

*1. PROJECT NARRATIVE/DESCRIPTION (Short Statement of Work):
The process utilizes a high efficiency filter and a vacuum distillation chamber to separate dirt, sludge, and water from process oils.

FUNDING TYPE: DERA-OPA INSTALLATION STATUS: Active/Inactive
REQUIRED FOR MOBILIZATION: Yes/No

2. SPECIFIC TYPE OF POLLUTION/CONTAMINATION:
Waste oils

3. AMOUNT OF POLLUTION/CONTAMINATION:

4. POLLUTION SOURCE AND DISCHARGE, EMISSION OR DEPOSIT POINT (Facility Description):
Waste oils are generated from manufacturing machines and testing equipment.

5. EXISTING TREATMENT AND OTHER CONTROL MEASURES (Existing Conditions):
Contaminated waste oil is disposed off-site.

6. EFFECTIVENESS OF EXISTING TREATMENT AND CONTROL:
Large amounts of money is spent by this installation to dispose of waste oils off-site. Hazardous Waste Minimization will be accomplished through this project.

7. REMEDIAL MEASURES PROPOSED AND ESTIMATED EFFECT IN CORRECTING PROBLEMS:

8. APPLICABLE STANDARD (State and Federal): NEPA

9. OTHER RELEVANT INFORMATION:
Purchase of a portable vacuum distillation unit would allow recycling of contaminated oils from machine and test equipment, and would reduce the volume of waste oils shipped off-site.

* If project is a study, etc., and not one installation specific, fill in only applicable numbered section and expand this project description section.

[illegible]
SUPPLEMENTAL [illegible] SHEET
(ATTACH TO [illegible])

DATE PREPARED: 19 SEP 83

*1. PROJECT NARRATIVE/DESCRIPTION (Short Statement of Work):
A waste compacting equipment will be used to compress paper, and cloth wastes generated through radioactive processes.

FUNDING TYPE: IF(M) INSTALLATION STATUS: Active/Inactive
REQUIRED FOR MOBILIZATION: Yes/No

2. SPECIFIC TYPE OF POLLUTION/CONTAMINATION:
Radioactive waste

3. AMOUNT OF POLLUTION/CONTAMINATION:

4. POLLUTION SOURCE AND DISCHARGE, EMISSION OR DEPOSIT POINT (Facility Description):

5. EXISTING TREATMENT AND OTHER CONTROL MEASURES (Existing Conditions):

6. EFFECTIVENESS OF EXISTING TREATMENT AND CONTROL:

7. REMEDIAL MEASURES PROPOSED AND ESTIMATED EFFECT IN CORRECTING PROBLEMS:

8. APPLICABLE STANDARD (State and Federal): NRC

9. OTHER RELEVANT INFORMATION:
Purchase of a waste compacting equipment would save the installation money by reducing the volume of waste shipped off-site.

* If project is a study, etc., and not one installation specific, fill in only applicable numbered section and expand this project description section.

HAZMIN PROJECT

1. PROJECT TITLE: Ion Vapor Deposition (IVD) Of Aluminum

2. DESCRIPTION OF PROJECTS HAZMIN APPLICABILITY:

   Reduction of cyanide and cadmium waste

   A. DESCRIPTION OF PROJECT:

      This process deposits a thin coating of aluminum on the surface of steel parts to provide corrosion protection. It is an authorized substitute for cadmium plating.

   B. PROJECTED WASTE REDUCTION: Cadmium oxide and sodium cyanide

   C. SOURCE REDUCTION: Yes

   D. END OF PIPE TREATMENT: No

3. ESTIMATED COST: $900,000.00

4. TYPE OF FUNDS: ACP

5. LOCATION: Plating Shop, Bldg 8

6. MISSION SUPPORTED: CCAD, Dir/Maintenance

7. ESTIMATED COST SAVINGS PER YEAR:

8. FISCAL YEAR FUNDING REQUIRED: unfunded

9. PRIORITY RANKING:

10. REMARKS:

    This is a documented process which will nearly eliminate the requirement for cyanide based cadmium plating solutions. This process also eliminates the risk of hydrogen embrittlement and the required baking associated with cadmium plating.

    Restrictions: IVD Aluminum can not be used for coating internal diameters of long bores such as transmission masts (7 feet in length).

11. POINT OF CONTACT: Jim Holiday, Engineering Branch, ext. 4449

PEI ASSOCIATES, INC.

MEMORANDUM

TO: Craig MacPhee

DATE: 6/20/89
Revised: 6/30/89

SUBJECT: Trip report: Letterkenny Army Depot
Contract No. DAAA15-88-D-0001
Task Order No. 0004

FROM: Jeff Davis
Fred Hall
Bob Hoye

FILE: 3769-4

CC: Dick Gerstle

USATHAMA and PEI personnel participated in meetings and a tour of the facilities at the Letterkenny Army Depot (LEAD) on May 18 and 19, 1989. The purpose of this visit was to acquire information on the operations at LEAD that are relevant to the referenced task order. Specifically, information on VOC emissions, PMB, chemical paint strippers, degreasing, and generation of metals-contaminated sludges was sought. This is one of a series of visits to eight depots being made to acquire comparable data on these topics. In the near future, USATHAMA will use this information to select and define research projects that will be conducted by PEI under this task.

LEAD is located in south central Pennsylvania in the Cumberland Valley near Chambersburg, and is approximately 25 miles west of Gettysburg. Craig MacPhee represented the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). PEI personnel present were Fred Hall, Bob Hoye, and Jeff Davis.

Our primary contacts at LEAD were Dennis Reed and Craig Musser of the Production Engineering Division. In addition, we met with Pat Mullen with metal pretreatment and finishing operations; James Gaynor, operator of the industrial wastewater treatment plant; and Leonard Snyder, chief of the Electronics Shop.

The purpose of this trip report is to document the information obtained during the site visit. The trip report is presented in eight sections to address pertinent topics included in the scope of work of Task Order No. 0004. These sections are: Background, VOC Emissions and Paint Operations, Blasting Operations, Alternate Chemical Strippers, Alternate Degreasers, Electroplating Operations and Metal-Contaminated Sludges, Other Areas of Interest, and Conclusions/Recommendations.

BACKGROUND

LEAD's primary mission is to receive, store, maintain, and issue general supplies and ammunition in support of DOD activities. This mission includes the overhaul, rebuild, and testing of wheeled and tracked combat vehicles, missile systems, fire control systems, and associated secondary items. LEAD employes over 4,000 people. The depot covers 19,511 acres, 2,500 of which are dedicated to industrial operations.

Four waste categories are regulated by Pennsylvania law: solid waste, industrial waste, nonhazardous chemical waste, and hazardous waste. Each category has different disposal requirements. The industrial waste category has only been implemented within the last month and includes any waste from an industrial operation, including items such as rags and floor sweepings. Although there are no current reporting or manifesting requirements, industrial wastes must be disposed in a lined landfill.

The following is a summary of the buildings visited and a brief overview of the processes conducted in each building.

- Building 1: Gun System Recoil Operations Support
  - — Chromium electroplating
  - — Abrasive blasting (walnut shells, steel grit, glass beads)
  - — Small paint booth
  - — Metal pretreatment and finishing operations (chromium stripping, black chromium, rust prevention, chromate conversion coating, zinc phosphating, black oxide coating)

- Building 350: Vehicle Shop (disassemble, clean, and re-assemble vehicles). May schedule: 36 five-ton trucks, 34 two and a half-ton trucks, 12 Toweds, 2 Hawkloaders, one M575, 5 M110's, 4 M109's.
  - — Abrasive Blasting (walnut shells and steel grit)
  - — Alkaline (EC-900, Calgon P-2000) and acid (Penstrip NPX) paint stripping
  - — Cold and vapor degreasing (1,1,1-trichloroethane)
  - — Painting (2 large paint booths)
  - — Alodining (chromate conversion coating)
  - — Phosphate coating

- Industrial wastewater treatment plant

- Building 370: Electronics Shop (processes approximately 450 pieces per day)
  - — Small-scale precious metals plating
  - — Abrasive blasting (walnut shells, steel grit, plastic media, glass beads)
  - — Alkaline and acid stripping
  - — Vapor degreasing
  - — Alodining
  - — Painting

- Building 37: General Shops Division, Automotive Components Branch (overhaul engines)
  - — Abrasive Blasting (walnut shells, plastic media)
  - — Alkaline (potassium and sodium hydroxide) and acid paint stripping
  - — Cold and vapor degreasing
  - — One large and 3 small paint booths

- Building 57: M12 Maintenance
  - — Abrasive Blasting (Plastic media)
  - — Painting (3 paint booths)

- Building 320, Supply Directorate (not visited)
  - — 9 paint booths

Most of the buildings at LEAD operate fairly independently of other buildings. As shown in the above list, many buildings contain metal pretreating (blasting, chemical stripping, degreasing) and metal finishing (chromate conversion coating, phosphate coating, painting) operations. Although this arrangement simplifies the logistics of production, the sources of hazardous waste are widely spread throughout the depot. A list of hazardous waste generation by the Maintenance Directorate for the fourth quarter of 1988 is provided as an attachment to this report.

The categories used in this report are rarely stand-alone operations; rather, they are interrelated and somewhat arbitrary. For example, the electroplating line at LEAD contains the degreasers and chemical strippers necessary to preclean the metal prior to actual electroplating, as well as a small paint booth for metal finishing. Many of the buildings contain abrasive and chemical stripping, degreasing, and metal finishing (painting and alodining) operations. Figure 1 presents an overview of how these operations are interrelated and dependent on each other. This figure is a summary of procedures defined in a disposition form dated February 2, 1987, portions of which are provided as an attachment to this report. Although this figure is slightly out of date, it gives an idea of the metal treatment trains at LEAD and most other depots.

VOC EMISSIONS AND PAINT OPERATIONS

LEAD currently has 48 painting booths on the depot, 22 to 25 of which are operated on any given day. Many small booths are located in the ammo area; ammo coatings typically have low VOC contents. The other booths are distributed among several buildings. Numerous coatings are used, although 90 percent of the painting is done with the top 7 or 8 coatings. LEAD does not currently use any VOC capture or control methods.

VOC emissions are regulated by state law in Pennsylvania, which specifies the maximum VOC content (lb/gal) of surface coatings unless the surface coating processes emit no more than a total of 500 pounds per day or 50 tons per year of VOCs. LEAD has met the regulations in the past by limiting VOC content in paint used to 475 pounds per day. Each booth is allocated a daily allowance of paint and, once the allotted paint is consumed, that booth ceases production. Regulations do not specify transfer efficienies.

Once an emission source exceeds the 50-ton threshold limit, other alternatives exist for complying with Pennsylvania laws. One method is by meeting the upper limit for VOC concentration for each paint used. For example, the depot is in compliance when it exceeds the 50 ton per year limit if each primer or paint has a VOC content less than or equal to 3.5 pounds per gallon. Another method of compliance is by the "bubble plan", in which the entire depot is considered as one paint booth. In the bubble plan, the weighted average of all paints and primers must be below 3.5 pounds per gallon.

Since painting operations at LEAD have used CARC, VOC emissions have increased because the two-component CARC originally used had higher VOC content than previous paints. As a result, LEAD has switched to single-component CARC. In addition, the painting workload has increased because old enamel paints are being replaced with CARC. The workload has also increased because new Hawk units are supplied in green even though they must be fielded in sand color. Finally, personnel in the field cannot conduct polyurethane painting operations because of breathable air requirements, so all pattern painting must be conducted at a depot. As a result of these issues, LEAD expects to exceed the 50-ton VOC per year but will attempt to meet the average allowable VOC content of 3.5 lb VOC/gallon for suface coatings as specified in the bubble plan. This plan has been approved by the state for LEAD and is awaiting approval by U.S. EPA. By using paints with a VOC content less than 3.5 pounds per gallon (paint currently used is 3.25 pounds per gallon VOC content), the average VOC concentration is less than 3.5 pounds per gallon of paint or primer used. The bubble plan considers only surface coating processes such as priming and painting, and most metal pretreatment processes such as phosphating and chromate conversion coating (which have low VOC contents) do not count toward the average VOC content.

One issue that will make meeting the 3.5 lb VOC/gallon average difficult is that the State of Pennsylvania classifies acid wash pretreatment as a coating and, therefore, it is included in VOC sources. The acid wash pretreatment (primary component is isopropyl alcohol) used at LEAD in booths #56, 60, and 61, has a VOC content of 5.6 pounds per gallon. A study by FMC

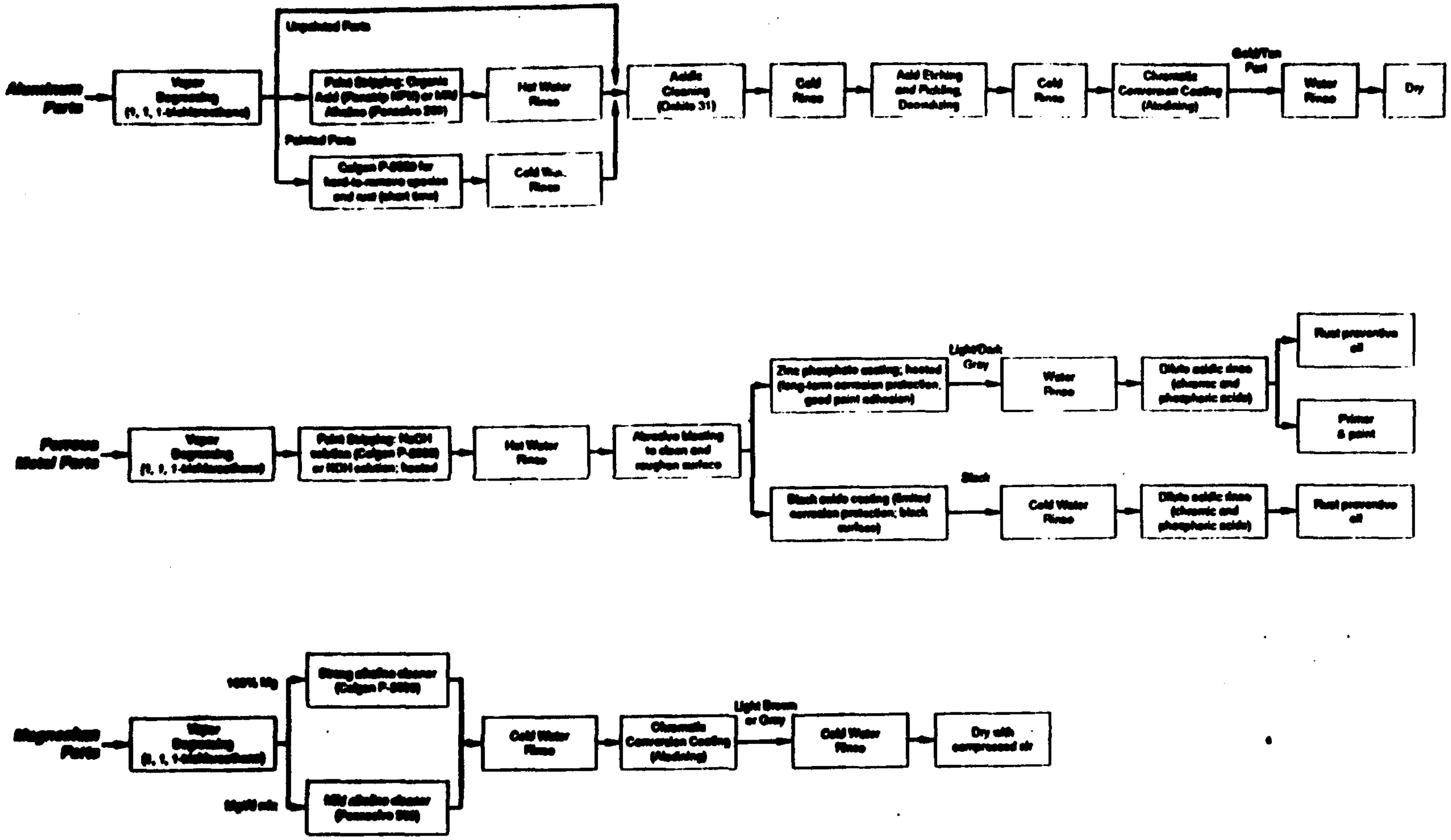

Figure 1. Generic flow diagram for metal finishing operations.

Corp. at San Jose concluded that the acid wash pretreatment currently used at LEAD was the best material for adhesion and corrosion resistance, and LEAD has not identified a low VOC alternative. LEAD has also looked at installation of a small booth with a VOC control incinerator dedicated to acid wash pretreatment (Dave Zimmerman conducted this evalution).

Another issue that will conflict with meeting the 3.5 lb VOC/gallon average is that the bubble plan covers only old booths, and any change to a booth will cause it to be regulated solely under the pounds per gallon VOC content requirement. This is ultimately a disincentive to reduce VOC emissions from existing operations. For example, changing the method of paint application to increase transfer efficiencies would only be effective for high-use coatings, such as the major primers. Once the booth was modified, however, the coatings used in this booth would no longer be used to calculate the average paint VOC content. Since the primers already have VOC contents under 3.5 pounds per gallon, deleting them from the weighted average would increase that average. If the average were increased to over 3.5 pounds per gallon, the depot would no longer be in compliance with the bubble plan even though the net VOC emissions had been reduced. Adding controls to destroy VOCs is another example of reducing VOC emissions, but with the result of exempting a booth from the bubble plan and risking noncompliance.

Larry Holmes at LEAD conducted a study to investigate options for reducing VOC emissions from large paint booths (i.e., #59, 60, and 61). The options and their associated costs are as follows:

- Thermal Incineration: $4,500,000
- Catalytic Incineration: $2,100,000
- Carbon Adsorption with VOC recovery: $2,000,000
- Low VOC Coatings: $340,000

The conclusion of the study was that carbon adsorption followed by catalytic incineration was worth pursuing depending on the final economic analysis. Carbon adsorption would be used to concentrate the VOC's and incineration would then destroy them. Incineration alone would be very expensive because of the low concentration of VOC's in the effluent stream of air.

LEAD is actively investigating VOC emission and waste reduction methods. They have looked at electrostatic painting, but this is a maintenance intensive method. In addition, the Faraday cage effect limits the effectiveness of this technique on irregularly-shaped parts.

Proper atomization needed for irregularly-shaped parts is difficult to obtain when using the high-solids paints at LEAD. LEAD is investigating spray guns to identify the one providing the best atomization of high-solids paint. The Binks air-spray system, No. 18 gun, is currently used. LEAD has investigated high-volume, low-pressure spray systems, but determined that application was difficult on irregularly shaped surfaces.

Complete records on VOC emissions are on computer disk in Basic format, which could be accessed should USATHAMA or PEI desire further information. A sample of the VOC emission inventory that LEAD compiles is provided as an attachment.

Paint operations are a source of hazardous waste as well as of VOC emissions. For most paints, LEAD specifies the maximum concentration of EP Toxicity metals. Some older paints, however, are still used. Bright yellow safety paint used at LEAD contains lead chromate (25% by weight). Older paints containing toxic metals also are used on ammunition because of proven performance and military specifications.

All paint booths use dry filters to capture paint particulates. These filters are disposed as hazardous wastes, although recent tests have shown them to be non-EP Toxic. LEAD is currently conducting statistical sampling to demonstrate that the filters are not EP Toxic. The blowers in paint booths are left on prior to filter changes so that the paint on the filters is allowed to dry. Tests have shown that the barium in paint is not extractable once the paint cures. The filters contaminated with bright yellow safety paint (which contains hazardous metals) are kept separated from other filters.

Paint booths at LEAD are coated with Nanapeel®, a white rubberized coating that can be brushed on and peeled off. The coating is periodically removed from the wall and a fresh coating is applied. LEAD is currently disposing of the Nanapeel as a hazardous waste but believes that a re-characterization will show the residue to be nonhazardous.

The water-reducible primers contain barium sulfate, which the industrial wastewater treatment plant cannot handle. Sludges from these operations must therefore be disposed as hazardous wastes.

Building 370, the Electronics Shop, has implemented a number of waste minimization activities for surface coating activities. This building contains one drive-through booth, three open-face booths, and one small stencil booth, with one more paint booth planned for next year. Four colors of green paint and three colors of gray were previously used, but these have all been replaced with one shade of each color with a low VOC content. The use of standardized colors reduces the number of times an item is painted; a part no longer has to be repainted for different customers. For painting with non-standard colors, parts are allowed to accumulate and then they are all painted on one day to minimize waste paint. The Electronics Shop also uses a distillation column to recycle thinner from cleaning guns and from spill clean-up.

Several vapor degreasers containing 1,1,1-trichloroethane as the solvent are used on the depot. The 1,1,1-trichloroethane is an exempt solvent and is not considered by the state in calculation of VOC emissions.

BLASTING OPERATIONS

Numerous blasting operations are conducted at LEAD, with most buildings containing at least small glove boxes. Walnut shells and steel grit are the most common abrasive blasting materials. Glass beads are also used in Building 1 to remove small cracks in parts.

USATHAMA conducted demonstration testing of plastic media blasting (PMB) at LEAD in 1988. Tests were conducted in a glove box modified for PMB use and a new walk-in facility was installed. Building 57 contains the walk-in PMB booth. The testing included optimizing the choice of plastic media (hardness and sieve size) and blast conditions, and involved an analysis of damage to substrates, waste generation compared with other media, economics, rust removal, and materials suitable for PMB use. The complete results can be found in "Demonstration Testing of Plastic Media Blasting at Letterkenny Army Depot," Arthur D. Little, Inc. December, 1988. The current task involves determining which depots could benefit by the use of PMB.

Building 370 conducts a variety of abrasive blasting in one blast booth, including walnut shells, steel grit, glass beads, and plastic media. The steel grit is recycled but the particles are not separated by a cyclone. Ogden Air Force Base has been working on reprocessing steel for reuse in the blasting operation. Plastic media has been used for a couple of years in this building. The booth was not specifically designed or modified for plastic media blasting. Installation of a cyclone in this booth could increase recycle rates.

The waste disposal list provided as an attachment to this report indicates that 582 drums of walnut shells, 96 drums of steel grit, and 4 drums of glass beads were disposed as hazardous wastes during the fourth quarter of 1988.

ALTERNATE CHEMICAL STRIPPERS

LEAD utilizes numerous chemical stripping operations. Personnel at the depot have changed some blast operations to chemical stripping because they feel stripping is quicker. Two of the largest waste streams in several buildings are alkaline and acid waste from stripping operations. LEAD's preferred approach to minimizing stripper waste is to maximize the use obtained from each unit quantity of stripper rather than to replace the stripper.

Aluminum and steel parts are segregated and given separate pretreatments, as indicated in Figure 1. Penstrip NPX, a formulation of methylene chloride and formic acid without phenol, is used to strip paint from aluminum parts. Liquid is occasionally pumped off the top of the tanks and the sludge at the tank bottoms is removed and disposed as a hazardous waste.

EC-900, an alkaline solution, is used to strip paint from steel. Other alkaline strippers are also used, including Calgon P-2000 and a mixture of sodium hydroxide and sodium glutamate (which are mixed on the depot). The liquids and sludges from these operations are disposed as hazardous wastes. Typically, these alkaline stripping tanks are changed every 4 to 6 months and generate 10 to 12 drums of hazardous waste per change. A 3,000-gallon tank of EC-900 in Building 350 is dumped every 4 months.

For the fourth quarter of 1988, 24 drums of spent Penstrip NPX and 24 drums of spent Calgon P-2000 were disposed. Several LEAD personnel suggested that large savings could be realized by extending the bath lives of the acid and alkaline paint strippers. To do this, the chemistry of the baths needs to be understood. LEAD has tried using filters to extend bath lives, but foaming interfered with the operation. There may be other filter configurations that would help, such as a continuous gravity filter. A portable unit could perhaps be purchased that could be taken to each building using a specific stripping process. A continuous gravity filter may not be useful for the Penstrip NPX tank because the methylene chloride would evaporate. Similarly, filtration may not be useful for Penstrip NPX because the methylene chloride may break down chemically. Personnel indicated that paint chips may rapidly plug an in-line filter. LEAD personnel are currently collecting information on this subject.

In Building 370, two sequential methylene chloride/formic acid tanks are used. The older tank is used as an initial strip, and the newer tank as a polishing step. This allows the initial stripper tank to become more contaminated before replacing.

ALTERNATE DEGREASERS

Two large vapor degreasers (5 x 15ft) are used, one each in Buildings 37 and 350, and six smaller (3 x 4 ft) vapor degreasers are located throughout the depot. Several cold degreasers and some spray-on degreasers are also used. All of the degreasers use 1,1,1-trichloroethane. No Freon degreases are used.

Degreasing tanks are changed every 3 to 4 months and generate from 4 to 6 drums of hazardous waste per change. LEAD's goal is to extend the life of the degreasers so that they are changed once every year. A study by Hill Air Force Base concluded that butylene oxide could extend the life of 1,1,1-trichloroethane degreasers by 300 percent.

Most solvent that is disposed of results from the cold wash units. The waste disposal list provided as an attachment to this report indicates that 67 drums of spent 1,1,1-trichloroethane were disposed in the fourth quarter of 1988. The spent solvent is currently sold through DRMO for $0.22 per gallon.

Some degreasers are used on parts that have been blasted with abrasive media; these degreaser tanks generate almost no sludge. Make-up solvent is added as required to replace evaporative losses.

A distillation column was used years ago to recycle 1,1,1-trichloroethane. The operation was centralized, and all buildings sent spent solvent to one location. However, moisture content was not well controlled and the product became acidified. The end users were not satisfied with the quality of the returned product, and there is skepticism on the depot that a centralized operation could ever work. The buildings at LEAD are spread out, and each shop operates somewhat independently. A centralized degreaser recycling operation would thus be difficult to coordinate. By distilling the degreaser, any additives, such as butylene oxide, would probably be lost; these would need to be replenished. LEAD is interested in pursuing the purchase of a portable unit that could be taken to each shop as needed. The recovered product would be used in vapor degreasers; since the vapor pressure of 1,1,1-trichloroethane is much higher than any remaining impurities, the vapor blanket would be relatively pure.

ELECTROPLATING OPERATIONS AND METAL-CONTAMINATED SLUDGES

Electroplating operations at LEAD are conducted primarily in Building 1. Two below-ground tanks are used for chromium electroplating. Sludge from these operations is collected in pits below the tanks and are removed once every 3 months, generating approximately five 55-gallon drums of hazardous waste. These pits also receive any wastewater spilled during operations. A chromic acid tank is used to apply a chromate conversion coating. When the tank is dumped to the industrial wastewater treatment plant, ferric sulfate is added to prevent shock to the treatment plant.

Chromium electroplating is conducted on such critical parts as gun guide rails. A thick chromium coating is plated on a part and then ground down to ensure that the coating is even. Because the chromium is required for strength, aluminum ion vapor deposition would not be a suitable replacement.

Silver, gold, and brass plating are conducted on a small scale in Building 370. LEAD contracts out all cadmium plating; none is conducted on depot.

Rinse waters from the pretreatment operations and electroplating are sent to the Industrial Wastewater Treatment Plant (IWTP). Scrubber water and chromic acid process water are also sent to the IWTP. The incoming wastewaters are screened to remove debris and then pumped to three 28,000 gallon holding tanks, which serve to equalize the flow rate and composition of the wastewater. Sulfuric acid and ferrous sulfate are added in a separate tank at a pH between 2.5 and 3.5 to reduce hexavalent chromium. The use of ferrous sulfate as a reducing agent creates significant amounts of sludge because three moles of iron are needed to reduce one mole of chromium. The chromium precipitate is removed in a gravity separator. A skimmer removes oil and grease from the top of the tank. The pH is adjusted to between 10 and 11 with lime in another tank to remove phosphorous. A polymer is added to aid flocculation, and the wastewater is slowly mixed with paddles. The sludge is allowed to settle in a settling tank and is collected at the end of each shift. The pH of the wastewater is reduced to between 6 and 9 in an acid reaction tank. The wastewater is passed through a trickling filter and final clarifier. The effluent is discharged to a nearby stream under NPDES permit.

The sludges from the gravity separator, settling tanks and clarifiers are combined and dewatered in a filter press. Approximately 20 to 25 tons of sludge per month is disposed as hazardous waste (F006). This sludge could perhaps be delisted because the chromium contamination is very low. Prior to installation of the filter press, 8,000 to 10,000 gallons of wet sludge were being generated per day.

The IWTP treats a maximum of 220,000 gallons of wastewater per day. The most contaminated influent stream is the scrubber water, which contains 100 ppm chromium. After dilution by other wastewater streams, tne IWTP influent contains 1.5 ppm chromium on average. LEAD is actively working on minimizing sludge by reducing the hydraulic loading to the wastewater treatment plant. Personnel are concentrating on reusing slightly contaminated water. For example, the vapor degreaser cooling water is used as rinse water for the alodine process, and chromium rinse water is used as the scrubber water.

In Building 350, a phosphoric acid rust remover and a nitric acid aluminum etch are changed out biannually. The tanks contain 3,000 gallons each. LEAD's goal is to extend the lives of these baths to 5 years.

Several attachments to this trip report are relevant to the electroplating operations. These include:

- General procedures for cleaning and treating metal surfaces.
- Operating parameters and description of process tanks.
- Floor layouts of Buildings 1, 37, 350, and 370.
- Floor layout for Building 1N NE area tanks for hard chrome and black chrome plating, showing locations of pits.
- Floor layout of Building 350, including how often tanks are changed and suggested HAZMIN goals.

OTHER AREAS

LEAD is planning to install a fluidized bed (24 inch bed) parts cleaning system to remove surface contaminants and paint.

Building 370, the Electronics Shop, has implemented a statistical quality control system that reduces the number of parts rejected by quality control inspectors. Shop supervisors also encourage better work habits among employees.

Lead is also evaluating sodium bicarbonate stripping by sending some parts to Cherry Point to be stripped.

CONCLUSIONS/RECOMMENDATIONS

The following list presents some potential HAZMIN projects on which USATHAMA could provide assistance to LEAD.

- Prepare a report listing available options for VOC control that could be implemented by depots facing noncompliance in the future. Conduct demonstration testing for depots risking noncompliance.
- Assist in evaluating paint application spray guns that provide the best atomization and transfer efficiencies.
- Install a cyclone separator in the blast booth in Building 370 to obtain better recycle rates for abrasive media.
- Evaluate methods to extend lives of alkaline and acid strip tanks by filtration or other means.
- Evaluate potential for recycling 1,1,1-trichloroethane. Purchase a distillation column
- Determine whether filters, Nanapeel, dried paint, and IWTP sludge are actually hazardous wastes.
- Extend lives of phosphoric acid rust remover and nitric acid aluminum etch.
- Evaluate alternatives for minimizing sludge generated by IWTP, including the use of a reducing agent other than ferrous sulfate.
- Evaluate alternatives for minimizing hydraulic loading to IWTP.
- Evaluate replacing other blasting or chemical stripping operations with plastic media blasting.
- Evaluate use of alternate paint strippers in building 370 where the stripping operation is not time critical.

LEAD's interests and needs will be compared to those of other depots that will be visited in the near future. LEAD personnel should be kept informed of the results of any testing relevant to their needs conducted under the current HAZMIN effort.

ATTACHMENTS

Documents obtained from LEAD

List of waste disposal for fourth quarter of 1988.

General procedures for cleaning and treating metal surfaces.

Operating parameters and description of process tanks.

Floor layouts of Buildings 1, 37, 350, and 370.

Floor layout for Building 1N NE area tanks for hard chrome and black chrome plating, showing locations of pits.

Floor layout of Building 350, including how often tanks are changed and suggested HAZMIN goals.

Daily VOC emission summary for 5/2/88.

Alternative Emissions Reduction Plan (Bubble Plan)-Vol. 1 Data and Analysis (not included in attachments).

Wash Primer-VOC Emission Control Report (not included in attachments).

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MAINT DIR 40 CYBB GENRS WASTE PENDING TURN-IN as of 9097 Page 1

START DATE	AMOUNT IN LOT	WASTE DESCRIPTION NON-HAZARDOUS	PRESENT LOCATION	DATE RCVD	DOCUMENT NUMBER	SOURCE C.C.	LOT	
7148	2 DR	MOTOR OIL, 5%DIRT, 10% KEROSENE	357	7149	7192-0178		DDD	Bldg. 350
8351	1 dr	FOG OIL-USED	378	8351	90230183	SB730 mechanical	M04	Bldg. 370
8321	1 DR	INSULTATING OIL	378	8321	90230174	SB740 hydraulic & pneumatic	HR4	
8014	3 dr	ANTIFREEZE 40%WATER10%DIRT/OIL	357	8014	8015-0171	SV110 assembly	000	Bldg. 350
8025	9 dr	ANTIFREEZE 5% WATER 5% DIRT	357	8025	8029-0187	SV110	000	
8269	5 DR	BRAKE FLUID, USED	357	8269	8278-0187	SV110	000	
8001	6 dr	DIESEL FUEL 10%WATER 5%DIRT	357	8001	8011-0172	SV110	000	
8138	11 DR	DIESEL FUEL 5% DIRT 5% WATER	357	8138	8155-0184	SV110	000	
8075	6 dr	DIESEL FUEL 5%WATER 5%DIRT	357	8075	8085-0187	SV110	000	
8175	9 DR	ENG OIL, USED, 10%WTR, 5%DRT/GRT	357	8175	8207-0180	SV110	000	
~~8025~~	~~3 dr~~	~~ENG/OIL 5%BRAKE FLU/WATER/DIRT~~	~~357~~	~~8025~~	~~8029-0185~~	~~SV110~~	~~000~~	
7099	2 dr	ENGINE OIL	357	7099	7164-0180	SV110	BBB	
7099	1 dr	ENGINE OIL	357	7099	7164-0186	SV110	CCC	
7254	3 dr	ENGINE OIL 10% WATER/DIRT	357	7254	7264-0171	SV110	000	
8083	15 dr	GEAR OIL, 5%WATER 5%DIRT	357	8083	8085-0190	SV110	000	
7340	3 dr	HYD OIL (RED) 10%WATER 10%DIRT	357	7340	7345-0182	SV110	000	
7190	3 dr	SPEEDY DRY/OIL	357	7190	7192-0177	SV110	HHH	
7355	9 dr	USED ANTIFREEZE 50%WATER	357	7355	7357-0171	SV110	000	
7350	15 dr	USED ENGINE OIL 10%WATER/DIRT	357	7350	7357-0174	SV110	000	
7340	3 dr	USED GEAR OIL,10%WATER, 5%DIRT	357	7340	7345-0181	SV110	000	
8155	15 DR	USED OIL, 90%OIL, 5%WTR, 5%DRT	357	8155	8175-0177	SV110	000	
8333	48 dr	STEAM CLEANING SLUDGE	357	8341	8278-0173	SV150 wash	000	Bldg. 351
8316	27 dr	Brown Hyd Oil	357	8336	8152-0170	SV160 disassembly	000	Bldg 350
7164	93 dr	DIESEL	357	8144	7164-0183	SV160	EEE	
7189	102 dr	DIESEL	357	8144	7192-0176	SV160	GGG	

MAINT DIR 4Q CY88 GENRS WASTE PENDING TURN-IN as of 9097

START	AMOUNT	WASTE DESCRIPTION	PRESENT	DATE	DOCUMENT	SOURCE			
DATE	IN LOT	NON-HAZARDOUS	LOCATION	RCVD	NUMBER	C.C.	LOT		
7166	264 dr	Diesel Fuel	357	8144	8175-0176	SV160	000	disassembly	Bldg. 350
8321	72 dr	Engine Oil, 10% wtr/drt	357	8364	BULK	SV160			
8086	6 dr	HYD OIL (BROWN)	357	8088	8098-0178	SV160	000		
8043	18 dr	HYD OIL 10% DIRT 10% WATER	357	8328	8062-0157	SV160	000		
7099	21 dr	HYDRAULIC OIL	357	7099	7164-0178	SV160	AAA		
8266	55 dr	Sponges satur w/Diesel Fuel	357	8336	8278-0174	SV160	000		
8098	45 dr	USED ANTIFREEZE, 50% WATER	357	8098	8098-0183	SV160	000		
8130	5 DR	HYD OIL, USED, 10% WATER	357	8130	8138-0187	SV250	000	armament	
8122	6 DR	HYD FLUID, 3%DIRT 3% WATER	357	8122	8136-0189	SV253	000	armament hydraulic	
8356	3 DR	HYD OIL, USED 5% DIRT/WATER	357	8358	9024-0181	SV253	000		
~~8062~~	~~2 dr~~	~~HYD OIL (RED) 10% WATER~~	~~357~~	~~8062~~	~~8062-0158~~	~~SV260~~	~~000~~	plating	Bldg 1N
8029	24 dr	HYD OIL 10% DIRT 10% WATER	357	8328	8042-0174	SV260	000		
7282	12 dr	HYD OIL, 10% DIRT 10% WATER	357	7282	7202-0177	SV260	000		
7324	9 dr	HYD OIL, 10% DIRT 10% WATER	357	7324	7330-0189	SV260	000		
8251	33 DR	06888JONCOOL800	357	8251	8278-0172	SV310	000	machine	Bldg 350A
8088	3 dr	30%M.OIL 20%MTL CHIPS W/SPDRY	357	8088	8098-0179	SV310	000		
8287	3 dr	30%MTROIL,20%MTLCHPS,50%SPDRY	357	8287	8291-0172	SV310	000		
8069	1 dr	50% HYD OIL 50% WATER	357	8069	8081-0171	SV310	000		
8043	14 dr	HYD OIL (RED) 5%DIRT	357	8043	8048-0172	SV310	000		
7188	1 dr	SPEEDY DRY W/OIL	357	7188	7192-0180	SV310	FFF		
8341	5 dr	USED FILTER PAPER	357	8342	8222-0156	SV310	000		
8341	36 dr	USED SOLUBLE OIL & WATER	357	8342	8222-0181	SV310	000		
8357	2 DR	FILTERS W/FUEL OIL	357	8357	9024-0179	SV330	000	paint	Bldg. 350
8297	17 dr	CHEMREX,BONDO,GLUECANS IN SPDR	357	8297	8278-0175	SV340	000	bar	
8351	1 DR	OIL W/80% CUTTINGS, 20% DIRT	357	8351	9024-0178	SV350	000	sheet material	

MAINT DIR 4Q CY86 GENRS WASTE PENDING TURN-IN as of 9097

START DATE	AMOUNT IN LOT	WASTE DESCRIPTION NON-HAZARDOUS	PRESENT LOCATION	DATE RCVD	DOCUMENT NUMBER	SOURCE C.C.	LOT	
8312	3 dr	PNT CAN F/ED IN SPEEDY DRY	357	8312	8348-0166	SV410	000	Bldg. 350
7267	1 dr	DIESEL FUEL 100%	357	7267	7268-0188	vehicle support SV430 ASRS	000	
7267	1 dr	DIESEL FUEL 6% WATER 94%	357	7267	7268-0187	SV430	000	
8297	1 dr	GRSE 1-55GAL F/ED RECOVERY DR	357	8297	8278-0177	SV430	000	
8297	1 dr	GRSE/6-5GAL CAN IN RECOVERY DR	357	8297	8278-0176	SV430	000	
6327	1 dr	Penetrant	357	6327	9021-0175	SV430	000	
7337	1 dr	OIL CONTAMINATED W/DIRT	057	7337	7342-0173	SV510	000	Bldg. ~~37N~~ 57N
8055	1 dr	OIL CONTAMINATED W/DIRT	057	8055	8162-0171	chemical equipment SV510		
8197	1 dr	OIL CONTAMINATED W/DIRT	057	8197	8181-0175	SV510		
8252	1 dr	OIL CONTAMINATED W/DIRT	057	8252	8285-0173	SV510		
8272	2 dr	~~FUEL FILTERS~~	~~037~~	~~8272~~	~~8277-0183~~	SV520		Blc 37
7296	3 dr	OIL CONTAMINATED W/DIRT	037	7329	7333-0174	engine SV520	000	
7335	3 dr	OIL CONTAMINATED W/DIRT	037	7335	7336-0176	SV520	000	
8012	3 dr	OIL CONTAMINATED W/DIRT	037	8012	8012-0175	SV520	000	
8039	1 dr	OIL CONTAMINATED W/DIRT	037	8039	8039-0171	SV520	000	
8048	2 dr	OIL CONTAMINATED W/DIRT	037	8048	8049-0180	SV520		
8075	6 dr	OIL CONTAMINATED W/DIRT	037	8075	8075-0153	SV520		
8090	2 dr	OIL CONTAMINATED W/DIRT	037	8090	8088-0166	SV520		
8102	6 dr	OIL CONTAMINATED W/DIRT	037	8102	8103-0174	SV520		
8112	2 dr	OIL CONTAMINATED W/DIRT	037	8112	8112-0151	SV520		
8125	1 dr	OIL CONTAMINATED W/DIRT	037	8125	8138-0186	SV520		
8138	2 dr	OIL CONTAMINATED W/DIRT	037	8138	8152-0171	SV520		
8152	2 dr	OIL CONTAMINATED W/DIRT	037	8152	8155-0182	SV520		
8168	2 dr	OIL CONTAMINATED W/DIRT	037	8168	8168-0153	SV520		
8172	2 dr	OIL CONTAMINATED W/DIRT	037	8172	8174-0163	SV520		

MAINT DIR 4G CY86 GENRS WASTE PENDING TURN-IN as of 9097 Page 4

START DATE	AMOUNT IN LOT	WASTE DESCRIPTION NON-HAZARDOUS	PRESENT LOCATION	DATE RCVD	DOCUMENT NUMBER	SOURCE C.C.	LOT
8176	5 dr	OIL CONTAMINATED W/DIRT	037	8176	8175-0162	SV520 engine	
8193	3 dr	OIL CONTAMINATED W/DIRT	037	8193	8180-0190	SV520	
8193	5 dr	OIL CONTAMINATED W/DIRT	037	8193	8181-0176	SV520	
8204	3 dr	OIL CONTAMINATED W/DIRT	037	8204	8222-0174	SV520	
8230	3 dr	OIL CONTAMINATED W/DIRT	037	8230	8264-0176	SV520	
8230	3 dr	OIL CONTAMINATED W/DIRT	037	8230	8264-0175	SV520	
8272	4 dr	OIL CONTAMINATED W/DIRT	037	8272	8277-0161	SV520	
8272	3 dr	OIL CONTAMINATED W/DIRT	037	8272	8279-0177	SV520	
8272	0 dr	OIL CONTAMINATED W/DIRT	037	8272	8279-0176	SV520	
8311	10 dr	OIL CONTAMINATED W/DIRT	037	8311	8313-0183	SV520	
8312	3 dr	OIL FILTERS	037	8312	8312-0151	SV520	
8109	15 dr	OIL CONTAMINATED W/DIRT	037	8109	8318-0185	SV530 disassembly & wash	
8201	24 dr	OIL CONTAMINATED W/DIRT	037	8201	8249-0172	SV530	
8217	3 dr	OIL CONTAMINATED W/DIRT	037	8217	8222-0175	SV530	
8238	3 dr	OIL CONTAMINATED W/DIRT	037	8238	8244-0157	SV530	
8277	3 dr	OIL CONTAMINATED W/DIRT	037	8277	8278-0171	SV530	
8311	3 dr	OIL CONTAMINATED W/DIRT	037	8311	8313-0151	SV530	
8355	3 dr	Oil, Used	037	8355	9023-0182	SV530	
7303	1 dr	SPEEDY DRY	037	7303	7306-9175	SV530	000
8342	84 dr	TRIPLE RINSE EMPTY	037	8342	9023-0182	SV530	
8313	2 dr	FUEL FILTERS	037	8313	8319-0151	SV540 transmission	
8276	63 dr	OIL CONTAMINATED W/DIRT	037	8278	8322-0181	SV540	

Bld.
37

Bl.
37

MAINT DIR AG CY88 GENRS WASTE PENDING TURN-IN as of 9097 Page 5

START DATE	AMOUNT IN LOT	WASTE DESCRIPTION HAZARDOUS	PRESENT LOCATION	DATE RCVD	DOCUMENT NUMBER	SOURCE C.C.	LOT
8272	1 dr	GLASS BLAST RESIDUE	drmo	9006	82850152	58020	55-
8294	1 dr	GLASS BLAST RESIDUE	drmo	9006	8294015c	[illegible]	[illegible]
8327	1 DR	GLASS BLAST RESIDUE	675	8327	[illegible]	[illegible]	64-
8363	1 dr	GLASS BLAST RESIDUE	675	8363	9005015c	[illegible]	[illegible]
8365	1 dr	PENN-STRIP SLUDGE	drmo	9006	[illegible]	[illegible]	[illegible]
[illegible]	1 dr	STEEL GRIT BLAST RESIDUE	drmo	9006	[illegible]	[illegible]	[illegible]
8319	1 DR	STEEL GRIT BLAST RESIDUE	675	8319	[illegible]	[illegible]	[illegible]
[illegible]	1 DR	STEEL GRIT BLAST RESIDUE	675	8321	[illegible]	[illegible]	[illegible]
[illegible]	1 dr	TRICHLOROETHANE-USED	656	8322	[illegible]	[illegible]	[illegible]
[illegible]	1 dr	TRICHLOROETHANE-USED	655	[illegible]	[illegible]	[illegible]	[illegible]
8321	1 DR	TRICHLOROETHANE	696	8321	[illegible]	[illegible]	[illegible]
8321	1 DR	TRICHLOROETHANE SLUDGE	675	8321	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	1 DR	USED CAUSTIC [illegible] SLUDGE	675	[illegible]	[illegible]	[illegible]	[illegible]
8340	1e dr	USED PENSTRIP NPX	675	8340	[illegible]	[illegible]	[illegible]
8340	1 dr	USED PENSTRIP NPX SLUDGE	675	8340	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	PAINT ARRESTERS	675	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	PAINT ARRESTERS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	PAINT ARRESTERS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	PAINT ARRESTERS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	PAINT ARRESTERS	drmo	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	PAINT ARRESTERS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	PAINT ARRESTERS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	PAINT ARRESTERS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	PAINT ARRESTERS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

cleaning + plating

prep + paint

Bldg. 370

MAINT DIR 40 CY88 GENRS WASTE PENDING TURN-IN as of 9097 Page [illegible]

START DATE	AMOUNT IN LOT	WASTE DESCRIPTION HAZARDOUS	PRESENT LOCATION	DATE RCVD	DOCUMENT NUMBER	SOURCE C.C.	LOT
8351	1 dr	PAINT ARRESTERS	675	8351	83550153	5E330	51
8357	2 dr	PAINT ARRESTERS	675	8357	90050158	5E330	006
8364	1 dr	PAINT ARRESTERS	675	8364	90050155	5E330	54
8277	1 dr	PAINT RESIDUE	drmo	9006	82780160	5E330	[illegible]
8306	1 dr	PAINT RESIDUE	drmo	9006	83140154	5E330	7
8340	1 dr	PAINT RESIDUE	675	8340	83460162	5E330	[illegible]
8364	1 dr	PAINT RESIDUE	675	8364	90050157	5E330	[illegible]
8277	1 dr	PAINT SOLVENT RESIDUE	drmo	9006	82780162	5E330	47
8305	1 dr	PAINT SOLVENT RESIDUE	drmo	9006	83050153	5E330	51
8319	1 DR	PAINT SOLVENT RESIDUE	drmo	9006	83260157	5E330	53
8319	1 dr	PAINT SOLVENT RESIDUE	675	8319	83220167	5E330	52
8321	1 DR	PAINT SOLVENT RESIDUE	DRMO	8321	83450165	5E330	54
8322	1 dr	PAINT SOLVENT RESIDUE	675	8322	83260157	5E330	53
8324	1 DR	PAINT SOLVENT RESIDUE	drmo	8266	83290157	5E330	[illegible]
8343	1 dr	PAINT SOLVENT RESIDUE	675	8343	83540163	5E330	55
8351	1 dr	PAINT SOLVENT RESIDUE	675	8351	83550154	5E330	[illegible]
8357	1 dr	PAINT SOLVENT RESIDUE	675	8357	[illegible]	[illegible]	[illegible]
8306	1 dr	PAINT, AIR HOSES	drmo	9006	83140155	[illegible]	[illegible]
[illegible]	1 dr	PAPER, TAPE & ALUMINUM FOIL	drmo	9006	[illegible]	[illegible]	[illegible]
[illegible]	1 dr	PAPER, TAPE, ALUMINIUM FOIL	675	8335	[illegible]	[illegible]	[illegible]
[illegible]	1 DR	PAPER, TAPE, ALUMINUM FOIL	drmo	[illegible]	[illegible]	[illegible]	[illegible]
8319	1 DR	PRIMER COAT EPOXY	675	8319	[illegible]	[illegible]	[illegible]
[illegible]	1 dr	PRIMER COATING EPOXY	drmo	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	1 dr	PRIMER COATING EPOXY	drmo	9006	[illegible]	[illegible]	[illegible]
[illegible]	1 DR	PRIMER COATING EPOXY	675	8321	[illegible]	[illegible]	[illegible]

prep + paint

Bldg.
370

MAINT DIR 42 CYBE GENRS WASTE PENDING TURN-IN as of 9097 Page

START DATE	AMOUNT IN LOT	WASTE DESCRIPTION HAZARDOUS	PRESENT LOCATION	DATE RCVD	DOCUMENT NUMBER	SOURCE C.C.	LOT
8324	1 DR	PRIMER COATING EPOXY	drmo	8266	83290154	SE[illegible]	34
8337	1 dr	PRIMER COATING EPOXY	675	8337	83480164	SE[illegible]	4F
8341	1 dr	PRIMER COATING EPOXY	675	8341	83480161	SE[illegible]	[illegible]
8343	1 dr	PRIMER COATING EPOXY	675	8343	83540162	SE[illegible]	[illegible]
8351	1 dr	PRIMER COATING EPOXY	675	8351	83550152	[illegible]	[illegible]
8362	1 dr	PRIMER COATING EPOXY	675	8362	90050154	[illegible]	[illegible]
8321	1 DR	SANDING BOOTH [illegible]	675	8321	83260156	[illegible]	[illegible]
8355	4 dr	SANDING BOOTH [illegible]	675	8355	83550151	[illegible]	[illegible]
8343	1 dr	STEEL GRIT [illegible] RESIDUE	675	8343	83540160	SE[illegible]	[illegible]
8354	1 dr	TRICHLOROETHANE-USED	drmo	9006	83010175	SE[illegible]	[illegible]
8326	1 dr	TRICHLOROETHANE	drmo	9006	83220169	[illegible]	[illegible]
8265	1 dr	TRICHLOROETHANE-USED	drmo	9006	82770169	SE[illegible]	[illegible]
8319	1 DR	[illegible] SODIUM ACID	675	8319	83220161	SE[illegible]	[illegible]
8302	1 dr	LUBRICATING OIL	675	9002	90230166	SE[illegible]	[illegible]
8323	1 DR	TRICHLOROTHANE	656	8323	90230171	SE[illegible]	[illegible]
8342	1 dr	TRICHLOROETHANE-USED	656	8342	90230176	SE[illegible]	77
8356	1 dr	TRICHLOROETHANE-USED	656	8356	90230177	SE760	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8743-0177	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8021-0171	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8A30-0151	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8712-0151	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

prep + paint

electronic-mechanical

hydraulic + pneumatic

cable + harness

motor reconditioning

Bldg. 37C

Assembly

Bldg 35C

wash

Bldg 351

light recoil

Bldg 12

heavy recoil

Bldg 13

armament reclamation

armament hydraulic

Bldg 35C

plating

Bldg 1N

MAINT DIR 40 CY88 GENRS WASTE PENDING TURN-IN as of 9057 Page 8

START DATE	AMOUNT IN LOT	WASTE DESCRIPTION HAZARDOUS	PRESENT LOCATION	DATE RCVD	DOCUMENT NUMBER	SOURCE C.C.	LOT
8295	1 dr	7-1GALCANS,33UNICHROM IN SPDY	DRMO	8295	9021-0176	5V260	001
8312	1 dr	COMP CHROM TRIOXIDE CONTAM	DRMO	8312	GEN-8313	5V260	002
8313	15 dr	COMP CHROMTRIOXIDE 20%UNICHORM	DRMO	8313	GEN-8313	5V260	002
8362	1 DR	COMP UNICHROM W/1% TRIOXIDE	DRMO	8362	GEN-8362	5V260	002
8307	4 dr	COMPOUND UNICHROME 20	DRMO	8307	GEN-8307	5V260	002
8352	1 DR	NANAPEEL	357	8352	GEN-8352	5V260	002
8305	6 dr	PAINT FILTERS 10%ABSORBENT	DRMO	8305	8343-0159	5V260	002
8364	1 DR	SELECTRON BRUSH PLATING CHEM	DRMO	9001	GEN-9009	5V260	002
8318	6 dr	STEEL GRIT CONTAM 10%PAINT	357	8318	GEN-8313	5V260	002
8295	5 dr	TRICO 10%DIRT 10%WATER	DRMO	8295	9021-0172	5V260	001
8295	1 dr	70%AG/STEEL 20%WTR 5%DRT/SOLV	DRMO	8295	8343-0166	[illegible]	[illegible]
8295	1 dr	80%WTR 10%AG/STEEL 5%DRT/SOLV	DRMO	8295	8343-0167	[illegible]	[illegible]
8305	543 dr	AG BLAST DUST 10% PAINT DUST	DRMO	8305	8343-0160	[illegible]	[illegible]
8294	22 dr	DUSTBAG CONTAM W/STEEL DUST	DRMO	8294	8343-0169	[illegible]	[illegible]
8294	32 dr	DUSTBAGS CONTAM W/AG DUST	DRMO	8294	8343-0168	5V[illegible]	[illegible]1
8295	3 dr	PENESOLVE 204 SLUDGE	DRMO	8295	9021-0177	[illegible]	[illegible]
8295	4 dr	PENESTRIP NPX SLUDGE W/PNTCHPS	357	8295	9021-0175	[illegible]	[illegible]1
8305	26 dr	STEEL BLAST 10%PNT DUST	DRMO	8305	8343-0157	[illegible]	[illegible]1
8291	4 dr	USED DA ITE 31 (SOLID)	DRMO	8291	[illegible]-0156	[illegible]	[illegible]
8306	6 dr	60%THINNER 40%PAINT	357	8306	8343-0162	[illegible]	[illegible]
8320	24 dr	80% Thinner, 20% Paint	357	[illegible]	8343-0153	[illegible]	[illegible]
8309	21 dr	85% THINNER 15% CARC PAINT	357	8309	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	85% WATER 15% Primer	357	[illegible]	[illegible]	[illegible]	[illegible]
8315	7 dr	APPRO. 20%EPOXY/PRIMER 80%WTR	357	8315	8343-0164	[illegible]	[illegible]
8306	7 dr	NANAPEEL W/ABSORBENT	357	8306	8343-0161	[illegible]	[illegible]

plating

preparation

paint

Bldg

Blc

35

MAINT DIR 4Q CY88 GENRS WASTE PENDING TURN-IN as of 9097

START DATE	AMOUNT IN LOT	WASTE DESCRIPTION HAZARDOUS	PRESENT LOCATION	DATE RCVD	DOCUMENT NUMBER	SOURCE C.C.	SOURCE LOT
8306	98 dr	PAINT FILTERS W/ABSORBENT	DRMO	8306	8343-0163	SV330	002
8326	3 dr	Paint Chips	357	8327	8343-0154	SV330	002
8322	12 dr	TRASH,FLOORSWEEP CONTAM PAINT	357	8322	8343-0152	SV330	002
8312	4 dr	DUST FILTERS 40%DUST 60% FLTR	DRMO	8312	8343-0156	SV340	002
8357	5 DR	PAINT FILTERS	DRMO	8357	9023-0167	SV350	002
8341	5 dr	NAPAFEEL	057	8341	8341-0151	SV510	
8341	3 dr	PAINT FILTERS	057	8341	8341-0152	SV510	
8341	5 dr	PAINT RESIDUE	057	8341	8341-0153	SV510	
8341	27 dr	POLY-BLAST	057	8341	8341-0155	SV510	
8358	3 dr	Asbestos Clutch	037	8358	8358-0151	SV520	
8315	3 dr	OIL CONTAMINATED W/TRICO	037	8315	8322-0178	SV520	
8362	2 DR	OIL, USED, CONT W/TRICO	037	8362	9023-0178	SV520	000
8362	2 dr	Oil, Used, Cont w/Trico	037	8362	9023-0178	SV520	0
8362	5 dr	Oil, used, cont w/Trico	037	8362	9023-0178	SV520	
8312	5 dr	PAINT FILTERS	037	8312	8312-0153	SV520	
8315	12 dr	AG BLAST	037	8315	8322-0174	SV530	
8340	15 dr	AG BLAST	037	8340	8341-0154	SV530	
8358	5 dr	AG Blast	037	8358	8362-0151	SV530	
8315	1 dr	TRICO	037	8315	8322-0175	SV530	
8315	4 dr	TRICO	037	8315	8322-0175	SV530	
8314	16 dr	PAINT-LI[illegible]	037	8314	8319-0153	SV540	
8314	1 dr	[illegible]	037	8314	8319-0152	SV540	
8315	17 dr	TRICO	037	8315	8322-0170	SV540	
8312	1 dr	SUBSOIL CONTAM [illegible]/CHROM/LEAD	037	8312	9021-0178	[illegible]	[illegible]

paint

box

sheet material

Bldg. 350

chemical equipment

Bldg. 57

Engine

disassembly & wash

transmission

Bldg. 37

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                    ****************************************
                    SUMMARY OF VOC EMISSIONS FOR - 05/02/89
                    ****************************************

OOTH  603 Shift 1 Emissions =  0.15 lbs   BOOTH lb/gal Average = 1.200 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  0.13 gal
LDG.3315 Shift 1 Emissions =  0.15 lbs   BLDG. lb/gal Average = 1.200 lb/gal   BLDG. VOCs Disposed = 0.00 lb  BLDG. VOL =  0.13 gal

OOTH 320P Shift 1 Emissions =  0.00 lbs   BOOTH lb/gal Average = 0.000 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  0.00 gal
OOTH 320S Shift 1 Emissions =  5.86 lbs   BOOTH lb/gal Average = 6.694 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  0.88 gal
OOTH 3000 Shift 1 Emissions = 10.43 lbs   BOOTH lb/gal Average = 3.208 lb/gal   BOOTH VOCs Disposed = 3.25 lb  BOOTH VOL =  3.25 gal
OOTH 3002 Shift 1 Emissions =  1.63 lbs   BOOTH lb/gal Average = 3.250 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  0.50 gal
OOTH 3003 Shift 1 Emissions =  9.74 lbs   BOOTH lb/gal Average = 3.247 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  3.00 gal
OOTH 3006 Shift 1 Emissions =  9.75 lbs   BOOTH lb/gal Average = 3.250 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  3.00 gal
LDG. 320 Shift 1 Emissions = 37.40 lbs   BLDG. lb/gal Average = 3.520 lb/gal   BLDG. VOCs Disposed = 3.25 lb  BLDG. VOL = 10.63 gal

BOOTH   59 Shift 1 Emissions = 36.01 lbs  BOOTH lb/gal Average = 3.440 lb/gal   BOOTH VOCs Disposed = 1.63 lb  BOOTH VOL = 10.47 gal
BOOTH   61 Shift 1 Emissions =  7.90 lbs  BOOTH lb/gal Average = 3.078 lb/gal   BOOTH VOCs Disposed = 1.31 lb  BOOTH VOL =  2.57 gal
BOOTH  252 Shift 1 Emissions =  4.54 lbs  BOOTH lb/gal Average = 3.364 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  1.35 gal
BOOTH  200 Shift 1 Emissions =  4.25 lbs  BOOTH lb/gal Average = 2.953 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  1.44 gal
BOOTH  460 Shift 1 Emissions =  3.12 lbs  BOOTH lb/gal Average = 3.115 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  1.00 gal
BOOTH  470 Shift 1 Emissions =  0.68 lbs  BOOTH lb/gal Average = 2.710 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  0.25 gal
BOOTH  717 Shift 1 Emissions =  2.71 lbs  BOOTH lb/gal Average = 2.710 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  1.00 gal
BOOTH  718 Shift 1 Emissions =  3.25 lbs  BOOTH lb/gal Average = 3.250 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  1.00 gal
BOOTH  719 Shift 1 Emissions =  4.88 lbs  BOOTH lb/gal Average = 3.250 lb/gal   BOOTH VOCs Disposed = 1.63 lb  BOOTH VOL =  1.50 gal
BOOTH 1010 Shift 1 Emissions =  4.23 lbs  BOOTH lb/gal Average = 2.817 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  1.50 gal
BOOTH 2527 Shift 1 Emissions =  4.33 lbs  BOOTH lb/gal Average = 3.096 lb/gal   BOOTH VOCs Disposed = 0.27 lb  BOOTH VOL =  1.40 gal
BOOTH 2541 Shift 1 Emissions =  9.75 lbs  BOOTH lb/gal Average = 3.250 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  3.00 gal
BOOTH 350F Shift 1 Emissions =  3.19 lbs  BOOTH lb/gal Average = 3.190 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  1.00 gal
BOOTH 350P Shift 1 Emissions =  0.00 lbs  BOOTH lb/gal Average = 0.000 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  0.00 gal
BLDG. 350 Shift 1 Emissions = 88.83 lbs  BLDG. lb/gal Average = 3.233 lb/gal   BLDG. VOCs Disposed = 4.83 lb  BLDG. VOL = 27.47 gal

BOOTH  200 Shift 1 Emissions =  6.50 lbs  BOOTH lb/gal Average = 3.250 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  2.00 gal
BOOTH 2013 Shift 1 Emissions =  3.25 lbs  BOOTH lb/gal Average = 3.250 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  1.00 gal
BOOTH 370P Shift 1 Emissions =  0.00 lbs  BOOTH lb/gal Average = 0.000 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  0.00 gal
BOOTH 3077 Shift 1 Emissions =  2.70 lbs  BOOTH lb/gal Average = 2.700 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  1.00 gal
BOOTH 4290 Shift 1 Emissions = 10.82 lbs  BOOTH lb/gal Average = 2.705 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  4.00 gal
BLDG. 370 Shift 1 Emissions = 23.27 lbs  BLDG. lb/gal Average = 2.909 lb/gal   BLDG. VOCs Disposed = 0.00 lb  BLDG. VOL =  8.00 gal

SHIFT 1 Total VOC Emission = 149.65 lbs  SHIFT lb/gal Average = 3.237 lb/gal   SHIFT VOCs Disposed = 8.08 lb  SHIFT VOL = 46.22 gal

BOOTH 3000 Shift 2 Emissions = 40.63 lbs  BOOTH lb/gal Average = 3.250 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL = 12.50 gal
BOOTH 3003 Shift 2 Emissions =  6.50 lbs  BOOTH lb/gal Average = 3.250 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  2.00 gal
BOOTH 3006 Shift 2 Emissions =  6.50 lbs  BOOTH lb/gal Average = 3.250 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  2.00 gal
BOOTH 4370 Shift 2 Emissions = 22.75 lbs  BOOTH lb/gal Average = 3.250 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  7.00 gal
BLDG. 320 Shift 2 Emissions = 76.38 lbs  BLDG. lb/gal Average = 3.250 lb/gal   BLDG. VOCs Disposed = 0.00 lb  BLDG. VOL = 23.50 gal

BOOTH   59 Shift 2 Emissions = 22.75 lbs  BOOTH lb/gal Average = 3.250 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  7.00 gal
BOOTH   60 Shift 2 Emissions = 20.77 lbs  BOOTH lb/gal Average = 2.898 lb/gal   BOOTH VOCs Disposed = 0.23 lb  BOOTH VOL =  7.17 gal
BOOTH  200 Shift 2 Emissions =  3.12 lbs  BOOTH lb/gal Average = 3.115 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  1.00 gal
BOOTH  460 Shift 2 Emissions =  2.17 lbs  BOOTH lb/gal Average = 2.890 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  0.75 gal
BOOTH  470 Shift 2 Emissions =  4.88 lbs  BOOTH lb/gal Average = 3.250 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  1.50 gal
BOOTH  718 Shift 2 Emissions =  6.50 lbs  BOOTH lb/gal Average = 3.250 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  2.00 gal
BOOTH  719 Shift 2 Emissions =  6.50 lbs  BOOTH lb/gal Average = 3.250 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  2.00 gal
BOOTH 2527 Shift 2 Emissions =  2.60 lbs  BOOTH lb/gal Average = 2.600 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  1.00 gal
BOOTH 350F Shift 2 Emissions =  3.25 lbs  BOOTH lb/gal Average = 3.250 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  1.00 gal
BLDG. 350 Shift 2 Emissions = 72.52 lbs  BLDG. lb/gal Average = 3.097 lb/gal   BLDG. VOCs Disposed = 0.23 lb  BLDG. VOL = 23.42 gal

BOOTH  200 Shift 2 Emissions =  5.96 lbs  BOOTH lb/gal Average = 2.980 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  2.00 gal
BOOTH 2013 Shift 2 Emissions =  9.75 lbs  BOOTH lb/gal Average = 3.250 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  3.00 gal
BOOTH 4290 Shift 2 Emissions = 12.33 lbs  BOOTH lb/gal Average = 2.740 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  4.50 gal
BLDG. 370 Shift 2 Emissions = 28.04 lbs  BLDG. lb/gal Average = 2.952 lb/gal   BLDG. VOCs Disposed = 0.00 lb  BLDG. VOL =  9.50 gal

SHIFT 2 Total VOC Emission = 176.94 lbs  SHIFT lb/gal Average = 3.136 lb/gal   SHIFT VOCs Disposed = 0.23 lb  SHIFT VOL = 56.42 gal

BOOTH   59 Shift 3 Emissions = 31.35 lbs  BOOTH lb/gal Average = 3.226 lb/gal   BOOTH VOCs Disposed = 0.00 lb  BOOTH VOL =  9.72 gal
BOOTH   60 Shift 3 Emissions = 39.42 lbs  BOOTH lb/gal Average = 3.205 lb/gal   BOOTH VOCs Disposed = 1.75 lb  BOOTH VOL = 12.30 gal
BLDG. 350 Shift 3 Emissions = 70.77 lbs  BLDG. lb/gal Average = 3.214 lb/gal   BLDG. VOCs Disposed = 1.75 lb  BLDG. VOL = 22.02 gal

SHIFT 3 Total VOC Emission =  70.77 lbs  SHIFT lb/gal Average = 3.214 lb/gal   SHIFT VOCs Disposed = 1.75 lb  SHIFT VOL = 22.02 gal


    SUMMARY OF VOC EMISSIONS FOR - 05/02/89                              VOC BALANCE TABLE
    ****************************************************    **********************************************************************
    SURFACE COATING EMISSIONS:          397.36                  BLD   START   ISSUED   SPRAYED   DISPOSED   LEFT    ERROR   lb/gal
    [illegible] VOC lb/gal AVERAGE:       3.19                  320   11.30   117.03   113.78     3.25     11.30   -0.00    3.33
    [illegible] COMPLIANCE LEVEL:         3.71                  350    9.75   232.32   232.12     6.81     10.40   -7.26    3.10
    Volume at 3.50 compliance level:  92.41                     370    3.25    51.31    51.31     0.00      3.25   -0.00    2.92
    Volume at 4.30 compliance level:  32.00                    3315    0.00     0.00     0.15     0.00      0.00   -0.15    1.20
    Volume at 6.04 compliance level:   0.75                   **********************************************************************
    Pounds of coating VOCs disposed:  10.06
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**** NIIN Historical Use/Balance Report By Building ****

For 05/02/89 thru 05/02/89

** BLDG 320 **

NIIN	USE	NOMENCLATURE	MIL SPEC	PAINTERS ADDED	PSP ISSUED	INV DELTA
00-067-5434	C	*PRIMER,BROWN,SPRAY	A-A-1552	0.13		
00-067-5434	I	*PRIMER,BROWN,SPRAY	PSP REPORTED:		0.13	
00-181-8080	E	THINNER, ALIPHATIC	MIL-T-81772T1	8.00		
00-181-8080	I	THINNER, ALIPHATIC	PSP REPORTED:		8.00	
00-290-6983	C	LACQUER, SPRAY,WHITE	A-A-665	0.13		
00-290-6983	I	LACQUER, SPRAY,WHITE	PSP REPORTED:		0.13	
00-469-7910	C	INK,BLACK,SPRAY	UNKNOWN	0.50		
00-469-7910	I	INK,BLACK,SPRAY	PSP REPORTED:		0.50	
00-X75-1428	C	ENAMEL,SPRAY,BLACK	LOCALPURCHASE	0.13		
00-X75-1428	I	ENAMEL,SPRAY,BLACK	PSP REPORTED:		0.13	
00-193-0519	C	PRIMER, RED EPOXY WR	MIL-P-53030	0.25		
00-193-0519	I	PRIMER, RED EPOXY WR	PSP REPORTED:		0.25	
01-235-4166	C	BLACK,HEAT RESISTANT	MIL-P-14105	1.00		
01-235-4166	I	BLACK,HEAT RESISTANT	PSP REPORTED:		1.00	
01-X86-0262	C	PUP, BLACK 37030	MIL-C-53039HS	7.00		
01-X86-0262	I	PUF, BLACK 37030	PSP REPORTED:		7.00	
01-X86-0263	C	PUP, GREEN 34094	MIL-C-53039	22.00		
01-X86-0263	I	PUP, GREEN 34094	PSP REPORTED:		22.00	
01-X86-0265	C	PUF, BROWN 30051	MIL-C-53039HS	4.00		
01-X86-0265	I	PUF, BROWN 30051	PSP REPORTED:		4.00	
			BLDG. 320 Total:	43.13	43.13	

**** NIIN Historical Use/Balance Report By Building ****
For 05/02/89 thru 05/02/89

** BLDG 350 **

NIIN	USE	NOMENCLATURE	MIL SPEC	PAINTERS ADDED	PSP ISSUED	DIV DELTA
00-181-8080	C	THINNER, ALIPHATIC	MIL-T-81772T1	0.10		
00-181-8080	E	THINNER, ALIPHATIC	MIL-T-81772T1	18.88		
00-181-8080	I	THINNER, ALIPHATIC	PSP REPORTED:		19.00	
00-281-2726	C	PRETREATMENT,ACID	DOD-P-15328	3.00		
00-281-2726	I	PRETREATMENT,ACID	PSP REPORTED:		3.00	
00-298-2280	C	PRIMER, ZINC RICH	TT-P-641G	0.25		
00-298-2280	I	PRIMER, ZINC RICH	PSP REPORTED:		0.25	
00-599-9201	C	WALKWAY COMPOUND	MIL-C-5044C	1.00		
00-599-9201	I	WALKWAY COMPOUND	PSP REPORTED:		1.00	
01-127-3683	C	CORROS PREVENT(55GL)	MIL-C-62218	4.00		
01-127-3683	I	CORROS PREVENT(55GL)	PSP REPORTED:		4.00	
01-193-0519	C	PRIMER, RED EPOXY WR	MIL-P-53030	2.19		
01-193-0519	I	PRIMER, RED EPOXY WR	PSP REPORTED:		2.19	
01-193-0520	C	PRIMER,RED EPOXY WR	MIL-P-53030	7.50		
01-193-0520	I	PRIMER,RED EPOXY WR	PSP REPORTED:		7.50	
01-X86-0263	C	PUP, GREEN 34094	MIL-C-53039	43.25		
01-X86-0263	I	PUP, GREEN 34094	PSP REPORTED:		41.25	
01-X86-2547	C	EPOXY, WHITE 17925	MIL-C-22750HS	13.50		
01-X86-2547	I	EPOXY, WHITE 17925	PSP REPORTED:		13.50	
01-X86-0623	C	PUP, TAN 33446	MIL-C-53039HS	1.00		
01-X86-0623	I	PUP, TAN 33446	PSP REPORTED:		1.00	
			BLDG. 350 Total:	94.67	92.69	

**** NIIN Historical Use/Balance Report By Building ****
For 05/02/89 thru 05/02/89

** BLDG 370 **

NIIN	USE	NOMENCLATURE	MIL SPEC	PAINTERS ADDED	PSP ISSUED	DIV DELTA
0-181-8080	E	THINNER, ALIPHATIC	MIL-T-81772T1	8.00		
0-181-8080	I	THINNER, ALIPHATIC	PSP REPORTED:		6.00	
01-193-0520	C	PRIMER,RED EPOXY WR	MIL-P-53030	3.00		
1-193-0520	I	PRIMER,RED EPOXY WR	PSP REPORTED:		3.00	
01-X86-0263	C	PUP, GREEN 34094	MIL-C-53039	3.00		
01-X86-0263	I	PUP, GREEN 34094	PSP REPORTED:		3.00	
1-X86-2549	C	EPOXY, GRAY,26307	MIL-C-22750HS	4.50		
1-X86-2549	I	EPOXY, GRAY,26307	PSP REPORTED:		4.50	
01-X86-2554	C	EPOXY,SEAFOAM,24533	MIL-C-22750HS	3.00		
1-X86-2554	I	EPOXY,SEAFOAM,24533	PSP REPORTED:		3.00	
01-X88-0623	C	PUP, TAN 33446	MIL-C-53039HS	4.00		
01-X88-0623	I	PUP, TAN 33446	PSP REPORTED:		4.00	
			BLDG. 370 Total:	25.50	25.50	

**** NIIN Historical Use/Balance Report By Building ****
For 05/02/89 thru 05/02/89

** BLDG 3315 **

NIIN	USE	NOMENCLATURE	MIL SPEC	PAINTERS ADDED	PSF ISSUED	DIV DELTA
00-754-0064	C	SOLID FILM LUBE	MIL-L-23398	0.13		
			BLDG. 3315 Total:	0.13	0.00	
			Report Period Total VOLUME:	163.42	161.31	

The reported quantities are in GALLONS and include amounts disposed.

USE CODES:
C: Surface Coating
D: Graphic Arts
E: Clean-Up
F: Facility Painting
I: Reported Issued
* in NOMENCLATURE means a low VOC substitute should be considered.

DELTA = INITIAL ISSUE + WALK THRUS - EXPECTED O/H END and is only applicable to Weekly Balance Reports.

DISPOSITION FORM

For use of this form, see AR 340-15, the proponent agency is TAGO.

REFERENCE OR OFFICE SYMBOL SDSLE-MA	SUBJECT Comments/Action DRAFT LEADR 750-30

TO DAP ~~ME~~ ~~MA~~
[redacted] [redacted] [redacted]

FROM Chief, Maint Mgt and Anal Ofc

DATE 2 Feb 87

CMT 1

Mrs. Ausherman/8581

Request action be taken as indicated below:

X a. Review subject draft, attached at Enclosure 1. Comments/concurrence should be forwarded to SDSLE-MA no later than 25 ~~17~~ Feb 87.

X b. Indicate number of finalized copies required by your activity.

____ c. Comments/data requested per attached should be forwarded to SDSLE-MA no later than ____________.

____ d. Appropriate action per attached should be taken.

Encl

f Donald E Slaughter
BETTY L. ELLIOTT
Chief, Maint Mgt
and Anal Ofc

SDSLE FL-114 10:7 84

DA FORM AUG 60 2496 PREVIOUS EDITIONS WILL BE USED

U.S. GOVERNMENT PRINTING OFFICE: [illegible]

7. Procedures: The information in the following subparagraphs and as provided in the Appendix, is primarily for general guidance in accomplishing cleaning/surface treatment requirements. It should be noted that requirements for cleaning/paint stripping and treatment for each item will depend on the applicable DMWR, and some of the items will omit certain steps in the chemical processes. Mechanical cleaning, using appropriate blast media, may be used as a substitute or supplement to the chemical cleaning processes used. For bath make-up and operating requirements, see the Appendix.

a. General Procedure for Aluminum:

(1) Vapor Degreasing - After identifying the material as aluminum, the part is suspended in the vapor degreasing tank until such time that all heavy oils, greases, and dirt have been removed. The degreasing agent used is 1,1,1 trichlorethane (MIL-T-81533). The amount of time needed for effective cleaning in the degreaser depends on the type and amount of foreign matter on the part.

(2) Paint Stripping - After degreasing, the part is immersed in an organic solvent-acid (Pen-Strip NPX) or a mild alkaline (Pensolve 206) paint

stripper until all of the paint has been removed from the substrate. The amount of time needed for effective removal of the paint will depend on the thickness and the type of coating(s). A thorough rinsing in either hot water or steam is necessary immediately following the removal of the part from the strip tank. Unpainted aluminum parts will omit this step. Calgon P-2000 may also be used as a paint stripper under certain conditions. It may be used to strip hard to remove red epoxy primer and/or hard to remove surface oxidation, but only if the Program Control Documentation Package for the item does not strictly prohibit the use of a highly alkaline sodium hydroxide base solution. The immersion time should be limited to no longer than 1 to 2 minutes for painted parts and to no longer than 30 seconds for unpainted oxidized parts. A thorough rinsing in cold water is required immediately after immersion in Calgon P-2000 to prohibit any attack by the base on the aluminum.

(3) Cleaning - After all paint has been removed from the metal substrate, the part is immersed in an acidic cleaning solution (Oakite 31) until all remaining soils are removed from the part. The time needed to accomplish this is dependent on the extent of the soils to be removed. A thorough rinsing in an overflowing cold water tank or in a cold water spray, is necessary after removal from the cleaning tank.

(4) Acid Etching and Pickling - After cleaning of the metal substrates the part is immersed in an acid etch tank (Oakite Deoxidizer LNC or generic acid mixture) for the chemical removal of oxides, films and dirt from the pores of the material. Immersion for 30 seconds to 3 minutes is generally sufficient to produce a bright etched finish. A thorough rinsing in cold water is required following removal from the etch tank, since the conversion coating tank which follows is easily contaminated by inadequate rinsing and drag-in.

(5) Chromate Conversion Coating - When the surface is free of contaminants, the part is immersed in the chromate conversion coating bath (Oakite chromicoat L-25, Amchem Alodine 1200) to provide corrosion protection and promote good bonding of paint, lacquer, and organic finishes. These solutions contain hexavalent chromium in the presence of activators, such as flourides, in an acid solution. The amount of time needed to produce a satisfactory coating is dependent on the alloying constitutents of the part being processed. In general, low alloying constituent metals are easiest to treat and achieve the maximum corrosion protection. The color of the coating is indicative of the thickness and the proper shade is somewhere between iridescent gold and tan, although white coatings are obtained with certain high alloy constituent metals. Immersion time of two minutes is usually sufficient to achieve the proper thickness with the alloys and solutions used at LEAD.

(6) Rinsing and Drying - Once the chromate conversion coating has been formed satisfactorily, the surface should be rinsed as soon as possible in order to minimize the continuing reaction which takes place on the part.

Prolonged rinsing or the use of a very hot rinse can dissolve or leach the hexavalent chromium compounds from a freshly formed coating, resulting in a decreased protective value. If a hot rinse is used to aid drying, immersion in a rinse tank at a temperature greater than 140°F should be limited to a few seconds. Compressed air (at 35psi or less) can also be used to facilitate drying.

b. General Procedure for Ferrous Metals:

(1) Vapor Degreasing - After identifying the material as a ferrous metal, the part is suspended in the vapor degreasing tank until such time that all heavy oils, greases, and dirt have been removed. The degreasing agent used is 1,1,1 trichloroethane (MIL-T-81533). The amount of time needed for effective cleaning in the degreaser depends on the type and amount of foreign matter on the part.

(2) Paint and Corrosion Removal - After degreasing, the part is suspended in a paint and corrosion removing solution, either sodium hydroxide base solution (MIL-C-46156, Calgon P-2000) or potassium hydroxide base solution (Share Paint and Rust Remover) at temperatures from 180° to 210°F. The amount of time needed to effectively remove the paint and corrosion depends on the type and thickness of the coating and the degree of corrosion on the part. After all paint and corrosion are removed, the part is to be thoroughly rinsed in the overflowing hot water rinse tank to remove surface contamination of the part and eliminate carryover of the caustic solution into subsequent treatment tanks.

(3) Phosphating - After the part is clean of all soils and foreign matter, a zinc phosphate coating may be applied when long term corrosion resistance and good bonding for organic finishing is required. Parts should be mechanically cleaned with appropriate blast media prior to phosphating in order to provide a clean, rough surface. The part is immersed in a zinc phosphate solution (Oakite Cryscoat OC, MIL-P50002A, or DOD-P-16232, Type Z, Class 4) at 200°F until a satisfactory coating is obtained. A satisfactory coating shall be light to dark gray in color, with a uniform crystal structure. This requires approximately 15 minutes for a heavy absorption coating (for absorption of rust preventive oil) and 5 minutes if the part is to be painted. Immersion times can vary with the size of the part; larger parts require longer immersion. This is followed by clean water rinse and a final acidified rinse in a dilute chromic acid-phosphoric acid rinse (Oakite FN) for approximately 30 seconds. Further treatment will require either application of an emulsifiable rust preventive oil (Oakite Rust Preventive #2), or application of paint and/or primer.

(4) Black Oxide Coating - If specified, in lieu of a zinc phosphate coating, a black oxide coating may be applied where a black surface and limited corrosion protection is required. The part is immersed in a boiling black oxide solution. (Mitchell-Bradford Black magic, MIL-C-13924) until a good black color is obtained (approximately 30-45 minutes). After a

satisfactory coating is obtained, the part is thoroughly rinsed in an overflowing cold water rinse tank. The part is then dipped in a dilute chromic acid-phosphoric acid rinse (Oakite FH) at a temperature of 140° - 160°F for approximately 30 seconds. Normally, an emulsifiable rust preventive oil (Oakite Rust Preventive #2) is applied as a supplementary treatment following the black oxide coating. Black oxide coatings are not used prior to the application of paint and lacquer.

(5) Rust Preventive Oil - As a final treatment against corrosion for parts that do not require paints, an emulsifiable rust preventive oil (Oakite Rust Preventive #2) is applied over the black oxide or zinc phosphate coating. This requires immersion time of 5 minutes at a temperature of 160°F to 180°F. After removal from the rust preventive oil, the part should be allowed to sit until a dry film is formed over the phosphate or black oxide coating before further handling.

c. General Procedure for Magnesium:

(1) Vapor Degreasing - After identifying the material as magnesium, the part is suspended in the vapor degreasing tank until such time that all heavy oils, greases, and dirt have been removed. The degreasing agent used is 1,1,1 trichloroethane (MIL-T-81533). The amount of time needed for effective cleaning in the degreaser depends on the type and amount of foreign matter on the part.

(2) Paint and Corrosion Removal - After degreasing, the part is immersed in either a strong caustic alkaline cleaner (Calgon P-2000, MIL-C-46156) or a milder alkaline solution (Pennsolve 206 with Penstrip A), until all paint and corrosion have been removed. The milder alkaline solution is used when aluminum and magnesium are both present in the part being cleaned. The amount of time needed to effectively remove the paint and corrosion is dependent upon the thickness and type of coating to be removed. After all paint and corrosion are removed, the part shall be thoroughly rinsed in an overflowing cold water rinse tank or in a cold water spray.

(3) Chemical Conversion Coating - After all paint and corrosion have been removed from the metal substrate, the part is immersed in a chromic acid calcium sulfate conversion coating (MIL-M-3171 Type VI) until a satisfactory coating is obtained. An acceptable light brown or gray color, depending on the alloy coated, can usually be achieved in 1 to 2 minutes. After an acceptable color has been achieved, the part is thoroughly rinsed in cold water and dried with compressed air.

8. Reference:

a. Federal Specifications - TT-C-490 Cleaning Methods and Pretreatment of Ferrous Surfaces for Organic Coatings

b. Military Specifications

(1) MIL-S-5002 - Surface Treatments and Inorganic Coatings for Metal Surfaces of Weapons Systems

(2) MIL-C-5541 - Chemical Conversion Coatings on Aluminum and Aluminum Alloys

(3) MIL-C-81706 - Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys

(4) MIL-C-13924 - Coating, Oxide, Black for Ferrous Metals

(5) MIL-M-3171 - Magnesium Alloy, Processes for Pretreatment and Prevention of Corrosion On

(6) MIL-P-50002 - Phosphate Coating Compounds for Phosphating Ferrous Metals

(7) DOD-P-16232 - Phosphate Coatings, Heavy Manganese or Zinc Base (for Ferrous Metals)

(8) MIL-C-46156 - Corrosion Removing Compound, Sodium Hydroxide Base, for Immersion Application

(9) MIL-T-81533 - 1,1,1 Trichloroethane (Methyl Chloroform) Inhibited, Vapor Degreasing

c. Military Standards - MIL-STD-171 Finishing of Metal and Wood Surfaces

d. Military Handbook - MIL-HDBK-205 Phosphatizing and Black Oxide Coating of Ferrous Metals

e. AMCP-702-20 - Quality Assurance Depot Process Control Cleaning

f. LEAD-R 420-10 - Treatment, Storage, and Disposal or Recycling Hazardous Waste and Petroleum Waste

g. LEAD-R 420-7 - Environmental Pollution Abatement

h. Metal Finishing, Guidebook and Directory, 1983 Edition, Hackensack, New Jersey

i. FED-STD-313 - Material Safety Data Sheet Preparation and the Submission Of

j. OSHA Form 20 - Material Safety Data Sheet

APPENDIX

OPERATING PARAMETERS AND DESCRIPTION OF PROCESS TANKS

1. Degreasing Tanks - 1,1,1 Trichloroethane - (methyl chloroform) as per MIL-T-81533 is the vapor degreasing solvent used for removal of oils, greases, and dirt. The parts to be cleaned are suspended in the upper part of the tank containing the solvent vapors. The vapors condense on the surface of the part, carrying the contamination to the solvent reservoir. Weekly samples should be taken and analyzed by the Chemical Lab for percent contamination. When contamination is 20 percent or more, the recycling/cleaning process should be accomplished. This process consists of the following:

a. Turn heat or steam on only to the vapor generating chamber.

b. From the vapor separator, close the solvent distillate return line to the degreaser, and route the condensate return to a clean, unused barrel or other suitable container.

c. Continue to apply heat to the boiling chamber until 1½ to 2 inches of 1,1,1 Trichloroethane remains above the heating element. In no case should the heater be on and the heating element exposed to the environment.

d. Turn off the heater or steam and allow the residue to cool before pumping or draining.

e. Clean any remaining residue out of the tank.

f. Replace drain plug or close drain valve, open solvent return line to the degreaser, return the 1,1,1 Trichloroethane that was collected and add fresh solution for make-up.

g. Samples of the solvent condensate should be periodically submitted to the laboratory for determination of acid condition as per MIL-S-5002. The vapor degreasing tank shall be operated at the solvent boiling point (160° - 180°F).

2. MIL-C-46156 Corrosion Removing Compound - Sodium Hydroxide Base for Immersion Application (EC-900) paint and corrosion remover for ferrous metals, containing sodium hydroxide, sodium gluconate, detergents, wetting agents, inhibitors, and accelerators. Also provides a corrosion resistant ferric-ferrous complex conversion coating (bluing). Two tanks are initially charged with Type I corrosion removing compound at 3 pounds per gallon of water. When the derusting component (sodium gluconate) is expended in one tank, that tank is used a paint stripping tank while the other tank is used for corrosion removal. Type II rejuvenating additive (Penetone 815 or 905) is used to replenish the solution used for corrosion removal. The amount of

rejuvenating additive to be added to the solution should be based on weekly laboratory analyses for sodium gluconate concentration. In addition this tank should also be checked weekly for sodium hydroxide concentration and specific gravity. The temperature of the solution shall be maintained at 180°F to 210°F. For directions for charging the tank and laboratory evaluation procedures, see manufacturer's data sheets (Engineering Chemical Co.) and MIL-C-46156.

3. Pen-Strip NPX - Solvent-acid paint stripper used primarily on aluminum parts. It contains 70 percent dichloromethane (solvent) and 25 percent formic acid. No laboratory analysis is recommended for this solution. Additons to solution should be made when the time needed for effective paint removal becomes exceedingly long. The tank should be drained and recharged when the sludge content of the tank prohibits effective cleaning and paint stripping (visual inspection). This solution is used full strength at room temperature. Immersion time when stripping magnesium parts with this solution should be limited to a few seconds.

4. Calgon P-2000 - A highly alkaline, sodium hydroxide based (80 percent), paint and corrosion remover for ferrous metals and magnesium. This solution should be maintained at a concentration of 0.25 to 0.75 pound P-2000 per gallon of water. The operating temperature should be maintained at 180°F to 210°F. Additions to the solution should be based on weekly titration for sodium hydroxide concentration. For laboratory analysis procedure, see manufacturer's technical data sheet (Calgon Corp).

5. Share Paint and Rust Remover - A highly alkaline, potassium hydroxide based paint and corrosion removing solution used on steel parts. The solution is maintained at a temperature of 180°F - 210°F. The tank is originally charged with 25 percent by volume Share Paint and Rust Remover in water. Additions to the solution should be made when the time needed for effective removal of paint and corrosion becomes exceedingly long. The tank should be drained and recharged when the sludge content of the tank prohibits effective cleaning and paint stripping (visual inspection). See Share Corp Technical Data Sheet for operating instructions.

6. Share Rust Inhibitor - A sodium silicate - sodium nitrate solution used to provide a rust inhibiting coating to steel parts. The tank is originally charged with a one percent by volume solution. Additions to the tank and recharging should be based on the performance of the solution. See Share Corp Technical Data Sheet for operating instructions.

7. Penesolve 206 - (with Penstrip A) - An alkaline paint stripper which is milder and slower acting than the hydroxide based solutions. It is used primarily for aluminum and magnesium, especially where both metals co-exist on the same part. Penstrip A is used as an additive to reduce the time required for effective paint stripping, and to provide the capability to strip chemical resistant coatings, such as epoxies and urethanes. The tank is initially charged with 0.76 pounds per gallon Pensolve 206 and 7 fluid oz.

per gallon Penstrip A in water. The temperature is maintained at 180°F - 210°F. Additions to the solution should be based on a weekly labotatory titration for alkalinity, and should be made in the same ratio as the initial make-up. Results of analysis should be between 10-25 cc required for neutralization.

8. Oakite 31 - An acidic detergent material which is used for cleaning, deoxidizing and etching aluminum parts. The tank is originally charged with a concentration of 20 percent by volume Oakite 31 and maintained at a temperature of 180°F - 210°F. Additions to the tank should be made based on weekly laboratory titrations for total acid concentration. Acid content should be maintained in the range of 17 to 25 percent. For detailed operating instructions, see Oakite Technical Data Sheet.

9. Oakite Deoxidizer LNC - An acidic deoxidizing agent used to remove smut, mill scale, and oxides from aluminum parts prior to the application of chromate conversion coatings. The solution shall be maintained at a concentration of 10-20 percent by volume in water. Additions to the solution should be based on a weekly laboratory titration for acidity. This solution is used at room temperature (60° - 80°F).

10. Oakite FH - A mixture of chromic and phosphoric acids used as a acidified rinse in the Oakite Cryscoat OC zinc phosphating process. The tank is originally charged with approximately 21 oz. Oakite FH per 100 gallons water. The temperature of the solution shall be maintained at 140°F to 160°F. Additions to the solution shall be made to maintain the pH of the solution between 2.0 and 4.0 based on weekly chemical laboratory pH measurements. In addition, total acid concentration will be maintained at no more than seven times the free acid concentration, A-2 based on a weekly titration in the chemical laboratory.

11. Oakite Cryscoat OC - A zinc phosphating solution used to establish heavyweight absorption coatings prior to the application of rust preventive oils or as a prepaint treatment for steel parts. The tank is originally charged with 4.0 gallons of Cryscoat OC per 100 gallons of water. The temperature of the tank is maintained at 170°F - 200°F. Additions to the solution shall be based on weekly titrations for total acid and free acid in the chemical laboratory. The total acid concentration should be maintained at 3.8 to 4.2 percent by volume, and the free acid concentration should be maintained at 0.9 to 1.1 percent by volume. For process procedures and quality inspection requirements, see Oakite Technical Data Sheet, MIL-P-16232 (Type Z), and MIL-P-50002.

12. Mitchell-Bradford Black Magic - A caustic, highly alkaline solution containing blackening salts which is used to establish black oxide coatings on specific steel parts. The concentration of the blackening salts shall be maintained such that the boiling point of the solution is around 280°F. If the solution boils before reaching 280°F, more salts must be added and stirred into the solution. If the solution reaches 280°F without boiling, the addition of more water is required. The boiling point of the solution

should be checked every time the solution is put into use. The correct concentration of Black Magic salts giving the boiling point of 280°F is approximately 5.5 pounds per gallon of solution. For detailed instructions on the operation and the maintenance of this solution and quality inspection requirements, see Mitchell-Bradford Technical Data Sheet and MIL-C-13924.

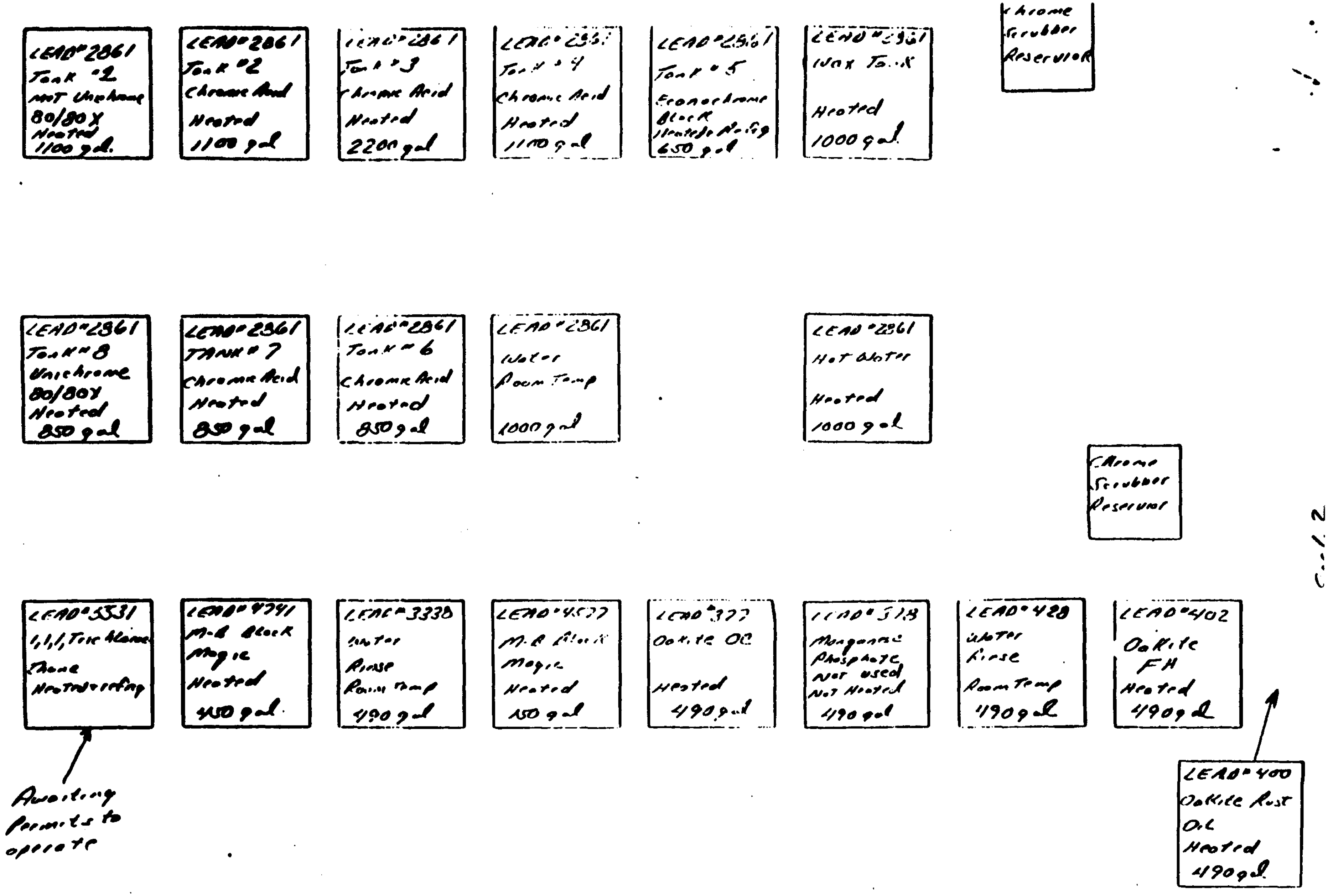
13. Oakite Chromicoat L-25 - Chromate conversion coating solution which is used to provide an adherent prepaint base and an effective barrier to corrosion on aluminum parts. The temperature of this solution shall be maintained at 90°F - 110°F. Additions to the solution shall be based upon a weekly titration for hexavalent chromium concentration and a pH measurement in the chemical laboratory. The solution shall be maintained at a hexavalent chromium concentration of 4.5 - 5.5 percent by volume and a pH of 1.6 to 1.8. Total chromium concentration shall not exceed twice the hexavalent chromium concentration, based on a monthly check in the chemical laboratory.

14. AmChem Alodine 1200 - Chromate conversion coating solution which is used to provide an adherent prepaint base and an effective barrier to corrosion on aluminum parts. This solution shall be operated at room temperature (60°F - 80°F). Additions to the solution should be based upon a weekly titration for hexavalent chromium concentration and a pH measurement in the chemical laboratory. The solution shall be maintained at a hexavalent chromium concentration equivalent to a titration value of 4.0 - 5.0 cc and at a pH of 1.6 to 2.0. The hexavalent chromium concentration is controlled with additions of Alodine 1200 and the pH is controlled with additions of nitric acid. For detailed operating instructions and quality control requirements, see AmChem Product Technical Data Sheet, MIL-C-5541, and MIL-C-81706.

15. Tri-acid Etch - A mixture of hydrofluoric acid, sodium dichromate, and sulfuric acid in water, used to etch and deoxidize aluminum parts prior to the application of the chromate conversion coating. Additions to the solution shall be based on a weekly titration by the chemical laboratory for total acid concentration. The solution shall be maintained at a total acid concentration equivalent to a titration value of 15.0 - 22.0 cc. The solution is initially charged with 0.86 lbs/gallon sodium dichromate, 13.5 percent sulfuric acid, and 1.31 percent hydrofluoric acid. Additions to the solution should be made in the same ratios as the make-up of the original solution. This solution shall be maintained at room temperature (60°F - 80°F).

16. MIL-M-3171C, Type VI (DOW 19) - Chemical conversion coating which is used to provide an adherent prepaint base and an effective barrier to corrosion on magnesium parts. The tank is initially charged with 1.33 oz/gallon chromium trioxide and 1.00 oz/gallon calcium sulfate dihydrate ($CaSO_4$ $2H_2O$) or 0.80 oz/gallon calcium sulfate ($CaSO_4$). Additions to the solution shall be based on a weekly titration and pH measurement in the chemical laboratory. The titration value shall be maintained between 14.0 - 18.0 cc and the pH shall be maintained between 0.8 to 1.3. This solution shall be maintained at room temperature (60°F - 80°F).

17. Oakite Rust Preventive #2 - An emulsified oil solution used to provide a protective coating over steel parts after application of zinc phosphate and black oxide coatings. The temperature of the solution shall be maintained at 160°F - 180°F. The concentration of the oil shall be maintained at 10 - 20 percent by volume. Additions to the solution shall be made based on a weekly extraction performed in the chemical laboratory. For operating instructions, see Oakite Technical Data Sheet.



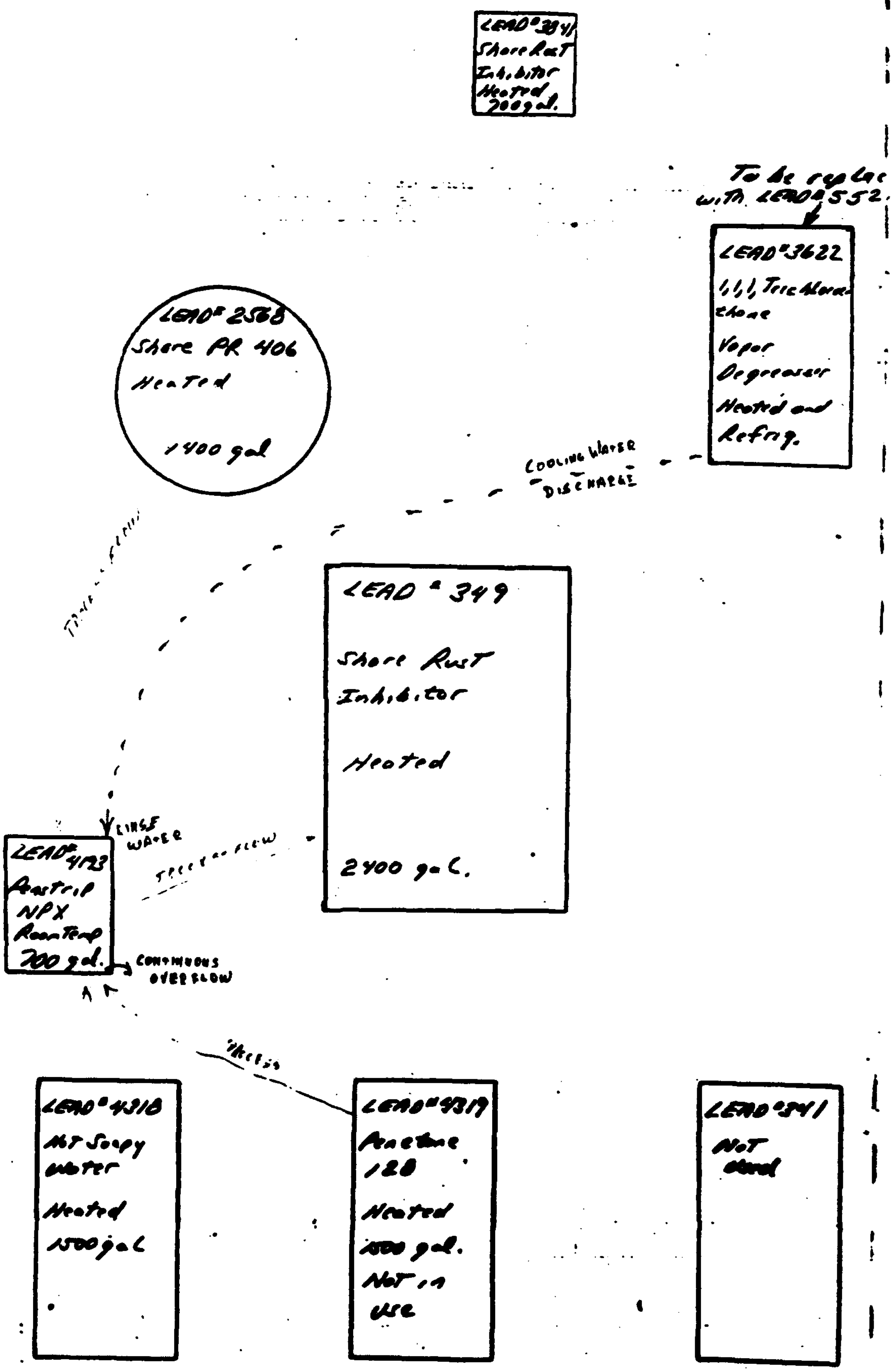
BLDG #1M NC Area Tanks

LEAD# 5038
1,1,1, Trichloroethane
Heated + Refrig

LEAD# 2169
1,1,1, Trichloroethane
Heated + Refrig

BLDG. #1N S. Central Area Tanks

9K
3/6/87


LEAD# 3941
Shore Rust
Inhibitor
Heated
700 gal.
To be replac
with LEAD# 552.
LEAD# 3622
1,1,1, Trichloroethane
Vapor
Degreaser
Heated and
Refrig.
LEAD# 2568
Shore PR 406
Heated
1400 gal
COOLING WATER
DISCHARGE
LEAD # 349
Shore Rust
Inhibitor
Heated
2400 gal.
RINSE
WATER
LEAD# 4123
Anstrip
NPX
Room Temp
700 gal.
CONTINUOUS
OVERFLOW
LEAD# 4318
Hot Soapy
Water
Heated
1500 gal
LEAD# 4319
Acetone
128
Heated
1500 gal.
Not in
use
LEAD# 341
Not
Used

JK
3/9/87

BLDG #350 N.E Area Tanks

LEAD #2512
1,1,1, Trichloroethane
Heated + Refrig.

LEAD #2514
MIL-C-46156 (EC-900)
Heated 3000 gal

LEAD #2516
Hot Water
Heated 3000 gal

~~LEAD #2518~~
~~MIL-C-46156 (EC-900)~~
Heated 3000 gal
To be changed
*to Oakite 31
proposed

LEAD #2520
Oakite Chromicoat L-25
Heated 3000 gal

LEAD #2522
Water
Room Temp 2800 gal

LEAD #2606
Not Used
500 gal

LEAD #2744
Oakite 31
Heated 500 gal

LEAD #2523
Oakite #LNC
Room Temp 500 gal

To be removed
To add 500 gal
Oakite Deoxidizer
LNC Tank
Room Temp

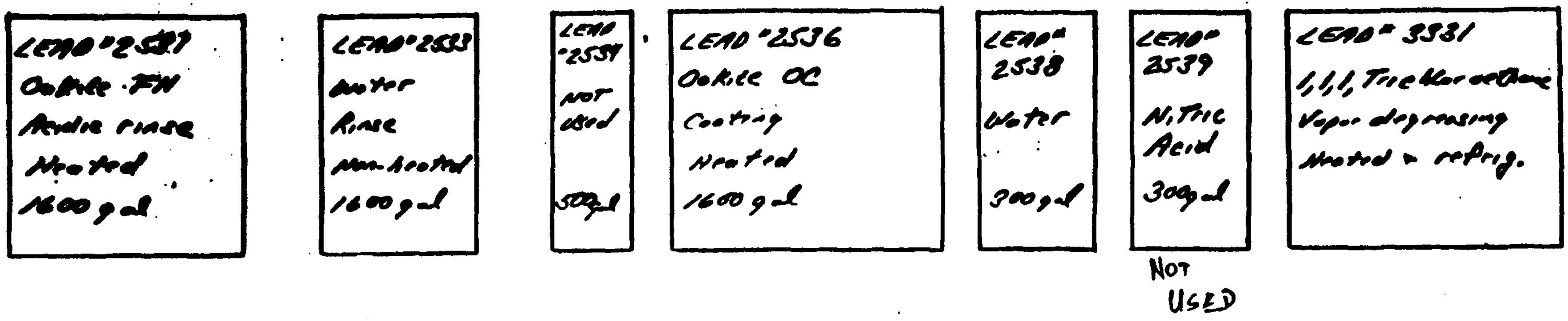
LEAD #1979
Shore OS-44
Heated 500 gal

LEAD #1980
Arestone NPX
Room Temp 500 gal

LEAD #4192
Hot Water
Heated 500 gal

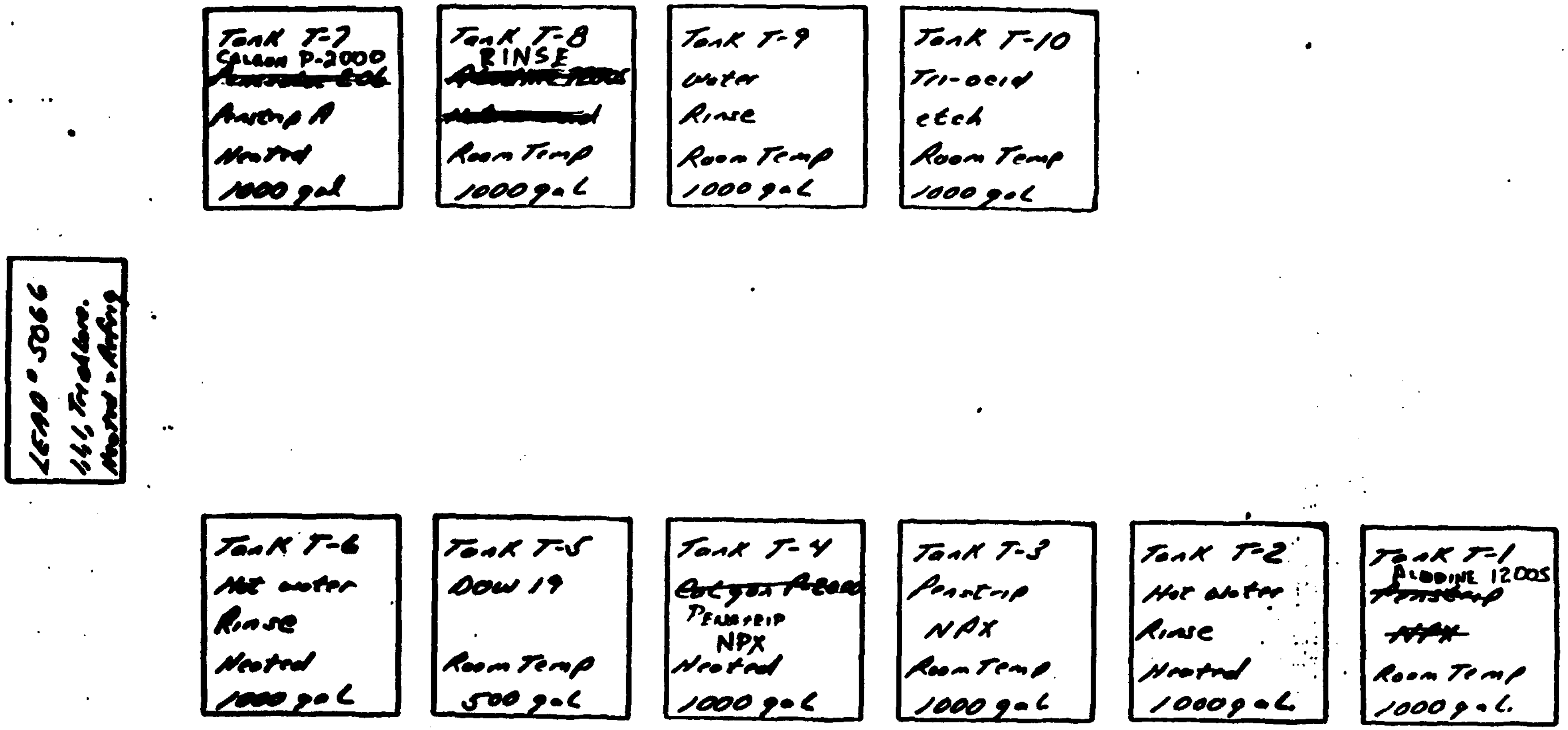
LEAD #1319
Water
Room Temp 500 gal

OK
3/6/..



BLDG. #350 S.E. Area Tanks

OK
3/6/87



BLDG 370 Tanks

gk
7/6/87

DRAFT

LETTERKENNY ARMY DEPOT
CHAMBERSBURG, PA 17201-4150

Facilities Engineering Division
SOP No.

9 June 1987

Facilities Engineering
ELECTROPLATING PROCEDURES FOR BUILDING 1

1. Purpose. This SOP provides process procedures and controls for the hard chromium and black chromium plating operations.

2. Scope. The provisions of this SOP are applicable to Directorate for Maintenance.

3. Definitions. Definitions of terms used in this publication are consistent with those used in LEAD-R 750-28, LEAD-R 750-29, and LEAD-R 750-30.

4. General.

a. This SOP provides step-by-step process procedures and controls to successfully accomplish hard chrome and black chrome plating without causing unnecessary leaks/spills or creating excess rinsewater which accumlates in the sump pit. The chemical and engineering aspects of these electroplating processes can be found in LEAD-R 750-28, LEAD-R 750-29, and LEAD-R 750-30.

b. Hard chrome plating and black chrome plating as referenced in this publication are tank or immersion electroplating processes. These operations are accomplished by suspending the item to be plated in a tank filled with the appropriate solution and applying electrical current.

5. Policies.

a. Operation and inspection:

(1) The northeast area of Building 1N houses eight tanks which are used for the hard chrome and black chrome plating. (See Figure 1 for the layout of these tanks.)

(2) Table 1 lists the dimensions for these eight tanks. Tank 2 and Tank 3 are the deepest tanks in the building. All parts being plated must be completely submerged in order to insure complete and successful coatings.

(3) The parts being plated in Building 1 range in size from a few inches to 93 inches (approximately 8 feet). The larger parts (i.e., rails, recoil, rods) require Tanks 2 and 3 due to their depth.

(4) All tanks are lined with VINYL POLYESTER ~~[illegible]C~~ liner. All tanks also have a 6 inch grating along the bottom to catch any parts which may fall from their fixtures.

(5) Tanks 6, 7, and 8 have a catch basin along the bottom to catch any material due to leakage, spillage, or excess rinsewater before it collects on the floor. Tanks 1 through 5 have no catch basin, but Tanks 2 and 3 (the deep ones) are inside a pit. The pit is lined with 9 to 14 inches of concrete. The other three tanks (1, 4, and 5) also drain to the pit.

(6) The parts to be plated are hung from a copper fixture. These fixtures range in length from 6 to 16 inches. The proper fixture is determined by the size of the part to be plated.

(7) Four inches of the copper fixtures are exposed to the chromic acid, so the copper fixtures are painted with "stop-off lacquer" along the sections exposed to prevent plating on these areas.

(8) The configuration to electroplate a part consists of a box structure made of copper (Cu) bars with eight lead (Pb) anodes equally spaced. The lead anodes are approximately 8 inches in length and surround the part being plated. There is approximately 6 inches from the top of the copper bar to the surface of the chromic acid solution.

(9) In order to assure complete and successful coatings of parts in Tanks 2 and 3, these tanks must be kept full of chromic acid solution. A good estimate is 3 inches of free room from the top of the tank.

6. Responsibilities.

Plating shop supervisor will:

(1) Assure that procedures are being properly followed.

(2) Check all levels of the tanks to assure that the level of solution is at the proper level. There must be proper coating, but at the same time, no spillovers should occur.

7. **Procedures.**

Plating:

(1) All items to be chrome plated shall be cleaned and processed in accordance with MIL-STO-171, MIL-S-5002, QQ-C-320, and LEAD-R 750-29.

(2) When plating a part to a specified size, plating may be stopped, the part taken out of the tank, checked with a micrometer and/or plate gauge, and, if necessary, put back into the tank for resumption of plating.

(3) When the part is completely and successfully plated, the part should be pulled out of the tank and taken down to the specified rinsing area (see Figure 1) and rinsed to remove all traces of plating solution. The excess rinsewater will then collect in the drain which empties into the Industrial Waste Treatment Plant (IWTP). This drain does not start until the middle of Tank 5 so that the parts must be taken down past this tank for rinsing.

(4) The part can then be dried and inspected.

8. **References.**

a. LEAD-R 750-29, Electroplating Procedures and Process Control

b. Water Quality Engineering Study No. 32-24-0571-85, Metal Finishing Operation Compliance

Robert G. Hoit
~~DONALD L. [illegible]~~
Chief, ~~[illegible] Engineering Division~~
Environmental Management
Division

DISTRIBUTION:

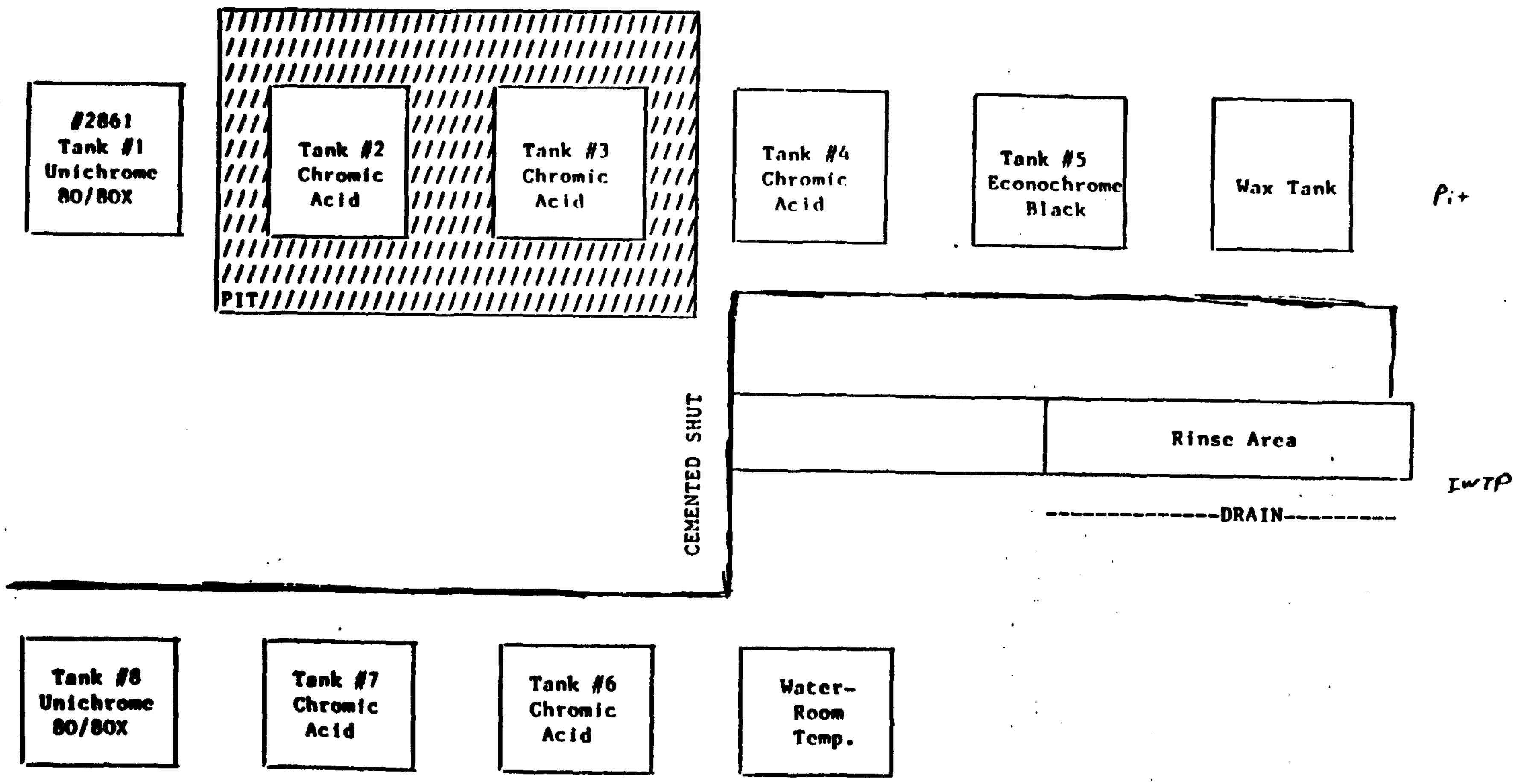


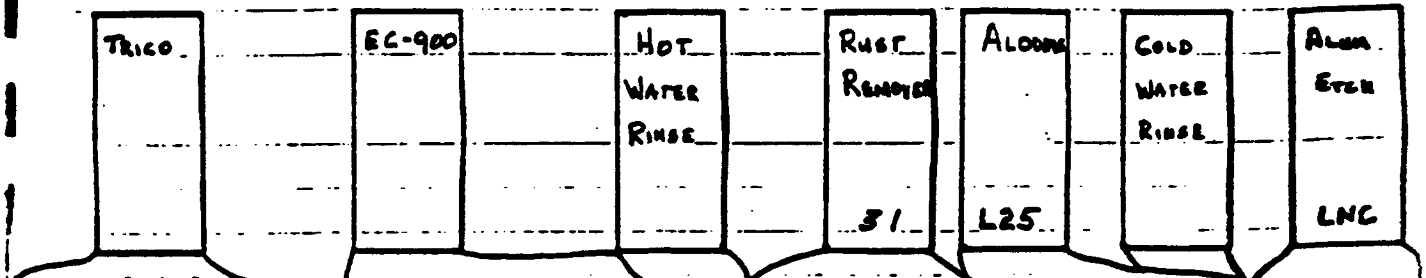
FIGURE 1 - Building IN NE Area Tanks for Hard Chrome and Black Chrome Plating

TABLE 1

Dimension of Hard Chrome and Black Chrome Plating Tanks in Building 1N

Tank No.	Length (FT)	Width (FT)	Depth (FT)	Total Cubic Feet (FT)	Maximum Holding Volume (GAL)	Actual Volume Used (GAL)
1	10	4	4	160	1,197	1,000
2	5	3	10	190	1,122	1,000
3	10	3	10	300	2,244	2,000
4	10	3	5	150	1,122	1,000
5	10	3	3	90	673	550
6	10	3	4	120	898	800
7	10	3	4	120	898	800
8	10	3	4	120	898	800

BLDG 33 ✓ NORTH



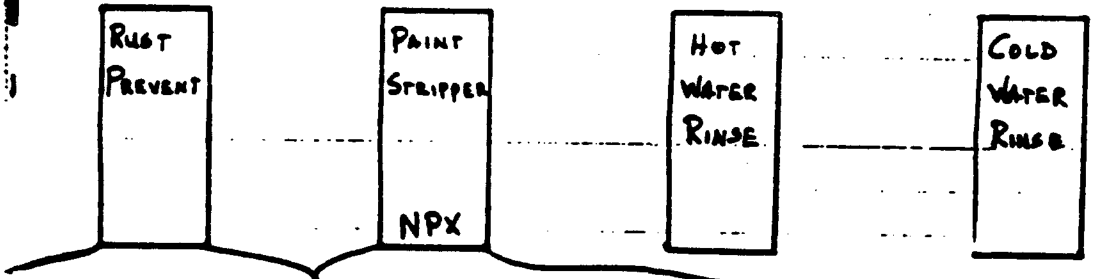
VAPOR DEGREASER
1,1,1, TRICLOROETHANE
MAKE-UP ≈ 55 gal/wk
CHANGE OUT
300 gal/change
TOTAL DEPOT WASTE 300 /year
HAZMIN:
RECYCLE: COLD WASH → VAPOR
COOLING WATER → RINSE
* AUXILLARY STILL ON LARGE VAPOR
PROCESS: VAPOR DEGREASE WHENEVER POSSIBLE

STEEL PAINT STRIPPER
SODIUM HYDROXIDE
EC-900
ANNUAL CHANGE OUT
3000 gal/CHANGE
HAZMIN
MONITORING CHEMISTRY
* DETERMINE FAILURE MODE & RECHARGE
* FILTER BOTTOMS

DERUST STEEL & AL
PHOSPHORIC ACID
OAKITE 31
BIANNUAL CHANGE OUT
3000 gal/CHANGE
HAZMIN:
EXTENDING LIFE, GOAL 5 YR
COMBINE 31 LNC & 41
INTO ONE CHEM

CHROMATE CONVERSION
OF ALUMINUM
OAKITE L25
MAKE-UP ONLY
HAZMIN:
KEEP CLEANING
CHEMICALS IN
GOOD CONDITION
SOLE SOURCE REQ
IN LNC, 31 & 41
TANKS

CLEAN & PREP
NITRIC ACID
OAKITE LNC
NEW TANK
BIANNUAL
3000 gal/ch
HAZMIN:
EXTEND TO 5 YR
COMBINE



STEEL DIP AFTER EC900
SHARE CS 44
MILD NaOH, SODIUM
SILICA SALTS
MAKE-UP ONLY
HAZMIN:
GOOD RINSING
BEFORE RUST
PREVENT DIP

ALUMINUM
FORMIC ACID & METHYLENE CHLORIDE
PENNSTRIP NPX
QRTRLY CHANGE OUT
400 gal/CHANGE
HAZMIN:
LOOKING FOR BETTER CHEMICAL
MONITORING CHEMISTRY
* DETERMINE FAILURE MODE & RECHARGE
* FILTER BOTTOMS

500 to 1100 gal

PEI ASSOCIATES, INC.

MEMORANDUM

TO: Craig MacPhee

DATE: 8/4/89
Revised: 8/14/89

SUBJECT: Trip report: Red River Army Depot
Contract No. DAAA15-88-D-0001
Task Order No. 0004

FROM: Jeff Davis
Bob Ressl
Fred Hall

FILE: 3769-4

CC: Bob Hoye
Dick Gerstle

USATHAMA and PEI personnel participated in meetings and a tour of the facilities at the Red River Army Depot (RRAD) on June 12 - 14, 1989. The purpose of this visit was to acquire information on the operations at RRAD that are relevant to the referenced task order. Specifically, information on VOC emissions, plastic media blasting (PMB), chemical paint strippers, degreasing, and generation of metals-contaminated sludges was sought. This is one of a series of visits to eight depots being made to acquire comparable data on these topics. In the near future, USATHAMA will use this information to select and define research projects that will be conducted by PEI under this task.

RRAD is located just west of Texarkana, Texas, approximately 150 miles east of Dallas, Texas, on Interstate 30. Craig MacPhee represented the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). PEI personnel present were Fred Hall, Bob Ressl, and Jeff Davis.

Our primary contact at RRAD was Edward R. Hanna (PED 214-334-3658). In addition, we met with Walter House and Ralph Linsey. At each of the various buildings and areas inspected, we also met with the manager or supervisor of those areas.

The purpose of this trip report is to document the information obtained during the site visit. The trip report is presented in eight sections to address pertinent topics included in the scope of work of Task Order No. 0004. These sections are: Background, VOC Emissions and Paint Operations, Blasting Operations, Alternate Chemical Strippers, Alternate Degreasers, Electroplating Operations and Metal-Contaminated Sludges, Other Areas of Interest, and Conclusions/Recommendations.

BACKGROUND

RRAD employs approximately 6,000 people, and its primary mission is to repair Sherman tanks and armored personnel carriers. Additionally, the depot is frequently involved in the repair of some larger trucks and miscellaneous other equipment. Individual operations include cleaning, blasting, painting, and complete machine shop and repair capabilities including heavy and light welding, electrical repair, and armament repair. The work load at RRAD varies, and the associated waste generation rates vary with the work load. Because the quantity of waste generated is largely determined by work load, the HAZMIN goals set by the Army relative to the 1985 baseline figures may not always be directly relevant.

RRAD is the site for the fluidized bed demonstration test to be conducted under Task Order No. 0005 of this contract. During this visit, information was collected on the facilities and personnel that will be available during the conduct of this task.

The following is a summary of the buildings visited and a brief overview of the processes conducted in each building.

- Building 315: Machine Shop
  - degreasing
  - chemical stripping

- Building 323: Final Painting

- Building 345
  - Electroplating, semi-automatic barrel plating line for hardware
  - Component cleaning area

- Building 333: Parts Chemical Cleaning Area
  - New cleaning line, not currently operational
  - 2 paint booths for vehicle hulls
  - Tank and truck disassembly

- Building 441: Small arms shop
  - Phosphatizing
  - Black oxide

- Building 493: Rubber shop
  - Zinc phosphatizing line
  - Chromate conversion line

VOC EMISSIONS AND PAINTING OPERATIONS

Currently, RRAD is in compliance with the Texas Air Control Board (TACB) regulations. This compliance is based primarily on the fact that the facility is in an attainment area. Although the depot is currently in compliance, the TACB expects RRAD to make a good-faith effort to reduce or control VOC emissions. For new permit applications, a health analysis must be conducted and best available control technologies (such as high-efficiency paint transfer) must be considered.

Painting includes a variety of coatings from CARC to enamels and vinyls. RRAD currently uses high-solids, two-component CARC. Personnel indicated that they were not satisfied with the performance of single-component CARC. RRAD does not use water-reducible primers because AMCCOM and the Missile Command are not satisfied with the performance of these paints.

RRAD conducts painting operations in both water-wall paint booths and in booths with dry filters to trap the paint particulates. Personnel prefer the water wash booths because the polyurethane paint (CARC) is thick enough that the dry filters require changing every day. The dry filters were previously disposed as hazardous waste, but personnel determined that once the paint cured, the filters were no longer hazardous. A total of 28 paint booths are actively used.

Problems with the water-wall booths included corrosion and the buildup of sludge in the troughs. The troughs also developed some biological growth that had a strong odor when the booths were cleaned. New booths have skimmers to remove sludge from the top of the troughs, and all wetted parts are stainless steel. The water is recirculated from the skimmers to the booth. The booths are cleaned once a week, and the removable wall coating is stripped.

Personnel expressed an interest in the use of some kind of chemicals (such as detackifying agents) to reduce the volume of paint sludge. RRAD tried roll-up filters, but tightening of the roll created heat and spontaneous combustion. Revamping the booths would require approximately $19,000 per booth. The sludges collected from the water-wall booths are currently treated as a hazardous waste.

Two small adhesive spray booths are located in the rubber shop. These are used to apply an adhesive to the road wheels to facilitate the attachment of the rubber on the road wheels. The paint booths use dry filters, and there are no VOC control devices on the paint booths.

Most of the booths used for larger parts, like tank bodies and personnel carrier bodies, are downdraft booths. The engine shop paint booth is somewhat unique in relationship to all the other paint booths located in the facility in that it has a pit that is equipped with a drag-type bucket arrangement that is designed to remove solids from the pit. However, this drag bucket conveyor was not operational at the time of our visit.

Some paint booths in the facility are not currently operational. For example, in the small arms area, the paint booth was shut down. The operations personnel in that area were wanting to put the paint booth back into operation so that they could use it with the CARC system.

Most of the paints are applied using air atomization spray guns. Paints are typically applied by hand-held spray guns from either 55-gallon drums or spray gun pots. Some of the systems use two-component paints; most of these paints are applied with two-legged proportional spray guns, and the paint is typically thinned in the pot. There are some three-legged proportional spray guns used where thinner is added at the gun. Most of the painting is done on large, flat surfaces (tank and personnel carrier bodies). No data exists to determine paint transfer rates.

Personnel have tried electrostatic precipitation as a paint application method, but were not satisfied with its performance.

The paint-application guns are typically cleaned with methyl ethyl ketone (MEK), which is shot into the waste drums. The waste solvents are then transferred to DRMO for disposal.

The items painted in the paint booths are usually sent to some kind of dryer. Most of the dryers are steam heated; however, there are a few infrared-heated paint dryers.

VOC emissions from vapor degreasers are typically controlled with either water or refrigerated chillers. Some of these strippers have automatic covers. Most of the degreasers are equipped with some kind of lid. Most of the degreasers use 1,1,1-trichloroethane as the degreasing medium. One of the vapor degreasers is equipped with an in-line vapor distillation unit. There are some minor VOC emissions that occur from the degreasing operations located at the facility and some at the supply area where a stoddard solvent and protective coating are mixed and applied to tracks that are being shipped from the facility.

The facility has several non-vapor degreasers using mineral spirits and stoddard solvents. These degreasers are all maintained by Safety Kleen, which comes in on an as-required basis (typically once a week) and services the degreasers.

There are some minor VOC sources from an MEK paint stripper. TACB is trying to convince RRAD to discontinue the use of MEK as a paint stripper because of the phenols present in the waste stream.

BLASTING OPERATIONS

Most of the parts blasted at RRAD are aluminum, with some steel parts. Most of the blasting operations are associated with the vehicle hulls and are done with stainless steel shot in an automated shot blast operation. Typical time for blasting a vehicle hull is 47 minutes. There are also some Wheelabrator and Pangborn type shot cleaning devices scattered around the facility. For example, in the rubber shop (Building 493), there are several that are used for removing the last traces of rubber from the road wheels and track segments prior to their going through the reconditioning shop. An automated buffing machine is being installed to replace this operation. An automated steel blast booth is used in Building 333 to remove paint from vehicle hulls. The booth measures approximately 30 ft high and 15 ft wide.

There are a couple of hand cabinets that still use walnut shells in the facility; however, RRAD personnel plan to discontinue the use of these cabinets. Some sand is still used, but it is gradually being replaced with peridot. Where the sand is being used, it is recycled using seperators and cyclones. Some aluminum oxide and glass beads are also used on a small scale. The residue from all blasting operations is disposed as a hazardous waste because of cadmium and chromium content.

The depot has held discussions on trying carbon dioxide blasting and plastic media blasting. Although the depot is interested in information regarding the use of these two blast media, they are somewhat skeptical of their usefulness on the kinds of parts blasted at the facility. Personnel believe that both the carbon dioxide and the plastic media blasting would take significantly longer than the current blasting media and provide only minimal benefits with regard to reduced quantities of hazardous waste that must be disposed of from the blasting operations. RRAD has tried PMB on two occasions, but was not impressed with the results.

For some operations, parts are stripped and repaired as necessary; however, some clients want an item completely stripped.

ALTERNATE CHEMICAL STRIPPERS

Several large chemical stripping tanks are used at RRAD. RRAD has been designated the Center for Technical Excellence (CTX) for nonchlorinated solvents. A specification for a nonhazardous alternative stripper has been written and a product has been ordered. The product selected will likely be one of the solvents recommended by USATHAMA under a previous project in which numerous solvents were evaluated. This new product will be incorporated into a new electroplating line that has been partially constructed.

Most plating lines contain a caustic cleaner (TT-R-230) followed by a rinse and a hydrochloric acid dip. Phosphoric acid is used as a rust remover. Nitric acid is used for precleaning in anodizing lines. Sludges from these tanks were previously emptied once a year, but this practice has been stopped because of the manpower involved. The caustic corrosion tanks last about 6 weeks; make-up is added as necessary.

A filter is used for paint strippers to remove floatable substances and extend product life. Otherwise, the stripper keeps working on the paint, thereby decreasing the chemical activity. Personnel expressed an interest in a filter press for the caustic corrosion removers. A filter is used on a caustic corrosion remover in Building 345, but the shop chief believes that a grease trap would perform better. Personnel sample each tank once a week to specify make-up.

ALTERNATE DEGREASERS

A number of large vapor degreasing tanks are located throughout the depot. The degreasing solvent used is 1,1,1-trichloroethane. A vapor degreaser is occasionally used in the rubber shop to dissolve rubber remaining on wheels after being mostly removed with a vertical lathe. This degreaser is frequently gummed up, and personnel plan to stop using it. This operation will be replaced by an automated buffing machine, and later by a fluidized bed.

A centralized recycling facility was once operated on depot. There were only two occasions when the solvent became acidified, and in both cases an excess amount of recycled solvent was used in the process tanks (a maximum of 25 percent recycled solvent should be used). The 1,1,1-trichloroethane is currently sold for recycling off site.

ELECTROPLATING OPERATIONS AND METAL-CONTAMINATED SLUDGES

The electroplating shop conducts chromium, cadmium, and zinc electroplating, and electroless nickel plating. Building 345 has a semi-automatic barrel cadmium plating line that processes 1,000 pounds per hour of hardware. A number of chromate conversion coating (anodizing) operations are used; the chromic acid in these operations contributes most of the chromium in the rinse waters sent to the industrial waste treatment plant.

RRAD personnel have made a number of changes in their operations to address safety concerns, reduce waste, and improve their efficiency. The electroplating shop no longer uses any cyanide in their process solutions. Zinc plating is conducted in a chloride solution and cadmium plating is done in a sulfuric acid-based solution.

RRAD has replaced a lot of cadmium plating with zinc plating on non-critical items. Some work orders give the option of cadmium or zinc. For general purpose hardware, zinc is a sufficient replacement for cadmium, but for some applications such as electronics, cadmium must be used. The first rinse after the cadmium plating is used as make-up to the cadmium plating tank. Additional rinse tanks provide countercurrent rinsing.

Most of the chromium electroplating has been replaced with spray metallizing. In this operation, a stainless steel wire feed is vaporized and coats the parts, which is then ground to the required tolerance.

Rinses for all process tanks are supposed to be on only when actually rinsing. This minimizes the amount of water that must be treated in the IWTP.

Aluminum parts are treated by a phosphoric/chromic acid strip, a non-etch cleaner, and a chromic/nitric acid deoxidizer. A new cleaning area has been installed in Building 333 that contains 5 separate lines. The new alternate stripper will be used here. The lines are not currently operational because of problems with the design, including narrow walkways.

Chromate and phosphate wastewater streams are treated separately in the industrial waste treatment plant (IWTP), which receives an estimated 260,000 to 290,000 gallons of wastewater per day. The influent chromate stream (consisting of chromium and all acidic wastewaters) contains approximately 3 ppm chromium and 1 ppm lead. The chromate is pumped into an equalization lagoon, and then transferred to the chromate storage tanks. The water is treated with sulfur dioxide to reduce chromium, and lime is added to precipitate the heavy metals and neutralize the solution. The chromate is then pumped to a lagoon, where it is tested.

The phosphate wastewater enters an API oil separator, and the oil is reclaimed and sold through DRMO. The remainder of the stream is transferred to one of three 500,000 gallon equalization tanks. Lime and calcium are added in a rapid mix chamber to reduce the phosphate concentration. The water is sent through a flocculator clarifier, and the pH is then adjusted with carbon dioxide. The effluent is pumped to the final holding lagoon and, after testing, is released into a nearby creek.

Prior to 1987, the chromate and phosphate sludges were not segregated, and the entire volume was disposed as a hazardous waste. In 1987, however, the price of sludge disposal rose from $75 to $300 per ton. The phosphate sludge is disposed in a depot landfill, and the chromate sludge is removed once or twice a year by a contractor from drying beds. Approximately 6.8 tons of chromate sludge are generated per month, and 3.7 tons of phosphate sludge are generated per month. Extraction Procedure Toxicity results for the chromate sludge show a concentration of cadmium in the extract of 14.0 mg/L (EP Toxicity limit is 1.0 mg/L) and a concentration of chromium in the extract of 0.33 mg/L (EP Toxicity limit is 5.0 mg/L). These results indicate that the sludge is hazardous for cadmium, not for chromium. Personnel indicated that sludge disposal is currently a big problem. Because of the rate of generation of the sludge, it often does not have time to dry in the drying beds before another layer is placed on top. Most of the chromium in the sludge results from the alodining operations conducted in two spray booths in Building 333. A contractor has been recently hired to recover chemicals in these operations, with the thought that this action should reduce the amount of hazardous sludge.

However, the cadmium in the sludge is above the EP Toxicity limit and would need to be reduced to make the sludge nonhazardous.

RRAD personnel are interested in more point source treatment in the future to reduce sludge volume and metal concentrations. Ed Hanna believes that the alodining process itself may be unnecessary. Elimination of this operation would result in a large decrease in chromium treated by the IWTP.

OTHER AREAS OF INTEREST

RRAD will be the site of the demonstration testing for the fluidized bed parts cleaning system to be conducted under Task Order No. 0005. The fluidized bed system will be used to replace many of the chemical stripping operations. RRAD personnel plan to install the system in Building 345. The area that has been set aside for the equipment consists of three 24' x 24' bays that are 39 ft high. The area is not adjacent to a wall, so venting the unit will require ducting, and the afterburner fan will need to be sized for the pressure drop. Venting of the unit could partially block a bridge crane However, this was indicated as acceptable to the facility personnel present. RRAD indicated they would begin accumulating representative components planned for the demonstration test so they could be shipped to a vendor for demonstration prior to purchasing the equipment. Facility personnel seemed cooperative and enthusiastic regarding the demonstration tests. In particular, they were willing to begin the permit application process by preparing an outline of the permit application as soon as possible.

Operation of the equipment will probably require a special permit from the Texas Air Control Board (TACB). Current permit practices may require as much as six months to obtain the permit, with an expedited duration of two to three months.

Some of the special problems in using the fluidized bed parts cleaning system were discussed. The use of the system on aluminum wheels may require a quench tank treatment to restore the aluminum temper. The effect of heat on the aluminum will need to be determined. Use of the system for engine blocks, other complex shapes, and small parts could require special provisions to remove the fluidized bed media (aluminum oxide) from the parts after treatment. Also at issue is whether repeated use of the fluidizing media will cause a buildup of metals in the bed. Most parts to be processed in the bed will be steel, although some aluminum parts will also be processed. The effect of processing both aluminum and steel parts in the same bed may be an issue. The post treatment of parts necessary to remove char will need to be determined. The racks used in the conveyor lines are often thickly coated with paint. These may be candidate parts for fluidized bed cleaning.

RRAD is also purchasing a fluidized bed unit to remove rubber from tracked vehicles, of which they have seen successful demonstrations. The fluidized bed used in the demonstration test will not be used to remove rubber from tracked vehicles.

Ed Hanna is interested in aluminum ion vapor deposition to replace cadmium and zinc plating. The chief difficulty in implementing this technology would be convincing the Tank and Automotive Command (TACOM) to accept the product. A demonstration test of this technology will be conducted at Anniston Army Depot under Task Order No. 0006 of this contract.

CONCLUSIONS/RECOMMENDATIONS

The following list presents some potential HAZMIN projects on which USATHAMA could provide assistance to RRAD.

- Evaluate the use of methods to reduce paint sludge volume, including addition of detackifying agents.

- Evaluate the effectiveness of the nonhazardous chemical stripper that has been purchased for the new plating line.
- Purchase a filter press to reduce sludge from the caustic corrosion removal tanks.
- Evaluate the use of on-site solvent recycling for 1,1,1-trichloroethane.
- Determine methods of reducing chromium and cadmium concentrations in the wastewater treatment sludge.
- Evaluate whether alodining is necessary for sufficient corrosion protection.
- Transfer results of aluminum ion vapor deposition demonstration tests to RRAD. Assist with meeting requirements to obtain a unit.

RRAD's interests and needs will be compared to those of other depots that have been visited. RRAD personnel should be kept informed of the results of any testing relevant to their needs conducted under the current HAZMIN effort.

ATTACHMENTS

Documents obtained from BRAD

Sources of hazardous waste generation and suggested HAZMIN activities

Process flow diagram of the IWTP

Process flow diagram of new cleaning area in Building 333 (not attached)

Text description of the IWTP (not attached)

Process flow diagrams of the new electroplating shop in Building 345; chemical cleaning of ferrous and aluminum parts in Building 348; chemical cleaning process sequence, North wash rack, Building 345 (not attached)

[redacted] [illegible] TEAL PROC [illegible] [redacted] [redacted] IGA [redacted] ISP IE ATDLR [illegible] [redacted] [redacted]

INSTALLATION: RED RIVER ARMY DEPOT   POC: RALPH LINDSEY   HAZMIN CATEGORY 15: Metal Plating Solution

FR0954 CADMIUM PLATE (30-PSC) - - - NA Plating MAINTENANCE/SEC ITEMS DIV 335 0 0 85% REDUCTION OF CADMIUM PLATING. CADMIUM REPLACED BY ZINC. POSSIBLE CLOSED LOOP SYSTEM. Cd Recl. was to W.A. [illegible] FOR Aluminum Ion Vapor Deposition

FUNDED?: N   BUDGET YEAR $/FUNDING:
DESC: CADMIUM OXIDE-NSN 6810-00-110-6592. SULFURIC ACID-NSN 6810-00-106-4935. CANTRT-374 NSN 6850-00-176-2950. CANTRT-375-NSN 6850-00-176-2959. THIS WAS A ONE-TIME EVENT RESULTING FROM MOVING CADMIUM SOLUTION TO SMALLER TANKS. APPROXIMATELY [illegible] OF [illegible] FORMERLY PLATED WITH CADMIUM NOW RECEIVE ZINC PLATING.

FR0957 CHROME PLATE 6810-00-264-3720 NA Plating MAINTENANCE SEC ITEMS DIV 335 55 55 HARD CHROME PLATING REDUCED 50% SINCE APR 87. METAL SPRAY USING THE METCO 451 PROCESS, IS USED AS A REPLACEMENT FOR MOST HARD CHROME PLATING. (SEE REMARKS AS PLATED PARTS EXIT THE SOLUTION, THEY WILL BE SPRAY RINSED OVER THE CHROMIC SOLUTION, PUTTING THE CHROME BACK IN THE VAT INSTEAD (SEE DESCRIPT)
6810-00-106-4935

FUNDED?: NA   BUDGET YEAR $/FUNDING:
DESC: OF IN THE RINSE WATER. PLATING SHOP REDUCTION IN CHROMIC ACID EFFLUENT TO THE WASTE TREATMENT PLANT COMPARED TO PRIOR AN EXPECTATION BEFORE METAL SPRAY IS ABOUT 60%. / CHROMIC ACID AND SULFURIC ACID.

FR0960 CHROMIC ACID DIP (SYNTHOT) 6810-00-149-4265 NA Plating MAINTENANCE/SEC ITEMS DIV 3[illegible] 4,400 lbs 400 lbs [illegible] Waste concentrated as the result of a spill [illegible] RRAD IS INVESTIGATING THE POSSIBLE REPLACEMENT OF VARIOUS CHROMIC ACID IMPREGNATED CHEMICALS WITH CHROMIC ACID FREE SOLUTION.
- - -

FUNDED?: N   BUDGET YEAR $/FUNDING:
DESC: + 9001.

TOTALS OF Metal Plating Solution [illegible] [illegible]

55 Gals 55 Gals
400 lbs 400 lbs

DESIGN CTRL NO	CHEMICAL	NSN	HAZ ?	PROCESS	FUNCTION	LOCATION BLDG	WASTE GEN (GAL)	HW F/OFFSITE DISP (GAL)	EFFORTS IMPLEMENTED TO REDUCE HW	EFFORTS PROPOSED TO REDUCE HW
		INSTALLATION: RED RIVER ARMY DEPOT			POC: RALPH LINDSEY		HAZMIN CATEGORY IS: Aluminum Conversion Coatings			
RR0054	CHROMATE CONVERSION	8030-00-179-1024 8030-00-179-1804	NA	Plating	MAINTENANCE/VEH SHOPS DIV	333 345/1 345/2 34 8 493	5,119.0 ~~4,350~~	1,272 X ~~[illegible]~~	THESE BOOTHS ARE NEW BUT HAVE NOT PERFORMED ACCORDING TO SPEC REMTS. COE ARE HAVING CONSULTING FIRM REDESIGN BOOTHS TO UTILIZE CHEM RECOV/RECYC EQUIP.	CHEM EQUIP TO TREAT OR RECOVER CH COMPOUNDS PROPOSED IN BLDGS 333/345/1/4 93. SEE IMPL. BLDG 345/2 & 348 OP. EDULED TO BE ELIMINATED.
		FUNDED?: N		BUDGET YEAR $/FUNDING:						
		DESC: COAT F/ALUMINUM MIL-C-81706 (AMCHEM CORP ALODINE 600 OR EQUAL). 13.5 LB PER 100 GAL OF WATER.								
RR0057	CHROMATE CONVERSION •	6810-00-281-2596 6810-00-183-1009	NA	Plating	MAINTENANCE/SEC ITEMS DIV	345/2	0 ~~600~~	0 ~~[illegible]~~ HRS.		OPERATION TO BE RELOCATED TO BLDG
		FUNDED?: N		BUDGET YEAR $/FUNDING:						
		DESC: *COAT FOR MAGNESIUM. MIL-M-3171. TABLE IV. SODIUM DICHROMATE. CALCIUM FLOURIDE - NSN 6810 00-183-1009.								
					TOTALS OF Aluminum Conversion Coatings		5,119.0 ~~4,950~~	1,272 ✓ ~~[illegible]~~		

~~Updated Total will be fur-nished when data is received for RR0054 & RR0057.~~

CTRL NO. CHEMICAL [illegible] FUNCT KG DISP [illegible] IN [illegible] IN

INSTALLATION: RED RIVER ARMY DEPOT POC: RALPH LINDSEY HAZMIN CATEGORY IS: Waste Water Treatment Sludge

WWTP SLUDGE * - - - Treatment on Plating Rinsewaters MAINTENANCE 3.9 -0- 3.9 -0- NONE

FUNDED?: NA BUDGET YEAR (FUNDING):
DESC: * IN TONS RATHER THAN GALLONS.

TOTALS OF Waste Water Treatment Sludge 3.9 -0- 3.9 -0-

~~NONE~~ Study conducted
By contractor July 87
For possible means of
minimizing discharges
From shops Bldgs.
Results not Received

LIN_NO . UNIT

INSTALLATION: RED RIVER ARMY DEPOT PNC: RALPH LINDSEY HAZMIN CATEGORY IS: Cleaning Compounds

RR0043 CLEAN COMPOUND ALKALI 6850-00-140-1008 Y Clean/Finish MAINTENANCE 493, 233, 348, 315/1, 348/2 3050 ~~6170~~ 0 ~~6400~~ X

FUNDED?: N BUDGET YEAR 1/FUNDING:
DESC: HW GENERATED: ~~DRAINS TO SUMP EST OF 4159-333 THEN TRUCKED TO IWTP. DO NOT DUPLICATE QUANTITIES.~~

RR0044 PHOSPHORIC ACID 6810-00-823-0004 Y Cleaner MAINTENANCE 315/2 0 ~~6,900~~ 0 ~~4,[illegible]~~

FUNDED?: N BUDGET YEAR 1/FUNDING:
DESC: HW GENERATED: TANK DRAINED AND CLEANED ONCE A YEAR.

Add:
Phosphoric Acid 6810-00-823.[illegible] Y Cleaner MAINTENANCE 348 3,962 ~~[illegible]~~ 3,962 ~~[illegible]~~ X
[illegible] Cleaning Compounds

Totals of Cleaning Compounds 4,112 3862

~~Updated total will be furnished when data is received for RR0044~~

[illegible] CHEM SN [illegible] [illegible] [illegible] BIS [illegible] [illegible]

INSTALLATION: RED RIVER ARMY DEPOT POC: RALPH LINDSEY HAZMIN CATEGORY IS: Other Paint Stripping Solvent

RR0008 METHYLENE CHLORIDE 6810-00-281-0634 Y Paint Stripper MAINTENANCE 345/1 ~~[illegible]~~ 0 ~~2,154~~ 0

FUNDED?: ~~N~~ NA BUDGET YEAR $/FUNDING:
DESC:

Replacement Product
(Non-chlorinated & containing no Phenols)
To be used in the Future.

RR0009 METHYLENE CHLORIDE 6810-00-281-0634 Y Paint Stripper MAINTENANCE 345/2 ~~[illegible]~~ 691 ~~[illegible]~~ 691

FUNDED?: ~~N~~ NA BUDGET YEAR $/FUNDING:
DESC:

FR0010 METHYLENE CHLORIDE 6810-00-153-0358 Y Paint Stripper MAINTENANCE 340 ~~[illegible]~~ 597 ~~[illegible]~~ 597

FUNDED?: N BUDGET YEAR $/FUNDING:
DESC:

RR0034 PAINT STRIPPER TT-R-230 8010-00-227-1693 Y Paint Stripper MAINTENANCE 345/1 ~~[illegible]~~ 0 ~~[illegible]~~ 0

(1) Fluidized Bed Incinerator
(2) Operations at 345/1 & 345/2 will be combined.

FUNDED?: ~~N~~ Y BUDGET YEAR $/FUNDING:
DESC: HW GENERATED: QUANTITIES BASED ON DRAINING AND CLEANING TANKS ONCE PER YEAR

FR0035 PAINT STRIPPER TT-R-230 8010-00-227-1693 Y Paint Stripper MAINTENANCE 345/2 ~~[illegible]~~ 0 ~~[illegible]~~ 0

FUNDED?: ~~N~~ Y BUDGET YEAR $/FUNDING:
DESC: HW GENERATED: QUANTITIES BASED ON DRAINING AND CLEANING TANKS ONCE PER YEAR

RR0036 PAINT STRIPPER TT-R-230 8010-00-227-1693 Y Paint Stripper Clean/Finish MAINTENANCE 340 ~~61,560~~ 9,422 ~~[illegible]~~ 9,422

FUNDED?: N BUDGET YEAR $/FUNDING:
DESC: HW GENERATED: QUANTITIES BASED ON DRAINING AND CLEANING TANKS ONCE PER YEAR

RR0037 CORROSION REMOVER ~~6850-00-181-0427~~ 6850-00-550-5515 Y Clean/Finish Paint Stripper MAINTENANCE 345/1 ~~[illegible]~~ 29,420 ~~21,600~~ 8,000 X

Operational Procedures being Reviewed in an effort To Lower all Sufficiently for Industrial Waste Treatment Plant to accept.

FUNDED?: N BUDGET YEAR $/FUNDING:
DESC: HW GENERATED: QUANTITIES BASED ON DRAINING AND CLEANING TANKS ONCE PER YEAR

RR0038 CORROSION REMOVER ~~6850-00-181-0427~~ 6850-00-550-5515 Y Clean/Finish Paint Stripper MAINTENANCE 344 ~~11,880~~ 2,150 ~~[illegible]~~ 0 X

FUNDED?: N BUDGET YEAR $/FUNDING:
DESC: HW GENERATED: QUANTITIES BASED ON DRAINING AND CLEANING TANKS ONCE PER YEAR

TOTALS OF Other Paint Stripping Solvent ~~[illegible]~~ 42,313 ~~31,162~~ 18,758

Updated Total with [illegible]

REGION CTRL NO	CHEMICAL	NSN	HAZ ?	PROCESS	FUNCTION	LOCATION BLDG	WASTE GEN (GAL)	DISP (GAL)	REDUCE HW	REDUCE HW
					TOTALS OF Petroleum Based Solvent		~~44,146~~	~~8,265~~		

ADD The following Waste Streams:

Methyl Ethyl Ketone	6810-00-281-2[illegible]	Data Proc Shop Cleaned	Maintenance	321/2	299	299			
Stoddard Solvent "Safety Kleen"	6850-00-637-6135	Parts Cleaning	Maintenance Supply Logistics Quality	315, 377 421, 373 1106, 1107 1514, 1161 1160, 511 592, 1160, 594, 595 571	477,977	N/A; Off-Site Recycling			Penetone Corp. "Citrikleen" Proposed For use when Safety Kleen Contract Expires

TOTALS of Petroleum Based Solvent 477,276* ~~Updated Total will be Furnished when data is Received for Reports~~ 299

*Includes S.K. Stoddard Solvent

[illegible]	NOMENC	[illegible]		[illegible]	FUNCTION	[illegible]	[illegible]	[illegible]	
AA0028	METHYLETHYL KETONE	6810-00-295-0011	Y	Cleaner Painting	MAINTENANCE	360	4,270	0	[illegible] EVAPORATE AS PAINT CURES
		FUNDED?: N DESC: USED TO FLUSH PAINT LINES.			BUDGET YEAR $/FUNDING:				
AA0029	METHYLETHYL KETONE	6810-00-295-0011	Y	Cleaner Painting	MAINTENANCE	373	0 ~~[illegible]~~	0	
		FUNDED?: N DESC: USED TO FLUSH PAINT LINES.			BUDGET YEAR $/FUNDING:				
AA0030	METHYLETHYL KETONE	6810-00-295-0011	Y	Cleaner Painting	MAINTENANCE	[illegible]	0 ~~[illegible]~~	0	
		FUNDED?: N DESC: USED TO FLUSH PAINT LINES.			BUDGET YEAR $/FUNDING:				
AA0031	METHYLETHYL KETONE	6810-00-295-0011	Y	Cleaner Painting	MAINTENANCE	[illegible]	0 ~~[illegible]~~	0	
		FUNDED?: N DESC: USED TO FLUSH PAINT LINES.			BUDGET YEAR $/FUNDING:				
AA0032	METHYLETHYL KETONE	6810-00-295-0011	Y	Cleaner Painting	MAINTENANCE	[illegible]	0 ~~[illegible]~~	0	
		FUNDED?: N DESC: USED TO FLUSH PAINT LINES.			BUDGET YEAR $/FUNDING:				
AA0033	METHYLETHYL KETONE	6810-00-295-0011	Y	Cleaner Painting	MAINTENANCE	[illegible]	0 ~~4,046~~	0	
		FUNDED?: N DESC: USED TO FLUSH PAINT LINES.			BUDGET YEAR $/FUNDING:				
~~AA0040~~	~~PETROLEUM [illegible] NAPTHA~~	~~6810-00-290-0040~~	~~Y~~	~~Cleaner~~	~~QUALITY~~	~~373~~	~~[illegible]~~	0 ~~[illegible]~~	~~LIMITED USE BASIS.~~
		~~FUNDED?: N~~ ~~DESC:~~			~~BUDGET YEAR $/FUNDING:~~				
AA0047	TOLUENE	6810-00-290-0040	Y	Painting	QUALITY	1174	0 ~~[illegible]~~	0 ~~[illegible]~~	None; Thinners Evaporate As Paint Cures or is in Form of Paint Sludge.
		FUNDED?: N DESC: HW GENERATED: WASTE IS IN FORM OF PAIN SLUDGE			BUDGET YEAR $/FUNDING:				
AA0025	METHYL ETHYL KETONE	- - -	Y	Painting	DEPOT VEHICLE MAINT	571	0 ~~[illegible]~~	0 ~~[illegible]~~	DISTILLATION OF MEK
		FUNDED?: N DESC:			BUDGET YEAR $/FUNDING:				

CTRL NO	CHEMICAL	NSN	?	PROCESS	FUNCTION	[illegible]	[illegible]	[illegible]
RR0019	THINNER ALIPHATIC	8010-00-181-8079	Y	Painting	MAINTENANCE	350	0 ~~[illegible]~~	0
		FUNDED?: N DESC:		BUDGET YEAR $/FUNDING:				
RR0020	THINNER ALIPHATIC	8010-00-181-9079	Y	Painting	MAINTENANCE	373	0 ~~[illegible]~~	0
		FUNDED?: N DESC:		BUDGET YEAR $/FUNDING:				
RR0021	THINNER ALIPHATIC	8010-00-181-8079	Y	Painting	MAINTENANCE	4200	0 ~~[illegible]~~	0
		FUNDED?: N DESC:		BUDGET YEAR $/FUNDING:				
RR0022	THINNER ALIPHATIC	8010-00-181-9079	Y	Painting	MAINTENANCE	4225	0 ~~[illegible]~~	0
		FUNDED?: N DESC:		BUDGET YEAR $/FUNDING:				
RR0023	THINNER ALIPHATIC	8010-00-181-9079	Y	Painting	MAINTENANCE	473	0 ~~[illegible]~~	0
		FUNDED?: N DESC:		BUDGET YEAR $/FUNDING:				
RR0024	METHYLETHYL KETONE	6810-00-285-8011	Y	Painting Cleaner	MAINTENANCE	323	0 ~~[illegible]~~	0
		FUNDED?: N DESC: USED TO FLUSH PAINT LINES.		BUDGET YEAR $/FUNDING:				
[illegible]	METHYLETHYL KETONE	6810-00-285-8011	Y	Painting Cleaner	MAINTENANCE	333	0 ~~34,330~~	0
		FUNDED?: N DESC: USED TO FLUSH PAINT LINES.		BUDGET YEAR $/FUNDING:				
RR0026	METHYLETHYL KETONE	6810-00-285-8011	Y	Cleaner Painting	MAINTENANCE	345	0 ~~2,550~~	0
		FUNDED?: N DESC: USED TO FLUSH PAINT LINES.		BUDGET YEAR $/FUNDING:				
RR0027	METHYLETHYL KETONE	6810-00-285-8011	Y	Cleaner Painting	MAINTENANCE	357	0 4,340	0
		FUNDED?: N DESC: [illegible] FLUSH [illegible] LINES		BUDGET YEAR $/FUNDING:				

Note; THINNERS EVAPORATE AS PAINT CURES

[redacted] NO [redacted] (SE) NSN ? PROCESS FUNCTION [redacted] BLDG [redacted] [redacted] (GAL) DISP (GAL) RECYCLE (GAL) [redacted]

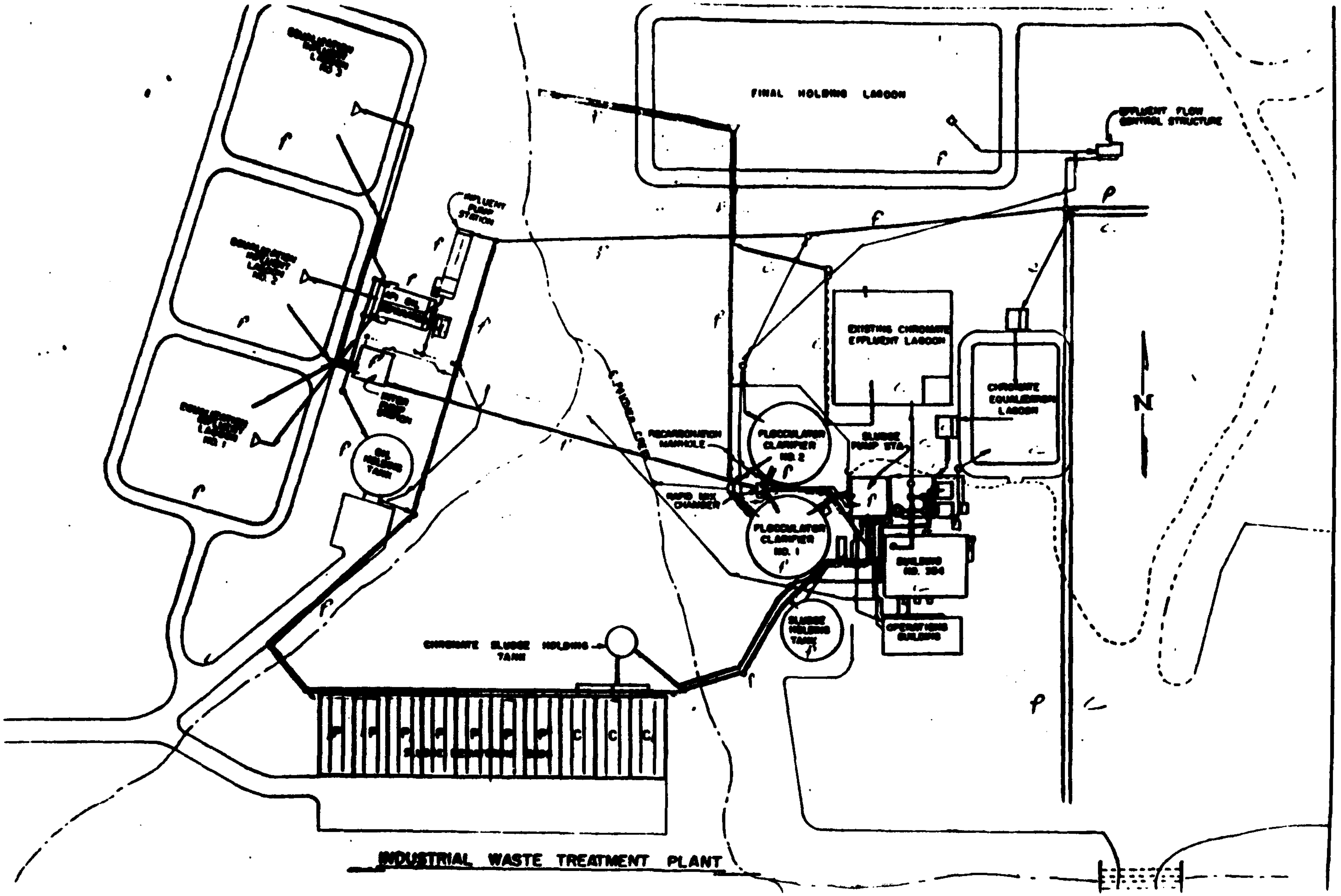
INSTALLATION: RED RIVER ARMY DEPOT   POC: RALPH LINDSEY   HAZMIN CATEGORY IS: Petroleum Based Solvent

~~RR0011~~	~~SOLVENT CLEANING~~	~~6850-00-285-8011~~	~~Y~~	~~Degreaser~~	~~MAINTENANCE~~	~~373~~	~~3,553~~		← Delete
		FUNDED?: N DESC:		BUDGET YEAR $/FUNDING:					
RR0012	XYLENE	6810-00-252-2144	Y	Painting	MAINTENANCE	335/2	0 ~~40~~	0	None; Thinners Evaporate As Paint Cures
		FUNDED?: N DESC:		BUDGET YEAR $/FUNDING:					
RR0013	TOLUENE	6810-00-290-0048	Y	Painting	MAINTENANCE	357	0 ~~44~~	0	
		FUNDED?: N DESC:		BUDGET YEAR $/FUNDING:					
RR0014	THINNER LACQUER	8010-00-160-5788	Y	Painting	MAINTENANCE	335/2	0 ~~4.9~~	0	
		FUNDED?: N DESC:		BUDGET YEAR $/FUNDING:					
RR0015	THINNER ALIPHATIC	8010-00-209-1751	Y	Painting	MAINTENANCE	333	0 ~~5,520~~	0	
		FUNDED?: N DESC:		BUDGET YEAR $/FUNDING:					
RR0016	THINNER ALIPHATIC	8010-00-181-8079	Y	Painting	MAINTENANCE	323	0 ~~5,200~~	0	
		FUNDED?: N DESC:		BUDGET YEAR $/FUNDING:					
RR0017	THINNER ALIPHATIC	8010-00-181-8079	Y	Painting	MAINTENANCE	335	0 ~~1,330~~	0	
		FUNDED?: N DESC:		BUDGET YEAR $/FUNDING:					
RR0018	THINNER ALIPHATIC	8010-00-181-8079	Y	Painting	MAINTENANCE	357	0 ~~4,959~~	0	
		FUNDED?: NA DESC:		BUDGET YEAR $/FUNDING:					

INSTALLATION: RED RIVER ARMY DEPOT POC: RALPH LINDSEY HAZMIN CATEGORY IS: Chlorinated Solvent

PRCSN CTRL NO	CHEMICAL	NSN	HAZ ?	PROCESS	FUNCTION	LOCATION BLDG	WASTE GEN (GAL)	HW F/OFFSITE DISP (GAL)	EFFORTS IMPLEMENTED TO REDUCE HW	EFFORTS PROPOSED TO REDUCE HW
RR0001	1.1.1 TRICHLOROETHANE	6810-00-476-5613	Y	Vapor Degreaser	MAINTENANCE	333/3	0 ~~[illegible]~~	0	ON-SITE DISTILLATION	
		FUNDED?: N DESC:		BUDGET YEAR 1/FUNDING:						
RR0002	1.1.1 TRICHLOROETHANE	6810-00-476-5613	Y	Vapor Degreaser	MAINTENANCE	335/1	5,102 ~~[illegible]~~	5102 ~~-0-~~	(1) DRMO is Presently Sell for Recycling off-Site	CENTRALIZED DISTILLATION FACILITY FOR ALL BLDGS
		FUNDED?: Y ~~N~~ DESC:		BUDGET YEAR 1/FUNDING: 1989						
RR0003	1.1.1 TRICHLOROETHANE	6810-00-476-5613	Y	Vapor Degreaser	MAINTENANCE	335/1	720 ~~[illegible]~~	720 ~~[illegible]~~		
		FUNDED?: Y ~~N~~ DESC:		BUDGET YEAR 1/FUNDING:						
RR0004	1.1.1 TRICHLOROETHANE	6810-00-476-5613	Y	Vapor Degreaser	MAINTENANCE	335/2	1,155 ~~[illegible]~~	1,155 ~~-0-~~		
		FUNDED?: Y ~~N~~ DESC:		BUDGET YEAR 1/FUNDING:						
RR0005	1.1.1 TRICHLOROETHANE	6810-00-476-5613	Y	Vapor Degreaser	MAINTENANCE	338	2,162 ~~[illegible]~~	2,162 ~~-0-~~		
		FUNDED?: Y ~~N~~ DESC:		BUDGET YEAR 1/FUNDING:						
RR0006	1.1.1 TRICHLOROETHANE	6810-00-476-5613	Y	Vapor Degreaser	MAINTENANCE	411	530 ~~[illegible]~~	530 ~~-0-~~		
		FUNDED?: Y ~~N~~ DESC:		BUDGET YEAR 1/FUNDING:						
RR0007	1.1.1 TRICHLOROETHANE	6810-00-476-5613	Y	Vapor Degreaser	MAINTENANCE	493/4	14,241 ~~[illegible]~~	14,241 ~~-0-~~		Fluidized Bed Incinerator To Dispose Rubber From Roadwheel and Tracks.
		FUNDED?: N DESC:		BUDGET YEAR 1/FUNDING:						
RR0019	1.1.1. TRICHLOROETHANE	6810-00-476-5613	Y	Degreaser	SUPPLY	595	0 ~~[illegible]~~	0 ~~[illegible]~~		Centralized Distillation ~~distillation~~ Facility To Serve All Bldg
		FUNDED?: Y ~~N~~ DESC:		BUDGET YEAR 1/FUNDING:						

REGION CTRL NO	CHEMICAL	NSN	HAZ ?	PROCESS	FUNCTION	LOCATION BLDG	WASTE GEN (GAL)	F/O DISP (GAL)	IS IT [illegible] REDUCE HW	EG TO	EFFORT [illegible] DEED [illegible] REDUCE HW
[illegible]C350	1.1.1. TRI CHLOROETHANE	6810-00-476-5513	Y	Degreaser	SUPPLY	591	216 ~~[illegible]~~	216 ~~[illegible]~~	1,1,1 TCCO is Presently Sold For Recycling off-Site ↓		~~DISTILLATION~~ Centralized Distillation Facility To Serve ALL Bldgs. ↓
		FUNDED?: ~~N~~ Y DESC:		BUDGET YEAR $/FUNDING:							
[illegible]0951	1.1.1. TRI CHLOROETHANE	6810-00-476-5510	Y	Degreaser	SUPPLY	591	106 ~~[illegible]~~	106 ~~[illegible]~~			~~DISTILLATION~~
		FUNDED?: ~~N~~ Y DESC:		BUDGET YEAR $/FUNDING:							
~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~Y~~	~~Cleaner~~	~~SUPPLY~~	~~595~~	~~1,100~~	~~0~~	~~SAFETY KLEEN CONTRACT~~		~~DISTILLATION~~ Delete FRom This Section. These have been included in Petroleum Based Solvent Section.
		FUNDED?: N DESC:		BUDGET YEAR $/FUNDING:							
~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~Y~~	~~Cleaner~~	~~SUPPLY~~	~~591~~	~~115~~	~~0~~	~~SAFETY KLEEN CONTRACT~~		~~DISTILLATION~~
		FUNDED?: N DESC:		BUDGET YEAR $/FUNDING:							
~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~Y~~	~~Cleaner~~	~~SUPPLY~~	~~591~~	~~110~~	~~0~~	~~SAFETY KLEEN CONTRACT~~		~~DISTILLATION~~
		FUNDED?: N DESC:		BUDGET YEAR $/FUNDING:							
					TOTALS OF Chlorinated Solvent		21,352 ~~[illegible]~~	21,352 ~~[illegible]~~			



INDUSTRIAL WASTE TREATMENT PLANT

PEI ASSOCIATES, INC.

MEMORANDUM

TO: Craig MacPhee

DATE: 4/19/89
Revised: 5/2/89

SUBJECT: Trip report to Sacramento Army Depot

FROM: Fred Hall
Bob Hoye
Jeff Davis

FILE: 3769-4

CC: Dick Gerstle
Don Henz

USATHAMA and PEI personnel participated in meetings and a tour of the facilities at the Sacramento Army Depot (SAAD) on April 6 and 7, 1989. SAAD is located in southeast Sacramento, California. Craig MacPhee represented the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). PEI personnel present were Fred Hall, Bob Hoye, and Jeff Davis.

Our primary environmental contact at SAAD was Pat Christman, Environmental Coordinator. In addition, we met with Lloyd Porter, Paint Section Chief; William Anderson, Chief of the Refinishing Branch and Chair of the Environmental Council; Richard Eldridge and Roy McClymonds, both of the Equipment Cleaning Section; sandblasting booth operators; John Wilson, Chief of the Plating Section; Richard Solander, who showed us the wastewater treatment plant; Benjamin Guerra, operator of the wastewater treatment plant; and Ronald Stevenson.

The purpose of this trip report memo is to document the information obtained during the site visit. The trip report is presented in eight sections to address pertinent topics included in the scope of work of Task Order No. 4. These sections are: Background, VOC Emissions, Blasting Operations, Alternate Chemical Strippers, Alternate Degreasers, Electroplating Operations, Other Areas of Interest, and Conclusions/Recommendations.

BACKGROUND

SAAD employs approximately 3,300 people, and its primary mission is to repair and maintain electronic and communications equipment. Letterkenny Army Depot and Lexington Bluegrass Army Depot perform similar functions. SAAD will experience an increased workload when Lexington Bluegrass is closed in the near future.

SAAD has been the site for installation of a plastic media blasting facility and pilot-scale testing of alternate chemical strippers. Personnel at SAAD expressed a willingness to continue to conduct R & D efforts with USATHAMA. Pat Christman emphasized that the tests conducted under this contract should be as time-sensitive as the regulations that drive the tests.

VOC EMISSIONS

SAAD painting operations were in compliance with state regulations until 1988, when California adjusted its air emissions regulations. Under the California "Air Toxics Hot Spots

Information and Assessment Act of 1988", SAAD is required to devise a plan by August 1, 1989, to come into compliance with state VOC emissions regulations. SAAD must initiate this plan within six months after that date. The initial phase of the compliance plan is an inventory of all stationary sources on the depot. Because SAAD has not conducted air emissions measurements in 11 years, personnel will use estimates of emissions based on information contained in three depot tracking systems to complete the inventory. SAAD maintains an automated Material Safety Data Sheet (MSDS) file, with over 3,000 records. These records were entered by depot personnel and thus contain information on substances specific to SAAD. The depot also has tracking systems for hazardous materials and hazardous wastes, which are on two different computer systems.

California regulations for painting operations cover paint VOC content, transfer efficiency, and air emissions. The allowable VOC content in paint has decreased from 500 g/L to 340 g/L, and depot personnel believe that the state will decrease this value to 280 g/L. Painting operations must also meet a minimum transfer efficiency of 65 percent regardless of the resulting VOC emissions; a transfer efficiency of 85 percent has been proposed. Finally, the air emissions from painting operations are regulated in terms of concentrations and total emissions per year. Although this system may be unique to California at present, other states often follow California's lead in environmental legislation, and other depots throughout the country may be required to meet these standards.

We visited the automated painting line booth in Building 420. The stripped and cleaned parts are carried through the facility on an overhead transport system, given a primer coating in an open-ended paint booth, dried in a drying oven, painted with CARC (a single-component, polyurethane paint), and dried again in a drying oven. Paint is applied with a turbo air-operated spray system, which achieves a transfer efficiency of 60 to 65 percent. The high-solids paints are abrasive and wear out the spray gun parts quickly. Dry filters prevent the overspray paint from discharging to the outside air, but do not decrease VOC emissions. These filters are soaked in water and discarded as a nonhazardous waste.

Epoxies and one-component CARC are the only paints used. Enamels contain more than 340 g/L VOC content and are therefore not used at SAAD. Paint costs have doubled since the maximum VOC content regulations have been promulgated because only one vendor manufactures the high-solids paint. Any new paint formulation is subjected to a rigorous and expensive testing procedure which many manufacturers do not want to endure.

The painting operations at SAAD employ no air emissions control devices, with the exception of dry filters that trap the overspray paint. Pat Christman said that the control of VOC emissions at the stack is very expensive, and that devices such as incinerators would create an ozone problem. Personnel at SAAD thus prefer to study the up-front solutions, such as changing paint specifications or application methods. The painting operations must also meet the required transfer efficiency and maximum allowable VOC content regardless of the controls on the air emissions stacks. Stack control would also be a problem for facilities such as SAAD where the painting operations are scattered throughout different buildings, since each source would require separate control equipment. SAAD has 23 permitted paint booths of various sizes in nine different buildings, although the majority of painting is conducted in Building 420. Two additional paint booths are under construction.

William Anderson, Chief of the Refinishing Branch at SAAD, is interested primarily in application techniques that would reduce paint use and VOC emissions. Powder coatings are another alternative in reducing VOC emissions, but switching all equipment and facilities to this system would be very expensive. In addition, available powder coatings probably do not have CARC's desirable properties of chemical resistance and ability to absorb infrared radiation (to elude detection). Depot personnel have also considered applying paint by electrostatic precipitation, but demonstrations that they have seen were not successful. Mr. Anderson's chief interest is in inexpensive modifications to the painting facilities that allow compliance with present and upcoming VOC regulations. He noted that the proposed 280 g/L may be the lowest practical limit for VOC content, and control technologies may eventually be required.

One methylene chloride paint stripping tank is in use for small parts in the plating shop. The tank is approximately 15 by 6 feet, and is vented to the outside air without any air pollution controls. During use the tanks are not covered. The parts are manually taken from the stripper tank and dipped in a hot caustic solution, which vaporizes the methylene chloride and removes the paint from the parts. The parts are then dipped in a cold water rinse bath. The water from the rinse bath is periodically sent to clarifiers (Building 301) without treatment. The transportation of the rinse water to the clarifiers and the associated agitation may serve to strip any methylene chloride from the water, but analyses of the water for methylene chloride have not been conducted. The clarifier water is analyzed for metals prior to discharge to the POTW, but is not analyzed for total toxic organics (TTO). Studies, as described later in this report, are being conducted to find an alternate stripper to replace the methylene chloride.

The plating shop (Building 420) has a vapor degreaser that uses 1,1,1-trichloroethane as the solvent. The tank has a cover and measures 40 x 70 x 90 inches. Another degreaser in this same building uses Freon and ultrasonic waves for cleaning small parts.

A list of SAAD permitted air emissions sources is provided as an attachment to this report.

BLASTING OPERATIONS

A plastic media blasting (PMB) facility was recently constructed at SAAD but is not in full-time use yet because of operational problems, although some tests have been conducted. The construction of the plastic media blasting booth cost $900,000 and was supervised by the Army Corps of Engineers. The system and plastic media were manufactured by Aerolyte. SAAD will use this facility primarily to remove paint from communications shelters. The exterior of the shelters are currently sandblasted and the interiors, which have delicate wiring and honeycomb vents, are hand sanded. The hand sanding of the interiors is a very labor-intensive process and requires approximately 40 man hours to complete. The blasting of the exterior requires approximately 4 man hours.

The use of PMB will reduce paint use because the operators can remove one layer at a time. The primer does not need to be stripped if it is still in good shape. Although the Army is switching to the use of CARC paint on all parts, DESCOM guidelines specify that if there is a good coating on an item, the part should not be stripped just to provide a CARC coating. The primer, however, must be an epoxy for good adhesion of CARC paint. When SAAD operators cannot identify the primer, the item is stripped to the bare substrate. Parts can also be partially stripped and repainted if the coating is good in some areas; however, an item coated with an old layer of enamel cannot be partially repainted with CARC. In such cases, the entire item is stripped. Every item painted with CARC has a label with a date on which the part was painted, allowing for positive identification in the future.

During operation, the overhead dust in the booth is vented outside to a baghouse without passing through a recycling system, and the residue is collected in 55-gallon drums. The facility is designed to collect the particles of plastic media that fall to the floor in floor vents. The media is sent to a small cyclone inside the building, which separates the different media sizes. Heavier, reusable media empty to a hopper and then to four feed tanks, from which the media are recycled to the blasting booth. The fine particles in the cyclone exhaust are transported to a small baghouse and are collected in a 30-gallon drum.

A number of unsolved operational problems with the plastic media blasting facility have prevented the full-time use of the equipment. The operators have not been able to get enough breathing air to their respirators. The ventilation system for the booth has been shutting down at random every 15 to 20 minutes; the operators suspect an electrical problem. The recycling system on the floor becomes clogged with plastic media. In addition, the door to the booth does not form a good seal with the floor and the media escapes under the door. In previous tests, the PMB operators had problems with running out of plastic media. During the visit the waste drum and baghouse hopper were full of media, which may have been caused by an improper setting of the air flow through the cyclone. A sieve analysis of the used plastic media could help adjust cyclone operating parameters (e.g., modifying damper settings or fan speed) to obtain maximum use of the plastic media and minimal waste generation. Most of these problems should be solved by the equipment manufacturer and contractor.

The corners of the communications shelters are overlain with steel for lifting purposes, and several steel handles are on the outside of the shelters. These parts are often rusted and would not be amenable to stripping only with plastic media. This problem will need to be solved if PMB is to be used on both the inside and outside of the shelters.

Sandblasting is still being used to strip shelters in building 420. Air leaks in the baghouse collection system and dumpster (a roll-off box) loading system are a common problem. This leads to emissions of fine dusty sand. The duct work inside the building has been degraded by the abrasive sand, and has been repaired temporarily. The duct work is scheduled for replacement. Operators of a sandblasting glove box in a small room adjacent to the large sandblasting booth indicated that the door to the booth is sometimes left open for large sandblasting jobs, which leads to an obvious loss of media.

The sand used is size 30 mesh, and the usage rate is approximately 600 pounds per hour of blasting. One or two dumpsters per day of waste sand are collected and disposed of as nonhazardous waste. Garnet and aluminum oxide are also occasionally used.

ALTERNATE CHEMICAL STRIPPERS

SAAD has been working with the Construction Engineering Research Laboratory (CERL) in Champaign, Illinois, to find a non-chlorinated, non-phenolic stripper to replace methylene chloride. CERL originally conducted laboratory-scale studies on 25 to 30 strippers. Of these, five were chosen for pilot-scale studies in a 25-gallon tank. Oakite stripper was selected for a Phase 3, full-scale study, and SAAD installed a 1,700-gallon tank. The stripper cost $638 per drum, and SAAD spent $25,000 in start-up costs. The primary problems with the stripper were a high rate of evaporation, a long dip time, and the cost, but otherwise the stripper was working well. After six months, however, Oakite completely lost its effectiveness and the vendor has not been helpful in remedying the problem. SAAD personnel feel that a life span of six months is much too short to make the process economically viable. The tank of Oakite remains in the plating shop, and in addition, SAAD has 10 drums of fresh Oakite. The approximate cost of disposal of the liquid would be $500 per drum.

During our visit, personnel from CERL were on site conducting laboratory-scale testing of other strippers (Turko and McGean Rocco). A stripper from Fine Organics, which uses a titration procedure to determine make-up chemicals, has already passed the laboratory-scale testing with satisfactory results. A phone survey of users may be useful in determining the expected life of these strippers.

Since Oakite has stopped working, methylene chloride is again being used to strip paint off small parts. Pat Christman and others said that they would be willing to conduct a full-scale test on another stripper if necessary.

Red River Army Depot (RRAD) has also been studying the same alternate chemical strippers as SAAD, but is planning to skip the laboratory- and pilot-scale tests and go to full-scale use. Information obtained at SAAD should thus be very useful to RRAD.

ALTERNATE DEGREASERS

Six vapor degreasers at SAAD have air permits. A vapor degreaser containing 1,1,1-trichloroethane as the solvent is used in the plating shop, Building 420. The tank is covered and measures 40 x 70 x 90 inches. A degreaser using Freon and ultrasonic waves is also in this building. The methylene chloride stripper in the plating shop also cleans parts and is permitted as a cold degreaser. William Anderson believes that DuPont may have a substitute for Freon, but this chemical is much more expensive.

ELECTROPLATING OPERATIONS

During our site visit to SAAD, we toured the electroplating operations and wastewater pretreatment system. SAAD electroplates cadmium, chromium, nickel, silver, gold, copper, and tin. Plating solutions are analyzed in SAAD's laboratory to determine when to empty tanks or add metals. The items to be plated are manually moved from tank to tank. The parts are allowed to drain as much as possible to reduce drag-out.

Two wastewater collection systems are in place corresponding to different methods of treatment. Chromium and other acidic wastewaters are collected in one system, and rinse waters containing cyanide are collected in another system. Specific metals and waste streams are not segregated. Precious metal rinse waters are very dilute and, after pH adjustment, are sent to the final clarifier prior to discharge to the POTW.

The rinse waters are sent to a pretreatment facility outside the plating shop, which does not have a treatment permit. Chromium and other acidic wastewaters are treated with sulfur dioxide under acidic conditions to reduce hexavalent chromium to trivalent chromium. This process occurs in three treatment tanks with capacities of 2,440 gallons each. This system also receives a small chromium wastewater flow from the graphics arts building. Cyanide wastewaters are treated with chlorine under basic conditions to oxidize cyanide. The two streams are combined in a 25,000 gallon settling tank. SAAD has installed a polymer addition system that will begin operations soon to aid flocculation of particles. The sludge from this settling tank is pumped to a 710-gallon capacity sludge holding tank in a diked area. The liquid is decanted off the top and the sludge disposed as a hazardous waste. Approximately 6,000 gallons of sludge are collected per year .

The liquids from the settling tanks are sent to Building 301, which has two outside 125,000-gallon clarifiers. These tanks also accept liquid from the precious metal rinse tank after pH adjustment and from the methylene chloride rinse tank. The precious metal rinse waters and methylene chloride rinse waters are referred to as "DHC" wastewater. The clarifier liquid is sampled and analyzed; if the analysis reveals that contaminant levels in the liquid do not exceed permit discharge limits, the water is discharged to the POTW. The sewer discharge limits set by the County of Sacramento are provided in an attachment to this report. The laboratory analyzes for metals but not for total toxic organics. During a recent inspection, the state of California analyzed for total toxic organics, but has not informed SAAD of the results. The sludge from the bottom of these tanks is pumped out about two times per year and disposed as a hazardous waste. Approximately 6,000 gallons are disposed per year.

The sludges from the settling tank and clarifier are classified as F006 wastes and are EP Toxic for chromium. Results of the sludge laboratory analyses are provided as an attachment to this report. Richard Solander estimated the total volume generated at 12,000 gallons per year. The sludges are collected by MP Vacuum Truck Service and transported to Pacific Treatment in San Diego, California. The disposal cost for a recent shipment was $18,000 for 4,000 gallons.

The sludges do not undergo any dewatering processes, although a sludge drying bed is being installed near Building 301. According to a recent EPA manual ("Reducing Water Pollution Control Costs in the Electroplating Industry"), a typical sludge from a clarifier contains 0.5 to 3 percent solids, while the sludge from a holding tank will concentrate to approximately 3 to 5 percent solids if sufficient time is allowed. Analysis of the sludge moisture content would reveal the benefits of sludge dewatering techniques. Pat Christman indicated that the depot may be interested in stabilization of the sludge.

SAAD is considering installing a monorail system for electroplating large parts. The depot is also considering adding a lead plating line. A recent study by Acurex recommended various recycling techniques that could reduce SAAD's electroplating waste by 80 to 85 percent. However, depot personnel consider electroplating waste minimization a low priority.

OTHER AREAS

SAAD uses a drum crusher that is located in a fenced area to reduce the volume of 1-gallon and 5-gallon cans and 55-gallon drums. Regulations require that the the 1-gallon and 5-gallon cans must be crushed if there is more than one inch of material at the bottom; otherwise the cans are considered "RCRA empty" and discarded in a non-hazardous dumpster. All 55-gallon drums that cannot be reused are crushed. Drums in good condition are turned in for reuse.

SAAD collects batteries from other Army installations. The depot empties the acid but does not treat it as the facility does not have a RCRA treatment permit. The acid is pumped out of a holding tank and disposed as a hazardous waste. The battery casings are sent to DRMO.

CONCLUSIONS/RECOMMENDATIONS

Personnel at SAAD have undertaken a number of cooperative efforts with USATHAMA aimed at reducing their hazardous waste generation and are interested in pursuing other activities. SAAD has participated in alternate stripper testing, use of plastic media blasting, and a study by Acurex to minimize electroplating waste. We should keep ourselves informed on the progress of these activities so that we may transfer information to other depots.

SAAD expressed interests in reducing VOC emissions from painting operations by inexpensive modifications and application techniques, bringing their plastic media booth on line, and conducting further tests with alternate chemical strippers. They are also installing a sludge drying bed to reduce the volume of their electroplating sludge.

The following list presents some potential HAZMIN projects on which USATHAMA could provide assistance to SAAD.

- Assist with optimization or trouble shooting of plastic media blasting operation.
- Investigate methods and waste minimization potential of dewatering electroplating sludge.
- Implement recommendations provided in the Acurex report.
- Continue alternate stripper testing. Conduct phone survey of users to gather information on expected life of strippers.
- Investigate reduction of VOC emissions from paint operations by changing paint VOC content or method of application. Evaluate powder coatings.
- Evaluate feasibility of VOC emissions control for small, multiple sources.
- Explore methods of reducing fugitive sand emissions from the sandblasting facility.

SAAD's interests and needs will be compared to those of other depots that will be visited in the near future. SAAD personnel should be kept informed of the results of any testing relevant to their needs conducted under the current HAZMIN effort.

ATTACHMENTS

Documents obtained from SAAD

Air Sources and permits list, 12/28/88 (attached)

Sewer discharge limits (attached)

Laboratory analysis of sludge from pretreatment plant and clarifiers (attached)

SAAD AIR SOURCES AND PERMITS LIST 12/28/88

	A	B	C	D	E	F	G	H	I	J	K
1	#	BLDG.	EQUIPMENT	PERMIT #	SERIAL #	OWNER	POSTED	AUTH.	AUTH. TO	VOC #	COMMENTS
2								TO CONST.	OPERATE		
3											
4	1	242	PAINT BOOTH	#04716		D/S	YES	YES	YES		LABELING & STENCILING
5	2	248	PAINT BOOTH	#07845		D/M	YES	YES	YES		LARGE: VEHICLE BOOTH
6	3	248-	VAPOR DEGREASER			D/M					PCB FACILITY
7	4	248-	VAPOR DEGREASER			D/M					PCB FACILITY
8	5	248-	VAPOR DEGREASER			D/M					PCB FACILITY
9	6	248-	VAPOR DEGREASER			D/M					PCB FACILITY
10	7	248-	VAPOR DEGREASER			D/M					PCB FACILITY
11	8	287-	PAINT BOOTH	#8455		D/M	YES	YES	NPR<10lbs/day		VEHICLE BOOTH: NPR 9/5/86
12	9	287-	PAINT BOOTH	#8466		D/M	YES	YES	NPR<10lbs/day		VEHICLE BOOTH: NPR 9/5/86
13	10	287-	PAINT BOOTH			D/M	NO	NO	NO		CARC PROJECT: #13 MEDIUM VEHICLE
14	11	287-	PAINT BOOTH			D/M	NO	NO	NO		CARC PROJECT: #14 LARGE VEHICLE
15	12	287-	PAINT BOOTH			D/M	NO	NO	NO		CARC PROJECT: #15 LARGE VEHICLE
16	13	287-	PAINT BOOTH			D/M	NO	NO	NO		CARC PROJECT: #16 SMALL TU & REP
17	14	287-	PAINT BOOTH			D/M	NO	NO	NO		CARC PROJECT: #17 SMALL TU & REP
18	15	287-	PAINT BOOTH			D/M	NO	NO	NO		CARC PROJECT: #18 SMALL TU & REP
19	16	287-	PAINT BOOTH			D/M	NO	NO	NO		CARC PROJECT: #19 SMALL TU & REP
20	17	399	PAINT BOOTH	#04712		D/M	YES	YES	YES		SMALL:TOUCH UP AND REPAIR
21	18	399	PAINT BOOTH	#04713		D/M	YES	YES	YES		SMALL:TOUCH UP AND REPAIR
22	19	399	PAINT BOOTH	#06482		D/M	YES	YES	YES		SMALL:TOUCH UP AND REPAIR
23	20	399	SOL.SPRAY BOOTH	#05407		D/M	YES	YES	YES		GRAPHIC ARTS
24	21	399	PAINT BOOTH	#04714		D/M	YES	YES	YES		LARGE: VEHICLE BOOTH
25	22	399	PAINT BOOTH	#04715		D/M	YES	YES	YES		SMALL:TOUCH UP AND REPAIR
26	23	348	PAINT BOOTH	#05405		FAC.SVCS.	YES	YES	YES		SUPPORT SERVICES: IES VEHICLE BOOTH
27	24	382	BOILER #1	#04722		FAC.SVCS.	YES	YES	YES	N/A	
28	25	382	BOILER #2	#04723		FAC.SVCS.	YES	YES	YES	N/A	
29	26	382	BOILER #3	#04724		FAC.SVCS.	YES	YES	YES	N/A	
30	27	381	PAINT BOOTH	#06367		FAC.SVCS.	YES	YES	YES		FACILITES SERVICES:BLDGS & STRUCT.
31	28	429	PAINT BOOTH	#04709		D/M	YES	YES	YES		AUTOMATED LINE BOOTH
32	29	429	PAINT BOOTH	#04710		D/M	YES	YES	YES		AUTOMATED LINE BOOTH
33	30	429	PAINT BOOTH	#04711		D/M	YES	YES	YES		LARGE: VEHICLE BOOTH
34	31	429	VAPOR DEGREASER	#04720		D/M	YES	YES	YES		1,1,1-TRICHLOROETHANE
35	32	429	AFD BLASTCUBE	#06390		D/M	YES	YES	YES	N/A	SAND & GARNET
36	33	429	ABRASIVE BLAST	#5400		D/M	YES	YES	YES	N/A	SAND & GARNET
37	34	429	COLD DEGREASER	#05406		D/M	YES	YES	YES	N/A	MS111
38	34	429	BLASTCUBE	#7887		D/M	YES	YES	YES	N/A	SAND & GARNET
39											
40											
41											

SAAD AIR SOURCES AND PERMITS LIST 12/28/88

	A	B	C	D	E	F	G	H	I	J	K
42											
43	#	BLDG.	EQUIPMENT	PERMIT #	SERIAL #	OWNER	POSTED	AUTH.	AUTH. TO	VOC #	COMMENTS
44								TO CONST.	OPERATE		
45											
46	35	420	SANDBLASTER	#7688		D/M	YES	YES	YES	N/A	SAND & GARNET
47	36	420	BAGHOUSE	#7689		D/M	YES	YES	YES	N/A	SAND & GARNET
48	37	420	SANDBLASTER	#7690		D/M	YES	YES	YES	N/A	SAND & GARNET
49	38	420	VAPOR DEGREASER	#7844	#3116	D/M	YES	YES	YES		FREON
50	39	423	ABRASIVE BLAST	#8820		D/M		YES		N/A	PMB: 7/29/88 MUST PERFORM OP TEST
51	40	423	AFC BAGHOUSE	#8821		D/M		YES		N/A	PMB: 7/29/88 MUST PERFORM OP TEST
52	41	555	PAINT BOOTH	#4718		D/M		YES	NPR<10lbs/day		SMALL:TOUCH UP AND REPAIR: NPR 9/5/86
53	42	555	PAINT BOOTH	N/A		D/M		YES	YES		SMALL:TOUCH UP AND REPAIR
54	43	699	GAS PUMPS			AAFES		YES	YES	N/A	AAFES OBTAINS PERMITS
55	44										
56	45										
57	46										
58	47										
59	48										
60	49										
61	49										
62	50										

LABORATORY ANALYSES OF SLUDGES
(Results in ppm, as received)

METAL	SLUDGE FROM 710-GALLON SETTLING TANK	SLUDGE FROM BUILDING 301	FILTRATE FROM BUILDING 301
As	137.5	192	0.07
Se	104.2	384	0.13
Sb	65.8	482	0.04
Zn	426.7	5737	0.04
Pb	160.0	384	0.08
Cd	186.7	8582	0.06
Ni	1055.8	530	0
Mn	25.0	241	0
Fe	1801.7	46432	0.03
Cr	320.8	35873	0.04
Mg	1878.5	9257	1.09
Al	1355.0	7763	2.49
Ca	3122.5	21504	8.17
Cu	824.2	19672	2.87
Ag	9.2	2748	0
Ba	37.5	48	0.02
Be	1.0	0	0
V	5.7	0	0

Administration: (916) 855-8300
Collection: (916) 855-8330
Engineering: (916) 855-8320

DOUGLAS M. FRALEIGH, Director
TERRY TICE, Deputy Director
W.C. WANDERER, JR., Deputy Director

COUNTY OF SACRAMENTO

DEPARTMENT OF PUBLIC WORKS
WATER QUALITY DIVISION ........F.I. Hodgkins, Chief
COLLECTION SYSTEM . . . . S. Walton, Superintendent
ENGINEERING SECTION . . . J. P. Gaffney, Principal Engineer
9660 Ecology Lane
Sacramento, California 95827

-8 SEP 1987 13 26

September 1, 1987

1550.000

Pat Christman, Environmental Coordinator
Sacramento Army Depot
8250 Fruitridge Road
Sacramento, California 95813

Mr. Christman:

Subject: Sewer Use Permits

Your existing sewer use permit requires compliance with EPA Categorical Pretreatment Standards in an indirect way, by referring to "existing ordinances".

A recent state audit was critical of this approach; therefore, we are adding, as a condition to your permit, the actual pretreatment standards for your operation.

The limits are:	MAX. mg/l	AVG. mg/l
CN,T	1.20	0.65
Cu	3.38	2.07
Ni	3.98	2.38
Cr	2.77	1.71
Zn	2.61	1.48
Pb	0.69	0.43
Cd	0.11	0.07
TTO	2.13	
Ag	0.43	0.24

The above listed limits are now a condition of your sewer use permit, #41. A copy of our enforcement policy is included for your information.

Very truly yours,

Larry Bristow

Larry Bristow
Supv. Ind. Waste Insp.

LB:kj

PEI ASSOCIATES, INC.

MEMORANDUM

TO: Craig MacPhee

DATE: 4/19/89
Revised: 5/2/89

SUBJECT: Trip report to Sharpe Army Depot
Contract No. DAAA15-88-D-0001
Task Order No. 0004

FROM: Fred Hall
Bob Hoye
Jeff Davis

FILE: 3769-4

cc: Dick Gerstle

USATHAMA and PEI personnel participated in meetings and a tour of the facilities at the Sharpe Army Depot (SHAD) on April 5, 1989. SHAD is located in Lathrop, California, approximately 75 miles south of Sacramento on Interstate 5. Craig MacPhee represented the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). PEI personnel present were Fred Hall, Bob Hoye, and Jeff Davis.

Our primary environmental contact at SHAD was Dean Baker, an environmental engineer in the Environmental Program Office. In addition, we met with Bob Stroh, Chief of the Mechanical Processing Section of the Preservation and Packaging Branch (Building 649); Al Gouveia of the Non-Mechanical Preservation Group (Building 404); Abel (Jack) Haines, Environmental Program Manager; and the blasting booth operators.

The purpose of this trip report memo is to document the information obtained during the site visit. The trip report is presented in eight sections to address pertinent topics included in the scope of work of Task Order No. 4. These sections are: Background, VOC Emissions, Blasting Operations, Alternate Chemical Strippers, Alternate Degreasers, Electroplating Operations, Other Areas of Interest, and Conclusions/Recommendations.

BACKGROUND

SHAD employs approximately 1,200 people, and its primary mission is to maintain inventories of nonperishable items and to distribute equipment and parts to Army facilities on the West Coast and overseas. Individual operations include cleaning, painting, preserving and repackaging a diversity of items including belt buckles, parachutes, tanks, and water craft. SHAD is not limited to the maintenance of any major system; it is involved in maintaining, storing and shipping a wide variety of items. New Cumberland Army Depot, Red River Army Depot, and SHAD have the same missions; of these three, SHAD is the smallest. The work load at SHAD — and the associated waste generation rates — varies with the demand for particular items and with the types of material sent to SHAD for inventory maintenance. All waste disposal is through DRMO. Because the quantity of waste generated at SHAD is largely determined by the work load, the HAZMIN goals set by the Army relative to the 1985 baseline figures may not always be directly relevant.

VOC EMISSIONS

California air regulations are becoming more stringent, and several people at SHAD expressed concerns over the potential impact of new state regulations currently under development. Of particular concern is Assembly Bill 2588, the "Air Toxics Hot Spots Information and Assessment Act of 1988," which will require that all stationary sources conduct an inventory of all air emissions. After these inventories are complete, California will stipulate both controls and discharge limitations. Dean Baker assumes SHAD will fall in what is termed an "intermediate emissions category" (i.e., sources emitting between 10,000 and 25,000 tons per year of total air emissions). The major source of emissions at SHAD is burning of fossil fuels, which Mr. Baker estimates contributes about 8,000 tons of combustion gas emissions per year based on heating fuel usage. SHAD has not conducted air sampling to quantify emissions, but has previously estimated emissions of some compounds based on known sources of emissions and emissions factors.

Bob Stroh, Chief of the Mechanical Processing Section of the Preservation and Packaging Branch, provided us with assistance in several areas of this task. Paint operations are conducted in Building 649, which has 2 large open-ended paint booths. Currently,15 people — including two painters and two blasters — work in this building. Detailed and well organized records are kept on daily paint and thinner use. These records include the quantities of all approved paints (PUP, epoxy, CARC), primers, and solvents used each day. A copy of a blank form used to keep these records is provided as an attachment to this report.

Water-reducible epoxy primers and CARC paints are the principle coatings used at SHAD. Paint application is via conventional air spray guns. SHAD is currently below the allowable VOC threshold limits, which the depot personnel have accomplished by using low-VOC paints and paying close attention to how much thinner is used. The spray pot is double-rinsed with solvent at the end of each day. SHAD uses the second rinse as the first rinse on the following day, thus reducing the amount of waste solvent generated in this process by half, or by two and a half gallons per day. Depot staff installed extensions on the paint pot feed tubes to minimize the quantity of paint left in the pot. This simple and inexpensive modification has reduced painting waste and should be applicable at other depots, if not already common practice.

SHAD also minimizes paint use by selectively removing old coatings rather than blasting every part down to the substrate. The part then requires less painting, which produces fewer VOC emissions. Using still lower-VOC paints would require extensive and perhaps expensive testing on the paint application systems at SHAD.

SHAD personnel continue to search for ways to minimize their waste stream. A table listing HAZMIN efforts in building S-649 (Mechanical processing Section) is provided as an attachment to this report. Bob Stroh indicated that of the approximately 207 gallons of primer waste disposed during the past 13 months, 90 percent is water, and this waste stream could be reduced by using open-pan evaporation. SHAD has considered applying paint with electrostatic precipitation, but Mr. Stroh indicated that he had not yet seen a convincing demonstration of the supposed advantages of this technology.

Dry filters are used to collect the overspray paint from the paint booths. These filters are soaked with water and discarded as a non-hazardous waste. SHAD experiences some problems with paint fumes re-entering Building 649, and they are planning to install extensions on the air discharge stacks.

Al Gouvela of the Non-Mechanical Preservation Group in Building 404 showed us a small paint booth that is operated 24 to 30 hours per week. Mostly touch-up work is conducted here with aerosols and primers. Although the painting operations at SHAD are not very large, Dean Baker believes that the State of California may eventually require controls on the paint booth emissions.

SHAD does not keep an inventory of degreasing solvents in and out of the depot, but will start an inventory in the near future. The depot has one vapor degreaser in the small parts preservation area (Building 404 or North A3) that uses 1,1,1-trichloroethane as the solvent.

Another source of potential VOC emissions is an air stripping column operated under the Installation Restoration Program. The ground water under SHAD is contaminated with trichloroethylene from past aircraft maintenance. Approximately 330,000 gallons per day of water are being pumped through an air stripping column without air pollution controls. The influent to the stripper contains 200 to 300 ppb trichloroethylene, and the concentration in the effluent is nondetectable (<0.5 ppb). Based on an average concentration of 250 ppb, trichloroethylene emissions from this air stripper would be approximately 0.9 pounds per day. Current plans call for installation of a second air stripping plant.

BLASTING OPERATIONS

Various items are blasted with garnet at SHAD to remove paint, including truck frames, wood sideboards, and bridge parts. The bridge parts are often 20 to 30 years old and heavily corroded. Most of the parts blasted consist of steel; very few parts consist of aluminum or wood. Dean Baker said that SHAD's primary need in its blasting operations is versatility; rather than having a continual stream of parts in and out of the depot, the depot tends to accumulate large amounts of a particular item until it is requested. When requested, the item is refurbished and sent to the appropriate location.

The blasting system at SHAD was installed two and a half years ago by Lange Enterprise. The cost for the equipment was $377,071; the total cost including man hours was approximately $500,000. The system uses 36-mesh garnet blast material, which costs $0.10 per pound. Two to three drums of waste are generated per day, and is disposed as a hazardous waste through Northwest Environmental Services for $0.31 per pound. Laboratory results of a total metals analysis is provided as an attachment to this report.

Only the areas of an item where the paint is in poor shape or rust exists is blasted with the garnet. This method results in less waste generated, less paint used, and reduced VOC emissions. After selective blasting, the part is pretreated, primed and painted. Sometimes only hand sanding is used on part of an item. For heavy corrosion, the entire part is blasted and repainted.

Two operators work in the blasting booth simultaneously for reasons of safety. The operators said that blasting with garnet creates a large amount of dust in the booth. The blasting pressure can be varied from 40 psi to 100 psi, with the lower pressure being used for removing paint from wood. The overhead dust from the blasting booth is collected in a baghouse and emptied into 55-gallon drums. The material that falls to the floor of the booth is potentially reusable and is collected in vents and transported to a recycling system. This garnet enters a cyclone, where the finer material is separated and collected in a 55-gallon drum. The heavier media are collected in a hopper, which empties to a stack of 3 screen filters. The filters separate the incoming stream into fine material that is passed through a baghouse and disposed, reusable media that is recycled, and heavy miscellaneous items such as sticks and rocks.

A visual inspection of the waste drums revealed that the overhead media is a white, very fine dust. The fine media collected from the floor of the booth, however, is streaked with purple stains, indicating that some fairly large and potentially reusable particles are being disposed of as waste. The operators feel that the system does not recycle as much as it should. More could be recycled using smaller screens; however, higher recycle rates would create more dust in the blasting booth. Booth operators indicated that the cyclone that receives the blast material from the floor of the booth cannot be adjusted.

SHAD is considering replacing garnet with steel shot to minimize the quantity of hazardous waste generated in the blasting operation. Bob Stroh has requested assistance from the Productivity Management Division regarding implementation of steel shot blasting to reduce costs of hazardous waste disposal. A copy of the disposition form is provided as an attachment. The steel should be effective on heavy corrosion and more recyclable than garnet. DLA in Tracy has been using steel shot on similar items. The waste steel shot is sent to a company that accepts the waste at no cost. Sierra Army Depot also uses steel shot, and Bob Stroh is attempting to contact personnel at Sierra familiar with the effectiveness of this operation.

SHAD has looked at the plastic media blasting process (PMB) at Sacramento Army Depot, but does not feel that the process removes paint down to the base metal. Personnel do not feel plastic media blasting is relevant to the kind of work conducted at SHAD. Bob Stroh said that in a PMB test at Sacramento on a rusted logging chain, the fine-grained plastic media was not able to remove the rust. On most parts, a rough white metal surface is needed, which PMB alone cannot provide.

ALTERNATE CHEMICAL STRIPPERS

SHAD does not have any chemical stripping operations.

ALTERNATE DEGREASERS

The Non-Mechanical Preservation Group in Building 404 uses PD-680, a nonchlorinated petroleum distillate, in covered tanks to remove fingerprints. The top of the tanks are left open to allow the parts to drain. QA personnel decide how often to change the tanks. The drying oven in this building is not currently operating because the electrical system is not explosion-proof.

Building 404 also uses a 1,1,1-trichloroethane vapor degreaser with water-cooling coils. The tank holds three 55-gallon drums of degreaser and is emptied about three times a year.

SHAD has bought some batch solvent distillation equipment for use in the vehicle maintenance area (Building 330); however, the equipment is not currently in use because the maintenance activity in this building has not generated enough solvent. The still would be used for both PD 680 and 1,1,1-trichloroethylene. A solvent distillation unit is also in the small parts area (Building 179) but is not operating. Al Gouveia indicated that he is awaiting a hood for the still, after which it will become operational.

SHAD uses Safety-Kleen degreaser in vehicle maintenance, Building 330. Safety-Kleen provided the tank and the fresh solvent, and occasionally hauls the spent solvent away for recycling. Personnel involved in this operation are happy with the performance of Safety-Kleen, and do not believe that solvent distillation would be worth the extra trouble of operating the still.

Jack Haines indicated an interested in Citrikleen and the use of alternate degreasers. Dean Baker prefers reducing the use of degreasers over changing to an alternate non-hazardous degreaser, since changing compounds requires the approval of process personnel.

ELECTROPLATING OPERATIONS

SHAD does not conduct any electroplating operations.

OTHER AREAS OF INTEREST

SHAD disposes of a large amount of engine oils and fuels, which are considered hazardous wastes in California. This is their second largest waste stream, after spent blasting media. These oils are currently disposed through DRMO at little cost, but they may be of concern in the future.

SHAD also disposes of a large amount of ethylene glycol coolant and sulfuric acid, for which there is no current waste minimization plan. Dean Baker feels these items are common enough among all the depots that there would be a lot of interest in developing a minimization plan.

Jack Haines suggested that a useful volume reduction of empty drums could be obtained by buying a drum crusher. Empty drums could then be crushed and placed in an 80-gallon drum, thereby reducing the total volume that must be disposed.

CONCLUSIONS/RECOMMENDATIONS

Personnel at SHAD have undertaken a number of efforts aimed at reducing their hazardous waste generation and are enthusiastic about participating in USATHAMA HAZMIN activities. Interest was expressed in reducing and controlling VOC emissions from painting operations, replacing garnet blast material with steel shot, and the use of alternate degreasers. SHAD does not have any electroplating or chemical stripping operations, and opportunities for plastic media blasting are limited due to the amount of heavy corrosion on the parts that the depot processes.

Any testing conducted in California could receive high visibility due to stringent environmental regulations. However, the operations at SHAD are small compared with other depots that we will visit in the future. Thus, although further USATHAMA and PEI activity at SHAD could result in a large percentage of waste reduction, the ratio of waste reduction achieved to effort expended could be low.

The following list presents some potential HAZMIN projects on which USATHAMA could provide assistance to SHAD.

- Obtain better recycle rates for the garnet blasting material.
- Change garnet blasting operation to a steel shot blasting operation.
- Evaluate feasibility of VOC emissions control for small, multiple sources.
- Investigate reduction of VOC emissions from paint operations by changing paint VOC content or method of application.
- Develop minimization plan for ethylene glycol coolant.
- Develop minimization plan for sulfuric acid from battery operations.
- Evaluate feasibility and environmental impact of reducing primer waste by open-pan evaporation. Help procure the necessary equipment.
- Help procure a drum crusher to minimize the volume of empty drums that must be disposed.

SHAD's interests and needs will be compared to those of other depots that will be visited in the near future. SHAD personnel should be kept informed of the results of any testing relevant to their needs conducted under the current HAZMIN effort.

ATTACHMENTS

Documents obtained from SHAD

Waste generation rates and HAZMIN efforts implement to reduce Hazardous waste (attached)

SHAD installation hazardous waste data for various waste categories (attached)

MSDS's for solvents, primers, paints, blast media

Disposition form from Bob Stroh, Chief of the Mechanical Processing Section requesting assistance in reducing primer waste by using an open-cover evaporation pan

Blank form for Volatile Organic Compounds (VOC) Emissions Record (attached)

Disposition form from Bob Stroh, Chief of the Mechanical Processing Section requesting assistance in reducing hazardous waste disposal cost by substituting steel shot for garnet (attached)

Laboratory analysis of spent garnet sand (attached)

Laboratory analysis of paint waste

Documentation concerning us of Biotek 134 Hi-Solv as a replacement for PD-680 (Stoddard solvent) in the mechanical processing section

ANNEX H

SHARPE ARMY DEPOT
INSTALLATION HAZARDOUS WASTE DATA

PROCESS	TYPE	1985 kg/yr BASELINE	1986 kg/yr GOAL	1986 kg/yr ACTUAL	1987 kg/yr GOAL	1987 kg/yr ACTUAL	1988** kg/yr GOAL	1988** kg/yr ACTUAL	1989 kg/yr GOAL
Paint Stripping*	D006-9	22,222	None	20,654	21,111	20,838	20,000	70,868	17,778
Painting	D001	8,111	None	9,826	7,916	9,143	7,500	2,855	6,665
Cleaning/Degreasing	F001- F005 D001	13,376	None	22,841	12,707	12,253	12,038	5,331	10,701
Vehicle Maintenance/ Fueling	D001	95,753	None	3,944	90,965	41,644	86,173	22,302	81,390
Battery Shop	D002	1,769	None	12,107	1,592	10,084	1,415	3,928	1,238
Other: Asbestos, PCB Pesticides, Contaminated Soil, Lab Waste, Empty Containers, Spill Cleanup Waste	Various	9,129	None	16,039	7,789	17,385	6,969	25,991	4,499
	TOTAL	163,028	None	85,411	142,080	111,347	134,100	131,275	122,271
RECYCLED BY DLA/DPMO CONTRACTOR				27,496		41,334		28,410	
TO DISPOSAL SITE				57,915		70,013		102,865	

* Sandblasting operations only, no liquids used for stripping.
** Reference 1988 Hazardous Waste Generation Summary Report

VOLATILE ORGANIC COMPOUNDS (VOC) EMISSIONS RECORD

DATE	SHIFT	BLDG	BOOTH No.	NAME	SUPERVISOR'S SIGNATURE
/ /	1 2 3				

[illegible]				QTY	CLN	CTG	AMT DIS	DR #	T	F	COPON	QTY	CLN	CTG	AMT DIS	DR #	T
GRAY	[illegible]	CARD	X07-1622														
GRAY	[illegible]	CARD	X07-1623								RED (PERM) TAP P/N EA-203						
[illegible]	[illegible]	CARD	X07-1624								IVORY TAP P/N EA-269						
[illegible]	[illegible]	CARD	X07-1625								UNDERCOAT WHITE TAP P/N EBA-28						
[illegible]	[illegible]	CARD	X07-1626								ACTIVATOR TAP P/N EA-4000						
BLACK	[illegible]	CARD	X07-1627								THINNER X85-1420 TAP P/N SA-65		N/A		N/A		
WHITE	[illegible]	CARD	X07-1629								NEOPRENE						
YELLOW	[illegible]	CARD	X07-1630								BLACK N-1700 GACO 145-0111						
GRAY	[illegible]	CARD	X07-1632								THINNER N-450-11 GACO 89463N450-11		N/A		N/A		
GRAY	[illegible]	CARD	X07-1633								THINNER						
[illegible]	[illegible]	CARD	X07-1634								THINNER I AIRCRFT CSD 181-8080		N/A		N/A		
CLEAR		CARD	[illegible]								THINNER I AIRCRFT CSD 181-8080	→		N/A			N/A
[illegible]	[illegible]	CARD	X08-0157								THINNER*EPOXY II CSD 200-2637		N/A		N/A		
BLUE	[illegible]	CARD	X08-0341								THINNER*EPOXY II CSD 200-2637	→		N/A			N/A
GREEN	[illegible]	CARD	[illegible]								STAIN						
GRAY	[illegible]	CARD	X08-1220								STAIN LT OAK EVER 597-8226						
[illegible]	[illegible]	CARD	[illegible]								STAIN DK OAK GSA 165-6628						
CATALYST		CARD	340HP								STAIN LT WALNUT FAR 281-2074						
[illegible]		CARD	1300-05	→		N/A			N/A	N/A	STAIN WALNUT GSA 597-8225						
REDUCER		CARD	1000-02		N/A		N/A				SPECIAL-APPS						
EPOXY											BLACK N/A DESO X87-8850						
BLACK	[illegible]	EVER	[illegible]								GRAY 36300 SIKK 663-35-18						
[illegible]	[illegible]	EVER	X07-0679								LUB S-F SAND 940-6912						
WHITE	[illegible]	EVER	X07-0881								GRAY POLY-U 16473 DEFT 181-8255						
CARC											INSUL VARNISH ELECT DOLP 285-0271						
[illegible]	[illegible]	[illegible]	[illegible]								WALKWAY DrkGRAY AKRO 641-0426						
[illegible]	[illegible]	[illegible]	[illegible]								WALKWAY BLK AKRO 641-0427						
BLACK	[illegible]	[illegible]	[illegible]								HEAT RESIST 383 GRN DAV X87-0489						
WHITE	[illegible]	[illegible]	[illegible]								SOLVENT/REDUCER S-250 DAV X87-1462						
TAN	[illegible]	[illegible]	[illegible]								LATEX GL 37875 GSA 754-2608						
SOLVENT	[illegible]	[illegible]	071-488A		N/A		N/A				LATEX CN 37875 GSA 754-2609						
TAN	[illegible]	[illegible]	[illegible]								PREP-SOLVENT S-W X54-3054	→		N/A			N/A
SAND	[illegible]	DEFT	[illegible]								YELLOW SAFETY SIMP X86-0891						
PRIMER											▼ IF NOT LISTED, ANNOTATE BELOW ▼						
[illegible]	[illegible]	DEFT	[illegible]														
[illegible]	[illegible]	[illegible]	[illegible]														
[illegible]	[illegible]	[illegible]	[illegible]														
[illegible]	[illegible]	[illegible]	[illegible]														
[illegible]	[illegible]	[illegible]	[illegible]														
OTHER																	
[illegible]	ELECT	OCTA	643-7415		N/A		N/A										
[illegible]	ELECT	OCTA	[illegible]	→		N/A											

INSTALLATION: POC: AUTOVON: DATE COMPLETED:

ITEM 1.

COLUMN 1 Product Name	COLUMN 2 NSN	COLUMN 3 SPECIFIC USER/LOCATION PROCESS/FUNCTION	COLUMN 4 TOTAL WASTE QUANTITIES GENERATED PER YEAR (GAL)	COLUMN 5 HW GENERATED ONLY FOR OFF-SITE DISPOSAL (GAL)	COLUMN 6 KNOWN EFFORTS (IMPLEMENTED) TO REDUCE HW	COLUMN 7 METHODS OF WASTE REDUCTION (PROPOSED)	COLUMN 8 FUNDED/UNFUNDED	COLUMN 9 BUDGET YEAR FUNDING	COLUMN 10 METHOD PRODUCT PROCURED 1. Local purchase 2. GSA 3. Contractor.
[illegible] (WASH) [illegible]	[illegible]-00-231-2726	[illegible]	N/A	10 GAL Per Year (ESTIMATED)	FLUID TUBE EXTENDED INSIDE TANK — LESS WASTE	N/A			GSA
Alcohol Denatured	6810-00-[illegible]-2686	[illegible]	N/A	80 GAL Per Year (ESTIMATED)	Min. used to Clean paint pot	N/A			GSA
[illegible]	[illegible]-01-193-0520	[illegible]	N/A	95 GAL Per year (ESTIMATED)	FLUID TUBE EXTENDED INSIDE TANK LESS WASTE	Check with EPO of evaporation pan	Checked with DESCOM about [illegible] Usually Dowel		GSA
Distilled Water	—	[illegible]	N/A	222 GAL Per year (ESTIMATED)	AIR. USED TO CLEAN PAINT POT.	Could be used in place of 55 gal drum for [illegible]	646 in place of our [illegible]		DEPOT
[illegible]	[illegible]	[illegible]	N/A	741 GAL Per year (ESTIMATED)	1st rinse disposed. 2nd rinse used as first rinse	N/A			GSA
[illegible]	[illegible]-01-229-7597	[illegible]	N/A	83 GAL Per year (ESTIMATED)	FLUID TUBE EXTENDED INSIDE TANK — LESS WASTE	N/A			GSA
Paint overspray & Dirt	[illegible]-00-Paint	[illegible]	N/A	220 GAL Per Year (ESTIMATED)	N/A	N/A			—
[illegible] Contaminated	7920-00-[illegible]	[illegible]	200 gal per year (estimated)	660 gal Per year (ESTIMATED)	USE TOTAL RAG, PACK DRUM	N/A			
[illegible]	[illegible]-00-[illegible]	[illegible]	N/A	7,700 gal Per year (ESTIMATED)	2 year old Sandblast Facility - Recycled sand	Send information to [illegible] to check into [illegible]	No action. Called the company to [illegible]	[illegible]	LOCAL PURCHASE
[illegible]	[illegible]-00-[illegible]-1069	[illegible]	N/A	55 GAL Per year (ESTIMATED)	RECYCLED	N/A		[illegible]	LOCAL PURCHASE
OIL LUBE	[illegible]-00-[illegible]-0210	[illegible]	N/A	385 GAL Per year from [illegible] & 655 (ESTIMATED)	Re-use oil [illegible]	N/A			GSA
[illegible]	[illegible]	[illegible]	N/A	165 GAL Per year (ESTIMATED)	RE-CYCLED	N/A			GSA
Cleaning Compound Solvent	[illegible]-00-[illegible]	[illegible]	N/A	165 GAL Per year (ESTIMATED)	USED AS LAST RESORT.	N/A			

TTLC/CAM METALS, EPA Method 6010

EUREKA LABORATORIES, INC.
3401 La Grande Blvd.
Sacramento, CA 95823
(916) 428-1193

Order No.: SHAD8805
Hazardous Waste Testing
Certification No.: 108

CLIENT: SHARPE ARMY DEPOT-
* CLIENT ID.: #200 Contaminated Sand
ELI SAMPLE ID.: S67524
SAMPLE LOCATION: -

CONTRACT NO.: DAAC21-87-M-1138
DATE RECEIVED: 9/8/1988
DATE EXTRACTED: 9/15/1988
DATE COMPLETED: 9/20/1988

	CONCENTRATION [mg/Kg (ppm)]	DETECTION LIMIT [mg/Kg (ppm)]
Silver	0.18	0.01
Arsenic	2.7	0.1
Barium	11.3	0.02
Beryllium	0.12	0.02
Cadmium	11.1	0.01
Cobalt	3.49	0.01
Chromium	48.9	0.02
Copper	9.96	0.02
Mercury	<0.05	0.05
Molybdenum	3.06	0.01
Nickel	15.4	0.1
Lead	114	0.1
Antimony	1.12	0.05
Selenium	<0.1	0.1
Thallium	48.9	0.1
Vanadium	2.21	0.01
Zinc	171	0.02

Note:

Results for Arsenic, Mercury and Selenium analysis generated by Method 6010 are subject to various interference factors and instrument limitation. Therefore the results should only be interpreted as a general screen for these three elements. Analysis by the following methods which give more precise and acurate results are highly recommended: EPA 7470/7471 for Mercury; EPA 7060/7061 for Arsenic; and EPA 7740/7741 for Selenium.

Chan Hsu

Felix Yeung
Manager, Inorganic/Physical
Testing Group

Chan Hsu
Chemist

October 3, 1988
Date

* 2 times per year Ted [illegible]

DISPOSITION FORM

use of this form, see AR 340-15, the proponent agency is TAGO

EFERENCE OR OFFICE SYMBOL	SUBJECT
D GH-SGS-P	Sandblast Material-Steel Shot versus Garnet

THRU C, Pres/Pkg Br
C, Gen Sup Div
Dir, Supply

FROM C, Mech Proc Sec

DATE 15 Mar 89
Stroh/mb/3520

CMT 1

TO Dir, Resr Mgmt
ATTN: Prod Mgmt Div,
Mike Del Cima

Request assistance from Productivity Manangement Division, Dir, Resr Mgmt, in reducing cost f Hazardous Waste Disposal.

Material now used in Sandblast Facility, Bldg S-660, is as follows:

5350-00-X77-0455
Garnet Abrasive, Mesh #36
100 LB Bag

Purchase request is for 20 tons each time garnet is ordered at $218.00 per ton X 20 tons= 4 360.00 or $10.90 per day.

Recycled contaminated garnet is generated on a daily basis, automatically cycled into 55 gal on drums. All elements of the turn-in procedures are carefully followed and submitted to Dir, ineering and Housing (DEH) in an expeditious manner for turn-in to Defense Reutilization and arketing Service (DRMS) for disposal of hazardous waste in accordance with DOD Directive 160.21-M.

Cost of removing contaminated (Lead/Zinc Chromate) garnet from Sharpe Army Depot is about 13,000.00 per load. A load consists of 40-55 gallon drums. During FY88 Mechanical Processing ection generated 138 drums of contaminated garnet which cost about $39,000.00 for removal r n SHAD.

Cost to have contaminated steel shot removed from Sharpe Army Depot could be reduced to e o dollars as per SHAD Environmental Program Officer.

Cost for steel shot is double the price of garnet abrasive, but questions need to be wered, such as:

a. What size steel shot will work best to accomplish our mission?

b. Will contaminated steel shot be removed from SHAD at no cost to the Government?

c. What is the recycled life of steel shot compared to garnet abrasive?

d. Will the sandblast recovery system withstand the weight of steel shot?

e. What will screens cost if replacements are needed for steel shot?

Under present operating conditions an average day of sandblasting produces 1-3 drums 5 gallons) of contaminated hazardous waste. Are larger size containers available that might d 275-330 gallons of contaminated garnet?

The 55 gallon drums cost $46.00 each. Can reusable containers be used?

FORM AUG 60 2496 PREVIOUS EDITIONS WILL BE USED GPO : 1987 O 191-043

SDSSH-SGS-P
SUBJECT: Sandblast Material - Steel Shot versus Garnet

10. Rundown of sandblasting in FY88:

a.	Drums 138 each @ $46.00=	$ 6,348.00
b.	Ship contaminated hazardous waste=	$39,000.00
c.	Purchase 69 tons of garnet @ $218.00 per ton=	$15,042.00
d.	Total cost for FY88 including drum, garnet, shipment of waste=	$60,390.00

11. Would appreciate your assistance in reducing costs of sandblasting wherever possible. Reducing present shaker screen size is another thought, if feasible.

12. POC is Bob Stroh, Ext 3520.

BOB STROH
C, Mechanical Processing Section
Preservation and Packaging Branch

CF:

EPO
Ind Hyg
Safety Dir

PEI ASSOCIATES, INC.

MEMORANDUM

TO: Craig MacPhee

DATE: 6/20/89
Revised: 6/30/89

SUBJECT: Trip report: Tobyhanna Army Depot
Contract No. DAAA15-88-D-0001
Task Order No. 0004

FROM: Jeff Davis
Fred Hall
Bob Hoye

FILE: 3769-4

CC: Dick Gerstle

USATHAMA and PEI personnel participated in meetings and a tour of the facilities at the Tobyhanna Army Depot (TOAD) on May 16 and 17, 1989. The purpose of this visit was to acquire information on the operations at TOAD that are relevant to the referenced task order. Specifically, information on VOC emissions, plastic media blasting (PMB), chemical paint strippers, degreasing, and generation of metals-contaminated sludges was sought. This is one of a series of visits to eight depots being made to acquire comparable data on these topics. In the near future, USATHAMA will use this information to select and define research projects that will be conducted by PEI under this task.

TOAD is located in northeast Pennsylvania in the Pocono Mountains, approximately 100 miles north of Philadelphia. Craig MacPhee represented the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). PEI personnel present were Fred Hall, Bob Hoye, and Jeff Davis.

Our primary contacts at TOAD were Steven O'Malley, Patrick Tierney, and Ron Scarnulis, all of the Maintenance Directorate, Production Engineering Division, Engineering Branch, Plant Engineering Section. In addition, we met with Ted Krolick, Chief of the Plating Section; Tony Martinez, Chief of the Paint Section; Jack Burns, Chief of the Sandblast Section; Joseph Nataloni of the Cleaning Section; Joe Ruane of the Sandblast Unit; Joe Folchek, operator of the industrial (i.e., electroplating) wastewater pretreatment plant (the IWTP); and the chief chemist.

The purpose of this trip report is to document the information obtained during the site visit. The trip report is presented in eight sections to address pertinent topics included in the scope of work of Task Order No. 0004. These sections are: Background, VOC Emissions and Paint Operations, Blasting Operations, Alternate Chemical Strippers, Alternate Degreasers, Electroplating Operations and Metal-Contaminated Sludges, Other Areas of Interest, and Conclusions/Recommendations.

BACKGROUND

TOAD's primary mission is to maintain and supply communication and electronic equipment to the U.S. Armed Forces. The depot preserves, overhauls, rebuilds, modifies, and repairs items such as electronic components, generators, communication shelters, and 2 & 1/2 and 5-ton (exterior overhaul) trucks. The depot also fabricates new shelters and other items; new fabrication represents about 30 percent of the work load. TOAD employs over 4,700 people, with over 100 of these jobs created recently for hazardous waste handling, training, and record keeping. The depot covers 1,300 acres, 400 of which are dedicated to industrial operations.

All waste disposal is currently handled by the Defense Reutilization and Marketing Office (DRMO). Although DRMO now pays for waste disposal, the procedure is being revised so that each depot will pay for its own waste disposal. This will make waste reduction more visible and more critical as it will directly impact each individual depot's budget.

In addition to the DOD goal of 50 percent reduction in hazardous waste generation by 1992, DESCOM is encouraging an ultimate target of zero generation. Personnel at TOAD have undertaken a number of waste minimization efforts and are very interested in pursuing additional projects. Under a current depot initiative, employees may be paid up to 10 percent of the savings resulting from a waste minimization suggestion.

TOAD's approximate waste generation for 1988 (in thousands of pounds) is given below for each of the processes or waste streams pertinent to this task:

•Abrasive Blasting Waste Generation		
-Grit/dust (before conversion of aluminum oxide booth to steel)	302	
-Residue (Coveralls, gloves, sandpaper)	26	
- <u>Total Abrasive Blasting Waste</u>		<u>328</u>
•Painting Waste Generation		
-Paint Sludge from waterwash booth	67	
-Paint Filters	28	
-Paint Thinner	12	
- <u>Total Paint Sludge</u>		<u>107</u>
•Ultrasonic Cleaning (Stoddard Solvent)		<u>1</u>
•Plating Shop Waste Generation		
-Paint Stripper	7	
-Bright Dip (Sulfuric/Nitric Acid)	8	
-Hydrochloric Acid	16	
- <u>Total Plating Waste</u>		<u>31</u>
•Sulfide Pretreatment Plant Sludge		<u>56</u>
•Sewage Sludge		<u>509</u>

VOC EMISSIONS AND PAINT OPERATIONS

VOC emissions are regulated by state law in Pennsylvania, which specifies that surface coating processes emit no more than 500 pounds per day or 50 tons per year of VOCs without additional restrictions. TOAD VOC emissions were estimated to be 47 to 48 tons per year two years ago; however, record keeping was incomplete and these figures may not represent actual emissions. The depot is currently emitting approximately 30 tons per year; the reduction is partly due to switching to high-solids paints and water-reducible primers and better tracking of paint operations.

TOAD personnel have experienced drying problems with the water-reducible primers that were used to reduce VOC emissions. The water-reducible primer takes longer to dry than solvent-reducible primers and the application of single-component CARC requires a dry surface. There are few drying facilities, especially for larger parts, and drying parts is a bottleneck in Building 9. In light of the drying problem, TOAD is considering changing back to solvent-based primers and has plans to install a drying oven in Building 9.

Single-component CARC is used for the top coating but TOAD has had problems with adhesion, the formation of bubbles, and the inability to paint a coating over a coating that is still wet, as is done in camouflaging. Two-component CARC, which has a higher VOC content than single-component CARC, is occasionally used in these circumstances.

TOAD obtains good transfer efficiencies with conventional air-spraying systems on mixed parts. In Building 9, low-pressure, high-volume paint application is planned for large, flat surfaces. TOAD has looked at several low-pressure, high-volume sprays and is installing the Smith-Eastern Air Verter Excel Spray guns. This system is cheaper than the Can-Am Turbo Spray system used at Sacramento Army Depot.

The paint shop is one of TOAD's largest generators of hazardous waste, with 225 drums of paint sludge, 76 drums of paint filters, and 26 drums of paint thinner being disposed of as hazardous waste from January through October 1988. A graphical summary of the hazardous waste generation for painting operations is provided as an attachment to this report. TOAD has 8 open-ended water wall paint booths in Building 1A for priming and painting; 4 of these booths are used for applying CARC. The back of each booth contains a wall of flowing water that washes airborne paint particles into a trough at the base of the wall. The water is drained once a week and sent to the IWTP, and the sludge is shovelled into 55-gallon drums. Skimmers and cyclones that could reduce the amount of labor involved and the waste generated by reducing the water content of the collected sludge, are commercially available; however, there is not enough available space to retrofit the booths. Another waste minimization opportunity practiced by some companies is the use of detackifying agents that form a loose suspension of the paint particles, facilitating particle removal and allowing the water to be recirculated. TOAD personnel indicated that Anniston Army Depot uses the spent mineral "Green Lightening" from their blasting operations as a detackifying agent.

Overspray from each booth passes through a vent at the top of the back wall. The baffles in the vents become coated with paint and must be dismantled and cleaned every month, which is a labor-intensive process. Because of the problems with the vent system and with sludges from the water wall, TOAD personnel would like to change their paint booths to a dry filter system, but are concerned that the resulting filters would be hazardous. A large paint booth in Building 9 uses 64 dry filters to capture overspray paint; these filters currently are disposed as hazardous wastes. Sacramento and Sharpe Army Depots use dry filter systems and dispose of their waste as nonhazardous after wetting the filters with water. Styrofoam filters are also being considered, with the thought that once the paint dries on the filters, it could be shaken off and the filter reused.

One waste minimization technique implemented at TOAD involves the process of cleaning spray guns. Previously, the guns were discharged by spraying the paint into the water wall, thus increasing the amount of sludge that must be disposed. The guns are now cleaned by solvent using a double rinse, and then collecting the waste solvent for disposal as a hazardous waste.

TOAD also purchased several dual-component spray systems, which mix dual-component paints as used instead of mixing the paint by batch at the beginning of each job. Unused batch mixed paint had to be disposed but the unused individual paint components resulting from the dual-component spray system can be saved for future use.

BLASTING OPERATIONS

Blasting operations generate one of the largest hazardous waste streams at TOAD, with 438 drums of dust and debris generated in 1987, and 241 drums generated through October 1988. Most of this waste was spent aluminum oxide. A summary of the hazardous waste generation from blasting is provided as an attachment to this report. TOAD uses aluminum oxide blasting, steel shot blasting, and hand sanding (on shelters). A current effort involves evaluation of zirconia alumina as a replacement for aluminum oxide.

Aluminum oxide is used as a blasting material in one small walk-in booth, about 10 glove boxes, and one rotoblast unit in Building 1A. TOAD personnel are evaluating the feasibility of replacing aluminum oxide blast media with zirconia alumina, which is reported to have a longer life than aluminum oxide and thus would generate less waste. (The manufacturer's literature on zirconia alumina is provided as an attachment to this report.) A preliminary side-by-side test of aluminum oxide versus zirconia alumina conducted by TOAD indicated that the zirconia alumina apparently recycled more and created less waste. The test results are provided as an attachment. Zirconia alumina puts less wear on parts, recycles more, but costs approximately 3 times more than aluminum oxide ($0.75 per pound vs. $0.27). Ten thousand pounds of zirconia alumina have been ordered and TOAD plans to use this media in all basting operations in Building 1A. (Purchase of this media is complicated because there is only one supplier, and thus sole source procurement must be justified.) Testing will be conducted over a month or two (or as long as the media lasts), and the production and waste generation rates will be compared to generation of aluminum oxide wastes. A possible disadvantage of zirconia alumina is that it may cause corrosion problems. It may be useful and convenient to conduct limited corrosion testing of blasted parts in the salt spray booths at Anniston Army Depot during demonstration testing of aluminum ion vapor deposition (Task Order No. 0006 under the current contract). Craig MacPhee will coordinate with TOAD on this possibility.

Communication shelters and large vans with an aluminum substrate are hand sanded (spot sanding) in Building 9. Blasting the shelters with aluminum oxide could potentially cause warping. Only areas where the paint coating is poor are sanded. Hand sanding of shelters requires from 6 to 32 hours; the time spent on a particular shelter depends on the thickness of the paint and the percentage of the shelter that is actually sanded. Hand sanding has been part of the operations at TOAD for a long time and staff are reluctant to change. The entire unit is repainted even if only partially depainted.

TOAD has a large 35-year-old blasting booth (in Building 9) that uses steel shot as the abrasive blasting material. This booth can accommodate a 40-foot trailer. High pressures (100 psi) are used to remove rust from flatbed trailers and other items. TOAD tried converting this booth to blasting with aluminum oxide in anticipation of an increase in the workload of shelters; however, the high pressure used caused a high media consumption rate and a corresponding high waste generation rate. The booth is being converted back to blasting with steel shot and will be used primarily to remove rust. Building 9 has space restraints which make expansion or addition of new equipment impractical.

TOAD evaluated PMB by blasting with one drum of plastic media and observed PMB at Letterkenny Army Depot to compare its effectiveness to aluminum oxide. The Section Chief concluded that the paint-removal rate by PMB was too slow, and that it was ineffective on steel, rust, and CARC. The plastic media was tested in a glove box that was not modified specifically for plastic media. TOAD personnel had understood that PMB required about 6 hours to blast an S2-250 electronic shelter; Craig MacPhee referenced his work at LEAD that indicated these units could be stripped in 45 minutes. TOAD personnel indicated that PMB looks good when compared to walnut shells and chemical stripping but may not compare favorably with aluminum oxide and hand sanding. Sacramento Army Depot, however, has decided to use PMB to strip this same equipment.

Gloves, sanding pads, and protective clothing used while handsanding or blasting parts are disposed as a hazardous waste, generating eighty-five 55-gallon drums between January and October, 1989. TOAD has recently hired a contractor to re-classify the waste generated; this effort will include determining whether this waste stream is actually hazardous.

ALTERNATE CHEMICAL STRIPPERS

Compared to other depots, TOAD does very little chemical paint stripping. A single, small (500 gallon) chemical stripping tank is used in the electroplating shop (Building 1A) to remove paint from small parts prior to plating. Parts are not segregated by metal prior to stripping. The stripping reagent is a methylene chloride and formic acid mixture (Datum 870-L). Because methylene chloride is more volatile than formic acid, over time the methylene chloride evaporates, leaving an increasingly more concentrated solution of formic acid that is ineffective in removing paint. TOAD has considered using wax chips on the surface of the tank to reduce surface evaporation, but the wax chips coat the parts being stripped.

A cold water rinse tank after the methylene chloride process washes the chemical stripper from parts. Previously two running rinse tanks were used, with the effluent going to the pretreatment system. To reduce the flow rate and Total Toxic Organics (TTO) load on the wastewater treatment system, a still rinse was substituted for the first running rinse tank. This method concentrated the stripper in one rinse tank, which was subsequently drummed and disposed as a hazardous waste. This technique lowered the concentration of TTO in the second rinse tank, which discharged to the pretreatment plant. After operating the rinse tanks in this manner for a period of time, the running rinse tank was eliminated to reduce hydraulic loading to the pretreatment plant (a critical concern at TOAD), leaving only the still rinse tank to wash parts. The process provides inadequate rinsing and creates liquid and sludge (8 drums/yr) that cannot be sent to the IWTP and must be disposed as a hazardous waste.

This paint stripping operation is not time-critical. An alternate stripper that is effective but takes longer than methylene chloride may be applicable. Depot personnel expressed interest in the USATHAMA research on alternative strippers being conducted at SAAD. It could be possible to use an alternate stripper in Tank No. 9 (a heated tank) and use Tank No. 8 as a cold water flowing rinse. This discharge could be sent to the IWTP because an alternate stripper should not contain any TTO compounds; however, the total flow rate sent to the IWTP is a critical concern.

ALTERNATE DEGREASERS

TOAD does not process greasy internal machine parts, so degreasing solvents are not rapidly spent or used in significant volume. Two small vapor degreasers containing 1,1,1-trichloroethane are operated infrequently in the printed circuit board shop. Freon degreasers are not used at this depot. In the cleaning area of Building 1A, Stoddard solvent is used to clean parts; this operation generates only a few (8) 55-gallon drums of hazardous waste per year. Cleaning with Stoddard solvent is followed by ultrasonic cleaning, which uses biodegradable "Payload" detergent, consisting of ammonia and water. Citri-kleen is used for wiping parts, but does not evaporate quickly enough to replace the Stoddard solvent. Another advantage of Stoddard solvent is that it does not require a rinse step after application, whereas Citri-kleen does. Safety-Kleen is also used in some very small operations. Depot personnel indicated that PCB in capacitors on circuit boards may contaminate solvent degreaser waste with PCB. They plan to check on this.

TOAD has a small (capacity of 15 gallons per 8-hour shift) solvent recovery still that has not been used. This unit operates at 250°F, is 3 years old, and has not been used because of ventilation and other operational problems. This still may eventually be used to generate a clean-up solvent. Currently Aircraft Thinner (81772) is used for clean-up (<250 gallons/month).

ELECTROPLATING OPERATIONS AND METAL-CONTAMINATED SLUDGES

TOAD personnel indicated a strong interest in reducing electroplating waste. One major limitation to implementation of waste reduction methods is that the plating shop floor space is limited, with little room to expand. Waste reduction methods that require additional pieces of equipment such as triple-rinse tanks or material recovery units may therefore be impractical. Steve O'Malley suggested a study to identify areas where waste can be reduced regardless of space limitations. A summary of the plating shop hazardous waste generation is provided as two attachments to this report.

TOAD's manual electroplating operation was designed in the 1930s, and consists of over 30 process tanks, including zinc phosphating of steel, cadmium electroplating, aluminum conversion coating, and accompanying cleaners and strippers. Copper, nickel, and silver are also plated on a smaller scale. TOAD is attempting to recycle copper etchant to the manufacturer. Gold electroplating is conducted in the printed circuit board operations. TOAD does not conduct hard chromium electroplating; some decorative chromium plating is occasionally done. Personnel would like to get rid of the chromium electroplating altogether since nickel plating followed by buffing will provide the same finish for decorative purposes, and nickel is nonhazardous. A summary of the tanks and chemicals used in the plating shop, and a floor layout, are attached to this report.

TOAD has eliminated cyanide electroplating solutions due to concerns about worker safety. The three cadmium plating tanks operated in the plating shop use a sulfuric acid solution, which has three proprietary additives and requires more attention than cyanide solutions. A lot of testing is required to determine make-up, and TOAD has had some problems with foaming. The three cadmium tanks are the only process tanks in the plating shop followed by triple rinsing.

Water from the electroplating operations is collected in one of three sumps: two acid/alkali sumps (one of which was used previously for cyanide collection) and one chromium sump. The water is sent to the pretreatment plant, which treats approximately 35 to 40 gallons per minute. The hexavalent chromium is reduced by sodium metabisulfite to trivalent chromium at a pH of about 2. A large storage tank is used for overflow but not for equalization; as a result, the pH of the influent stream can vary. Metals are removed by sulfide precipitation. The wastewater is then neutralized with lime, mixed with a polyelectrolyte to aid flocculation, passed through a settling tank, and filtered through a sand bed. The sand bed is occasionally backwashed to remove trapped solids.

The sulfide sludge from the settling tank is dewatered with a filter press. The high operating pressure of the filter press (5,000 psi) occasionally breaks the cells, throwing sludge to the ceiling. The filter press requires an operator to be available on a regular basis for maintenance. Approximately one-half drum per day of sludge is generated and disposed as a hazardous waste (F006).

The pretreatment plant is reported to be undersized, necessitating that the plating shop reduce its discharge. However, parts are receiving inadequate rinsing because of the reduction in water use. The pretreatment plant currently receives approximately 12,000 to 15,000 gallons of water per day, while personnel indicated that adequate rinsing would require 40,000 to 50,000 gallons per day.

Overflow from the settling tank in the pretreatment plant is sent to the sewage wastewater treatment plant, which accepts wastewaters from several process areas. Process chemicals that spill on the floor in the plating area are sent directly to the sewage plant without receiving pretreatment. Previously, the sumps occasionally overflowed due to mechanical problems such as the sump pump becoming clogged with debris, and the wastewater was sent directly to the sewage plant. In these cases, the metal loading to the sewage plant could have caused the sludge to be hazardous and the NPDES permit to be violated. A high-level alarm has been installed so that when the sump level reaches a certain height, rinse waters are turned off until the sump level decreases. This practice has an impact on the rate of production in the plating shop. TOAD personnel are conducting meetings to solve equipment problems that result in metal loadings to the pretreatment plant and the sewage plant; larger pumps could reduce sump overload. TOAD personnel feel that they have this problem under control.

The sludge from the sewage plant is currently treated as a hazardous waste based on EP Toxicity testing conducted in 1986; after the test, it was discovered that the pH meters had not been properly maintained, and thus the plant was not operating as designed. A recent test showed that the sludge was non-hazardous by the EP Toxicity test, and TOAD plans to re-classity the waste. This could significantly reduce TOAD's hazardous waste generation since the sewage sludge accounts for over half of the hazardous waste disposed (509,000 pounds per year).

TOAD has attempted using conductivity meters in rinse tanks so that make-up would only be added as needed rather than continuously. However, these meters did not work as they were designed to, and TOAD abandoned their use. The technique of spray rinsing has also been tried, but many of the parts processed in the plating shop are irregular in shape and spray rinsing was not effective. The operation at TOAD is manual, perhaps resulting in significant drag-out from process tanks. Hanging bars above the tanks could result in longer drip times and less drag-out.

Cadmium tends to show up in almost every process tank and rinse water because of drag-out; this cross-contamination increases the amount of sludge that must be disposed as a hazardous waste. TOAD personnel are very interested in aluminum ion vapor deposition as a solution to this and other problems with cadmium electroplating.

Other wastes are generated in small quantities in the plating shop, including cadmium and nickel filters. TOAD has recently hired a contractor to characterize the depot's waste streams, including these filters.

The two largest waste generators in the plating shop are hydrochloric acid pickling liquors and a nitric acid/sulfuric acid bright dip for copper. The hydrochloric acid tank is designed to clean steel, with a concentration of 20 percent hydrochloric acid by weight. However, in reality the tank is operated at 30 percent hydrochloric acid by weight and is used as an all purpose stripper, including stripping metals such as zinc and cadmium. With this heavy use, the hydrochloric acid is rapidly consumed (forming hydrogen gas and metallic chlorides) and becomes saturated with metals, including cadmium. The 50-gallon tank is replaced every 2 to 4 weeks, which generates approximately 16 drums of hazardous waste per year. After the hydrochloric acid tank becomes spent, the bright dip tank for copper is used as the all purpose stripper and cleaner.

Several methods of reducing the hydrochloric acid waste may be feasible. Changes in operation of the wastewater pretreatment plant could make bleeding the hydrochloric acid to the pretreatment system possible. Methods of extending the life of the bath could also be investigated, such as an ion exchange column to remove metals from solution. The resin from the ion exchange column would be a hazardous waste unless it was regenerated, in which case a hazardous solution would be created. Other possibilities are the use of scavengers, high-current density plating, vacuum distillation, reverse osmosis, or precipitation of the metals. However, metal precipitation would also destroy the acidic solution.

Aluminum parts that are chromated are given a phosphoric acid precleaning but this step is not sufficient for final product quality. Pat Tierney would like to learn of other precleaning methods at other depots.

A heated phosphoric acid tank is used to clean steel parts. The liquid in the tank is occasionally boiled off to concentrate the sludge, which is then disposed of as a hazardous waste. An alternate method used is to pump the liquid to another tank, remove the sludge, and return the liquid back to the phosphoric acid tank. This process generates very little waste each year.

TOAD has been approached by the vendor of a product called Rust Eliminator to replace phosphoric acid. The vendor demonstrated the product at several Army depots including TOAD, and claims that the product is non-toxic. However, TOAD concluded that the product was not very promising because the solubility of some metals in the product would create a hazardous waste, the product would need a large amount of agitation (during the demonstration, parts were scrubbed by hand), the action of the product on the part was slow, and the cost is approximately six times higher than the phosphoric acid solution. Finally, spent phosphoric acid and sludge from the bottom of the tank is a very small waste stream at TOAD; therefore, even complete elimination of this waste stream would result in only a small reduction in hazardous waste generation. DESCOM has, however, indicated an interest in finding a non-hazardous rust remover. Tooele Army Depot in Tooele, Utah, has purchased several drums of Rust Eliminator (information on the effectiveness of this product will be obtained during the USATHAMA and PEI visit in July). Vendor literature and a memorandum for record explaining why Rust Eliminator is not appropriate for use at TOAD are attached to this report.

OTHER AREAS

TOAD purchased solvent recycling equipment three years ago to recycle paint solvents. The recovered solvent was to be used for clean-up. However, the still has not been operated since because of operational and safety concerns, including ventilation, uncertainty about the composition of recovered solvent, and the inability to distill nitroethane in paint because of the explosion hazard. TOAD expects the still to eventually become operational.

CONCLUSIONS/RECOMMENDATIONS

The following list presents some potential HAZMIN projects on which USATHAMA could provide assistance to TOAD.

- Confirm whether dry filters and clothing used in blasting operations are actually hazardous wastes.
- Explore the use and effectiveness of detackifying agents to minimize paint sludge from water wall paint booths that is disposed as a hazardous waste.
- Assist with converting water wall paint booths to a dry filter system.
- In further testing of plastic media blasting, invite TOAD personnel to observe the effectiveness of this media on parts of interest to the depot.
- Compile a data base on various stripping media, including chemical stripping and blasting with walnut shells, glass beads, steel shot, or plastic media, so that various depots can compare their specific operations with the advantages and disadvantages of plastic media.
- Evaluate the use of zirconia alumina to reduce hazardous waste generation from aluminum oxide blasting.
- Conduct a study to identify waste reduction methods in the plating shop regardless of space limitations.
- Identify plating shop operating practices that contribute to hazardous waste generation.

- Identify operating or design changes that could be made to the pretreatment plant so that it could accept additional rinse waters, both from plating rinse tanks and from a running rinse after the methylene chloride stripper.

- Investigate methods of extending the life of the hydrochloric acid pickling solution.

- Investigate the use of nonhazardous rust removers.

TOAD's interests and needs will be compared to those of other depots that will be visited in the near future. TOAD personnel should be kept informed of the results of any testing relevant to their needs conducted under the current HAZMIN effort.

ATTACHMENTS

Documents obtained from TOAD

Paint Shop Hazardous Waste Generation, CY 87 vs CY 88 - 1 figure

Sandblast Hazardous Waste Generation, CY 87 vs CY 88 - 1 figure

Test Results of Aluminum Oxide versus Zirconia Alumina waste generation

Vendor literature for Zirconia Alumina

Plating Shop Hazardous Waste Generation, CY 87 vs CY 88 - 2 figures

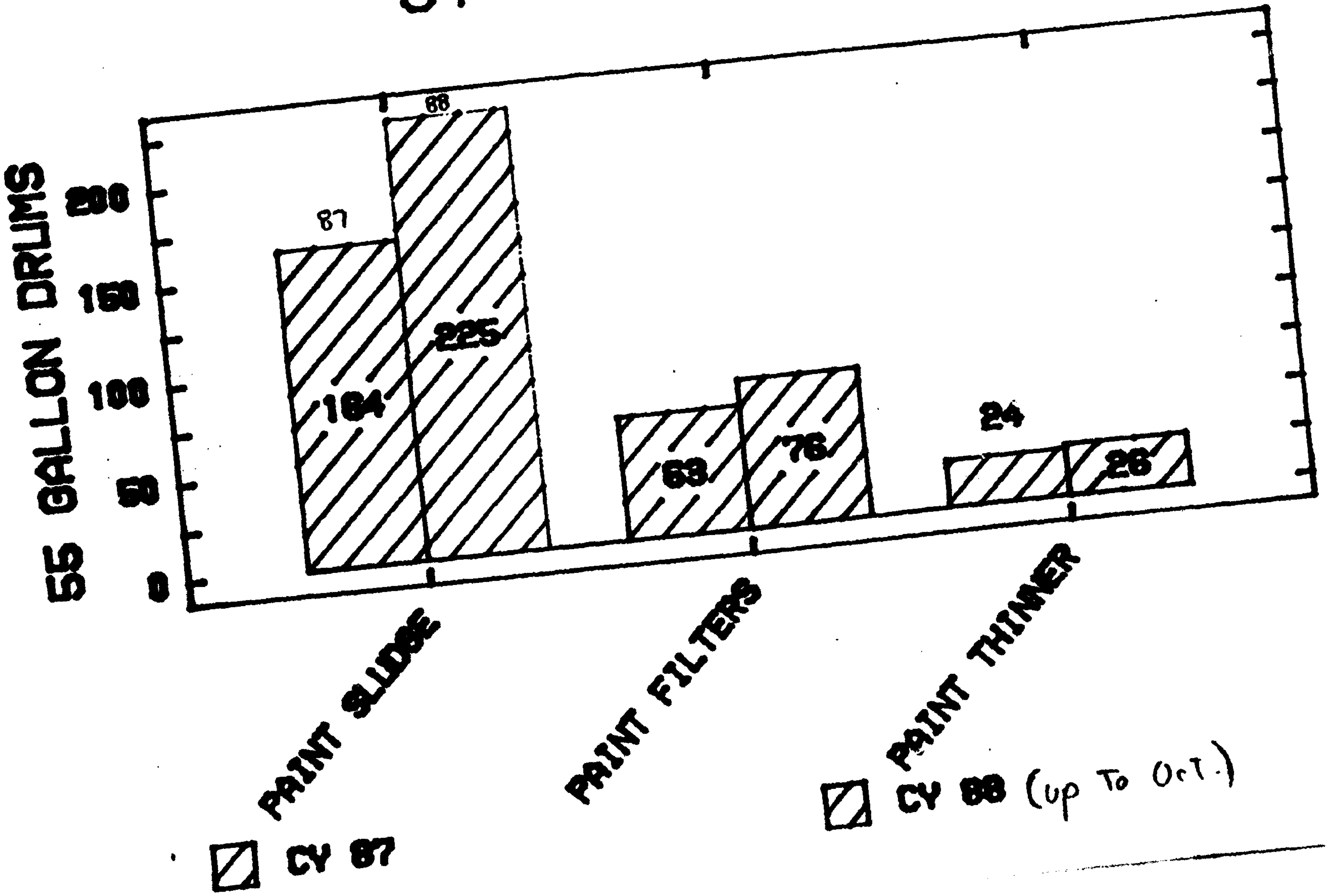
Safety Manual for the Plating Shop (Only floor layout and tank descriptions are attached)

Rust Eliminator Vendor Literature

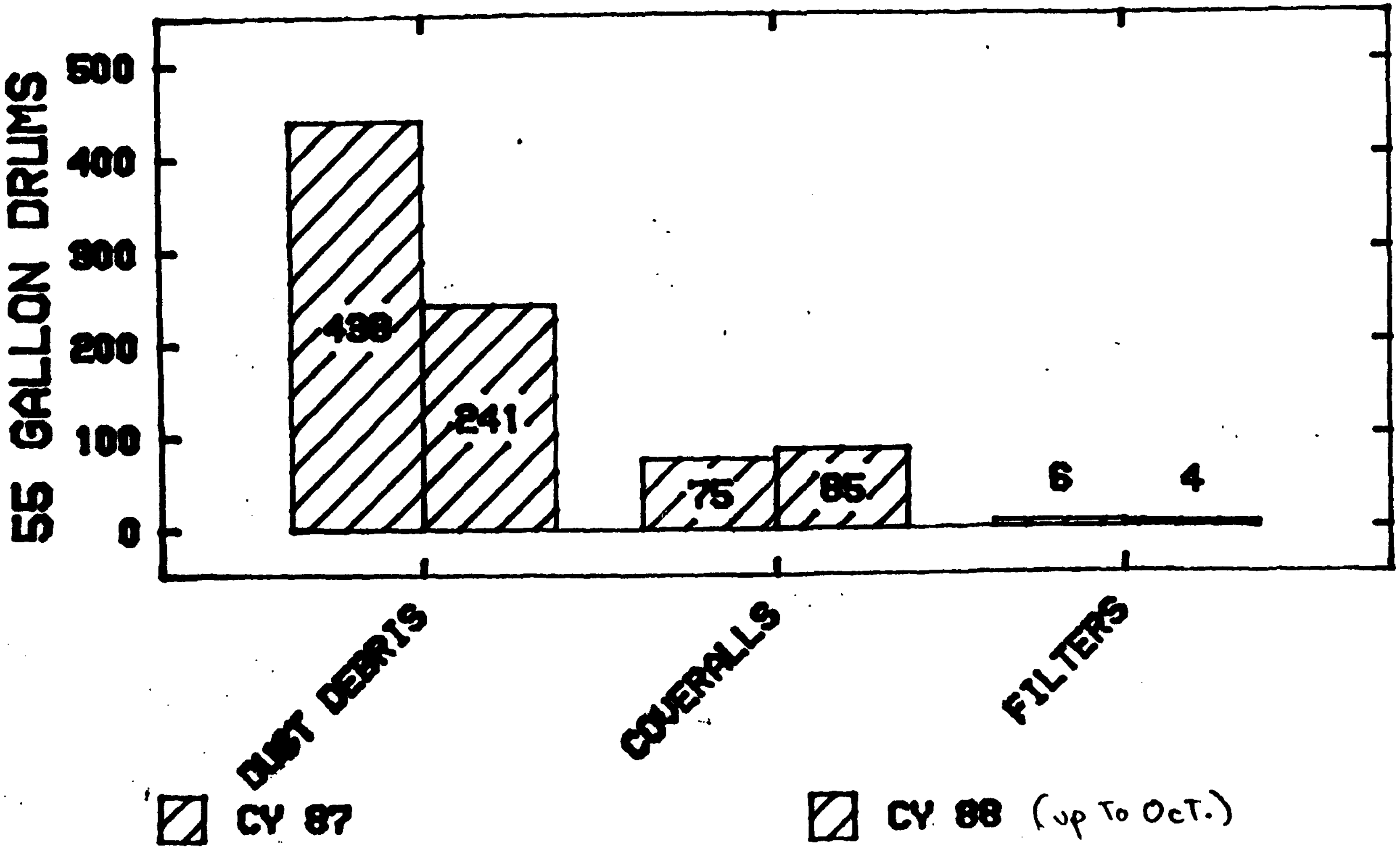
Memorandum for Record concerning Rust Eliminator

Standard Operating Procedures for Plating shop (23" x 33") (not attached)

PAINT SHOP HAZARDOUS WASTE GENERATION CY 87 VS CY 88



SANDBLAST HAZARDOUS WASTE GENERATION CY 87 VS CY 88



Test Results for Aluminum Oxide vs. Zirconia Alumina

Suction Type Machine

Alum. Oxide		Zircon. Alum.
49.5 lbs	Start	49.5
21.5 lbs	Finish	44.5 lbs
15.5 lbs	waste.	3.5 lbs.

High Pressure Machine

Alum Oxide		Zircon Alum.
75 lbs	Start	75 lbs.
78 lbs.	Finish	60 lbs
6 lbs	waste	2 lbs.

... and Increase Production Too.

When you specify Norton blasting abrasives, you have the assurance that you are using the most cost-effective abrasives available, developed and use-proven by the world's leading manufacturer of abrasive products. One or more of the Norton abrasives described in this brochure will enable you to increase production and reduce manufacturing costs.

Norton MCA-1360 Zirconia Alumina Abrasive

An Incredibly Tough Blasting Abrasive Alloy

MCA-1360 abrasive, developed through a Norton proprietary manufacturing process, is the first true abrasive alloy, perhaps the most significant, far-reaching development in blasting technology in decades. It is made from zirconium oxide and aluminum oxide fused under carefully-controlled conditions to produce a chemically-inert abrasive alloy, zirconia alumina.

MCA-1360 has proven its superiority in job after job on applications ranging from removal of mold sand and scale to developing specific finishes on sensitive and delicate electronic parts. It is an incredibly tough blasting alloy with sharp, durable edges, long-lasting strength and impact resistance, resulting in slow breakdown rates.

This abrasive minimizes wear on interior nozzle surfaces because it only fractures on direct impact.

Automated multiple blasting of machined castings.

Scale removal and surface preparation for coating.

Users Report on Outstanding Results with MCA-1360

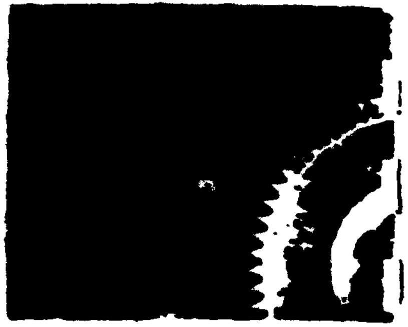
- An electronic component manufacturer got three times blasting life and eliminated contamination of sensitive parts.
- A company producing etched lighting fixtures cut abrasive consumption in half.
- A manufacturer of papermaking machinery eliminated the cost of handling and disposing of sand, and saved $8,000 annually on cleaning dust collectors.
- An electric frypan maker posted annual savings of $18,600 in overall abrasive blasting costs.

Use MCA-1360 Abrasive for Jobs Like These

• Cleaning and etching steel stacks and ducts • Cleaning and reconditioning titanium jet engine components • Cleaning calendar rolls prior to recoating • Producing desired micro inch RMS/AA finish on skillets for non-stick coating • Cleaning water tank interiors • Cleaning investment castings • Cleaning and deburring electronic components • Etching glass • Imparting matte finish to steel, brass and aluminum

SPECIFICATIONS

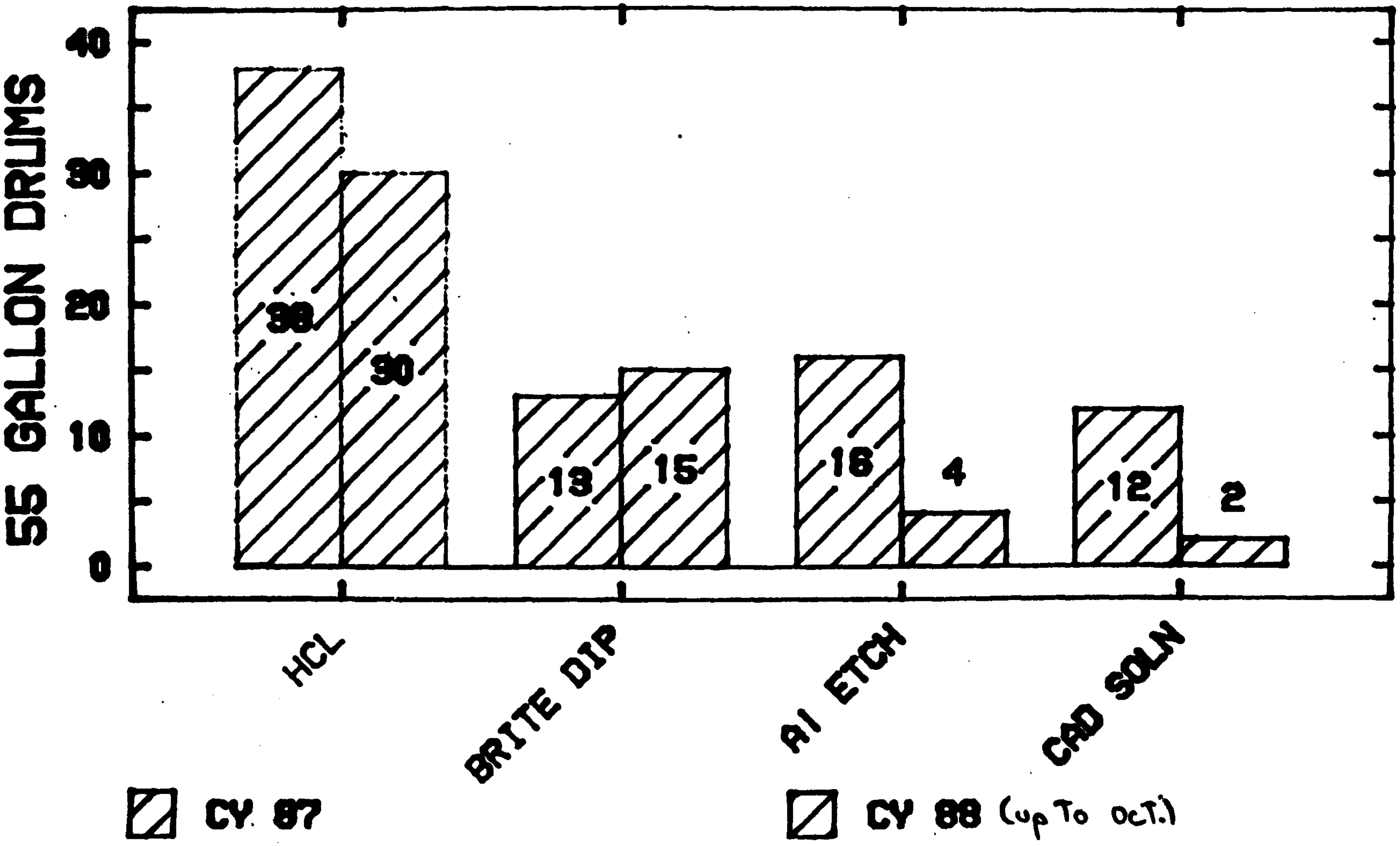
Shape: Blocky
Size range: 24 (coarse) to 240 (fine).
True specific gravity: 4.3 grams/cc
Bulk Density: 127-140 lbs/cu. ft. depending on grain size.
Hardness: Mohs scale 9.8; Knoop scale 2000



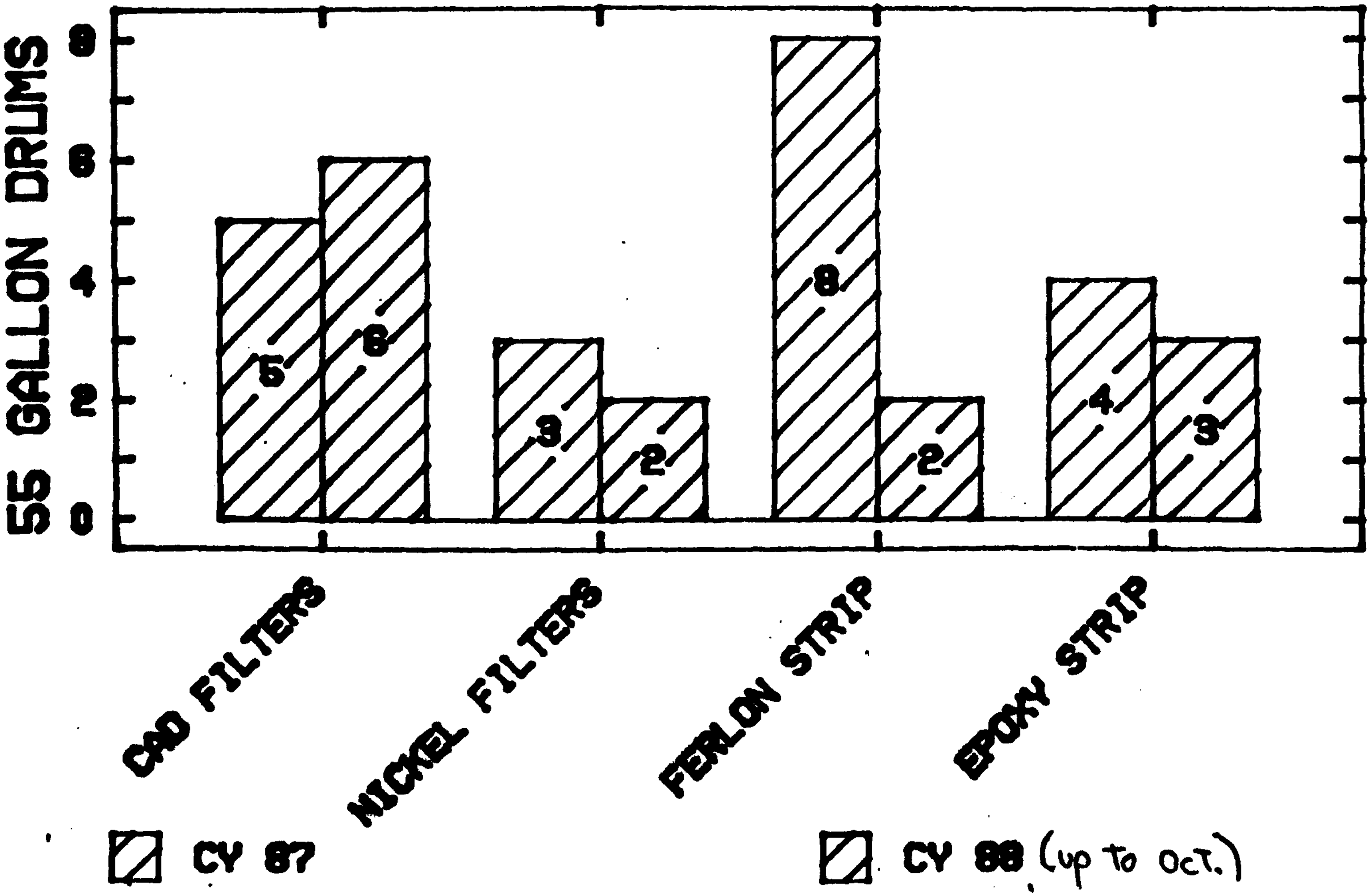
Removing burrs and forming radii on forged gears.

NoRTon Company
Materials Division
1 New Bond Street
Worcester, MA 01606
(617) 853-1000.

PLATING SHOP HAZARDOUS WASTE GENERATION CY 87 VS CY 88



PLATING SHOP HAZARDOUS WASTE GENERATION
CY 87 VS CY 88



SAFETY MANUAL

Plating Shop

COMPILED BY THE ELECTROPLATE (C.O.A.T.)
QUALITY CIRCLE

MEMBERS

Glen Allen

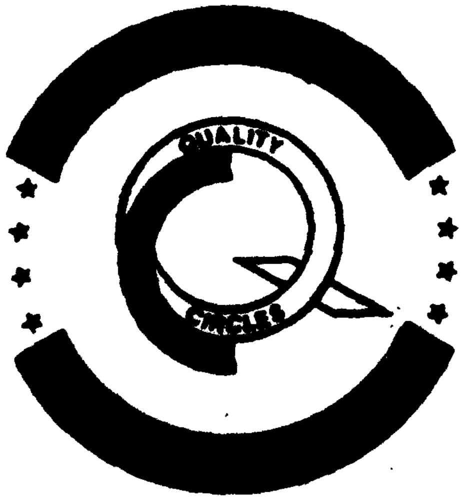
Frank Malacheski

Robert Montgomery

Joseph Olsommer

James Pennella

George Talerico



CHEMICALS USED IN THE SHOP

HEAVY DUTY LINE

Tank #	Description
1	Lye Tank - Caustic Soda
2	Fine Organic Tank - Phosphoric Acid
3	Phosphate Tank - Phosphoric Acid & water, Keykote-32, Keykote-61, Nitric Acid
4	Chromic Sealer Tank - C.R. 110 Flakes or Pellets

ALUMINUM LINE

Tank #	Description
5	Etch Tank - No. 2 or 3 Aluminum Etch (form of Caustic Soda)
6	Deoxidizer Tank - For aluminum only. Brightens up aluminum, is a form of Nitric Acid, will attack steel. Also known as "Brite Dip."
7	Iridite Tank - Chromic Acid 14-2-Powder from 10# can. Chromic Acid & water mix.
8	Epoxy Paint Strip Tank - Methaline Chloride. CAUSES SEVERE BURNS WHEN ALLOWED CONTACT WITH SKIN.
9	Small Lye Tank - Made up of Caustic Soda (trade name: Rust Off) and heated by steam.
10	Hydrochloric Acid Tank - Made up of Hydrochloric Acid at 40°F. Also known as Muratic Acid.
11	Magnesium Brite Dip Tank - Nitric Acid, Ammonia Biflouride, and water.
12	Chrome Strip
13	Anodize Tank - Sulfuric Acid and water at room temperature.
14	Black Dye Tank - Made up of black dye and water. Heated.
15	Black Magic Tank - Ebonol "C" and water. Heated.

Tank #	Description
16	Tin Tank - Sodium Stannate, Sodium Hydroxide, Peroxide, Anodes, and water. Heated.
17	Nickel Strip Tank - Sulfuric Acid and water and 5% Gyles Iron.
18	Steel Brite Dip Tank - Nitric Acid (15 gallons), Sulfuric Acid (13 gallons), and two Carboys mixed together.

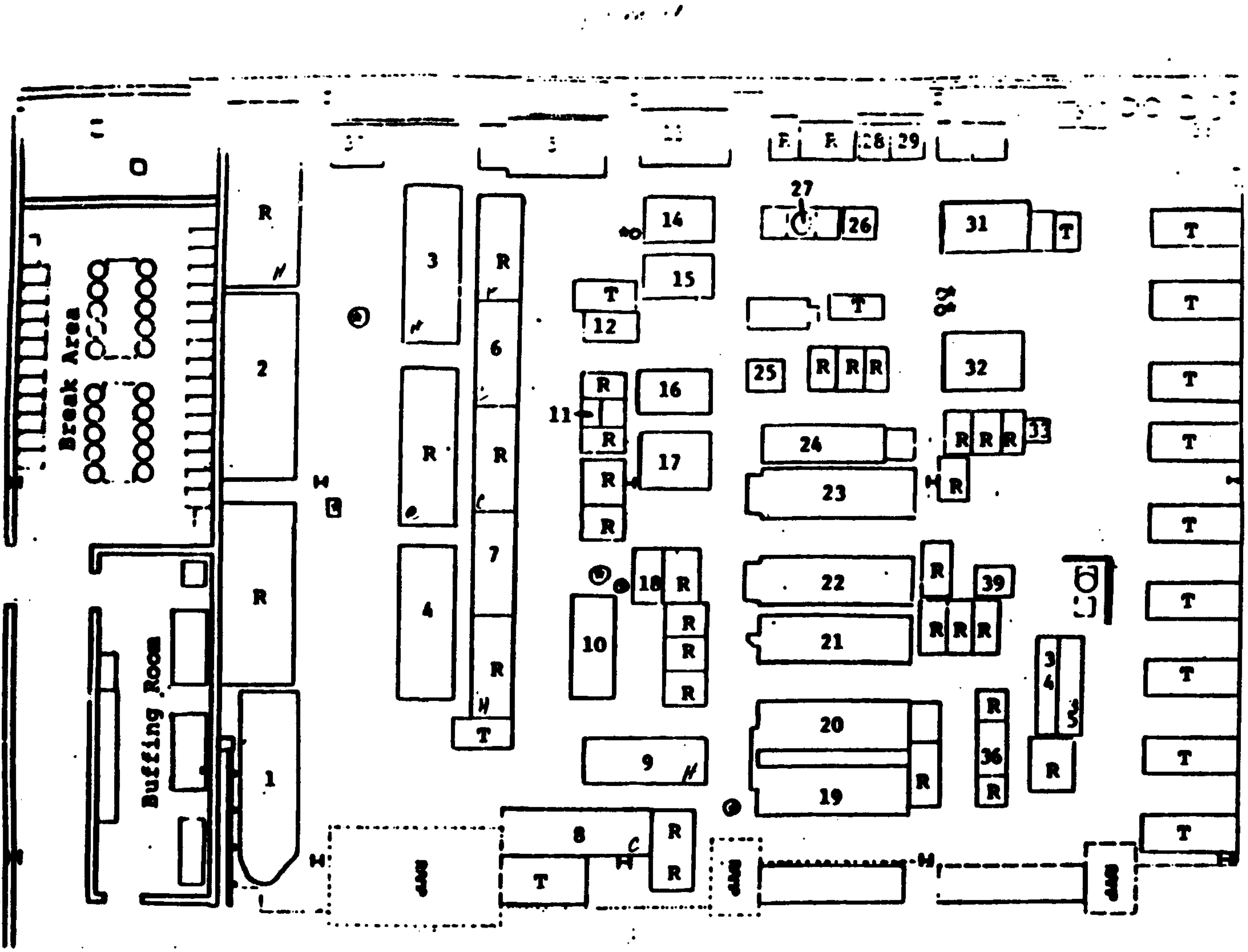
PLATING TANKS

Tank #	Description
19 20 21 39	Cad Tanks - D.I. Water, Sulfuric Acid, Cad Oxide, Brighteners, Stabilizers, Anodes (65 pounds with dynel bags), Starter-K, and Electricity.
22	Copper Tank - Copper Anodes, Copper Brightener, Phosphoric Acid, Cu-pure, Copper Mix, Dynel Bags, D.I. Water, and steam.
23 24	Nickel Tanks 1 & 2 - Nickel Chloride, Nickel Sulfate, Boric Acid, Sulfuric Acid, Nickel Carbonate, Nickel Anodes, Dy Bags, Steam, and Electricity.
25	Nickel Strike Tank - Water, Nickel Chloride, and Hydrochloric Acid.
26	Polish Cleaner Tank - K-2 Cleaner (14 pounds), Water, and Steam.
27	Nutralizer Tank - Sulfuric Acid and 1-30 gallons water.
28 29	Red & Yellow Dye Tanks
30	Steel Black Tank - Ebonol S-34, high heat, and water.
31	Etching Machine - For etching brass. Ferric Chloride and water.
32	Chrome Tank and Gray Chrome - CR-11 Pellets, Chromic Acid, water, heat, lead anodes, and electricity.
33	Amuminall Tank - Zinc Atc, used for plating over aluminum.
34	Cadmium Bronze Tank - Irridite, Chromic Acid, Boric Acid Nitric Acid, Phosphoric Acid.
35	O.D. Irridite - Chromic Acid, Nitric Acid, Boric Acid, and Phosphoric Acid.

Tank #	Description
36	Silver Tank - Silver Salts, C-1 Salt Brightener, and Potassium Hydroxide.
37 38	Keykote-32 and Keykote-61

LEGEND

1. Lye
2. Fine Organic
3. Phosphate
4. Chromic Acid Sealer
5. Aluminum Etch
6. Aluminum Brightner
7. Irridite
8. Epoxy Paint Strip
9. Lye
10. Hydrochloric Acid
11. Magnesium Bright Dip
12. Chrome Strip
13. Anodize
14. Anodize Black Dye
15. Black Magic (Oxidize)
16. Tin
17. Nickel Strip
18. Bright Dip
19. Cadmium
20. Cadmium
21. Cadmium
22. Copper
23. Nickel
24. Nickel
25. Nickel Strike
26. Polish Cleaner
27. Neutralizer
28. Anodize Red Dye
29. Anodize Gold Dye
30. Steel Black
31. Brass Etcher, Machine
32. Chrome
33. Alumin all
34. Irridite
35. OD Irridite
36. Silver
37. KeyKote 32
    KeyKote 61
38. D.I. Water
39. Cad Barrel Tank



* Emergency Eye Wash and/or Shower

T Tables

R Rinse Tanks

RUST ELIMINATOR INC.
P. O. Box 383
Johnstown, Pennsylvania 15907-0383
(814) 539-4577

RUST ELIMINATOR Technical Data

DESIGN CONCEPT

Rust Eliminator was formulated to create a metal cleaning solution that was safe for workers to use and could replace mineral acids in the work place. The original formulation of Rust Eliminator was to remove rust from steel exposed to the atmosphere. The original formulation has been improved to where Rust Eliminator will clean more than just rust from iron base metals.

COMPOSITION

The composition of Rust Eliminator is a proprietary formulation that contains only chemical substances that appear on the Toxic Substances Control Act (TSCA). Based on the foreign manufacturer's certification, the import and use of Rust Eliminator in the United States may commence without the need for EPA approval under TSCA. Rust Eliminator does not contain any ammonia derivatives.

APPEARANCE

Clear with a slight odor. The solution will turn olive green after cleaning metal due to metal oxides suspended in the solution. The solution will develop a surface foam if agitated.

FLASH POINT

Not applicable. The solution is non flammable.

BOILING POINT and pH

Approximately 222 F, pH is 2.1+.2 or −.2.

TOXICITY

Rust Eliminator is non-toxic and will not stain skin or react adversely with skin under normal conditions. Normal precautions are advised. Rust Eliminator will dry tacky on the skin; it can be removed by applying water to this area. Persons with sensitive skin should be careful when handling Rust Eliminator. The operating temperature for Rust Eliminator in an industrial application is between 125 F and 190 F, depending upon the customer's operation. Workers should be cognizant of this temperature and avoid contact with the solution at this temperature. NO HARMFUL VAPORS are given off by a heated bath of Rust Eliminator.

STORAGE

Rust Eliminator solution should be stored above 38 F. The solution should not be allowed to freeze. Room temperature storage for prolonged periods should be in plastic containers.

METAL CLEANING PROCEDURE

Rust Eliminator can be heated to not more than 190 F for fastest cleaning results. However, 125 F will result in less metal dissolution than 190 F; each customer has different requirements. The solution should be contained in a plastic container capable of withstanding this temperature or a stainless steel tank. The best results are obtained by immersing the part to be cleaned in the solution for a suitable time depending on metal composition. After the part is removed from the solution it should be thoroughly rinsed with water to remove all loose oxide from the surface. A dip in a hot water tank will clean the surface and promote quick drying to prevent the formation of rust on a steel part. Steel cleaned by this procedure will not rust for up to 12 hours under normal conditions. Steel cleaned with Rust Eliminator has proved to be superior to HC1 cleaned steel in resisting rust formation after cleaning.

RUST ELIMINATOR BATH TEMPERATURE

When the Rust Eliminator solution is heated to the recommended operating temperature, water vapor will escape from the bath. The volume of the bath should never drop more than 10% without the addition of water to make up this volume. The reaction of Rust Eliminator with the surface to be cleaned can be enhanced by agitation of the solution. Immersion time required for cleaning is controlled by bath temperature and oxide thickness on the metal. A thin rust coating is removed in 20 minutes at 190 F.

THEORY BEHIND RUST ELIMINATOR

Unlike typical acid cleaning methods, Rust Eliminator does not react with the oxide on the surface. The chemicals in Rust Eliminator attack the oxide bond at the metal oxide interface, reducing the strength of the bond, permitting it to be removed entirely with rinsing after immersion in a Rust Eliminator solution. The maximum cleaning potential of the solution is realized if the oxide coating is thin. A heavy oxide coating will be removed but could require extended immersion times.

METAL ATTACK BY RUST ELIMINATOR

Rust Eliminator does attack the surface of the metal after the removal of the oxide layer. The metal surface attack produces a slightly etched layer that is ideal for application of a coating. The amount of surface attack varies by grade. Tests conducted have shown no attack on stainless steel (304 and 321) for extended times. For carbon steel the metal removal during a typical cleaning cycle is less than 20 microns.

PRODUCTION EXPERIENCE

Although Rust Eliminator is a new product in the metal cleaning arena it has proved its worth in several applications.

1. A motor rebuilding company was using hazardous acids to try to clean out rusted cooling chambers in the motor housing. The acids were dangerous to use and did not perform well. In this situation the acids would attack the painted metal housing and not clean out the rusted water flow chambers. This customer tried Rust Eliminator by immersing the entire housing in a heated bath. Within one-half hour the previous rust clogged passages were opened and the painted housing was left untouched. The workers for this company no longer have to wear cumbersome protective gear when cleaning the motors. The company had found a reliable method to clean out these motor housings. The company has now expanded this operation due to the repeatable results obtained with Rust Eliminator. Rust Eliminator allows it to rebuild a motor at a more competitive cost and provide quick turnaround.

2. Another company is installing Rust Eliminator in its cleaning line to remove rust from its product prior to painting. This customer estimates the throughput will be double the current rate with Rust Eliminator as the cleaning agent.
3. A third company has used Rust Eliminator to remove the calcium build-up on the pipes of a boiler system. In this instance Rust Eliminator was circulated through the system for the appropriate time; discharged, the system was flushed with water then put back into operation. This procedure dramatically reduced down time on the boiler and eliminated the need for an expensive teardown of the boiler.
4. A company which fabricates brass pipes has found Rust Eliminator to be a good inprocess cleaning solution. In tests conducted by an outside laboratory the cleaning time was shown to be reduced by one-half by raising the bath temperature from 130 F to 198 F.
5. A midwest plating company is evaluating Rust Eliminator as a surface cleaner prior to deposition of a coating. In this instance Rust Eliminator will replace a complicated mechanical cleaning system.
6. A metal cleaning firm has substituted Rust Eliminator for acid cleaning in its production line. The results have been positive in two ways for this user. First the reliability of cleaning has improved dramatically and secondly, the waste disposal problem has been cut dramatically. In the past this customer was changing the acid tanks every week to ten days depending on operating conditions. With Rust Eliminator the tank did not need to be changed for up to ten to twelve weeks.
7. An independent laboratory evaluated several commercially available rust removers for use on stainless castings. In this study Rust Eliminator was compared to Chemprime, Decon 90 and Marraclean. Rust Eliminator was the only product to test negative in the Ferroxyl test. This indicates that Rust Elimintor removed all free iron from the surface of the castings.

DISPOSAL OF WASTE

The bulk of the oxides removed from the metal surface are insoluable in the Rust Eliminator solution. The metals can be filtered or precipitated from the solution by conventional techniques. Disposal should be in accordance with local, state and federal laws applicable to the discharge location.

SDSTO-ME-E (750-51a) 22 February 1989

MEMORANDUM FOR RECORD

SUBJECT: Rust Eliminator; A Corrosion Removal Product

1. A demonstration of 'Rust Eliminator', a nontoxic, nonhazardous rust remover, was given at TOAD in August 1988.

2. After viewing the demonstration and discussing the specifics of the process, PED personnel decided not to pursue additional testing of the product for the following reasons:

a. Although 'Rust Eliminator' is nonhazardous when initially formulated, it will become hazardous after our parts are processed through the solution.

b. The cost of the solution is approximately five times that of our current pickling solution.

c. To remove a light coating of oxidation, parts must soak in 'Rust Eliminator' for about 20 minutes, compared to approximately 5 minutes that it now takes. This additional soak time would significantly slow the throughput of work in the Plating Shop.

d. It is not known if the chelates used in 'Rust Eliminator' would interfere with the Sulfide Pretreatment Process.

e. 'Rust Eliminator' cannot replace our pickling solution and there is no additional space in the Plating Shop to install another process tank.

3. If further information is required, contact Mr. Pat Tierney, X6724.

Patrick T. Tierney

PATRICK T. TIERNEY
Chemical Engineer
Plant Engineering Section
Engineering Branch
Production Engineering Division

[illegible]

[illegible]

CF:
DD/Maintenance
DOO

PEI ASSOCIATES, INC.

MEMORANDUM

TO: Craig MacPhee
DATE: 8/4/89

SUBJECT: Trip report: Tooele Army Depot
Contract No. DAAA15-88-D-0001
Task Order No. 0004

FROM: Jeff Davis
Fred Hall
Dick Gerstle

FILE: 3769-4

CC: Bob Hoye
Paul Lurk

USATHAMA and PEI personnel participated in meetings and a tour of the facilities at the Tooele Army Depot (TEAD) on June 18 and 19, 1989. The purpose of this visit was to acquire information on the operations at TEAD that are relevant to the referenced task order. Specifically, information on VOC emissions, plastic media blasting (PMB), chemical paint strippers, degreasing, and generation of metals-contaminated sludges was sought. Additionally, information on a rust eliminator compound trial test was obtained as an item of special interest. This is one of a series of visits to eight depots being made to acquire comparable data on these topics. In the near future, USATHAMA will use this information to select and define research projects that will be conducted by PEI under this task.

TEAD is located in Utah; about 36 miles southwest of Salt Lake City and three miles south of Tooele. Mr. Paul Lurk represented the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). PEI personnel present were Fred Hall, Dick Gerstle and Jeff Davis.

Our primary contacts at TEAD were: Mr. John Cluff, Chief of Facilities, Engineering Division; Sue Richards, Chemical Engineer; Gerald Webster, Electrical Engineer; and Mr. Clarence Allred, Chief of the Metal Processing Branch. Lloyd Laycock gave us a tour of the depot facilities. We also met briefly with Mr. William Stem, Chief of Environmental Affairs.

The purpose of this trip report is to document the information obtained during the site visit. The trip report is presented in eight sections to address pertinent topics included in the scope of work of Task Order No. 0004. These sections are: Background, VOC Emissions and Paint Operations, Blasting Operations, Alternate Chemical Strippers, Alternate Degreasers, Electroplating Operations and Metal-Contaminated Sludges, Other Areas of Interest, and Conclusions/Recommendations.

BACKGROUND

TEAD's primary mission is to maintain and supply combat vehicles (primarily trucks), trailers, electrical generator sets, and related mobile equipment. The depot employs about 5,000 people. The site covers 44,096 acres, of which about 24,000 are devoted to depot and equipment storage activities. The remainder of the site is devoted to demilitarization and detoxifying chemical warfare agents. This part of the site (the south area) was not part of this inspection. In addition, railroad maintenance shops under TEAD's jurisdiction are located at Hill Air Force Base, about 60 miles north of this site. Environmental matters at the rail shop are under Hill's control.

TEAD is currently in compliance with environmental regulations. All hazardous wastes are stored in designated areas on site, and then manifested and taken to permitted sites by a licensed contractor. A list of the amount and cost of waste disposal is attached to this report. These wastes are listed below in decreasing order of the total cost of disposal for 1988.

WASTE GENERATED	COST FOR DISPOSAL IN CY 1988 ($)
Poly (CARC) paint sludge	136,690
Sodium hydroxide tanks	123,157
Paint filters	97,200
Phosphoric acid tanks	57,802
1,1,1-trichloroethane	54,464
Blast residue	43,327
Carbon-removing compound/paint stripper	21,092
Other drummed wastes	18,975
Poly (CARC) thinner	15,194
Accelagold	10,784
Enamel sludge	5,684
Smut Go	5,220
Sodium hydroxide sludge	4,943
Gasoline	1,312
Sump sludge	139
TOTAL	$595,983

In calculating the above costs, each drum was assumed to contain 55 gallons, the paint sludge was assumed to weigh 730 pounds per drum (reported density is 13.33 lb per gallon), and the paint filters were assumed to weigh 300 pounds per drum. These costs do not include those associated with the purchase of replacement chemicals or materials.

The following is a summary of the buildings visited and a brief overview of the processes conducted in each building.

- *Industrial Waste Treatment Plant (Drive by only)*

- Building 600-C
  - Solvent Recovery Plant

- Building 612
  - Large drive-in paint booths for final painting of trucks

- Building 602
  - Refurbish, assemble and paint large(25KW) electrical generator sets

- Building 611
  - Refurbish smaller electrical generator sets

- Building 647 - Consolidated Paint Facility
  - Degreasing, steam cleaning, repair and painting of truck engines

- Building 615 — Metal Processing Branch
  - Blasting (Aluminum oxide)
  - Painting (large drive-in booths with dry filters)
  - Chemical stripping

- Building 637 — Engine Rebuild Branch
  - Rebuilds engines
  - Vapor degreasing
  - Chemical cleaning in dip tanks

- Building 639
  - Engine container painting
  - Drive-in water-wall paint booth being installed

- Building 609
  - Initial steam cleaning of vehicles, and radiator and fuel tank testing and repair

VOC EMISSIONS AND PAINTING OPERATIONS

TEAD operations currently emit approximately 500 tons of VOCS per year(see attached list of sources). Utah air pollution regulations (Section 4.9.6 g(2)(c)and (d)) limit VOC content of paint used on small parts to 3 to 3.5 lbs/gal, depending on the type of paint. VOC emissions from painting larger parts like truck bodies are not specifically regulated and the depot has negotiated permitted limits for their painting operations. Current emissions are apparently within these permitted limits and there is little incentive to reduce VOC emissions.

Only limited amounts of methylene chloride are used for paint stripping at this plant. This solvent is exempt from air pollution regulations, but does cause employee exposure and disposal problems.

Most painting at TEAD is done using the two-component CARC system (which has a higher VOC content than the single component CARC). Some single component CARC is also used. Air-assisted De Vilbiss paint spray guns are used. The depot is moving toward high-volume, low-pressure guns to improve paint transfer efficiencies. Each year new replacement spray guns that are purchased are of the low-pressure type. A total of 12 guns have been ordered so far, and personnel plan to order 100 guns next year. TEAD uses about 420 paint spray guns per year.

Enamel paints are used on engines because CARC emits toxic fumes when heated above 400°F. Some depots are not permitted to use enamel paints because they have higher VOC contents than CARC.

Some operations use electrostatic spray paint application, but its use is not widespread at TEAD. A robotic engine paint system using electrostatic paint application was observed. This system cost $350,000 in 1983 and reduced paint consumption from 1.25 to 0.9 gallons per engine. Personnel noted that in robotic painting, less waste is generated if the robot only paints with one color. If a robotic system is used to paint with several colors, the spray gun must be cleaned out between colors.

Most paint booths at TEAD use dry filters to trap paint particulates. Steel filters are used in many of these dry booths and the filters are occasionally stripped of paint by using a carbon-removing compound and reused. Fiberglass filters are also used in some booths in addition to the steel filters. The fiberglass filters in some booths are changed at least once a week and are disposed as a hazardous waste. (Some other depots dispose of filters as a nonhazardous waste.) The paint filters are one of TEAD's largest waste streams, with nearly $100,000 spent on disposal in 1988. Personnel indicated that the dry filter systems generate less waste than water-wall paint booths and require less maintenance. A couple of water-wall booths were converted to dry filters 3 or 4 years ago.

A few water-wall booths are still used. In these booths, water flows down a wall at the rear of the paint booth, over an air vent through which the booth exhaust flows, and then into a trough. The paint particulates are trapped in the water as they pass through the vent. The water and paint mixture (sludge) collect in a trough at the base of the water wall where the solids settle and the water is recycled. Two water wall paint systems will have new sludge dewatering systems installed soon. These dewatering systems were reportedly in storage, but the only equipment that could be found were two pumps. More specific information on the dewatering systems was not available.

The floors and walls of the dry paint booths are covered with a removable plastic coating. This coating is occasionally removed and disposed as a hazardous waste.

BLASTING OPERATIONS

Numerous blasting booths are located throughout the depot, and several types of blasting media are used, including walnut shells, aluminum oxide, steel shot (#25), and occasionally glass beads. The spent media are not separated by type prior to disposal. In 1988, 393,880 lb of blast grit was disposed as a hazardous waste at a cost of $0.11/lb, for a total cost of approximately $43,000.

Walnut shells are used in two booths at the depot to blast aluminum trucks, differentials, and engine blocks. The walnut shells are collected from the floor of the booths and recycled. The recycling system consists of a simple air separator, in which lighter particles are entrained in the air and transported to containers for disposal, and heavier particles are returned to the booth for reuse. Aluminum oxide is sometimes added to the walnut shells to remove rust. Maintenance costs for walnut shell blasting are high, and the dust created during blasting presents an explosive hazard as defined by OSHA. Personnel are interested in replacing these operations with sodium bicarbonate or plastic media blasting (PMB). A booth in Building 615 is supposed to be capable of blasting with plastic media, but personnel indicated that it does not operate well. Walnut shells are currently used in the booth.

TEAD personnel have tried PMB for paint stripping in a glove box. These tests were encouraging, and showed that plastic media reduced dust, lasted longer, and achieved faster paint-removal rates than did walnut shells. Personnel indicated that they are interested in acquiring a new PMB booth. However, purchasing or converting existing booths for plastic media blasting would be very expensive; no funds are currently available for converting to PMB and there is not much incentive to switch.

ALTERNATE CHEMICAL STRIPPERS

Numerous stripping operations are used throughout the depot. Large quantities of sodium hydroxide are used for paint stripping. A total make-up of approximately 7,000 gallons is required about every 6 weeks. The tanks are occasionally pumped out as needed and disposed as a hazardous waste. A total of 43 drums of sludge were generated from these operations in 1988, and 58,927 gallons (approximately 1,100 drums) of sodium hydroxide solution were disposed at $2.09 per gallon. The spent sodium hydroxide solution is the depot's second costliest hazardous waste. This hazardous waste could potentially be reduced by continuously or periodically filtering the sodium hydroxide solutions to extend the lives of the stripping/cleaning tank solutions.

Phosphoric acid is currently used for rust removal. A total of 16,421 gallons of were disposed in 1988 at a cost of $3.52 per gallon. Combination of the phosphoric acid and sodium hydroxide waste streams for neutralization followed by precipitation of the metals may be feasible to reduce these waste streams.

DESCOM has indicated interest in evaluating the use of a product called Rust Eliminator to replace phosphoric acid baths for removing rust. Personnel at Tobyhanna Army Depot (TOAD) had concluded that Rust Eliminator was not a promising alternative for phosphoric acid because the solubility of some metals in the product would create a hazardous waste, the product would need a large amount of agitation (during the demonstration, parts were scrubbed by hand), the action of the product on the part was slow, and the cost is approximately six times higher than the phosphoric acid solution. Finally, spent phosphoric acid and sludge from the bottom of the tank is a very small waste stream at TOAD; therefore, even complete elimination of this waste stream would result in only a small reduction in hazardous waste generation. Personnel at TOAD, however, had been told that TEAD had purchased several drums of the product as a substitute for phosphoric acid.

TEAD performed several tests with Rust Eliminator on a variety of different parts; results of these tests are provided as an attachment to this report. Personnel concluded that the product performed about as well as phosphoric acid, but that it was much more expensive. The manufacturer sold the material on the basis of its being a nonhazardous waste; however, after use, the product is a hazardous waste because of the solubility of some metals. TEAD also tested the product for long-term rust inhibition, but again the product fared no better than phosphoric acid. Personnel at TEAD ordered only one drum of the product, and have some left over. Reports that TEAD personnel are satisfied with Rust Eliminator and are planning to replace phosphoric acid solutions with this product are erroneous.

TEAD uses a small quantity of methylene chloride-based paint strippers and larger quantities of sodium hydroxide solution. The methylene chloride stripper is brushed on parts with small areas of paint left on after abrasive stripping.

Some phenol-containing chemical strippers were previously used, but these have been replaced. The IWTP has experienced no problems with Total Toxic Organics (TTO) since these strippers were replaced.

A carbon-removing compound (Mil C-198533) is also used for paint stripping. A total of 118 drums are disposed per year at a total cost of $21,092.

In Building 615 (the Metal Processing Branch), aluminum and ferrous parts are segregated. Ferrous parts are treated with a sodium hydroxide strip, a cold water rinse, a phosphoric acid solution for rust removal, a hot alkaline rinse, and compressed air for drying. Aluminum parts are treated with an F-type paint stripper (Mil C-4G11GA), an etching solution (Mil C-5541C), a nitric acid solution (Mil C-5541C, trade name Smut-Go), and Accelagold (Mil C-5541C), with each step being followed by a cold-water rinse.

ALTERNATE DEGREASERS

Degreasers using Stoddard solvent and 1,1,1-trichloroethane are widely used at TEAD. These degreasers are equipped with chiller systems to minimize losses and to comply with State regulations. Spent solvents — including 1,1,1-trichloroethane, stoddard solvent, and lacquer and polyurethane thinners — are sent to an on-site recovery plant where they are distilled and the product reused. The solvent recovery plant is fairly new and consists of 3 separate stills manufactured by PRI (Progressive Recovery, Inc.) Package Systems. Paint thinner is recycled and used for wash down. The thinners are occasionally added to paint when there is a lot of it, but quality control personnel will not allow this practice to become standard unless tests are conducted showing that the recycled thinner does not affect paint quality. The thinners are allowed to stand before distillation, so that the paint sludge settles and the thin liquid on top can be decanted and distilled. Approximately 60 percent of the thinner is recovered.

Steam cleaning is also used to degrease parts. The choice of vapor degreasing or steam cleaning depends on the part to be cleaned. In general, vapor degreasing is the preferred alternative, especially for very greasy items. However, steam cleaning is quicker for large, flat surfaces, and vapor degreasing cannot be used on parts containing rubber since the 1,1,1-trichloroethane would dissolve the rubber. Sludge from steam cleaning is disposed in an on-site hazardous waste landfill even though it is not RCRA hazardous. Water from steam cleaning is treated in the industrial waste treatment plant, and occasionally clogs the pipes with settled solids.

ELECTROPLATING OPERATIONS AND METAL-CONTAMINATED SLUDGES

TEAD conducts no plating operations at this time. Aluminum anodizing is performed, but this does not result in a waste problem. Some anodizing solutions contain chromium. The Turco anodizing solution contains cyanide, which is chemically bound in the solution and therefore not very volatile.

All wastewater enters a new wastewater treatment plant owned and operated by an outside contractor. The plant treats approximately 140,000 gallons of wastewater per day. Effluent is of drinking water quality and is recycled for plant process use. Sludge is dewatered in a filter press and sent off site as a hazardous waste because of its metal (chromium, cadmium, and lead) content. Prior to construction of this plant, a study was conducted that concluded that segregation of wastewater streams to reduce the volume of sludge treated as hazardous would not be worthwhile. Water from the sludge dewatering is returned to the treatment plant inlet. Backwash water from reverse osmosis and sand filter cleaning is settled and returned to the plant influent or sent to the Tooele City treatment plant. The plant occasionally experiences problems with a high pH due to spilling of the sodium hydroxide paint stripper. It also occasionally receives slugs of oil and grease. The facility is a 5-year, temporary plant, and personnel indicated that in general it is operating well.

OTHER AREAS OF INTEREST

Waste oil is a large waste stream at TEAD because of the engines processed. Spec oil is sold through DRMO, and non-spec oil is disposed off site at a net expense. Personnel expressed an interest in burning the waste oil in the on-site steam-generating facility.

A furnace followed by blasting is used to remove paint from some parts. TEAD personnel believe improvements can be made in this area and are interested in observing the fluidized bed demonstration test to be conducted at Red River Army Depot under Task Order No. 0005. Clarence Allred and Lloyd Laycock should be contacted regarding these tests.

The depot is also concerned with closing an old wastewater treatment lagoon, and cleaning up groundwater contaminated with solvent.

CONCLUSIONS/RECOMMENDATIONS

The waste stream at TEAD that costs the most for disposal is CARC paint sludge. Two dewatering systems will be installed soon that could reduce the sludge volume, but we were unable to collect information on how these systems worked. PEI should maintain contact with TEAD to determine the effectiveness of these systems since many other depots are also concerned with reducing paint sludge.

Information gathered at both Tobyhanna Army Depot (TOAD) and TEAD indicates that Rust Eliminator is not a cost-effective substitute for phosphoric acid as a rust remover. Many depots have been evaluating the use of Rust Eliminator and are unaware or misinformed about activities at other depots. The information contained in this trip report should thus be transferred to all depots and to DESCOM.

Personnel at TEAD are interested in the use of plastic media blasting; however, no funds are currently available for purchase of a new booth or for conversion of a walnut shell booth for use with plastic media.

The following list presents some potential HAZMIN projects on which USATHAMA could provide assistance to TEAD.

- Determine the effectiveness of the new sludge dewatering systems.

- Re-evaluate whether the paint filters at TEAD are hazardous wastes.

- Assist with purchasing a plastic media blasting booth or converting an existing booth for use with plastic media. Conduct demonstration tests on parts at TEAD to develop data to support the purchase of a new facility.
- Evaluate the use of filters to extend the lives of sodium hydroxide solutions.
- Evaluate methods to extend the lives of phosphoric acid solutions.
- Evaluate combining the phosphoric acid and sodium hydroxide waste streams for neutralization followed by precipitation of the metals to reduce the volume disposed as a hazardous waste.
- Conduct tests to determine whether the use of recycled thinners in paints affects paint quality.
- Keep personnel informed of the results of the fluidized bed demonstration testing at Red River Army Depot.

TEAD's interests and needs will be compared to those of other depots that have been visited. TEAD personnel should be kept informed of the results of any testing relevant to their needs conducted under the current HAZMIN effort. TEAD staff were especially interested in fluidized bed parts cleaning.

ATTACHMENTS

Documents obtained from TEAD

Hazardous Waste Contract Disposals, CY 1988

List of cleaning solvents, paints and solvents/thinners used in 1988

Hazardous waste generation and disposal in 1988 at TEAD and the Hill Air Force Base Rail Shop

VOC emissions inventory

Results of Rust Eliminator evaluation

TEHi
7/19/89

HAZARDOUS WASTE CONTRACT DISPOSALS
CY 1988
RECAPITULATION

	per year	$/unit disposal cost
1,1,1-TRICHLOROETHANE	233 DRUMS	(4.25 GAL)
CARBON REMOVING COMPOUND/PAINT STRIPPER	118 DRUMS	(3.25 GAL)
GASOLINE	9 DRUMS	(2.65 GAL)
SUMP SLUDGE	9 DRUMS	(0.28 GAL)
SODIUM HYDROXIDE SLUDGE	43 DRUMS	(2.09 GAL)
POLY (CARC) PAINT SLUDGE	333 DRUMS	(0.56 LB.)
POLY(CARC) THINNER	85 DRUMS	(3.25 GAL)
OTHER DRUMMED WASTES	138 DRUMS	
" VARIOUS " (GAL)	134 GAL	(2.50 Gal)
" VARIOUS " (LBS)	----	
BLAST GRITS	393,880 LBS	(.11 PER LB.)
SODIUM HYDROXDE TANKS	58,927 GAL	(2.09 PER GAL)
PHOSPHORIC ACID TANKS	16,421 GAL	(3.52 GAL)
PAINT FILTERS	144 DRUMS	(2.25 LB.)
ENAMEL SLUDGE	39 DRUMS	(2.65 GAL)
SMUT GO	26 DR	(3.65 GAL)
ACCELAGOLD	57 DRUMS	(3.44 GAL)

CLEANING SOLVENTS USED IN 1988

Building No.	SOLVENT NOMENCLATURE	TANK CAPACITY (Gallons)	AMOUNT OF SOLVENT USED PER TANK	(GALLONS/ YEAR)
600	Stoddard Solvent	Var.tanks	N/A	800
600	1,1,1, Trichloroethane	Var.tanks	N/A	600
600	1,1,1, Trichloroethane	165	N/A	3850
604	Stoddard Solvent	Var.tanks	N/A	2750
604	1,1,1, Trichloroethane	165	N/A	3900
609	Sodium Hydroxide	1885	650 Galls. Sodium Hydroxide	7540
609	Sodium Hydroxide	1885	660 Galls. Sodium Hydroxide	7540
609	Sodium Hydroxide	1452	495 Galls. Sodium Hydroxide	5808
609	Safety Solvent	Var.tanks	N/A	6600
615	Carbon Removing Compound	1385	N/A	4180
615	Carbon Removing Compound	1385	N/A	4180
615	1,1,1, Trichloroethane	330	N/A	14000
615	Accelugold	1369	45 Lbs. Chromic Acid solid 20 Lbs. Sodium Fluosilicate & Potassium Ferricyanide	4104
615	Smut-Go	1369	165 Galls. Smut-Go 33 Galls. Nitric Acid	4104
615	Phosphoric Acid	1385	390 galls. Phosporic Acid	3510
615	Sodium Hydroxide	350	175 Galls. Sodium Hydroxide	3000
615	Sodium Hydroxide	2300	1150 Galls. Sodium Hydroxide	9900
615	Sodium Hydroxide	2300	1150 Galls. Sodium Hydroxide	9900
615	Sodium Hydroxide	1386	693 Galls. Sodium Hydroxide	7920
619	Stoddard Solvent	Var.tanks	N/A	3600
637	Carbon Removing Compound	1150	N/A	2530
637	1,1,1, Trichloroethane	210	N/A	4340
637	Phosporic Acid	1170	300 Galls. Phosporic Acid	1200
	Alum-Brite	600	300 Galls. Alum-Brite	600
637	Sodium Hydroxide	1200	600 Galls. Sodium Hydroxide	3960
637	Sodium Hydroxide	1200	600 Galls. Sodium Hydroxide	3960
637	Sodium Hydroxide	1200	600 Galls. Sodium Hydroxide	3960

QUANTITY OF FUEL USED BY THE DYNOS IN 1988

Gasoline- 4,130 gallons
Diesel- 37,270 gallons

GALLONS OF PAINTS AND SOLVENTS/THINNERS USED IN 1988

		BUILDING Nos.												
NOMENCLATURE	NSN	600 CENTER	601 NORTH	601	602	604 NORTH	604 SOUTH	611	612 NORTH	612 CENT.	612 SOUTH	615 OUTSIDE	615 INSIDE	615 ZIP-ZAP
Polyurethane Gray	8010-01-100-9094								18	18				
Polyurethane Clear	8010-01-042-1004								4	4				
Polyurethane White	8010-00-181-8281								8	10				
Polyurethane Yellow	8010-00-181-8700			12										
Polyurethane Black	8110-00-181-8276			6	4					2		520		
Polyurethane Green Camo	8010-01-160-6742	300	200	60	750			250	3000	5000	1000	1600	6240	[illegible]
Polyurethane Black Camo	8010-01-131-6261			15	100				200	950	100			
Polyurethane Brown Camo	8010-01-160-6746				50				50	250	50			
Polyurethane Forest Green	8010-01-144-9881									140				
Polyurethane Sand	8010-01-131-6259				25				50	100	25	30	[illegible]	
Polyurethane White	8010-01-144-9672								2	5				
Epoxy Black	8010-00-472-7130													
Epoxy White	8010-00-082-2439								4	5		[illegible]	[illegible]	208
Epoxy Green	8010-01-212-1710								20	30				
Epoxy White	8010-01-160-0114								4	5	2			
Epoxy Orange	8010-00-948-6733			6										
Lacquer Gray	8010-00-292-3025	20	20	5	10			20	25	25	25			
Lacquer Black	8010-00-290-6159				8			12			4			
Enamel Gray	8010-00-526-2856		25					4			2			
Enamel Gray	8010-00-286-7731		20								2			
Enamel Gray	8010-00-298-2298		4											
Enamel Blue	8010-00-597-7844							3						
Ename White	8010-00-664-4761		8		1			5			1			
Enamel Yellow	8010-00-527-2057	4	4	1	2			1	5	5	5			
Enamel Green Forest	8010-01-123-9278				325	1000	1000	100	10	40	5			
O.D. Enamel	8010-00-577-4281													
Aerosol Black	8010-00-616-9143	1		1	5			1	12	28				
Aerosol White	8010-00-782-9356	1		1	4			1	4	7				
Aerosol Corrosion Compound	8030-01-132-6513								42					
Aerosol Gray	8010-00-616-9144				2				3	12				
Aerosol Olive	8010-00-598-5936	1			1			1			1			
Aerosol Zinc Chromate	8010-00-899-8825	1		1	1				1					
Zinc Chromate	8010-00-515-2211					1000	2000							
Metal Treatment white prim	8010-01-187-9820		50		15			15	50	100				
Metal Treatment Non-Skid	5610-00-782-5556								120					
Metal Treatment Metal Wash	8010-00-165-8577					260	260		30	30		1300	208	104
Metal Treatment Corr. Comp	8030-01-127-3683								10560					
Rust Primer														
Aircraft Thinner	8010-00-280-1751								1210	8250	1100			
Aircraft Thinner	8010-00-181-8079	150	100	60	200			300	100	200	160	2000	4675	106
Dope & Lacquer Thinner	8010-00-160-5788	150	100	60	150	300	450	300	100	100	50			208
Alcohol Thinner	6505-00-299-8095	5	5		10	150	150	15	10	10	5	780	1248	624
Solvent Thinner	6850-01-x77-3161								880					
Xylene thinner	6810-00-584-4070					800	1000					260	60	

BUILDING Nos.

612	612	612	615	615	615	647	647	647	647	647		ADDED
NORTH	CENT.	SOUTH	OUTSIDE	INSIDE	ZIG-ZAG	ROBOT	BAY-STY	PW.TRAIN	ZIG-ZAG	PRIME	691	SOLVENT
18	18										12	25% Aircraft Thinner
4	4										4	25% Aircraft Thinner
8	10										24	25% Aircraft Thinner
											34	25% Aircraft Thinner
	2		500									50% Xylene
3000	5000	1000	1560	6240	2080						2000	25% Aircraft Thinner
200	750	100									250	25% Aircraft Thinner
50	250	50									100	25% Aircraft Thinner
	140											25% Aircraft Thinner
50	100	25	30	60							50	25% Aircraft Thinner
2	5										7	25% Aircraft Thinner
											2	25% Aircraft Thinner
4	5		3120	12480	2080						5	25% Aircraft Thinner
20	30										20	25% Aircraft Thinner
4	6	2									4	25% Aircraft Thinner
												25% Aircraft Thinner
25	25	25									20	
		4									2	
		2										30% Xylene
		4										30% Xylene
												30% Xylene
												30% Xylene
		1										30% Xylene
5	5	5									4	30% Xylene
10	40	5						2000			35	30% Xylene
						2000	1800		1500	1500		30% Xylene
17	25										16	N/A
4	7										18	N/A
40											8	N/A
3	12											N/A
		1										N/A
1												N/A
						1300	1200	1300	1500	1500		50% Xylene
50	100										250	
120											180	25% Aircraft Thinner
30	30		1300	2080	1040						75	25% Alcohol
10560												N/A
							500					N/A
1210	1250	1100									1100	N/A
100	200	160	2000	4676	1080							N/A
100	100	50			2080	160	150	80	80	80	50	N/A
10	10	5	780	1248	624						20	N/A
800												N/A
			260	60		2000	1800	200	1500	1500		N/A

HAZ. WASTE GEN AND DISPOSED OF IN 1988

TOOELE ARMY DEPOT

1. Steel Grit. Blasting, Building 615 & 637, NSN 5350 00 271 5968, 8,750 galllons, Density: 15.54 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

2. Sodium Hydroxide, Parts Cleaning, Bldg. 615 & 637, NSN 6850 00 935, 2,850 gallons, Density: 13.33 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

3. Glass Bead Blast, Blasting, Bldg. 604, 611, and 600, NSN 5350 00 935 7697, 750 gallons, Density: 20.66 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

4. Polyurethane Paint Sludge, Painting, Bldgs 615, 637, 647, 691, 604, 612, 609, 611, and 602, NSN 8010 01 160 6742, 17,000 gallons, Density: 3.33 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

5. Enamel Paint Waste, Painting, Bldgs 637, 609, 647, and 691, NSN 8010 1 123 9278, 1,750 gallons, Density: 8.996 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

6. Paper Filters, Paint Booths, Bldgs 612, 615, 691, 604, and 637, NSN 130 00 087 7305, 10,700 gallons, 90-Day Yard, EMO Lot, Picked up by USPCI.

7. Plating Solution, Metal Shop, Bldg 608, NSN 6850 01 064 1687, 1,500 gallons, Density: 9.746 lbs/gals, 90-Day Yard, EMO Lot, Picked up by USPCI.

8. Carburetor Cleaner, Clean Parts, Bldg 637, NSN 2945 00 x 79 1203, 150 gallons, Density: 9.704 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

9. Sump Sludge, Bldgs 637, 602, and 604, 350 gallons, 90-Day Yard, EMO Lot, Picked up by USPCI.

10. Carbon Removing Compound, Cleaning, Bldgs 615, 637, and 612, NSN 6850 00 550 7453, 6,100 gallons, Density: 10.83 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

11. W/O #1 Acid Waste, Cleaning, Dip Tanks, Bldg 615, NSN 6850 00 X77 3164, 1,200 gallons, Density: 9.16 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

12. Aluminum Brightener, Cleaning, Bldgs 615 and 637, NSN 6850 01 X84 7043, 350 gallons, Density: 9.496 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

13. Phosphoric Acid, Stripping, Bldgs 615 and 637, NSN 6850 00 551 9577, 100 gallons, Density: 11.66 lbs/gal, 90 Day Yard, EMO Lot, Picked up by USPCI.

14. Paint Stripper, Stripping, Bldg 615, NSN 8010 545 3508, 450 gallons, Density: 10.16 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

15. Silicone Brake Fluid, For Brakes, Bldgs 619 and 602, NSN 9150 01 102 9455, 250 gallons, Density: 8.06 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

16. Sulfuric Acid, Bldg 605, NSN 6810 00 893 8138, 100 gallons, Density: 10.70 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

17. Corrosion Preventive Compound, Bldg 612, NSN 8030 01 127 3683, 500 gallons, Density: 7.1055 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

18. Polyurethane Paint Chips, Paint Booth Cleaning, Bldgs 691, 615, 602, 612, and 647, NSN 8010 01 160 6742, 3,250 gallons, Density: 11.7 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

19. Turbine Oil, Used in Engines, Bldg 600, NSN 9150 00 681 5999, 50 gallons, Density: 8.25 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

20. Trichlorethane, Cleaning, Bldg 611, 615, 637, 602, 612, 647, 594, 691, and 600c, NSN 6810 00 551 1487, 5,750 gallons, Density: 11.13 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

21. Poly Thinner, Painting, Bldgs 600, 612, 615, 609, 691, 602, 611, 647, 637, and 604, NSN 8010 00 181 8079, 4,750 gallons, Density: 7.4554 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

22. Lacquer Thinner, Painting, Bldg 605, 594, and 647, NSN 8010 00 160 5788, 150 gallons, Density: 6.85 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

23. Walnut Grit, Blasting, Bldg 617-B, NSN 5350 00 X71 4071, 11,500 gallons, Density: 7.08 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

24. Paint Dust, Bldgs 615, 637, and 612, 250 gallons, 90-Day Yard, EMO Lot, Picked up by USPCI.

25. Smut Go, Stripping, Bldg 615, NSN 6850 00 X77 4070, 1,300 gallons, Density: 9.996 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

26. Brass Brightener, Bldg 615, 6 gallons, 90-Day Yard, EMO Lot, Picked up by USPCI.

27. Gasoline, Bldgs 600, 619, 611, and 691, 200 gallons, 90-Day Yard, EMO Lot, Picked up by USPCI.

28. Enamel Alkyd, Bldg 691, NSN 8010 00 664 4761, 50 gallons, Density: 9.163 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

29. Latex Paint Waste, Bldg 615, NSN 8010 01 X84 4291, 150 gallons, 90-Day Yard, EMO Lot, Picked up by USPCI.

30. Toluene, Bldg 520, NSN 6810 00 1627, 50 gallons, Density: 0.866 lbs/gal, 90-Day Yard, EMO Lot, Picked up by USPCI.

1. Thermal Furnace Ash, Bldg 600, 50 gallons, 90-Day Yard, EMO Lot, Picked up by USPCI.

2. Accelagold, Bldg 615, NSN 6810 01 X84 4251, 2,850 gallons, 90-Day Yard, EMO Lot, Picked up by USPCI.

HILL AIR FORCE BASE RAIL SHOP

1. Primer Surfacer, Filling sand scratches, Bldg 1701, NSN 8010 00 X77 8883, 6 gallons, DRMO, Picked up by USPCI.

2. Enamel EMD Gray, Spray finishing metal on Army Gen. Plants, Bldg 1701, NSN 72915 8133054, 5 gallons, DRMO, Picked up by USPCI.

3. Polyurethane Enamel Yellow, Spray Finishing metal on Locomotives, Bldg 1701, NSN 8010 00 181 8292, 6 gallons, Density: 7.772 lbs/gal, DRMO, Picked up by USPCI.

4. Polyurethane Enamel Blue, Spray Finishing on Air Force Locomotives, Bldg 1701, NSN 8010 00 839 5663, 2 gallons, DRMO, Picked up by USPCI.

5. Enamel Reducer, Thinning Enamel Paints, Bldg 1701, NSN 8010 00 558 7027, 10 gallons, Density: 6.364 lbs/gal, DRMO, Picked up by USPCI.

6. Epoxy Primer Thinner, Thinning Epoxy Primers, Bldg 1701, NSN 8010 01 212 1704, 24 gallons, DRMO, Picked up by USPCI.

7. Polyurethane Reducer, Thinning Polyurethane paints, Bldg 1701, NSN 8010 00 181 8079, 6 gallons, DRMO, Picked up by USPCI.

8. Primer Zinc Chormate, Priming Non-ferrous metals, Bldg 1701, NSN 8010 00 515 2211, 12 gallons, Density: 9.913 lbs/gal, DRMO, Picked up by USPCI.

9. Polyurethane Eng. Black, Spray finishing metal on locomotives, Bldg 1701, NSN 8010 00 X87 5251, 24 gallons, DRMO, Picked up by USPCI.

10. Epoxy Primer, Priming metal parts, Bldg 1701, NSN 8010 01 187 9820, 2 gallons, DRMO, Picked up by USPCI.

11. Polyurethane Enamel Green, Spray finishing metal, Bldg 1701, NSN 8010 01 160 6742, 2 gallons, DRMO, Picked up by USPCI.

12. Enamel Black, Spray finishing locomotive parts, Bldg 1701, NSN 8010 00 297 0591, 60 gallons, Density: 9,246 lbs/gal, DRMO, Picked up by USPCI.

13. Enamel O.D., Spray finishing parts, Bldg 1701, NSN 8010 00 290 6648, 5 gallons, DRMO, Picked up by USPCI.

14. Enamel Gray, Spray finishing parts, Bldg 1701, NSN 8010 00 286 7731, 24 gallons, Density: 8.663 lbs/gal, DRMO, Picked up by USPCI.

15. Primer Red Oxide, Priming Loco's & parts, Bldg 1701, NSN 8010 00 290 4078, 24 gallons, Density: 6.672 lbs/gal, DRMO, Picked up by USPCI.

16. Bituminous, Sealing roofs on Navy generator & Army, Bldg 1701, Bldg 1701, NSN 8030 00 709 3327, 5 gallons, Density: 8.080 lbs/gal, DRMO, Picked up by USPCI.

17. Wash Primer, Pretreatment of bare metal, Bldg 1701, NSN 8030 00 281 2726, 12 gallon, Density: 7.997 lbs/gal, DRMO, Picked up by USPCI.

18. Enamel Reducer, Thinning enamel paints, Bldg 1701, NSN 54636RHK179, 12 gallons, DRMO, Picked up by USPCI.

19. Lacquer thinner, Thinning lacquer paints & primers, Bldg 1701, NSN 3010 00 160 5789, 120 gallons, Density: 6.789 lbs/gals, DRMO, Picked up by USPCI.

20. Lacquer Acid Resistant Black, Painting Battery Compartments, Bldg 1701, NSN 8010 00 290 6158, 1 gallon, DRMO, Picked up by USPCI.

21. Tar Base (Liquid Plastic) Roof coating, Sealing roof seams on Navy generators, Bldg 1701, 2 gallons, DRMO, Picked up by USPCI.

22. Enamel O.D., Spray finishing Army generator parts, Bldg 1701, NSN 8010 00 577 4381, 10 gallons, DRMO, Picked up by USPCI.

23. Enamel Reducer, Thinning enamel paints, Bldg 1701, NSN 8010 00 812 2800, 36 gallons, DRMO, Picked up by USPCI.

24. Enamel reducer, Thinning enamel paints, Bldg 1701, NSN 8010 00 935 9889, 36 gallons, DRMO, Picked up by USPCI.

25. Denatured Alcohol, Cutting films on safety glass, Bldg 1701, NSN 6810 00 543 7415, 12 gallons, Density: 6.664 lbs/gal, DRMO, Picked up by USPCI.

26. Epoxy Primer, Spray priming metals, Bldg 1701, NSN 8010 01 193 0517, 6 gallons, DRMO, Picked up by USPCI.

27. Sand Blast Grit Abrasive Grain, Sandblast operations, Bldg 1704, NSN 5250 00 276 6123, 16,800 lbs, DRMO, Picked up by USPCI.

28. Sodium Hydroxide, Alkaline hot tank cleaning operation, Bldg 1701, 20450 lbs, Density: 8.722 lbs/gal, DRMO, Picked up by USPCI.

29. Primer Zinc Chromate, Priming Non-ferrous metals, Bldg 1701, NSN 8010 00 X77 3446, 6 gallons, DRMO, Picked up by USPCI.

30. Stoddard solvent, Cleaning electrical parts, Bldg 1701, NSN 6850 00 264 9039,1200 gallons, Density: 6.497 lbs/gal, DRMO, Picked up by USPCI.

31. Tuner Renu C1610, Cleaning of small electrical parts, Bldg 1701, NSN 6850 00 X82 4166, 18 gallons, DRMO, Picked up by USPCI.

32. Tuner Renu C240, Cleaning of small electrical parts, Bldg 1701, NSN 6850 00 X82 4168, 3 gallons, DRMO, Picked up by USPCI.

33. Electronic Products Degreaser & Wash PH200, Cleaning of small electrical parts, Bldg, 1701 NSN 6650 00 X86 7983, 3 gallons, DRMO, Picked up by USPCI.

34. Electrical Contact Cleaner Sprayon 2002, Electrical contact cleaner, Bldg 1701, NSN 6850 00 X87 4453, 3 gallons, DRMO, Picked up by USPCI.

35. Crystal Clear 1301 Krylon, Protectant coating after cleaning electrical parts, Bldg 1701, NSN 8010 00 990 7289, 4.5 gallons, DRMO, Picked up by USPCI.

36. Insulating Red Paint, Spray insulation of electrical parts, Bldg 1701, NSN 5970 00 785 4098, 3 gallons, DRMO, Picked up by USPCI.

37. Insulating Varnish Red, Spray insulation of electrical parts, Bldg 1701, NSN 5970 00 167 1564, 3 gallons, DRMO, Picked up by USPCI.

38. Trichlorothane 1,1,1, Parts degreasing & cleaning, Bldg 1701, NSN 6810 00 551 1487, 500 gallons, Density: 11.004 lbs/gal, DRMO, Picked up by USPCI.

Date 26 MAY 89

Firm Name TOOELE ARMY DEPOT
Mail Address TOOELE, UTAH 84074 Zip
Plant Address Zip
Contact Person DAVID WOODWORTH Title Environmental Engr. Tel 833-3504
General Nature of Business Storage and Maintenance of Military Equipment

NEDS

	County	No. Employees	Land Area	Township/Range	Normal Operation		
					Hr./Day	Day/Wk.	Wk./Yr.
ele	Tooele	≈ 4,000	≈50,000 Acres		10	4	52

Form 1. STACK OR VENT INFORMATION Stack heights & diameters are estimates

Point Source Identification Number	Date of Last Complying Stack Test	Height (ft)	Exit Diameter (ft)	Temperature (°F)	Flow Rate (ACFM)	Moisture Content
513 P	–	20	3	65-75		
594 P2	–	UK	UK	65-75		
[illegible]	–	22	4	65-75		
[illegible]	–	22	4	65-75		
601 P	–	19	1.5	65-75		
[illegible]	–	33	2.5	65-75		
[illegible]	–	20	4	65-75		
[illegible]	–	20	4	65-75		
[illegible]	–	25	3	65-75		
[illegible]	–	18	2	65-75		
[illegible]	–	19	2	65-75		
[illegible]	–	18	2	65-75		
[illegible]	–	18	2	65-75		
[illegible]	–	20	4	65-75		
[illegible]	–	20	[illegible]	65-75		
615 P6	–	20	4	65-75		
620 P1	–	20	4	65-75		
647 P1	–	40	3	65-75		
647 P2	–	40	3	65-75		
647 P3	–	40	3	65-75		
647 P4	–	40	3	65-75		
647 P5	–	40	3	65-75		
691 P1	–	33	3	65-75		
692 P2	–	33	3	65-75		
1721 P	–	20	3	65-75		
1375 P	–	20	3	65-75		

Date 26MAY89
Firm Name TOOELE ARMY DEPOT
Mailing Address TOOELE, Utah 84074

Form 2. CONTROL EQUIPMENT

[illegible]	Primary Control Code Number	Secondary Control Code Number	Combined Collection Efficiency	EMISSIONS (Tons/Year)							% Total Emissions from Breakdown/or Maintenance/Control						Method of Calculation
				Particulates	Uncontrolled (Office Use Only)	SO_x	NO_x	HC	CO	Other Specify	Particulates	SO_x	NO_x	HC	CO	Other Specify	
[illegible]	000	000	000	–		–	–	1.327	–	–	–	–	–	–	–	–	AP-42
[illegible]	"	"	"	–		–	–	0.150	–	–	–	–	–	–	–	–	"
[illegible]	"	"	"	–		–	–	0.150	–	–	–	–	–	–	–	–	"
[illegible]	"	"	"	–		–	–	0.150	–	–	–	–	–	–	–	–	"
[illegible]	"	"	"	–		–	–	0.150	–	–	–	–	–	–	–	–	"
[illegible]	"	"	"	–		–	–	0.150	–	–	–	–	–	–	–	–	"
[illegible]	"	"	"	–		–	–	0.169	–	–	–	–	–	–	–	–	"
[illegible]	"	"	"	–		–	–	[illegible]	–	–	–	–	–	–	–	–	"
[illegible]	"	"	"	–		–	–	0.600	–	–	–	–	–	–	–	–	"
[illegible]	"	"	"	–		–	–	[illegible].500	–	–	–	–	–	–	–	–	"
[illegible]	"	"	"	–		–	–	18.667	–	–	–	–	–	–	–	–	"
[illegible]	"	"	"	–		–	–	1.563	–	–	–	–	–	–	–	–	"
[illegible]	"	"	"	–		–	–	1.358	–	–	–	–	–	–	–	–	"
[illegible]	"	"	"	–		–	–	1.600	–	–	–	–	–	–	–	–	"
[illegible]	"	"	"	–		–	–	5.570	–	–	–	–	–	–	–	–	"
[illegible]	"	"	"	–		–	–	0.150	–	–	–	–	–	–	–	–	"
[illegible]	"	"	"	–		–	–	4.155	–	–	–	–	–	–	–	–	"
[illegible]	"	"	"	–		–	–	5.500	–	–	–	–	–	–	–	–	"
[illegible]	"	"	"	–		–	–	15.834	–	–	–	–	–	–	–	–	"
[illegible]	"	"	"	–		–	–	18.775	–	–	–	–	–	–	–	–	"
[illegible]	"	"	"	–		–	–	12.150	–	–	–	–	–	–	–	–	"
[illegible]	"	"	"	–		–	–	6.150	–	–	–	–	–	–	–	–	"
								91.431									

a : 26MAY89
: Name TOOELE ARMY DEPOT
ailing Address TOOELE, Utah 84074

orm 2. CONTROL EQUIPMENT

	Primary Control Code Number	Secondary Control Code Number	Combined Collection Efficiency	EMISSIONS (Tons/Year)							% Total Emissions from Breakdown/or Maintenance/Control						Method of Calculation
				Particulates	Unregulated (Office Use Only)	SO_x	NO_x	HC	CO	Other Specify	Particulates	SO_x	NO_x	HC	CO	Other Specify	
[illegible]	000	000	000	—		—	—	2.600	—	—	—	—	—	—	—	—	AP-42
[illegible]	"	"	"	—		—	—	2.000	—	—	—	—	—	—	—	—	"
[illegible]	"	"	"	—		—	—	1.090	—	—	—	—	—	—	—	—	"
[illegible]	"	"	"	—		—	—	0.500	—	—	—	—	—	—	—	—	"
[illegible]	"	"	"	—		—	—	2.570	—	—	—	—	—	—	—	—	"
[illegible]	"	"	"	—		—	—	[illegible]	—	—	—	—	—	—	—	—	"
[illegible]	"	"	"	—		—	—	35.315	—	—	—	—	—	—	—	—	"
[illegible]	"	"	"	—		—	—	1.398	—	—	—	—	—	—	—	—	"
[illegible]	"	"	"	—		—	—	54.84[illegible]	—	—	—	—	—	—	—	—	"
[illegible]	"	"	"	—		—	—	13.376	—	—	—	—	—	—	—	—	"
[illegible]	"	"	"	—		—	—	13.376	—	—	—	—	—	—	—	—	"
[illegible]	"	"	"	—		—	—	24.025	—	—	—	—	—	—	—	—	"
[illegible]	"	"	"	—		—	—	67.115	—	—	—	—	—	—	—	—	"
[illegible]	"	"	"	—		—	—	22.460	—	—	—	—	—	—	—	—	"
[illegible]	"	"	"	—		—	—	7.200	—	—	—	—	—	—	—	—	"
[illegible]	"	"	"	—		—	—	0.250	—	—	—	—	—	—	—	—	"
[illegible]	"	"	"	—		—	—	2.316	—	—	—	—	—	—	—	—	"
[illegible]	"	"	"	—		—	—	8.096	—	—	—	—	—	—	—	—	"
[illegible]	"	"	"	—		—	—	19.650	—	—	—	—	—	—	—	—	"
[illegible]	"	"	"	—		—	—	0.500	—	—	—	—	—	—	—	—	"
[illegible]	"	"	"	—		—	—	13.650	—	—	—	—	—	—	—	—	"
[illegible]	"	"	"	—		—	—	13.625	—	—	—	—	—	—	—	—	"
								362.213									

Date 26 MAY 89
Firm Name TOOELE ARMY DEPOT
Mailing Address TOOELE, Utah 84074

Form 2. CONTROL EQUIPMENT

Point Source Identification Number	Primary Control Code Number	Secondary Control Code Number	Combined Collection Efficiency	EMISSIONS (Tons/Year)							% Total Emissions from Breakdown/or Maintenance/Control						Method of Calculation
				Particulates	Uncontrolled (Office Use Only)	SO_x	NO_x	HC	CO	Other Specify	Particulates	SO_x	NO_x	HC	CO	Other Specify	
[illegible]	000	000	000	—		—	—	8.950	—	—	—	—	—	—	—	—	AP-42
[illegible]	″	″	″	—		—	—	11.450	—	—	—	—	—	—	—	—	″
[illegible]	″	″	″	—		—	—	11.450	—	—	—	—	—	—	—	—	″
[illegible]	″	″	″	—		—	—	6.150	—	—	—	—	—	—	—	—	″
[illegible]	″	″	″	—		—	—	10.725	—	—	—	—	—	—	—	—	″
[illegible]	″	″	″	—		—	—	12.500	—	—	—	—	—	—	—	—	″
[illegible]	″	″	″	—		—	—	1.705	—	—	—	—	—	—	—	—	″
[illegible]	″	″	″	—		—	—	[illegible]	—	—	—	—	—	—	—	—	″
[illegible]	″	″	″	—		—	—	1.327	—	—	—	—	—	—	—	—	″
										—	—	—	—	—	—	—	″
										—	—	—	—	—	—	—	″
										—	—	—	—	—	—	—	″
										—	—	—	—	—	—	—	″
										—	—	—	—	—	—	—	″
										—	—	—	—	—	—	—	″
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										—	—	—	—	—	—	—	″
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										—	—	—	—	—	—	—	″
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										—	—	—	—	—	—	—	″
										—	—	—	—	—	—	—	″

49.062

Σ = 503.0[illegible]

Date 26 MAY 89
Firm Name TOOELE ARMY DEPOT
Mailing Address TOOELE, UTAH 84074

Form 3. PROCESS INFORMATION

Point Source Identification Number	Process Equipment Description	Raw Materials	Thru Put (Units/Yr.)	% Annual Thru Put				Average Actual Production Rate (Units/hr.)	Design Rate (Units/hr.)	Operating Time Number of Hours /Yr
				Winter	Spring	Summer	Fall			
129P	Gasoline Dispensing	Gasoline	132,710 gal	25	25	25	25	64 GPH	–	2080
507P1	Solvent Tank	Stoddard Solvent	75 gal	20	30	30	20	–	–	"
507P2	" "	" "	75 gal	20	30	30	20	–	–	"
509P	" "	" "	75 gal	20	30	30	20	–	–	"
510P	" "	" "	75 gal	20	30	30	20	–	–	"
511P	" "	" "	75 gal	20	30	30	20	–	–	"
512P	Gasoline Dispensing	Gasoline	60,982 gal	25	25	25	25	29 GPH	–	"
513P	Spray Paint Booth	Paint, Thinner	300 gal	25	25	25	25	–	–	"
514P1	Solvent Tank	Stoddard Solvent	2000 gal	20	30	30	20	–	–	"
514P2	Spray Paint Booth	Paint, thinner	1,000 gal	25	25	25	25	–	–	"
[illegible]	Vapor Degreaser	1,1,1 Trichloroethane	4450 gal	20	30	30	20	–	–	"
[illegible]	Spray Paint Booth	Paint, thinner	650 gal	25	25	25	25	–	–	"
[illegible]	" " "	" "	543 gal	25	25	25	25	–	–	"
[illegible]	Solvent Tanks(5)	Stoddard Solvent	800 gal	20	30	30	20	–	–	"
602P	Spray Paint Booth	Paint, thinner	228 gal	25	25	25	25	–	–	"
602P1	Solvent Tank	Stoddard solvent	75 gal	20	30	30	20	–	–	"
602P2	Paint Booth	Paint, thinner	1663 gal	25	25	25	25	–	–	"
604P1	Solvent Tanks(6)	Stoddard Solvent	2150 gal	20	30	30	20	–	–	"
604P2	Solvent Tank	1,1,1 trichloroethane	3900 gal	20	30	30	20	–	–	"
604P3	Paint Booth	Paint, thinner	3510 gal	25	25	25	25	–	–	"
604P4	" "	" "	4800 gal	25	25	25	25	–	–	"
607P	Solvent Tanks(5)	Stoddard Solvent	75 gal	20	30	30	20	–	–	"
608P	" " (25)	" "	1300 gal	20	30	30	20	–	–	"
609P	Spray Paint Booth	Paint, thinner	1000 gal	25	25	25	25	–	–	"
611P1	Solvent Tank	1,1,1 trichloroethane	1500 gal	25	25	25	25	–	–	"

Date 26 MAY 89
Firm Name TOOELE ARMY DEPOT
Mailing Address TOOELE, UTAH 84074

Form 3. PROCESS INFORMATION

Point Source Identification Number	Process Equipment Description	Raw Materials	Thru Put (Units/Yr.)	% Annual Thru Put				Average Actual Production Rate (Units/hr.)	Design Rate (Units/hr.)	Operating Time Number of Hours/Yr
				Winter	Spring	Summer	Fall			
[illegible] P2	Solvent Tank	Stoddard Solvent	250 gal	20	30	30	20	—	—	[illegible]
6[illegible] P2	Paint Booth	Paint, thinner	1020 gal	25	25	25	25	—	—	[illegible]
612 P1	" "	" "	16,523 gal	25	25	25	25	—	—	[illegible]
612 P	" "	" "	15,327 gal	25	25	25	25	—	—	[illegible]
612 P3	" "	" "	2,537 gal	25	25	25	25	—	—	[illegible]
615 P1	Solvent Tank	1,1,1 Trichloroethane	19,00[illegible] gal	20	30	30	20	—	—	[illegible]
615 P2	Stripping Tank	Methylene Chloride	4,100 gal	20	30	30	20	—	—	[illegible]
[illegible]	" "	" "	4,100 gal	20	30	30	20	—	—	[illegible]
605 P	Paint Booth	Paint, thinner	9610 gal	25	25	25	25	—	—	[illegible]
605 P2	" "	" "	26,8[illegible] gal	25	25	25	25	—	—	[illegible]
[illegible]	" "	" "	8,[illegible] gal	25	25	25	25	—	—	[illegible]
[illegible]	Solvent Tank	Stoddard Solvent	3,600 gal	20	30	30	20	—	—	[illegible]
[illegible] P1	Paint Booth	Paint, thinner	100 gal	25	25	25	25	—	—	[illegible]
679 P	Gasoline Dispensing	Gasoline	231,571 gal	25	25	25	25	111 GPH	—	[illegible]
637 P1	Stripping Tank	Methylene Chloride	2530 gal	20	30	30	20	—	—	[illegible]
637 P2	Solvent Tank	1,1,1 Trichloroethane	18[illegible] gal	20	30	30	20	—	—	[illegible]
637 P3	Solvent Tank(s)	Stoddard Solvent	250 gal	20	30	30	20	—	—	[illegible]
697 P1	Paint Booth	Paint, thinner	5460 gal	25	25	25	25	—	—	[illegible]
697 P2	" "	" "	5450 gal	25	25	25	25	—	—	[illegible]
697 P3	" "	" "	3580 gal	25	25	25	25	—	—	[illegible]
697 P	" "	" "	4580 gal	25	25	25	25	—	—	[illegible]
697 P	" "	" "	4580 gal	25	25	25	25	—	—	[illegible]
697 P	Solvent tank	Stoddard Solvent	75 gal	20	30	30	20	—	—	[illegible]
691 P1	Paint Booth	Paint & thinner	4290 gal	25	25	25	25	—	—	[illegible]
691 P2	" "	" "	5000 gal	25	25	25	25	—	—	[illegible]

Date 26 MAY 89
Firm Name TOOELE ARMY DEPOT
Mailing Address TOOELE, UTAH 84074

Form 3. PROCESS INFORMATION

Point Source Identification Number	Process Equipment Description	Raw Materials	Thru Put (Units/Yr.)	% Annual Thru Put				Average Actual Production Rate (Units/hr.)	Design Rate (Units/hr.)	Operating Time Number of Hours /Yr
				Winter	Spring	Summer	Fall			
1221R	Paint Booth	Paint, thinner	690 gal	25	25	25	25	—	—	2[illegible]
13751	" "	" "	450 gal	25	25	25	25	—	—	[illegible]
5129P	Gasoline Dispensing	Gasoline	132,705 gal	25	25	25	25	—	—	[illegible]

DISPOSITION FORM

For use of this form, see AR 340-15, the proponent agency is TAGO

REFERENCE OR OFFICE SYMBOL	SUBJECT
SDSTE-MAE-S	Rust Eliminator Study

THRU Dir/Maintenance
Dir/Engrg & Logs

FROM 68 Actg Chief, Pdn Engrg Div

DATE 11 January 1989

CMT 1

Mr. Webster/paf/3148

TO Chief, Env Mgmt Ofc

1. Request your office review the attached rust eliminator study and provide comments.

2. Specifically, are the figures and findings correct as far as you can determine?

3. Request a response by 19 January 1989.

Encl

Pete Kearns
PETER M. KEARNS
Acting Chief, Production Engineering Division

SDSTE-ELE (200 1.6) Rust Eliminator Study

Ch, Prod Eng Div Ch, Env Mgmt Ofc 23 January 1989
Mr. Vance/nlf/3504

1. Except for the following items the information in the study is correct to our knowledge:

a. Rust Eliminator may be a hazardous waste after use because of EP Toxicity (heavy metals concentrations). The assumption that the disposal costs for Rust Eliminator will be negligible may be erroneous. The phosphoric acid is not contaminated with heavy metal before use. It is assumed by this office that the metals contamination is a result of use.

b. After the Industrial Wastewater Treatment System came on line, it was found ~~[illegible]~~ that phosphoric acid could <u>not</u> be sent to the facility.

2. POC for this information is Jay Vance, Environmental Management Office, ext. 3504.

CPT Pat Endres
Chief, Environmental
Management Office

Subject: Rust Eliminator Testing

To: FED
From: ESB

1) Reason for testing: Requested to provide an initial test to determ
efficacy of replacing Phosphoric Acid Dip in Metal Cleaning Areas with a
proprietary mixture called "Rust Eliminator".

2) Test procedure:
a. Distillation tank in Building 600C was used to run test.
- test conducted at 194F ± 1 degrees F.
- items tested were as follows:

ITEM	CONDITION	TIME
Cover plate 1040 steel #4,#5 (these are identifying numbers)	interior scale	5 min: 50% removal of scale 10 " : 30% remaining 15 " : 10% " 25 " : approx 50 deep pockets remaining rinsed, let dry: upon inspection noted interior flash rust.
Brake shoe Cast iron #6	surface scale	5 min: slight reduction 10 " : " " 15 " : 30% remaining 25 " : 20% remaining
Thin sheet 1040 #1	light surface rusting	5 min: clean surface appearanc rinsed, let dry: upon inspection noted flash rust equal to that e perienced with Phosphoric Acid
Derusted Cast item already thru NaOH line #2	black oxide coating	5 min: color lightened rinsed, let dry: upon inspection noted light flash rust
Cast gear item #8	heavy rust	10 min: little change 20 " : 50% reduction 45 " : cleaned equal to presen rinsed, let dry: upon inspection noted light flash rust
Brake drum Cast #7	heavy scale rust	5 min : little change 10 " : little change 40 " : cleaned equal to presen rinsed, let dry: upon inspection noted light flash rust
1040 steel #3	light rust	5 min : 50% reduction 15 " : cleaned equal to presen
Cast item #9	light rust	5 min : 50% reduction 15 " : cleaned equal to present

3) Economics

	Phosphoric Acid	Rust Eliminator
Cost per Gallon to acquire	$1.05	$30
Yearly cost to charge tanks	$6825	$30000
Cost per Gallon to dispose of	$1.86	Note 1
Yearly cost to dispose of	($16338.24)	Note 2
Present flow of parts	NaOH dependent	NaOH dependent
Temperature tank heated to - see note 3	180F ± 10	190 ± 10
Flash Rust Inhibition	10 days	Note 4
Metal removal - see note 5	50 to 60 mg	50 to 60 mg
Level of rework after processing	< 5% if indoors	Note 6

Note 1: Assuming that the disposal cost of "Rust Eliminator" would be negligible after neutralization. With the low pH, it is not possible to landfill this material without neutralization, regardless of constituent (violation of land ban). Also, concluded that due to location in the stripping process there would be the same level of metal contamination a Phosphoric Acid presently receives.

In addition, the present disposal cost of Phosphoric Acid should curtail as this is one of the materials that we will be able to treat in house via the water treatment plant. This is per the EMC, Jay Vance, a FE, Bob Kinsinger.

Note 2: As stated in Note 1, this is assumed to be negligible. A longer period of testing will need to be accomplished to verify the manufacturer claim of "unlimited tank life". Due to the consideration o drag out and material remaining on the surface of parts, adding water wi eventually dilute the solution. In the event that the "Rust Eliminator" materials is a hydrated salt, additional consideration needs to be extended to the amount of matgerial being removed from processed parts a the possibility of corrosion stress being induced. Only initial testing completed to this point.

Note 3: Due to the present temperature controllers, there would not be significant energy savings accomplished.

Note 4: Presently, rework on parts stored inside due to rusting is negligible (less than 5%). Further, parts are normally stored less tha days indoors before surface coatings are applied (the constraint here is storage space). However, parts that are stored outside (especially in conjunction with 604) are apt to experience rework (at time in excess o 25%).

At the present time it is impossible to verify the manufacturer s claim that this rusting would be inhibited. Testing is underway to prov or disprove this aspect. Exposure is being made of the above tested and coated parts. However consideration must be given to the fact that flas rusting occurred after treatment to some degree on the tested parts. (Level was comparable to what is presently experienced with Phosphoric Acid.)

Note 5: This determination was made comparing new Phosphoric Acid at strength and operating conditions used in 615 and 637 to "Rust Eliminator". Temperature was as noted above. This is an approximate first analysis.

Note 6: Parts that are stored inside are generally stored for less tha five days (due to space constraints) before painting. These parts rare contribute to a rework problem. Rework occurs in conjunction with part that are stored outside (such as at 604) during wet periods (this enhar rusting). At this point, rework is estimated to be 25 per cent.

4) Conclusions: The application that was being considered here was t substitution of the deruster, Rust Eliminator, for the presently used Phosphoric Acid material. Due to the fact that the Sodium Hydroxide treatment (which serves as a coating remover and deruster) for the ferr metal parts is the bottle neck in the processing, no direct time saving will be accomplished by substituting "Rust Eliminator" for Phosphoric Acid. The only savings that may be realize with the "Rust Eliminator" material would possibly be a decrease in the amount of rework of items exposed to the environment. This is being actively explored. but this study will take some time, depending on exposure conditions. One othe question that may be of significance is the quality control in the formulation of the material. The proported pH in the literature is 2. .2; however, laboratory analysis indicated a pH of 1.7.

This brings up the consideration of rework. How much monetary savings could be achieved through a reduction of rework to present items or fla rust prevention. Based on the data gathered at this point, the level c rework due to subsequent process flash rusting or inadequate initial treatment is as high as 25%, but only during periods of incliment weath (precipitation). As a result, the figures indicate that the material "Rust Eliminator" must be tested further in this area and prove out favorably to be considered any further from an economic standpoint. At this point, considering cost, covered storage areas are also suggested be considered.

The bottom line of this study is that the "Rust Eliminator" would need have a life of at least four years to be economic (added in a labor fac and downtime on the metal processing line to arrive at this) with the premise that the waste treatment plant will be able to accomodate disp of used process Phosphoric Acid. The only other rationale for purchase this material would be very favorable results on inhibition of rusting during extended time outdoors during incliment conditions.

FOLLOW UP ON PREVIOUS 3 [illegible] REPORT

Performed follow up on "Rust Eliminator". The items that I had placed outside to weather had faired no better than those conventionally treated (Phosphoric Acid). Cannot be optomistic about this product.

Due to the performance I noted in rust prevention, it is my opinion that "Rust Eliminator" not be used to replace Phosphoric Acid. Further, request if there is any desire by managment for further testing, please inform ~~director~~. direction.

HAZEL THOMAS