

FROM (NAME & LOCATION) J. F. Queeny Plant

DATE : December 29, 1970

SUBJECT : Aroclor Loss - Status Report

REFERENCE : Report 9/21/70

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* Summary only.

SUMMARY

PCB type Aroclors have been used or handled in four departments and the Research Pilot Plant at JFQ. Total annual losses have already been reduced from 21,500 lbs. to 14,000 lbs. via interim and permanent measures taken at a cost of \$3,000.

A program has been developed which, if fully implemented, would essentially eliminate all normal losses to the environment by 8/1/71 at a cost of approximately \$35,000.

Comments on the program by 1/15/71 are solicited.

The program is summarized in Table I. Priorities are based on probability of loss and estimated cost of correction.

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TABLE I

Aroclor Status and Proposals

<u>Priority</u>	<u>Problem Area</u>	<u>Est. Loss lbs./yr.</u>	<u>Source of Loss</u>	<u>Possible Actions</u>	<u>Status</u>	<u>Est. \$</u>	<u>Timing</u>
1	TSCl Nash Pump	6000	Seal fluid Sep. & Demist. Drains	Drain header connected to disposal drum.	complete	500	-----
2	"W" Bldg.	1000	Vapors, pump leaks, jacket steam outs.	Change fluid to Thermal - 66	complete	2000	-----
3	TSCl Heaters (2)	2500	Vapors, pump leaks.	a. Switch to T-66, inert system, or b. Switch to A-1242 pan pumps, cold trap vent.	Topping with 4000 A-1242. Awaiting completion of 4500 compatibility study of T-66 with TSCl.	Compatibility results by 12/31/ 70. PAFE by 2/1/71.	
4	Phthalyl Chloride	1000	Vapors pump leaks.	Switch to A-1242, permanent pump pan, pressurize system, vent condenser.	Topping with 1500* A-1242. Temp drip pan 500** proj. scope ready.	PAFE by 1/21/71.	
5	W Bldg. Leader Unit	8000	Vapors, pump leaks, steam out of jackets.	Clean system. Switch to A-1242 cold trap vent new type pump curb area.	Unit currently \$3,000 down. Top with A-1242. Major pump overhaul unsuccessful.	Investigate by 3/1/71. PAFE by 4/1/71.	

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6	W Bldg. Yard unit	small	Vapors, pump leaks, steam out of jackets.	Switch to A-1242. Cold trap vent Pan pump. Install chg. pump.	Unit currently down top with A-1242. Pump in good condition.	7000	Investigate by 3/1/71. PAFE by 4/1/71.
7	CLHS	3000	Pump leaks, hose drainage, piping leaks.	PCB containing Aroclors will be eliminated from all blends by 4/1/71. J. R. Savage memo of 9/23/70. PAFE for new unloading pump submitted.		2500	PAFE #10691 submitted 12/10/70.
8	W Bldg. Centerunit	0	Not in use.	Isolate to prevent use. Dismantle	down ---	500 2500	6/1/71. Defex.

* Total PAFE of \$5000 expected. Justification is primarily to prevent corrosion of vessel and jacket.

** Interim measure taken.

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FUTURE WORK

1. Continue to define details of changes required for the leader and south yard units servicing the "W" Building.
2. Proceed with program as outlined, or as modified to meet needs based on information received from addressees.

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I. INTRODUCTION

PCB's containing Aroclors are extremely stable and highly inert fluids and as such were considered to be a safe fluid. Recent evidence, however, indicates that PCBs have an adverse effect on the environment. Since aroclors are only slowly degradable through natural means there is concern over their buildup in the environment. Aroclors in the 1200 series are of primary concern. The higher the number, the more resistant is the fluid to bio degradation.

To protect the environment Monsanto has established a self imposed limitation of PCB losses to the waste effluent of 10 ppb. In addition, volatile losses to the atmosphere are to be essentially eliminated.

The purpose of this report is to relate the interim and permanent steps taken to date to reduce PCB losses to the environment and to invite comments on measures proposed to obtain a further and permanent reduction in losses.

II. DETAILS

A. General

An inspection of the Aroclor using facilities at TSCI, Phthalyl Chloride, "W" Building and the Research Pilot Plant ("WW" Bldg.) was made. Technical advice and recommendations were obtained from D. E. Roush of the Fluids Group. Discussions were held with Department Supervision and alternate solutions to the elimination of PCB losses to environment were presented and a course of action chosen. A final decision in TSCI can not be made until the outcome of a compatibility study is complete.

Interim and permanent measures where immediately feasible have been taken.

B. Departments

1. Research Pilot Plant

Two portable high temperature fluid heating systems have been employed in this facility. A third unit has just been obtained. Although the units originally used Therminol 77, Aroclor 1248 was substituted many years ago and its use continued. Fluid losses have been incurred from pump leaks and steaming of vessel jackets to the sewer when changing heating or cooling medium, and vaporization.

Alternate solutions for the WW problems were:

1. Continue with Aroclor fluid. Estimated cost \$6000.
 - a. Switch to Aroclor 1248 because it is more biodegradable.
 - b. Provide large drain pans under pumps.
 - c. Cold trap vent to prevent volatile losses.
 - d. Provide for trapping of effluent steamed from vessel jackets.
2. Change to non PCB containing fluid. Estimated cost \$2000.
 - a. Switch to Therminol 66.
 - b. Inert the systems to prevent oxidation and eliminate the fire hazard.

A meeting was held with Dr. Knapp and Mr. H. Close of the Research Pilot Plant to discuss the alternates proposed. Alternate #2 was recommended to and accepted by Research as the best overall solution. Since Therminol 66 contains no PCB, future concern over such losses from this facility will be eliminated. Dr. Knapp agreed to complete the changes required before the next startup of heating systems (12/18/70).

2. TSCl

a. Nash Compressor - HCl system

Aroclor 1232 is used as the sealing fluid for the Nash Compressor in the HCl system. Losses are estimated at 6,000 lbs. annually. Aroclor builds up regularly in the system's instrumentation and is drained periodically to the pump's catch pan. The drain line from the Brink's demister joins the pump pan drain. This line formerly ran directly to the sewer. The line has been altered so that the drainings are now caught in a drum. Full drums are marked "Aroclor for Incineration" and sent to WCK for storage.

HCl from TSCl is used in the manufacture of Bisphenol A. Samples of Bisphenol A have been submitted to Research to determine whether any PCB's are present. Analytical problems have been encountered by Research. New laboratory facilities have just been completed which are expected to provide reliable results. Analysis of the BPA sample is expected by year end.

A search was conducted for a substitute fluid for the Nash Compressor, but no satisfactory material could be found. Bisphenol A manufacture is scheduled to cease at JFQ by the end of 1971. At this time it may be possible to alter the HCL system to eliminate the Nash Compressor and thereby eliminate the use of Aroclor.

b. Heating Units - Two

Two heating systems employing Aroclor 1248 are in use. Annual losses total approximately 2500 pounds from these units. The bulk of the losses are the result of pump leaks. Some atmospheric losses are incurred as no conservation measures are employed on the vents.

As an interim measure the department is using Aroclor 1242 for loss makeup. Operating instructions have been modified and personnel instructed to exert extreme care in handling of Aroclor fluids to prevent inadvertent sewerage.

Alternate solutions to correct the problems with these heaters are:

1. Continue with Aroclor fluid. Estimated cost \$4500.
 - a. Switch fluid to Aroclor 1242.
 - b. Provide large drain pans for pumps.
 - c. Cold trap vents.
2. Change to non PCB containing fluid. Estimated cost \$4000.
 - a. Switch to Therminol-66.
 - b. Inert systems with CO₂.
 - c. Alter line from conservation vent and provide cold trap/flame arrester.

The alternates were discussed with the department supervisor Don Abresch and alternate #2 recommended. Mr. Abresch agreed with the recommendation providing that Therminol-66 was found to be compatible with the TSCL streams heated. A study has been requested of the TSD Process Group and results are expected by 12/31/71.

Both units are heated by 350 lbs. steam. The fluids are used at a maximum temperature of 205°C. While this temperature is above the flash and fire points of Therminol-66, inerting of the system with CO₂ should provide adequate fire protection. The auto ignition temperature of T-66 is 364°C or 120°C higher than temperature of the heating steam. Therefore instrument malfunctions cannot result in over heating of the fluid.

A PAFE for the necessary changes can be submitted by 2/1/71.

3. Phthalyl Chloride

This department has one Aroclor system used for both heating and cooling of a reactor. Heating is accomplished by the use of bayonet heater submerged in the agitated jacket. The fluid is circulated through an external heat exchanger for cooling of the reactor.

Losses are about 1000 lbs./yr. and are primarily from pump leaks. Atmospheric losses are estimated to be 69 lbs./yr.

Corrosion of the vessel has become a major problem. The corrosion is caused by the introduction of atmospheric moisture which causes the breakdown of Aroclor to form HCL at the temperatures used (300°C). The moisture is introduced by the breathing action taking place via the open vent as alternate heating and cooling cycles are employed.

Jacket maintenance costs from corrosion average \$1500/yr.

Corrective action is a necessity to prevent the loss of the \$15,000 reactor and consequent business interruption.

Interim actions have been taken to reduce the PCB loss and limit its effect on the environment. Aroclor 1242 is used to make up any fluid lost. A temporary drip pan at the pump packing gland has been provided. Operators have been instructed to take precautions against allowing Aroclor fluid to enter the waste effluent and operating instructions modified.

Two alternatives were developed to solve the combined PCB corrosion problem in this department. They are:

1. Continue with Aroclor fluid. Estimated cost \$5000.
 - a. Switch to Aroclor 1242.
 - b. Provide large drain pan for pump.

- c. Inert the system with N_2 and provide conservation vent.
 - d. Provide condenser on conservation vent.
 - e. Install rupture disc.
2. Change to non PCB containing fluid. Estimated cost \$5000.
- a. Switch to Therminol-66.
 - b. Inert the system with N_2 and provide conservation vent.
 - c. Provide vent condenser.

The alternatives were discussed with the department supervisor C. Schrock. Alternate #1 was chosen primarily for safety reasons. The use of electrical heating units in the jacket was the overriding consideration. Temperatures could exceed the auto ignition temperature. If the inerting system would fail, an explosive situation could result.

A PAFE will be submitted by 1/21/71, if no adverse comments are received.

4. "W" Building

The "W" Building has three Aroclor heater systems. The small homemade unit located in the center section is no longer used and will be isolated to prevent use.

The "yard" unit has an excellent maintenance record and addition of fluid is rare. The losses that do occur are from pump leaks and volatile losses through the open vent.

The principle source of loss for "W" Building operations is the leader unit located south of the "BBB" Building. Last year the pump seal failed on five occasions and accounts for the majority of the loss. In addition some volatile losses are incurred through the open vent.

A major overhaul of the pump was completed in November, but the seals failed within a week after startup.

All units are currently down. When operation is required only Aroclor 1242 will be used for makeup of losses. The manufacturing superintendent for the "W" Building, F. Copanas reports that current project forecasts indicate that only one heater will be required for the foreseeable future. Operations will be confined to the yard unit as long as only one heater is required.

Two basic alternatives for a permanent solution to the PCB losses from the two heaters were discussed with Messrs Sutherland and Copanas. One was to continue with Aroclor and the other to switch to Therminol-66. Both men objected to the use of Therminol-66 from a safety viewpoint. The fluids in both units are heated by open gas flame burners. A ruptured tube in the furnace would result in a fire. Special instrumentation would be required to sense the fire, shut off the gas and extinguish the fire automatically. Curbing to prevent the spread of burning fluid from the unit would also be required.

The stated auto ignition temperature of the fluid is somewhat lower when the material is soaked into insulation. Since the fluid is frequently heated to over 300°C, a leak into the insulation could result in a fire. System alterations for either Aroclor or Therminol-66 are in the same order of magnitude.

Although the steps required to be taken for the continued use of Aroclor fluids is still under investigation, the following changes are being considered.

1. Leader Unit. Estimated cost \$13,000.
 - a. Change fluid from Aroclor 1248 to 1242.
 - b. Provide new leakproof pump.
 - c. Cold trap vent.
 - d. Clean system.
2. Yard unit. Estimated cost \$7000.
 - a. Change fluid from Aroclor 1248 to 1242.
 - b. Provide system charging pump.
 - c. Provide sump pump.
 - d. Provide drip pan for pump.
 - e. Cold trap vent.
 - f. Partial roofing of area.
 - g. Clean system.

It is expected that a PAFE could be submitted for changes to both units by 4/1/71.

5. CLHS

The magnitude of PCB losses at CLHS are unknown, but are believed to be large. Mr. J. R. Savage in his memo of 9/23/70 stated that by 4/1/71 PCB containing Aroclors will no longer be handled in CLHS and that capital improvements cannot be justified on this basis.

Department supervision has been requested to exert care in preventing losses within equipment limitations. Mr. E. R. Reager has recommended a number of minor improvements to department supervision to minimize losses. The pollution group arranged a film presentation for all personnel involved for motivational purposes.

A PAFE has been submitted to replace the present Aroclor unloading pump which has always leaked badly. Prime justification for this project is not based on PCB losses, but on unloading capacity, safety and reduced repairs.

C. Sewer Sampling

Composite samples of the main effluent are submitted for PCB analysis each month. The reported results are:

<u>Month</u>	<u>ppb</u>
June	46
July	43.5
August	43.0
September	77
October	70
November	18.9

Analytical problems have been encountered by Research and the figures for September and October are open to question. New laboratory facilities have just been completed. The November results shown were obtained in the new facilities.

D. Volatile Losses

The volatile losses from the Aroclor unit in phthalyl chloride were calculated at 69 lbs./yr. Volatile losses from the other units are believed to be considerably less. No attempt to calculate or measure these losses was made since completion of the changes proposed in this report will essentially eliminate them.

A. E. Peterson
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