Monsanto

FROM W. B. PAPAGEORGE - ST. LOUIS

DATE SEPTEMBER 8, 1970

SUBJECT PCB ENVIRONMENTAL PROBLEM
AUGUST STATUS REPORT

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MARKETING:

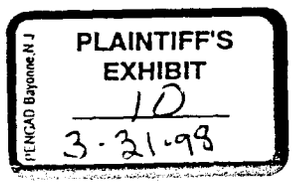
The withdrawal from the market of PCB containing Aroclors for plasticizer applications has been completed. All orders for these products which were received up through noon on August 31, 1970 were shipped. The only product area where we were left with an inventory was in the toluene blends of Aroclor 1254/1260/1262. The exact amount of the inventory will be determined the first week in September, however, it should be less than 20,000 pounds.

Orders for samples and small production runs have been placed for Aroclors 6040, 6050, 6062, and 6070. While it is certainly too early to predict the degree of success of our replacement program, it appears that some accounts have made significant progress in reformulating with Monsanto products.

Letters have been sent to Pydraul F-9 customers notifying them of the product reformulation. Production of F-9A is scheduled for the next required run.

NEMA has recommended that American National Standards Institute form a committee to provide guidance on PCB in the electrical industry. The committee will be made up of electrical equipment manufacturers, consumers, governmental agencies, and Monsanto. Purposes will be to:

1. Issue maintenance guides, proposed labeling instructions, etc.
2. Speed development of disposal systems.
3. Actively coordinate with international committees.



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ENGINEERING:

Waste Incineration - CEA 2415

An approved project scope report has been issued, and an appropriation request data transmittal was issued. Pre-approval funds were provided by the General Manager for definitive design and the purchase of long-delivery equipment. An incineration package was ordered, and definitive design is underway on the balance of the project.

Aroclor Distillation - CEA 2417

An approved project scope report has been issued, and an appropriation request data transmittal was issued. Pre-approval funds were provided by the General Manager for definitive design and the purchase of long-delivery equipment. Preparations are underway to clean, inspect, and dismantle the phthalic column and condenser at Chocolate Bayou. Definitive design is in progress.

Tributyl Phosphate - CEA 2371

This portion of the "New Phosphate Expansion Project for the E-E Building" has been isolated, and a separate preliminary project scope report was developed. This latter scope report has been issued for review and cost estimate.

p-Cumylphenol

An evaluation report was issued to members of the Business Group and others for review and comment.

N-C Phosphate

Work was deferred pending success in Research of a modified process and for breaking out the tributyl phosphate project CEA 2371. Based on new Research data, engineering work can be resumed when manpower is available.

EUROPE

The Norwegian Government has reportedly introduced controls whereby PCB will be placed on a restricted list. All users will have to be registered and will also need a permit to use PCB. We are seeking copies of the control regulation.

Meetings with the other West European PCB manufacturers have yielded a more positive response than anticipated. There is a good deal of sympathy for joint action following the North American pattern, and the implications of unilateral Monsanto action are appreciated. Timing is a problem and if they cannot act as quickly as us, then an acceptable compromise solution seems probably.

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EUROPE (continued)

Draft copies of the N.E.R.C. report on the Irish Sea incident have been sent to the various contributing bodies. We have not yet seen a copy and are seeking one.

JAPAN

No new developments.

MEDICAL

Reports on the chronic dog toxicity studies through the first year of the two-year project have been received. The reports on the rats have been delayed awaiting micropathology. The other projects, i.e. rat reproduction, chicken reproduction with 1242B, repeat fish toxicity studies, and the projects on MIPB and HB-40 are on schedule. Of particular interest, it may be noted that MIPB has been classified as "extremely irritating" to the skin as a result of the standard rabbit skin tests.

Three publications referring to research on PCB in the environment ("Toxicity to Mammalian Creatures and the Development of Protocol for Toxicity to Aquatic Animals") appeared in the May/June issue of the Bulletin of Environmental Contamination and Toxicology. Copies are being circulated.

PUBLIC RELATIONS

Use of our July 16 news release on PCB increased during August. Our practice of following up each PCB story with our news release -- to those media who did not receive the initial mailing -- seems to be paying dividends. The Booth Newspaper chain in Michigan

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PUBLIC RELATIONS: (continued)

was the first to run our release. Other major dailies include the Austin Statesman, Milwaukee Journal, San Francisco Examiner, Akron Beacon Journal, St.Louis Post-Dispatch and the St. Louis Globe-Democrat. Trade publications using the release were the Oil Daily, Chemical Week, OP&D and C&E News.

Work continues on a Monsanto Magazine article for the winter issue detailing our actions in solving the PCB problem.

RESEARCH

Carbonless Carbon Paper Solvents

The "happiness curve" for MIPB at NCR improved with favorable results from preliminary testing on odor, eye irritation and patch test irritation by their consultants, Hilltop Laboratories. More detailed tests are to follow, however, NCR have been supplied 10,000 - 12,000 lbs. of MIPB from Queeny Plant production in July and are preparing large quantities of commercial NCR paper for testing by their customers. Results from these latter tests are not expected for four months.

Meanwhile, as an emergency stop-gap measure if needed, NCR is anxious to qualify MIPB of a composition which would not require a fractionating column for production. We will supply this grade, along with additional orders for the regular grade MIPB from the next production run at the Queeny Plant.

Higher alkylated biphenyls (butyl thru $C_{6, 8, 10}$) have all given poor performance in print fade properties and are no longer of serious interest. NCR have initiated a fundamental study of the print fade problem. Our studies of print fade suggest that the problem is caused by light and excess solvent. Ways for minimizing or eliminating print fade are also under study in our laboratories.

Four additional solvent samples were sent to Nashua to zero in on the required viscosity and dye solubility in their equivalent of NCR paper.

We also agreed to supply NCR a sample of alkylated terphenyl (Santowax R) in order to provide an *in extremis* material for their evaluation.

Aroclor Replacements for Polysulfides

Our alternate replacement products have met mixed reaction in the field. Suggested blends of Aroclor 5460/S-261 or

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RESEARCH: (continued)

S-160 were rejected by Thiokol because of doubts concerning the use of any chlorinated aromatics. Other customers are evaluating suggested blends but have not yet finished reformulations. It is apparent that aggressive presentation of a new product (not simply a replacement) is needed at Thiokol. At present our best experimental candidate is B-phenoxyethyl benzyl phthalate. It is hoped that sufficient quantities for customer evaluation can be made in the near future.

MCS-1016

Drum lots of MCS 1016, (fractionated Aroclor 1242) were sent to G.E., Aerovox, Westinghouse-Bloomington and Pittsburgh, Sangamo, Cornell Dubilier, Hercules, Mitsubishi Monsanto, McGraw Edison, PR Mallory, Monsanto Ruabon, Sprague, Electronic Components for evaluation in capacitors. This new fluid removes Cl_5 and Cl_6 chlorinated biphenyl isomers to aid biodegradation. G.E. reports that 6-12 months will be required for full evaluation depending on assessing the degree of risk in making the new fluid substitution.

Aroclor 1242 Fractionation Column Bottoms

Aroclor distilled from Aroclor 1242 fractionation column bottom contains crystals when cooled to 20°C. Mass Spectrophotometry indicates that these crystals are tetra-chlorinated biphenyl. Aroclor 1242 bottoms containing the crystals were chlorinated to Aroclor 1254 and tested for insolubles. The laboratory produced Aroclor 1254 did not produce crystals after seeding and cooling to 0°C overnight.

Reclaim Aroclor

Jard #2 Aroclor 1242 was analyzed and proved satisfactory for reclaim into Pydraul 312. The material was free of low boilers with less than .01% hydrocarbon.

Krummrich began processing of Westinghouse-South Boston tank car Batch #1 material. This material was purified by batch distillation discarding the first 20% cut.

- Ruabon has followed reclamation of Pyranol 2 from BICC at Dalton to provide a reclaim service on electrical grade Aroclor in England.

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Removal of Aroclor 1221 and 1242 from Water Waste Streams -

A sand prefilter 3 1/2" diameter by 5 1/2" deep bed and a carbon bed are being evaluated to remove Aroclor from waste water at Anniston. The concentration of Aroclor was reduced from >1000 ppb to > 10 ppb by adsorption. Fifty gallons were passed through a 3 1/2" x 5 1/2" adsorbing bed before detecting > 1.0 ppb Aroclor.

NC Phosphate Ester

300 pounds of satisfactory product were produced by rewashing production trial material in the Pilot Plant. A trial washing run of production Batch 8 in the Podbelniak centrifuge at Baker Perkins was successful in eliminating emulsions. Soluble salts were 8 ppm.

However, two batches reworked in the pilot unit using tap water and longer hold and washing cycles had unsatisfactory O & C performance. Research doesn't know why the material is out of specification. 33,000 lbs. of material has not been successfully reworked because of lack of satisfactory rework process.

Pydraul 312 Line Replacements

Two reformulations of Pydraul 312 were investigated. The first contains Aroclor 5432, CDP, DIDA and petroleum oil. This fluid is slightly more FR than 312.

The second reformulation, without halogen, will depend on finding a solubilizing agent for oil and aromatic phosphate ester. Fatty acid esters are used in the D. A. Stuart DASCO FR 300.

Water-Glycol Fluids

A second production run was made on the water/glycol blends. No problems were encountered.

Aroclor - Environmental Program - St. Louis

The analysis of rat tissues (fat, kidney, liver and muscle) from the Industrial Bio-Test 30-day tissue collection study have been completed. The samples (72) were analyzed as outlined in Analytical Chemistry Method No. 70-1 and the PCB levels were estimated using the Aroclor fed as the standard. The results agreed very well with what is being observed environmentally, namely that the estimated PCB levels found in all tissues decreased as the degree of chlorination decreased (1260>1254>1242) and increased as the dietary level increased. The isomer distribution of all Aroclors fed were also markedly altered. A more detailed report has been issued.

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RESEARCH: (continued)

Several JFQ plant sewer water samples (4) were analyzed for PCB's. The N. trunk sewer contained less than 47 ppb, the S. trunk 147 ppb, a June composite sample from the main sewer effluent 46.0 ppb, and a July composite sample from the main sewer effluent, 43.5 ppb. In all cases, the PCB was identifiable as Aroclor 1248.

A second set of PCB/air samples (6) were analyzed for the Appleton Coated Paper Company. As in the past, the results were forwarded to them for interpretation.

Samples of mold sand used by Ford-Dearborn (2) and GMC-Pontiac (1) were analyzed for Aroclor 1242. The amounts found ranged from 80-1200 ppm.

The analysis of a variety of fish for PCB (31) collected during the semi-annual survey of the Choccolocco Creek have been completed and a report issued. A second set of fish samples (4) from this area are in hand and analysis of these will be completed this week.

PCB's have been observed in a number of carp and catfish (7) taken from the Mississippi river around Kimmswick, Mo. The levels found were, with one exception, in the low ppm range (>10 ppm).

Six (6) water samples from the JARD Company, Inc. have been analyzed for PCB's to establish if they have a significant effluent problem. PCB's were detected in all samples. A report is being written.

EC/GC support at the rate of 10 samples/day is being provided for the semi-continuous activated sludge degradation study of Aroclor 1130, 1242, 1254, and MCS 1016. These studies were started 8-10-70 and will run approximately 30-60 days.

A study to isolate and identify potentially toxic oxygenated impurities in Aroclors has been initiated. No compounds of this type have been observed in Aroclor 1260, Lot AK-3; detection limit ca 2 ppm. Higher levels of chlorinated naphthalenes have been observed. Aroclor 1242, Aroclor 1254 and the competitive product Pheneclor DP 6 will be investigated by this procedure.

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Environmental Studies - Ruabon

The NERC report on the Irish Sea Incident has not yet been published, but copies of the draft have been sent to the contributing bodies. We have now made a written request for a copy of this draft, but do not yet know whether this will be approved.

A further meeting on PCB analysis has been arranged by the Ministry of Agriculture, Fisheries and Food to take place late in September.

A paper has been prepared for presentation at the CIGRE conference in Paris this month on the PCB pollution problem as it affects the use of askarels in the electrical industry. This is intended to generate discussion amongst askarel users.

Biodegradation Testing - St. Louis

Testing of Aroclor 1242, Aroclor 1254, MCS 1016 and fractionated Aroclor 1330 in our semi-continuous activated sludge units is now in progress. These units are being fed at a daily rate of one milligram under identical conditions to permit a comparison between our present Aroclor products and the proposed substitutes. EC/GC analyses for the first weeks of operation have been completed except for calculations. River die-away tests are now being started on these same products.

Biodegradation - Ruabon

Thirteen day exposure of MCS 1016 to biphenyl-active soil culture (C_2) has produced considerable degradation of all major peaks in the chromatogram. Exposure will be continued to 83 days. Qualitatively it appears that degradation is greater than for Aroclor 1242, but identification and quantification of residues must be accomplished to provide adequate definition of the extent of degradation.

Thirteen day exposure of MCS 717 to C_2 shows considerable degradation. Qualitative judgement indicates more degradation than for Aroclor 1242. MCS 762 is also being examined.

Work on the key hexa and penta chlorinated isomers has continued using C_2. Increasing agitation has failed to induce degradation so far, but work in which lower chlorine isomers have been added to increase solubility, is in progress. The degradation of HB-40 is being assessed. Sample has been exposed to C_2. Analytical work is in progress, but the complexity of the chromatograms has caused some delay in interpretation.

Development of GLC techniques to provide greater selectivity in the analysis of PCB's is proceeding satisfactorily.

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MANUFACTURING

Anniston

Regulatory Action

In early August, the Alabama Water Improvement Commission informed the plant that FDA had furnished them with fish flesh analyses from samples taken in the Choccolocco-Coosa River Watershed, indicating appreciable levels of Aroclor as well as DDT metabolites. Mercury was also present at low levels. The plant's previous informational contacts with AWIC had prepared them for receiving this news. Due to a high level of public concern about a ban on fishing in some state streams having high mercury level, an intensive program was started immediately to correct remaining major Aroclor discharges. This program will be discussed with AWIC in September.

Current Level

Aroclor losses during August increased to a level of 7280 ppb in plant effluent, equal to 88 #/day. This increase corresponds to high turbidity of the effluent from limestone inert material as the settling capacity of the final acid treatment pit has deteriorated since last cleanout. Process research studies indicate that removal of solids will result in removal of Aroclor.

Plant Effluent Suspended Aroclor Control

The Aroclor department sump was put into service on August 12, three weeks ahead of target, and is controlling at the 100 ppb level in department effluent waters. Second phase is being separated and a high-Aroclor scum is being collected on sump surface. An experimental mechanical skimmer will be installed in September for evaluation in removal of this scum; tests with polyelectrolites in agglomerating this scum were not productive.

Final Effluent Treatment

July and August samples from Aroclor sources indicated that the final neutralization pit is now a major remaining source of plant effluent levels. Previous practice in pit cleanout has not been adequate to remove accumulated material, and limestone inert solids apparently are an effective adsorbent in the pit environment. A two phase program based on these facts is underway: 1) a second, uncontaminated pit will be put into service by mid-September to permit shutdown and decontamination of the permanent pit and to develop procedures for alternate operation cleanout without loss of neutralization or solids-settling capability. Concurrently, gross introductions

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MANUFACTURING: (continued)

of Aroclor into the sewer system are being stopped with the Aroclor department sump, new operating and housekeeping procedures, and cleanout of potential collection points in the sewer system. This program is targeted for mid-September completion and should reduce plant effluent to the 200-300 ppb level that is seen in source point water phase analyses. An initial reduction in water use - 100 gpm out of 700 gpm has been accomplished through a checkoff list.

Longer term, immediate steps are being taken to develop feasibility and costs of effluent solids-Aroclor reduction through continuous coagulation and clarification. Major vendors in the water treating field are being consulted with a final proposal targeted for December 1. Six projects for water reduction and improved housekeeping are underway and are being expedited.

1. Installation of concrete pads and curbs in major spill areas to replace chat.

2. Reuse water in Aroclor department still jets and blow-tank scrubbers (reduce water-Aroclor contact target - 100 gpm).

3. Reuse water in Muriatic Acid department fume scrubbers and absorber final scrubber and divert acid sewer through Aroclor department sump. (Reduce water-Aroclor contact target - 100 gpm).

4. Upgrade HCl off-gas organics removal system to improve efficiency.

5. Provide a collection system for carbon tower spent carbon to prevent spills to sewer.

6. Further water reductions by re-routing Parathion phosphoric acid wastes.

Bulk Waste Disposal

Data has been gathered on all solid materials to be collected and disposed of. This data has been reviewed and will serve as the basis for scoping a collection system and incinerator. A report will be issued in September on the use of fuel oil to dilute Montar for improvements in handling and pumping for incineration.

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MANUFACTURING: (continued

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PCB Levels in Sewer

Current losses to the river are about 30 to 35 #/day.

WGK laboratory is now training analysts in routine analysis of PCB's in sewer samples. This should be completed by September 4 at which time 3 to 4 samples/day will be analyzed.

One of the two chromatograph detectors was found faulty and has been returned to the manufacturer for repair. Although the instrument is operable on the remaining detector, some instrument time loss is experienced.

Projects to Reduce Sewered PCB's from Aroclor Department

Blow tank demister (Est. 2031) design package completed. Project construction will begin in September. Process Amendment has been prepared and is being circulated for approval.

Estimate being prepared for about $30,000 to provide paving, curbs, trenches and catch basin in tank car and tank truck loading areas.

Aroclor Incineration

Estimate 2292 for $7,419 capital and $4,700 expense submitted. Project will privide 150,000 gallons of storage for waste PCB's until incineration facilities are started up. Two to three weeks will be required to complete this project after approval is received. At this time, no bulk aroclors are being dumped at the sanitary landfill.

PCB Levels in Atmosphere

Report published which covered points of loss. It was pointed out that most severe vapor losses were from Therminol units in Depts. 239, 245, 248 and 255. To spur action, a meeting was held on August 17 with Bill Papageorge and Don Roush to give general philosophy and technical assistance to those responsible for correcting these problems.

Target date of 9/1 for obtaining samples has been missed. A special grade of toluene is needed for the sampling device and should be received during the week of 8/31. We should still meet our target date of 9/15 for setting air emission targets for Dept. 246 and the plant.

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MANUFACTURING: (continued)

Newport

Removal of Suspended Aroclors from Plant Effluent

Installation of sump level alarms now 80% complete.

Analysis of Newport plant effluent for PCB between July 1 and August 5 showed an average level of 374 ppb, with a range from less than 10 ppb to 2,500 ppb. The higher figures are thought to be due to leaks and spills and are still under investigation.

374 ppb of PCB is equivalent to approximately 3.74 lbs./day.

Spills

Drip trays have now been provided under seals of Santotherm pumps on 4NDPA plant. Work Orders have been issued for the installation of a bunded area around these pumps.

Atmospheric Emission

Preliminary Progress Report No. SQ 10306 issued. A list of twelve points to be sampled has been drawn up. Analysis work will be started as soon as the necessary sampling apparatus has been made up. The points to be sampled, and the expected levels of PCB are:

	Source	Estimated Loss
1.	Santotherm expansion tank 4NDPA plant	0.5 lbs./day
2.	Santotherm expansion tank Santolube 900 plant	0.5 lbs./day
3.	Aroclor F.P. storages	1 lb./day
4.	Still bottoms area	Anticipated to be in range 1 to 5 mg/m^3 of PCB concns.
5.	Chlorination circulating pumps	
6.	Chlorination operation floor	
7.	Tanker and tote bin loading shed	Anticipated to be in range 1 to 5 mg/m^3 PCB concns.
8.	Still ejector exhaust	
9.	Drumming off area	
10.	Lime tank area	
11.	Plant Office	
12.	Analytical special Pdts. Lab.	

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MANUFACTURING: (continued

Aroclor Bulk Deliveries

Bulk Off-loading Procedure now in the hands of Marketing and Distribution Departments.

Used Drum Disposal

Discussions held with drum reconditioning company to evaluate setting up of official used Aroclor drum disposal service for Aroclor users. A visit is planned to the cleaning/ reconditioning plant to inspect their effluent treatment and incineration facilities and monitor trials to be sure that the operation will not result in PCB pollution emissions.

W. B. PAPAGEORGE

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