Monsanto

FROM (NAME & LOCATION): W. B. PAPAGEORGE - ST. LOUIS

OCTOBER 6, 1970

cc H. S. Bergen
J. Mason
J. E. Springgate

PCB ENVIRONMENTAL PROBLEM
SEPTEMBER STATUS REPORT

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M. W. Farrar - 2nd Street
E. V. John
R. E. Keller - 2nd Street
R. M. Kountz
T. L. Gossage
P. S. Park
W. R. Richard
J. R. Savage
E. P. Wheeler

GENERAL:

Performance against the PCB plan was reviewed with the CMC on September 14. Overall the committee was satisfied with the progress which has been made and complimented the various departments in the Division who have been involved in the action. However, it was emphasized that we must continue to emphasize to all remaining users of PCB's the importance of preventing escape to the environment and we must ensure that these warnings are fully documented so that they will support the action we have taken in this area should we become involved in legal actions.

Two variances from the original plan were requested and approved:

1. NCR - As the customer has proved unwilling to commit himself to a take or pay contract, it was agreed that we can go ahead on the basis of producing MIPB in existing equipment or using toll manufacturing facilities ensuring that a satisfactory level of profitability is maintained. The emphasis here was to phase 1242 out of NCR formulations as soon as possible.

2. It was recognized that good progress is being made in reformulating industrial/hydraulic fluids and that it was not easy to completely replace PCB's with alternate material. In view of the progress made, an extension of a further three months (i.e. end first quarter 1971) was granted to enable

EXHIBIT NO. 701
10/1/92 KG

TRAN 003105

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us to reformulate those products still containing Aroclor 1242. It was emphasized, however, that this would be the last extension granted and if we are not successful in reformulating, it will be necessary to discontinue the business in spite of the significant gross profit involved.

Preparations are underway to test the disposal of solid waste contaminated with Aroclors in Enviro-Chem Systems pilot unit in St. Charles, Mo. Solid wastes from transformer and capacitor manufactures will be introduced into the unit during the week of October 12.

Negotiations are continuing with Rollins-Purle, Inc. to establish their capabilities and cost of incineration of liquid Aroclor waste.

MARKETING:

The withdrawal of Aroclor plasticizers from the market appears to have been completed with very few loose ends. Only a couple of companies have called claiming that they had not heard of our withdrawal, and to date these inquiries have not caused any significant problems. Our distributors are well on their way to zero inventories of the Aroclors, having pretty well matched their purchases from Monsanto with firm orders from their customers. It does not appear that there will be any extensive returning of unsold materials.

Orders for the products which will replace the withdrawn Aroclors in the market are starting to come in. It will be several months before substantial volumes are being sold, however, as most companies have some inventory of the old products in stock. Two major items of information indicate that the replacement program is progressing well. The first is that 3M has replaced Aroclors 1254 and 4465 with Aroclor 5442 in five product lines in the Industrial Tape and Electro Products Division. The second is that Thiokol states that Santicizer 261 now has the inside track ahead of all other products including chlorinated paraffins as a replacement for Aroclors 1254 and 1260.

ENGINEERING:

Waste Incineration - CEA 2415

Design is in progress both internally and at John Zinck's. Approval drawings for the incinerator are expected the week of October 7.

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Aroclor Distillation - CEA 2417

Definitive design is in progress. Because of recent decisions by Corporate and Division Management, marketing forecasts for MCS 1016 have been reduced. Accordingly, elements of the project are being reviewed with the idea of reducing the scope of work.

Tributyl Phosphate - CEA 2371

The project scope report is being reviewed by the plant. The II building explosion and subsequent related work has delayed this plant review. A preliminary estimate has been developed. Timing of the project has become critical so pre-approval funds will be requested for engineering and commitment of long-delivery equipment.

N-C Phosphate

Although Research has had success in bench scale operation, it has been decided to prove out the process in the E-E building at JFQ. Thus, the latest schedule for having process assurance is March 1971. Project development will not be resumed until after the process is proven.

EUROPE:

An informal meeting was held with the Directors of some of the voluntary societies, e.g. British Trust, for Ornothology, and they expressed considerable satisfaction at the responsible attitude adopted by Monsanto in Northern America and the U.K.

The N.E.R.C. REPORT on the Irish Sea incident is now expected to be published November/December.

We have been promised a copy of the latest draft.

Further contact with the other European manufacturers has not yet yielded agreement on when or how to act and it has not yet been possible to arrange a decision-making meeting with them.

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MEDICAL:

The latest status reports on the dog and rat chronic feeding studies, rat reproduction studies and chicken toxicity, reproduction and residue studies were reviewed with representatives of the National Institute of Environmental Health Sciences, Bureau of Commercial Fisheries Laboratory, Food and Drug Administration, U.S. Department of Agriculture and the Patuxent Wildlife Research Center.

PUBLIC RELATIONS

The July news release, stating our position to withdraw from certain PCB markets, was used in whole or in part by 13 more major newspapers. Total to date is 22. As the month closed, plant management at Pensacola speculated Monsanto may be sued by the Southeast Fisheries Association, Inc. for polluting Escambia Bay with PCB. At this writing, the suit has not been filed. A preparedness statement was drafted for use by the Plant Manager, should a suit develop.

RESEARCH:

Carbonless Carbon Paper Solvents

NCR now seems more committed to MIPB-2 as replacement for Aroclor 1242. It appears that an additional 100,000 lbs will be required for full scale trial with a "firm" answer expected late 1970 or early 1971.

Assistance has been provided the plant in preparing for the upcoming run of MIPB. An amendment was written to allow the manufacture of a MIPB containing higher (1.5 vs. 0.6) ratios of propylene to biphenyl. The most recent information indicates that this higher ratio material will not be needed by NCR.

Manufacturing is searching for a location to make larger quantities of MIPB.

Nashua likes a blend of Aroclor 5442/HB-40-1/4 as a dye solvent even though its viscosity is above their "upper limit". Three more blends are being sent them to help zero in on the proper ratio.

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Print fade on Nashua Clay coated paper is caused by light (as with NCR paper) but not by excess solvent. Use of a resin or rubber to extract excess solvent (beneficial in NCR paper) is harmful in the Nashua system.

Hydrogenation of the aliphatic double bond in AMS Dimer (liquid) eliminates most of the odor and reduced print fade, making this a very good hydrocarbon solvent.

Acute toxicity tests show the mono and dichlorinated AMS Dimer to be comparable to Aroclors of corresponding viscosities. The solid and liquid AMS Dimers and isopropyl biphenyl like HB-40 are "practically non-toxic" (or safe) but are noticeably more irritating to rabbit skin. Twenty four hour patch tests on one person showed no irritation from any of these materials.

Industrial Hydraulics

The removal of Aroclor 1242 from all Pydrauls will require reformulation of A-200, 281, 540, 312, 230, 135, 150, MCS 153 and MCS 974. The Pydraul 312 reformulation is farthest along. Fire resistance of the new formulation is greater than the fire resistance of Pydraul 312. Performance in the V-105C was excellent. Samples were sent to Ford for evaluation.

It will be desirable to make the hydraulic fluid application into a closed loop system. We cannot expect to stop leaks but we can expect to minimize contamination of water by (1) minimizing run-off to sewers; (2) treating contaminated water by adsorption (Anniston had no detectable PCB after passing through a limestone bed); (3) recycling adsorbents to remove Aroclor by squeezing, by extraction or by devolatilization-destruction.

Aroclor Pollution Study - Anniston

In the 13 day pilot run, initial concentrations of 1000-8000 ppb Aroclor in waste water were reduced to a range of 0-15 ppb upon passing through a series of packed carbon beds[1] at an average flow rate of 25 cc/min. Over 99% of Aroclor removal occurred in the prefilter. This unusual reduction is believed to be due to the filtration of solid on which Aroclor was adsorbed. In tests run at higher flow rates (0.5 gpm/ft.^{2}) through the prefilter, these plugged the prefilter. The study is presently being divided into two phases: 1) feasibility studies for continuous solids (with Aroclor) removal from limestone pit effluent and 2) carbon adsorption from the clear stream at the Aroclor sump.

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There was a temporary delay in the shipment of the pilot adsorption unit.[2] Start-up is now targeted for 9/23.

[1] The adsorber consisted of a prefilter (3.5 inch diameter tube packed to 5.5 inch bed depth) and a series of one (1) inch diameter columns packed to a total bed depth of 13.5.

[2] Pittsburgh Carbon (Calgon Division) rental unit containing pumps, 5 inch diameter columns, etc.

Determination of Polychlorinated Biphenyl Residues in Rats from 30 day Aroclor feeding Studies

One of the more significant objectives of the Aroclor-Environment program has been to develop a more complete picture of what occurs to Aroclor products once they are released to the ecosystem. The importance of this information is two fold, first it can be used to guide the development of a more "degradable" Aroclor product and secondly, the general methods developed to study the current Aroclor products can be used to determine the degree of control that must be exercised over the replacement products to avoid similar problems with these materials in the future.

As a part of achieving this overall objective, Industrial Bio-Test Laboratories was requested to carry out a 30 day tissue collection study in albino rats with Aroclor 1242, Aroclor 1254 and Aroclor 1260. This report deals with the subsequent analysis of these tissues for residual PCB's.

Summary: The results of this study demonstrate that the residual PCB levels in all tissues decreased significantly as the degree of chlorination and the dietary exposure level of the material fed decreased. Additionally, it was observed that the amount of isomeric alteration increased as the degree of chlorination decreased resulting in the fact that the major PCB isomers retained by the rats fed Aroclor 1242 were those predominantly present in Aroclor 1254 and Aroclor 1260. There were no significant differences in the type of isomeric alteration from tissue to tissue or between sexes.

Aroclor - Environmental Program - St. Louis

Preliminary testing by the National Water Quality Laboratory at Duluth, Minnesota of the tolerance of fish and fish food organisms (survival and reproduction) to our Aroclor products has indicated that Aroclor 5442 is much more toxic to Daphnia than any of the PCB's. Eleven reserve samples of production Aroclor 5442, one of which was used in test, have been received from Anniston to determine if

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any water soluble tramp component(s) could be responsible for the alleged increased toxicity. Initial results indicate that the pH of the water used to extract and/or solubilize the Aroclor 5442 is not changed; however, a number of EC active components can be isolated from the water extracts via a hexane extraction. An attempt will be made to identify these components.

A meeting was held to review the status of the residue analysis of the Bio-Test Laboratories tissues. It was agreed that the work should proceed and that in terms of current priorities the tissues from the chronic rat study should be done first, followed by the fish toxicity study, and then by the chronic chicken study. Provisions have been made for shipment of the rat tissues and fish samples to Monsanto.

Arrangements have also been made to have samples of fish from the semi-annual Anniston area survey and samples of shrimp from three locations around our Pensacola collected, quick frozen and shipped to St. Louis for confirmatory residue analysis.

Environmental Studies - Ruabon

The paper entitled 'Askarels - Environmental Pollution' was presented at the CIGRE conference in Paris. This was welcomed by the delegates as a useful guide to good practice and suggestions were made for wider publication. A modified version of this paper is being made available for the PCB conference organized by the Swedish National Environment Protection Board at Stockholm on Sept. 29.

The draft of the report on the deaths of sea-birds on the Irish Sea is now being made available to Monsanto, but we have not yet received a copy.

Biodegration Testing - St. Louis

Functional Fluids

Testing of Aroclor 1242, Aroclor 1254, MCS 1016 and fractionated Aroclor 1130 in our semi-continuous activated sludge units is continuing. Calculation of ED/GC analyses for the first five weeks of operation have been completed. Due to the high degree of scatter in the data, no conclusions can be made at this stage concerning differences in biodegradation rates. The source of the scatter is currently being investigated. One of the units has been equipped with a stirrer to determine if agitation is a significant factor.

Five additional units are now being added to our setup to permit simultaneous testing of a greater number of products. Testing of trichlorobenzene, Arobromchlor 1232, and Gulf 200

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Bright Stock will be started shortly. Testing of the chlorinated terphenyls, e.g., Aroclor 5432, is awaiting the development of the necessary analytical methodology.

Several enrichment tests involving biphenyl-acclimated sludge and nutrient feed withdrawal are also planned.

Plasticizers

A three-day sampling of the HB-40 and mono-isopropyl biphenyl (MIPD) semi-continuous activated sludge units nine weeks after the previous sampling period has shown significant changes in the biodegradation rates. For MIPB, disappearance rates for the three days by UV analyses were 75, 70 and 77 per cent compared with the mean of 67 per cent in the previous sampling period. GC analyses indicate that the predominant mono-isopropyl biphenyl components are almost completely degraded during the cycle, leaving as the undegraded portion the dialkylated components. For HB-40, the previous sampling period had shown essentially a zero disappearance rate with a high degree of scatter. During the three-day period, disappearance rates of 54, 52 and 58 per cent were found. From GC analyses, it appears that the one-ring hydrogenated components are more readily degradable than the two-ring hydrogenated components.

Feeding of the MIPB and HB-40 is continuing. An additional sampling period is planned to determine if any further significant changes will occur.

Five additional units are now being added to our setup to permit simultaneous testing of a greater number of products. Testing of Aroclor 1221 will be started in one of the new units.

Biodegradation Testing - Ruabon

In the presence of lower chlorine isomers and biphenyl we appear to have succeeded in degrading the key hexachlorinated isomer with the biphenyl-active soil culture C_2, but the penta-chlorinated isomer has not degraded under these conditions. Work is being initiated to check whether any of the "non-degradable" isomers (e.g. 4-4'dichlorbiphenyl) can be degraded under these more severe conditions.

The sensitivity of the analytical technique used was not high enough to show conclusively whether HB-40 was degraded by C_2. This is being repeated using a higher concentration.

Progress continues in the development of GLC-Mass Spectrometry techniques to allow identification and quantification of residues remaining after prolonged biodegradation tests on various products.

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MANUFACTURING

Anniston Plant

PCB Levels In Snow Creek

Average PCB loss for the month was high at 2600 ppb or 32 lbs/day, largely as a result of one very bad day (400 lbs). Contributing causes were:

1. The old limestone pit was overloaded and solid sludges were carried through,
2. Detergent cleaning of the department,
3. Sewering of excessive amounts of muriatic acid.

Since the new limestone bed was placed in service on September 23, pit effluent has been at 0-3 ppb PCB's. However, leaching of PCB's from the creek bed results in a plant effluent level of 90 - 240ppb or 1.1 - 2.8 lbs/day, gradually declining. The plant believes that the new pit can handle ordinary upsets and peak loads.

Regulatory Action

Telephone contact continued with the Alabama Water Improvement Commission. However, a planned meeting did not take place due to illness of AWIC members. Pressure for routine submission of analytical data is not intense at this time.

Department Suspended Aroclor Control

An experimental skimmer operated very well removing the PCB laden scum which accumulates in the new sump.

Solid Wastes

Solid waste data for evaluation of disposal methods has been accumulated. A report will be issued in October.

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W. G. Krummrich Plant

PCB Levels In Sewer

Current losses to the river from the treatment plant range from 12 to 742 ppb with an average loss of 311 ppb for 11 samples. This is an equivalent average loss of 71.5 lbs/day.

Projects To Reduce Sewered PCB's From Aroclor Department.

Blow Tank Demister (Estimate 2031) project construction is underway with completion scheduled for October. A Process Amendment was approved.

Project for about $30,000 to provide paving, curbs, trenches and catch basin in tank car and tank truck loading areas will be added to the incineration project to speed approval.

Program To Eliminate Sewered PCB's From Using Departments

Departments 243 and 244

Plans are to replace the Therminol FR-1 with Therminol 55. Lab work has been conducted to verify that there is no reaction between Therminol 55 and any process materials. Engineering is underway on system modifications required for use of Therminol 55. Target date for changeover is 12/1/70.

Department 245

The major problem here is air pollution from the supply tank vent. Our target is to scope a solution and prepare an estimate by 11/1. Changeover to a different fluid is undesirable in this department due to the high fire potential.

Department 251

No work has yet been done on the lubrication and hydraulic type systems in this department.

Department 239

Work is in progress to develop project premise. We expect to eliminate two pumps and a cooler in the Therminol lines. (Pending results of thermal stability of Santophen 1 residue). The project will include a new expansion tank with submerged

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W. C. Krummrich Plant

Department 239 (Cont'd)

pump. We also plan to upgrade controls and make furnace operation more reliable. How to sump the area around potential spills is still unresolved. To go to a flammable heat transfer fluid is considered too great a process safety hazard in this area.

Department 255

Plans are to replace FR-2 with Therminol 66 by 11/15/70.

Department 248

No progress has been made to date. A definite plan will be developed by 11/1/70 with the objective of solving any problems by 1/1/71.

Department 258 (DDS)

The unit is still down and most likely will not be started up again. The material on the pad has been removed.

Department 270

A 55-gallon drum has been placed under the vent. Chat soaked with Aroclor around the furnace must still be replaced.

Department 275

A 55-gallon drum must still be placed under the vent line (the vent will have to be shortened to do this). Chat around the furnace still needs to be replaced.

Department 273

Work completed: Drum placed under surge tank vent. Buckets placed to collect material from drip pans under Therminol circulating pumps.

Department 222

Unit in start-up. No visible source of loss observed.

Estimate 2292 will be revised. This is the project to provide 150,000 gallons of storage for scrap Aroclor. A plant level earnings expense estimate will be prepared

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W. G. Krummrich Plant

Department 222 (Cont'd)

to cover the cost of altering the storage tanks. The 4,000 gallon trailer originally used to haul Aroclors to Queeny Plant will be used for scrap Aroclor hauling in the plant.

PCB Levels In Atmosphere

Vapor losses from the Aroclor Department are estimated at 2.3 #/day now and 1.6#/day after the installation of the blow tank demister.

1. Scrubber Stack (from blow tank drowning jet) 0.90#/day

   This is a measured quantity. With installation of the demister and closing the batch blow tanks, air flow should be decreased to about 20% of present flow. Assuming the concentration to be the same, loss would be reduced to ~0.2#/day.

2. Fume Removal Stack (from drowning area and sampling stations) 0.03#/day

   This is an estimated quantity based on most vapors coming from the drumming station and assuming 10,000,000 #/year drummed, and 1242 vapor pressure at 80°C. Samples are being taken to verify.

3. Aroclor Transfers Within Department 1.34#/day

   This is an estimated quantity assuming 70M #/year production and 2.5 transfers/pound at 100°C. Samples will be taken at storage vents to verify.

4. Steam Jets - unknown

   Will be measured.

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W. G. Krummrich Plant

PCB Rework Project (Estimate 2095)

Phase II	Construction sufficiently complete to allow unloading tank cars to the rework still.
Phase III	Design package will be completed by mid-October.

This project will be added to the incineration project for approval. Phase III will be held up until approval is received. This will mean that material will be reworked direct from tank cars until the Phase III storage facilities are installed.

W. B. PAPAGEORGE

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