Monsanto

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

DATE November 10, 1970

SUBJECT PCB ENVIRONMENTAL PROBLEM
OCTOBER STATUS REPORT

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GENERAL:

The test to evaluate the disposal of solid waste contaminated with Aroclors in Enviro-Chem Systems' pilot unit in St. Charles, Missouri has been postponed to the middle of December.

Negotiations are underway with a drum reconditioning firm to develop a procedure for recovering contaminated drums.

MARKETING:

Marketing has reached agreement with management to continue offering Aroclor 1248 and 1254 to the vacuum industry. The product name will be Santovac I and Santovac II. Vacuum pumps are small users - from one pint to five gallons initial fill. The typical pump will use the same charge for one to two years. The pumps are under a negative pressure so there is no leakage. Customers and equipment manufacturers will be advised that the material cannot be dumped.

Westinghouse has communicated some concern with MCS 1016 as a capacitor fluid. They have noticed a greater effect on polypropylene film. The higher percentage of monochloro compounds may be the cause.

We visited a number of dielectric customers in October (both large and small). This will continue through the first two weeks of November. So far, we can report without exception, our customers are being very responsive to the "clean-up and close the system" program. They express an earnest management commitment

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and a clear interest in keeping communication open with St. Louis.

ENGINEERING:

Aroclor Liquid Incineration - CEA 2415

Process design is complete. John Zink's preliminary drawings for the incinerator package have been reviewed and they are in the latter stages of being approved. Zink has indicated shipment by February 15, which is a slight improvement.

Drafting and mechanical design are in progress on other elements of the project.

MCS 1016 Distillation - CEA 2417

Process design is complete, the distillation column at the Bayou is being dismantled, and mechanical design and drafting are proceeding. Preliminary information from our customers indicates that a project scope change may be in order to remove a percentage of the low boilers as well as the high boilers. The apparent marketing problem will be reviewed with Research and Marketing.

Tributyl Phosphate - CEA 2371

A pilot plant run revealed a much lower yield on phosphorous oxychloride and butanol. This is being studied. Additional laboratory runs are being made, and another pilot run will be made to establish and resolve the problem.

Nonyl-Cumyl Phenyl Diphenyl Phosphate

The tentative process report is currently being issued, and Engineering is initiating development of a scope report.

JAPAN:

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No new developments.

EUROPE:

Board of Trade in U.K. is considering classifying polychlorinated biphenyls as hazardous materials.

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MEDICAL:

Toxicity studies underway at Industrial Bio-Test Laboratories on the PCB's continue uneventfully. The beginning of the 90-day studies on rats on HB-40 and MIPB were delayed because of the receipt of a shipment of unacceptable rats. Currently these studies are scheduled to start November 2, 1970. We should have the final report in hand by February 15, 1971.

PUBLIC RELATIONS:

Two press queries were handled during the month. Science News, following an interview with Dr. Risebrough, called us to ask why we had not released production and sales figures. The reporter also asked about toxicity studies now under way. The Dayton Journal Herald wrote a lengthy article on the fate of local farmers in the area. Milk had been removed from the market due to higher than acceptable levels of PCB, calves died and some members of one family became ill. The farmers have related their bad luck to the presence of PCB in the area and charged "foot dragging" by Monsanto, the State of Ohio and the FDA in alerting them to the problem. Although the story prominently mentioned Monsanto, it did refer to PCB as a "new problem" and one in which Monsanto is playing a major role to solve.

RESEARCH:

PCB Analysis - U.S.

Fish from Anniston streams and shrimp from Escambia Bay were collected for analysis. Results will be available December 1. Plant effluent streams from two hydraulic fluid customers had 0.01 - 0.09% chlorinated biphenyl.

Impurities in Aroclor

Researchers at the University of Utrecht, The Netherlands, have reported finding low levels of polychlorinated dibenzofurans in competitive polychlorinated biphenyls. They also analyzed Aroclor 1260, Lot AK-3, and did not

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detect any oxygenated impurities. Because of the reported high toxicity of polychlorinated dibenzofurans, a study was undertaken to determine if these, or related compounds exist as impurities in our products.

Low levels (about 25 ppm) of polychlorinated dibenzofurans were confirmed in Phenoclor D.P. 6, a competitor to Aroclor 1260 from Prodelec (France). Aroclor 5442 appears to contain about 2 ppm polychlorinated dibenzofurans; none were detected in any other Aroclor studied. However, each of the Aroclor 1200 series contains polychlorinated naphthalenes at varying levels. The Aroclor 5442 contains polychlorinated anthracene or phenanthrene. The Aroclor 1242, 1254, and 1260 samples are the same lots tested for toxicity by Industrial Bio-Test Laboratories.

Adsorption of Aroclor from Plant Water Effluent

A series of four 5-inch diameter columns (each packed to a bed depth of 5.5 feet with Calgon's Filtrasorb 300 carbon) was placed on stream 10/2 at the Aroclor Sump. To-date the unit has been operating with minimum difficulties at an average flow rate of 2 gpm/ft^2 ($\approx$1000 cc/min.). The available test results indicate an Aroclor reduction in the range (600-2,000 ppb) in the influent to (NDA[1] 10 ppb) in the effluent of the first columns. Since there has been no indication of a breakthrough in the first column, plans are now to increase the flow to 4 gpm/ft^2.

In a 4 day pilot run, initial concentrations of 40-150 ppb in the effluent of the new limestone pit were reduced to an essentially NDA upon passing through a filter (4 inch diameter tube packed to 5.5 inch depth with carbon) at a flow of 100 cc/min. Tests are now being run under the same conditions utilizing sand as the filtering media.

1. NDA - no detectable amount

Contact was made with a Monsanto Biodize on 10/5. Biodize has agreed to provide a 2300 gallon clarifier to be used both in a flocculation and a batch adsorption study. A sludge sample and a sample of the new limestone pit effluent have been sent to Denver Equipment Company for an evaluation of solids removal by froth floatation. Pit effluent samples have also been sent to Betz's Waste Water Lab for an evaluation of their different coagulants.

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Photodegradation of Aroclor

Preliminary experiments with Aroclor 1242 indicate that it is easily decomposed by ultraviolet light. A 0.1% solution of Aroclor 1242 in iso-octane shows no significant EC active material after exposure to a 450 watt Hanovia Xenon arc at a distance 4" for 50 minutes. Upon completion of the

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analysis of all samples taken during the study, a report will be issued. The exposure of the Aroclor to ultraviolet light was carried out by Dr. Bloomfield in Monsanto Central Research.

Biodegradation Testing - St. Louis

A three-day sampling of the HB-40 and mono-isopropyl biphenyl (MIPB) 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 percent compared with the mean of 67 percent in the previous sampling period. GC analyses indicate that the predominant monoisopropyl 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 percent 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 rate studies on chlorinated biphenyl have not been reproducible. Semi-continuous activated sludge units for Aroclor 1242, Aroclor 1254, MCS 1016 and MCS 1043 were modified to permit use of magnetic stirring. The addition of stirring to the units appears to reduce the degree of scatter to some extent. The method of sampling is now being investigated to determine its contribution to the scatter. No conclusions can be drawn at this time concerning differences in biodegradation rates. Some changes in component ratios will be noted for MCS 1016 and MCS 1043. Testing of trichlorobenzene, Arobromchlor 1232, Gulf 200 Bright Stock, Aroclor 5432 and Aroclor 5442 are now started in magnetically-stirred units.

Aroclor 5460

Eleven lots of current Anniston Plant production were analyzed for polychlorinated biphenyls (PCB) by carbon skeleton GC. The results ranged from 0.32 to 1.29% PCB. The latter is probably too high to satisfy the FDA for use as a hot melt adhesive in food packaging.

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PCB - Environmental Studies - Europe

Environmental Studies - At an informal meeting on 24th Sept. with high level representatives of the British Nature Conservancy and British Ornithological societies, we gave a presentation of the PCB problem and Monsanto's efforts to deal with it. This was well received and comments approving of Monsanto's cooperative approach were made. Dr. Martin Holdgate, of the British Cabinet Office, who has wide responsibility for environmental problems in the U.K., thought that the Monsanto response to the problem was very generous. Among other things he has responsibility for the issue of the NERC report on the deaths of sea-birds in the Irish Sea. He undertook to ensure that Monsanto would see this report in draft before publication and that relevant comment from us would be included. We are still awaiting this draft, but understand that it is being revised at present and we will receive a copy on completion of this revision. We have been told, however, that the report accepts that high levels of PCB's were found in the dead sea-birds and thus although the deaths could not be attributed directly to the presence of PCB's this could have been a contributory factor.

The meeting at Stockholm, organized by the Swedish National Environmental Protection Board, was attended. Not very much new information was provided and, generally the meeting discussion was limited and rather an anticlimax. Reference to the Monsanto contribution at CIGRE was made in complimentary terms. A modified print of this paper was available to the delegates of the Stockholm meeting, but was not read. We presented a summary of the 9 month chronic toxicity trials on rats and dogs (Bio-Test) to counter some alarmist speculation on toxicity to humans.

A meeting on analytical problems of PCB's organized by the British Ministry of Agriculture was attended. A preliminary report from the Fisheries Laboratory of the Ministry suggested that no significant levels of PCB's were found in fish from the Severn Estuary. This is perhaps, surprising in view of the location of the Newport Plant.

Biodegradation - The Monsanto sponsored project at University College, Bangor has now started. A meeting with Professor Evans and his student was held to discuss the initial program and it was agreed that the elective technique would be used in an attempt to prepare soil cultures capable of degrading Aroclors 1242 and 1254 and specific isomers. Evans claims to have isolated a biphenyl degrading organism which operates through a different ring-splitting mechanism from the previous culture (C_2). This is being made available to Ruabon for study and is of interest since it opens up the possibility

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of degrading structures which are stable towards C_2.

Analytical results are awaited on the degradation tests on IBB-40, MCS 717 (repeat), MCS 762, MCS 1016 (repeat), and on the 2:3 - 2':3': 4':5' hexachlorinated biphenyl (repeat).

MANUFACTURING:

Anniston Plant

PCB Level In Sewer

Aroclor losses during October averaged 3#/day (405 ppb). Four high daily values (1000-4000 ppb) account for 1.8 lb/day - neglecting those, October average is 1.3 lb/day. Actions now being taken to reduce upsets.

Alabama Water Improvement Commission Contacts

A meeting was held with the AWIC technical staff. They were satisfied with the progress made at Anniston on the PCB problem. Plant effluent levels will be reported monthly.

Spills

Cleaning out a plugged Hontar drumout line caused some to spill on the floor which was absorbed in sand and cleaned up.

A leak in a chlorinator pump caused some Aroclor to enter the sump where it was contained without leaving the department into the plant waste sewer.

Projects & Evalutions

1. Input data to define magnitude of solid waste disposal problem was published in October. Later work has indicated that Hontar 5 (Aroclor 5460 bottoms) contains very little PCB. If confirmed, this reduces PCB containing bulk solids by 10 M pounds per year/

2. Premise approved for spent carbon (containing PCB) collection and burial. Ultimate disposal by incineration is present plan.

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Projects & Evaluations

3. Removal of PCB-laden sludge from limestone pit by pumping was successfully demonstrated. This opens the way to longer pit life by removal of solids during operation of the pit.

4. Premise for rehabilitation of No. 1 limestone pit by 1/1/70 was approved in plant. Project preliminary estimate is $12M Capital, $2M Dismantling, and $26M Mechanical Expense. This estimate will be reviewed and an AFE prepared in November. Cleanout work is presently underway by pumping (see 3 above) so that the usual PCB discharge to Snow's Creek from pit cleanout will be minimized. Precautions are being taken to minimize PCB escape during limestone removal.

5. Flow sheet developed for pilot clarifier intended to demonstrate removal of solids (with adsorb Aroclor) from limestone pit effluent. Premise and estimate will be developed by mid-November.

6. Approximately 500 gallons of liquid PCB was removed from department sump after 2½ months of operation.

"Skimmer" was successfully demonstrated with collected scum being very high in PCB content (200M ppb). Approval was received to purchase.

W. G. Krummrich Plant

PCB Levels In Sewer

A. For the period 9/22 - 10/15 losses to the river from the treatment plant ranged from 457 to 2416 ppb with an average loss of 597 ppb for 8 samples. This is equivalent to 86 lbs/day.

B. WGK Laboratory's chromatograph for measuring PCB's has been repaired and current schedule of 6 samples/week will be maintained.

Projects To Reduce Sewered PCB's From Aroclor Department

A. Blow tank demister (Est. 2031) project completed and started up on 10/22. No mist downstream from the demister was detected using a Brink mist sampler. Scrubber jet samples have been sent to the laboratory for analysis to verify loss reduction.

B. Design package for the project to provide paving, curbs, trenches and catch basin in the tank car and truck loading areas will be completed in November.

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Program To Eliminate Severed PCB's From Using Departments

A. Summary report covering losses from using departments in October will be issued by November 9. Only reported loss for September was 1 quart from Dept. 251. Facts concerning major loss on 10/23 at the Rip Track will be published separately by the investigation committee.

B. Project (Est. 2457 for $2490 Expense) to provide 150,000 gallons of interim storage for scrap Aroclor was completed in October.

PCB Levels In Atmosphere

A. Vapor samples taken to date are inconclusive. Some sampling problems are indicated. Sampling program to identify air losses will be completed in November.

PCB Rework Project (Est. 2095)

Design package completed and safety review held for Phase III (installation of storage facilities for rework material).

Newport Plant (September)

PCB Levels In Sewer

PCB's in the Newport Plant effluent between 1st September and 5th October ranged from 20 to 932 ppb. There were 3 high results of 2,998 ppb, 81,039 and 3,095 ppb. The highest of these coincides with leaks from the Santotherm pumps on 4-NDPA Plant. Excluding the 3 high results, the average figure is 246 ppb.

246 ppb of PCB is equivalent to approximately 2.46 lbs/day.

Information has been requested from Anniston on trials using carbon treatment for removal of Aroclors from waste effluent.

Installation of sump level alarms now complete.

Spills

A bunded area draining into a closed drum has been installed around the Santotherm pumps on the 4-NDPA plant. Modifications are in hand to improve the drainage from this area.

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PCB Levels In Atmosphere

TSD Progress Report No. 2 on Job No. 27/7139/2392 was issued on 15th October giving results obtained to date on sampling of plant atmosphere for PCB contamination. Results are:

Area	PCB mg/m³ air	Comments
1. Drumming	0.38	Indoors. 2 roller doors c
2. Chlorination (ground floor)	0.59 0.13	Enclosed area, large roll door open
3. Santolube 900	0.23	Indoors, Normal process c
4. 4-NDPA (Expansion tank)	0.94 Pract. Nil	Outdoors Outdoors
5. Aroclor control room	0.28	Indoors
6. Chlorination (1st floor)	0.12	Chlorinators shutdown
	0.19	Chlorinators operating
	0.12	" "
7. Airblowing room	0.39	Indoors. Normall process conditions

Used Drum Disposal

Blagdens drum reconditioning plant at Barking in Essex visited to see a trial to recondition used Aroclor drums.

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