Monsanto

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

December 7, 1970

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

SUBJECT: PCB ENVIRONMENTAL PROBLEM
NOVEMBER STATUS REPORT

REFERENCE:

TO:
P.J.A. Marsh - BRUSSELS
W. S. Clark
J. R. Durland - TOKYO
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

MARKETING:

NCR appears to be making very satisfactory progress toward the replacement of Aroclor 1242 in their carbonless reproduction paper solvent. To date, Monsanto has shipped nearly 100,000 pounds of the replacement product - monoisopropyl biphenyl (MIPB) to NCR. An additional 100,000 pounds is scheduled for delivery in January followed by 500,000 pounds in February. NCR is attempting to reach complete conversion by the end of February.

Through our Australian organization we have received an inquiry from the Electracity Trust of South Australia. They have recently received correspondence from General Electric Company, U.S.A., concerning the problems with Askarel Liquid Dielectric. As a result, they are requesting information from Monsanto as to the arrangements in Australia for the disposing of contaminated materials. We anticipate other inquiries from other parts of the world.

We met with Mr. Katayama of MMK in November. We discussed with him the PCB plans in the U.S. and reviewed the current situation in Japan. As a result, MMK representatives will meet with Kaneka (the other major supplier ofpolychlorinated biphenyl in Japan) to discuss future PCB plans for Japan.



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ENGINEERING:

Incineration - Krummrich - CEA 2415

Plot plans and layouts have been resolved, and process design is complete. Design of piping, electrical, and instrumentation are proceeding on schedule.

MCS 1016 - Krummrich - CEA 2417

Customer trials of the pilot plant product indicated an undesirable high level of low boilers. In a meeting with Research and Manufacturing it was decided to provide facilities in the project for removing a percentage of low boilers as well as the high boilers. The project scope and estimate are being revised, and a revised Data Transmittal is scheduled for submission in late December.

Tributyl Phosphate - Queeny - CEA 2371

An early pilot plant run indicated a severe yield problem in the process. Continued studies by Research and Engineering have pinpointed some of the problems, and it is believed a substantial yield improvement can be made.

Pre-approval funds have been requested to proceed with definitive design.

N-C Phosphate - Queeny - CEA 2451

Pilot plant studies are currently being made on this product, and a project scope report is being developed.

Solids Waste Disposal - Krummrich - CEA 8042

Engineering, Research, Manufacturing, and Marketing have been studying disposal of polychlorinated biphenyls on solids. A test was devised with Enviro-Chem, samples of wastes have been collected, and the test is scheduled to be run December 1.

Preliminary discussions have been held with potential equipment vendors.

JAPAN:

No new action or reports on toxicity to fish/animals. Court action on suits on bran oil exposure humans continuing with attendant newspaper publicity. Major executives of company which processed bran oil cannot be located. More stringent testing and licensing of equipment using PCB as heat transfer will probably occur for food processing equipment.



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NCR-Japan rejecting HB-40 because they prefer one oil for both clay and resin-type granules and Jujo Paper is definitely switching to resin-coat. Kureha oil refined from heavy oil cracking bottoms (mixed aromatics of complex nature) is also being tested. MMK is pushing MIPB assuming NCR-Dayton preference for MIPB. No final decision yet. HB-40 also offered by MMK but MIPB provides better balance on biphenyl/terphenyl.

EUROPE:

1. The decision has been taken to cease sales to non-controllable applications in the UK by 1 March, 1971.

2. Sales will continue for all applications in continental Europe until the end of 1971, but reformulated products will be introduced where possible.

3. We will continue to supply products containing PCB's to German mines through 1971 even where reformulated products are available, until approval is gained for the reformulated products.

4. Customers will be informed before the end of November 1970 of this policy.

5. We have been assured by the other European producers that they will not knowingly supply former Monsanto customers in the UK or USA.

6. Bayer have indicated that they are in agreement with the Monsanto timing for withdrawal from non-controllable applications.

7. Progil/Caffaro do not yet agree and wish to study the problem further. We have invited their representatives to Ruabon for technical discussion.

8. The UK Board of Trade, through their Marine Safety Department, have proposed that Aroclor should be classified under Class 9, Dangerous Goods, for the purpose of carriage by sea. We will meet with the Board of Trade in December to discuss this and following discussion with J. T. Garrett will attempt to persuade the Board of Trade to alter the proposal.

LEGAL:

A pretrial hearing was held December 2 in connection with the Humphreys'. lawsuit. At the hearing, trial was tentatively set by the judge to take place in April or May, 1971. Our attorney feels that the trial will actually take place later than either of these months.

All claimants' attorneys were contacted and asked that a Monsanto chemist be permitted to investigate the situation on plaintiffs' premises. Some attorneys have responded that such an investigation will be permitted provided the results of the investigation be shared with them. Our present position is that such an investigation should be for Monsanto's purposes only and not shared with anyone else.

MEDICAL:

Arrangements were made for initiating acute and sub-acute studies at Industrial Bio-Test Laboratory for Aroclor 1221, 5432, 5442 and MCS 1016. Sub-acute studies will include 90 day rat and 90 day dog studies and sub-acute fish studies (according to protocols to be developed). Rat and chicken reproduction and rabbit teratology studies are being deferred for the time being. Rabbit teratology studies were begun with Aroclors 1242, 1254 and 1260.

PUBLIC RELATIONS:

The Anniston Star, Anniston, Ala., obtained figures from the FDA which showed unusually high levels of PCB in fish samples taken from Choccolocco Creek. A Star reporter contacted the Anniston plant for comments on the data and information about our PCB production operations there. Public relations prepared replies to specific questions.

Plant management convinced the reporter to visit the plant for a firsthand view of what the plant was doing to eliminate PCB escape to the environment. A factual front-page feature appeared in the Star Sunday, November 22, edition reflecting the value of cooperation with news media planning PCB stories.

Quoting both plant management and the Alabama Water Improvement Commission, the feature emphasized the PCB problem was relatively new, was being solved by Monsanto and, at this point, was no cause for public alarm.

RESEARCH:

Biodegradation Testing - St. Louis

Statistical analysis (t-tests) of the data accumulated to date in the semi-continuous activated sludge (SCAS) testing of the PCB Aroclor products indicates that some bacterial degradation is occurring. The percent disappearance rates, based on a feed level of 1 mg/cycle, were as follows: MCS 1043--55% ($p = 0.05$); MCS 1016--11% ($p = 0.05$); Aroclor 1242--30% ($p = 0.05$); Aroclor 1254--0% ($p = 0.05$). However, the observed degradation

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rates are still highly scattered indicating that the units have not reached a steady state yet.

Other physical sources of data scatter are being investigated. The addition of stirring, modification of the sampling method and the elimination of the LAS from the feed all appear to be steps in the appropriated direction, but have by no means totally eliminated the scatter.

SCAS testing of trichlorobenzene (TCB) and Arobromochlor 1232 at the 1 mg/cycle level have been started and analysis of the first samples is in progress.

River die-away (RDA) tests have been started for Aroclor 1242, Aroclor 1254, MCS 1016, MCS 1043, Arobromochlor 1232, and TCB. Completion of the RDA tests is scheduled for 1-13-71.

A liquid chromatographic method for the analysis of halogenated terphenyl systems is being developed. A liquid-liquid chromatography system using Zipax Permaphaze (a new DuPont chromatography packing) as the stationary phase and water/methanol as the mobile phase appears to give sufficient separation to characterize the isomeric distribution of the materials. The system is being optimized for solvent composition and column length.

Environmental Program - U.S.

Analysis of a second set of Mississippi River fish collected above and below the WGK plant has been completed. The levels found in fillets from these fish ranged from 0.2 ppm to as high as 8 to 9 ppm total PCB's.

All the necessary equipment for PCB's, with the exception of two gas meters, required to sample the Enviro-Chem St. Charles incinerator has been assembled and laboratory tested. The PCB burn is now scheduled for 12-1-70. Additionally, analysis of background samples taken at the site 10-29-70 for PCB has been completed. Low levels of apparent PCB's were observed in all cases. The PCB analysis of the JFQ September and October sewer water composites has been completed. The levels found, 77 ppb and 70 ppb respectively, were higher than in previous months.

Shrimp from Escambia Bay, fat and liver from a dead pig found near the Anniston landfill, GE plant water samples, Delaware River phthalic acid, and a U.S. Steel plant water effluent sample have also been analyzed for PCB's.

Particle size analysis by microscopy was performed on a solids sample from the Anniston limestone waste pit. Correlations are being developed between particle size of adsorbent and waste retention in the Aroclor waste treatment studies.

Aroclor 1121 and 1129 distillation fractions were analyzed by GC for isomer distribution to compile data for plant design.

Aroclor 5442

We recently reported tetrachlorodibenzofuran as a possible impurity in Aroclor 5442. Additional work has shown that this identification is not conclusive; tetrachloromethyl biphenyl might interfere with this determination. Methylbiphenyl has been shown to be an impurity in the Santowax R used to make Aroclor 5442. Efforts are currently underway to develop a reliable method for distinguishing between chlorinated dibenzofuran and chlorinated methylbiphenyl.

Environmental Studies - Ruabon

Workers at the Tolworth Laboratory of the Ministry of Agriculture, Fisheries & Food have been studying effects of feeding Aroclor 1242 to pigeons and quail. Their analyses have indicated, what we have ourselves suspected, that the residues tend to resemble 1254/1260. Discussion with Bailey and Bunyan from this laboratory shows that they now believe that Aroclor 1242 may be a major source of the environmental pollution. They have also "discovered" that reproducing paper of the no-carbon type is a potent source of Aroclor 1242 and, although they have not published this information yet, they may wish to do so as an explanation of the presence of PCB in cardboard. Feeding trials using single isomers are also planned by the Tolworth group, who are hoping to establish metabolic routes for the degradation of PCB's in animal organs. A visit was made to the Monks Wood Experimental Station of the Nature Conservancy, but little new information emerged from the discussion.

Biodegradation - Ruabon

It has been confirmed that 2,3,2', 3', 4', 5'-hexachlorobiphenyl is degraded by $C_2$ when mixed with lower chlorine isomers. This has been achieved under less vigorous conditions of flask shaking than previously, which suggests that the addition of the lower chlorine isomers has increased the solubility of the material.

We are currently studying a pentachloro-biphenyl, which should degrade, and the 4,4'-dichlorobiphenyl, which should be resistant, using a similar technique to im-



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prove solubility. The analytical results are awaited on these tests.

The results of degrading a series of PCB products with $C_2$ until no further change with time can be observed are now available. Subject to limitations imposed by the difficulties of interpretation of the GLC chromatograms it appears that the order of degradability, or the inverse order of apparent residues, is as follows:

MCS 1016, MCS 717, MCS 762, Pyralene 1500, Aroclor 1242

Satisfactory progress in the identification of isomers corresponding to the peaks obtained using high selectivity PLOT columns is reported, but development work is still needed on GLS - Mass before this can be utilized.

The most recent results on attempts to degrade HB-40 by $C_2$ have shown that at low concentrations (5 ppm) considerable degradation has occurred. The main problem in this investigation has been that of sensitivity in the analysis, but this problem now seems to be overcome.

Pydraul Reformulation

Factory Mutual Visit

A representative of FM visited the fire test facility November 4 and 5. Tentative FM approval was obtained for Pydraul 625-A, F-9A, MCS 1063 (Turbinol 153A), MCS 1066 (312A), MCS 030T, 050T, 065T, 0115E, Santosafe W/G 15, 20 and 30. All fluids submitted were approved.

Pydraul 312A

A V105C pump test on MCS 1066 indicated excellent lubricity. A tentative process will be issued shortly.

Pydraul 540B

The terphenyl version is tentatively defined. The FR is equivalent to old 540. Approximately 3% of a polyglycol VI improver will be incorporated to meet old 540 viscosity specs.

Pydraul 230A

A terphenyl blend has been developed which looks good on the FM spray test. It will contain 2% of a polyglycol VI improver to meet 230 viscosity specs.



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Pydraul 135A

A blend of TCB, 5432, oil and Santicizer 711 has been developed which looks excellent on the FM spray test.

Turbinol 153A

MCS 1063 demonstrated good lubricity in a V105C pump test. The moderate wear noted was attributed to high TAN Krummrich CDP. This fluid also exhibited low deposits in the Alcor Deposition test.

Pydraul A-200B

A lower viscosity F-9A type blend was blended, tested and a tentative process issued to fill an order from Chevy Messena. They refused to purchase any more fluid containing PCB's.

A V105C pump test was terminated at 225 hours due to mechanical failure of the pump. A lobe cracked off of the rotor. This is considered to be a mechanical failure and not fluid related. The test will be repeated just to make certain, though. The wear observed up to 225 hours was very low (11.8 mg total) and no problems are expected.

Carbon Adsorption Study

The pilot unit (series of four five-inch diameter columns), that was put on stream 10/2, continues to operate with minimum difficulties. The initial flow of 2 gpm/$ft^2$ was increased to 4 gpm/$ft^2$ on 10/28. Effluent quality, at the present flow, is <10 ppb Aroclor for influent concentrations in the range 100-2,000 ppb. The present plan is to increase the flow to 6 gpm/$ft^2$ by 11/25.

MANUFACTURING:

W. G. Krummrich Plant

PCB Levels In Sewer

A. Aroclor losses from the Aroclor Department averaged about 1.0 lbs/day and ranged from about 0.4 to 2.5 lbs/day.

   Losses from the Sauget Village treatment plant for the period 10/16 - 11/16 averaged 72 lbs/day (495 ppb). Range for 9 samples was 32 to 115 lbs/day (220-796 ppb).



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Projects To Reduce Sewered PCB's From Aroclor Department

A. Blow tank demister project was successfully demonstrated. About 100 lbs/day of mist Aroclor is being collected. Sewer loss has been reduced from about 20 lbs/day to about 0.5 lb/day.

B. Project to provide paving, curbs, trenches, and catch basins in the tank car and truck loading areas has been approved as part of the Aroclor incinerator project. The design package is about 75% complete.

Program To Eliminate Sewered PCB's From Using Departments

A. A second meeting with Don Roush is scheduled for 12/7/70. Don will discuss with plant production and engineering personnel design considerations for changing Therminol units to non-Aroclor Therminols.

B. Status of work on Therminol units is as follows:

| | |
|---|---|
| Dept. 255 | Switched from FR-2 to Therminol 66 on 11/16/70. |
| Dept. 222 O & P, Dept. 273, Dept. 246 | Plans underway to change out these systems to Therminol 66. EDC for all units is 3/1/71. |

Removal of Soluble PCB's From Sewer Stream

A test is planned for the week of 12/7/70 to determine effect on Aroclor losses in the treatment plant effluent by neutralizing the sewer flow to the treatment plant. Lime will be added at Dept. 265 for about 3 days to hold the pH above 7.0 at the treatment plant. The resulting floc is expected to improve PCB removal based on Anniston work.

PCB Levels In The Atmosphere

Sampling program has been completed. Only significant area of loss is at the mix tanks due primarily to the nitrogen purge. Loss is in the range of 4 to 5 lbs/day. Plans are to replace the nitrogen purge with a nitrogen blanket.

PCB Rework Project

Project approved as part of the Aroclor Incinerator project. Construction schedule will be determined in December.



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Anniston Plant

PCB Levels In Sewer

Aroclor losses during November averaged 25#/day (4620 ppb). One high value accounted for 18#/day, neglecting this the November average would be 7#/day (1410 ppb). Based on knowledge of plant operations and performance of abatement devices in November, much of the high level data is due to sample contamination.

Spills

Minor leaks were contained by use of sand and disposal in drums. No spills occurred.

Projects and Evaluations

1. Laboratory work to date indicates the presence of minimal amounts of PCB in the residue from Solid Aroclor distillation (Montar 5). This eliminates 10M pounds per year or solid wastes from our PCB disposal plan.

2. Design work to collect spent carbon from HCl carbon towers has been deferred to early 1971 to accomplish the No. 1 HCl Limestone Pit rebuild.

3. Solids removal from plant effluent (part of program to reduce PCB in plant effluent to 10 ppb) is moving forward with preliminary screening tests at Denver Equipment Company and Betz Laboratories indicating good to moderate success with flocculation and settling. Further laboratory testing is scheduled for early December. A project has been written, design is underway and equipment modifications under study working with Monsanto Biodize to set up one of their clarifiers at Anniston for pilot scale testing of the apparent best techniques recommended by Denver and/or Betz.

4. A successful test was made of removal of limestone inerts from the #2 HCl neutralization pit while in operation. A total weight of 127,000 lbs was removed of which 36% by weight was solids. Lab analysis of the total material revealed more than 100,000 ppb Aroclor or 12 to 15 lbs of Aroclor. Present indications are that this method of removal of solids while the pit is in operation will increase the efficient life of the pit by 25%.

5. A project for repair of the No. 1 HCl neutralization pit was written and approved. This project will be coordinated with the Niran pit project to apply an asphalt lining at the same time, to save money on materials.

Newport Plant

The October Newport Report has not been received.

W. B. Papageorge

W. B. PAPAGEORGE

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