MANAGEMENT PLAN

POLYCHLORINATED BIPHENYL ENVIRONMENTAL PROBLEM

I. THE PROBLEM:

The presence of materials identified as polychlorinated biphenyl (PCB) in marine environments was first noted by Professors G. Widmark and S. Jensen of the Institute of Analytical Chemistry, Stockholm, Sweden and reported in November, 1966. Since then and with increasing frequency, other investigators have identified PCB in marine and animal life. Mounting evidence has been noted that indicates PCB is ubiquitously present in the environment and is resulting in damage to the ecological system. Monsanto is a major producer of PCB (Aroclors) worldwide and has been mentioned in many of the reports.

II. BASIC STRATEGY:

With the growing evidence of the presence of PCB and the apparent damage it can do to the world environment, Monsanto must respond as a responsible member of the business world genuinely concerned with the welfare of our environment, yet not take premature action which would compromise its responsibilities to its customers, shareholders or employees. Finding ourselves on the defensive, lacking considerable information to help in arriving at sound business decisions and with no real influence regarding the timing of any precipitous action by the press, competitors, public or governmental agency, we are forced to commit our limited resources in several directions.

Our basic strategy for coping with the problem is to direct our attention tothe following:

A. Actively seeking more information on the identification, toxicity and degradability of our Aroclors.

B. Working closely with our plants and our customers to control the discharge of Aroclors to the environment.

C. For those uses in which Aroclors cannot be contained, are resistant to degradation, and are harmful to the environment, we will replace these Aroclors with modified chlorinated biphenyls which do degrade or with substitute products. In those instances for which no acceptable substitute is developed, we will voluntarily discontinue sales.

DSW 333131

D. Developing processes for reclaiming Aroclor-containing fluids recovered from our customers.

E. Design and install incineration facilities for the total destruction of unreclaimable fluids.

We are deliberately assuming an aggressive posture and working closely with customers, co-producers, and regulatory agencies to prevent precipitous action.

Early reports had indicated that the polychlorinated biphenyls with 5 and 6 chlorines were being identified in environmental samples. From this information, it was surmised that the lower chlorinated biphenyls were being degraded and probably were not a problem. Consequently, a decision was made to plan to discontinue the manufacture of Aroclors 1254 and 1260. Recent data, although still very preliminary, indicates that not enough information is available to justify this action. It appears that in those uses where control of spillage and disposal can be rigidly exercised and the Aroclors are in sealed containers; e.g. capacitors and transformers, the manufacture of Aroclor 1254 and 1260 should be continued. The advantages of using these Aroclors, particularly where safety is a prime consideration and no practical substitute has been developed, far outweigh the potential threat to the environment. One of the principal users of Aroclors in electrical equipment, General Electric Company, has strongly indicated that the threat of explosions and fires and loss of electrical service is so great that the use of Aroclor 1254 and 1260 cannot be discontinued.

III. OBJECTIVES:

The overall objective of this plan is to manage the PCB pollution problem to prevent it from adversely affecting the established Return-on-Investment objectives of the Functional Fluids and Plasticizers Groups, while maintaining the Corporate image of Monsanto as a responsible and respected member of industry worldwide. We must assume worldwide leadership and work closely with the appropriate regulatory agencies in arriving at logical rational decisions.

Objectives supporting the overall objective are as follows:

STLCOPCB4079709

1. Reduce and effectively control the PCB content of all effluent from Monsanto plants.

2. Inform customers of the PCB problem and the importance of preventing environmental pollution both at their plants or by their products, and encourage them to take responsible action by offering assistance on reclamation, substitute products and proper disposal.

3. Develop products to replace Aroclors for those uses in which Aroclors have been demonstrated to be harmful to the environment and cannot be prevented from escaping into the environment.

4. Develop reliable analytical procedures for determining PCB content of liquids, gases, or solids.

5. Develop methods for effective disposal of wastes containing PCB without contaminating the environment.

6. Develop methods for reclaiming and reusing off-grade fluids containing PCB.

7. Determine effects of PCB's on birds, aquatic life, animals and humans.

8. Establish and maintain favorable relationships with our customers, the press, governmental agencies, other worldwide producers, the public, and the universities.

IV. ACTION PLAN:

1. Objective - Reduce and effectively control the PCB content of all effluent from Monsanto plants.

   Status - A tentative target of 10 ppb of PCB in plant liquid effluent has been established. Plants at Anniston, Alabama, Newport, Wales and Sauget, Illinois have monitored plant effluents and found high levels of PCB contamination in waste streams and in sediment at plant discharges. Leakage and spills are being identified and corrected. Arrangements have been made for the installation of interceptor basins to contain major spills.

   Action - All plants to continue emphasis on control to achieve target of 10 ppb in effluent.

   Responsibility - Manufacturing Manager
   Engineering Manager, Functional Fluids, CED
   Manager, Research & Development Functional Fluids

DSW 333133

Date - All plants achieve 50 ppb in effluent by January, 1971. All plants achieve target of 10 ppb by September, 1971.

2. Objective - Inform customers of the PCB problem and the importance of preventing environmental pollution both at their plants or by their products.

Status - All Functional Fluids and Plasticizers customers in the U.S. have been informed. Customers in Canada, U.K., South America, Japan and Continental Europe have not been informed.

Action - Inform customers in Canada, U.K. and Japan. Customers in Europe will not be informed until concensus is reached by all PCB producers in Europe. Notification of South American customers to follow.

Responsibility - Sales Directors, Functional Fluids and Plasticizers Groups

Date - Canada, U.K. and Japan by May 1, 1970
Europe and South America - as indicated.

3. Objective - Develop products to replace Aroclors for those uses in which Aroclors have been demonstrated to be harmful to the environment, are resistant to biodegradation, and cannot be prevented from escaping to the environment.

Status - Work on product substitutes has been directed primarily at Industrial Fluids applications and NCR Paper coating. Water-glycol mixtures, brominated Aroclors, brominated biphenyl, silicates, blends using chlorinated terphenyls with lower chlorinated biphenyls, terphenyls with phosphate esters, diphenyl ether with biphenyl, chlorinated paraffins, and fractionated Aroclor 1242 are all under study for Functional Fluids application. About 40% of our Pydrauls have been reformulated, successfully tested in our laboratories and are ready to be introduced to our customers. Alkylated biphenyls and HB-40 (hydrogenated terphenyls) appear promising for NCR paper applications.

Action - To assure tight control on Aroclor usage, the use of distributors by the Plasticizers Group will be discontinued.

Responsibility - Sales Director, Plasticizers Group

Date - Develop plan for phase-out May 1, 1970
Complete phase-out September, 1970

Action - Replace Aroclor 1242 in NCR paper coating with isopropylbiphenyl for U.S. applications and with HB-40 (hydrogenated terphenyl) for U.K. applications.

Responsibility - Manager, Research & Development, Plasticizers Group
Sales Director, Plasticizers Group

Date - U.K. applications - complete by Dec., 1970
U.S. applications - complete by April, 1971

Action - Develop acceptable substitutes and complete conversion from Aroclor 1254 and 1260 in sealants and coatings.

Responsibility - Manager, Research & Development Plasticizers Group
Sales Director, Plasticizers Group

Date - January, 1971

Action - Develop acceptable substitutes and selectively phase out of Aroclor-containing industrial fluids.

Responsibility - Manager, Research & Development Functional Fluids Group
Sales Director, Functional Fluids Group

Date -
Pydraul AC - September, 1970
Pydraul AC-WG - September, 1970
Pydraul 625 - September, 1970
Pydraul F-9 - December, 1970
Pydraul A-200 - December, 1970
Pydraul 540 - December, 1970
Pydraul 280 - December, 1970
Pydraul 135 - June, 1971
Pydraul 150 - June, 1971
Pydraul 230 - June, 1971
Pydraul 312 - June, 1971
Santosafe 100 - June, 1971
Santosafe 150 - June, 1971
Santosafe 300 - June, 1971

DSW 333135

Action - Discontinue sale of Aroclors for cutting oils, pesticide extender, medicinal, dental and cosmetic use.

Responsibility - Sales Director, Functional Fluids Group
Sales Director, Plasticizers Group

Date - Pesticide extender - Completed April 1970
Cutting Oils - June 1970
Medicinal, Dental, Cosmetic - June 1970

4. Objective - Develop reliable analytical procedures for determining PCB content of liquids, gases and solids.

Status - Procedures have been developed. Copies have been offered to university and governmental laboratories. Comments regarding our procedures and comparison of results with other procedures have been solicited. Arrangements have been made for exchange of samples to verify analytical results.

Action - Continue to refine methodology until we reach a level of competence which will provide data whose accuracy will not be challenged.

Responsibility - Section Manager, Applied Sciences

Date - July 1, 1970

5. Objective - Develop methods for effective disposal of wastes containing PCB without contaminating the environment.

Status - Studies are being conducted on biodegradability, incineration and removal from water solutions.

Biodegradability studies of existing and substitute products with aclimatized microorganisms are being conducted at Ruabon. Data to date indicates that the monochlor and some of the di and trichlor biphenyls degrade; remaining PCB's are highly resistant. Studies in St. Louis in river water indicate high resistance to degradation.

Incineration tests of 1242, 1260 and Inerteen PPO indicate combustion can be sustained with minimum fuel requirements. Analysis of stakc gas samples indicated the degree of destruction to be acceptable.

Recovery of Aroclors from dilute water solutions is being studied at Anniston and by MRC at Dayton. At Anniston, adsorption on carbon is being evaluated. At Dayton, the use of acid clays, limestone and treated silica are being studied. Serious consideration is being given to soliciting a government grant for a prototype unit at one of our plants.

At the W. G. Krummrich plant, the removal of Aroclors from HCl gas streams by high temperature cracking are being studied.

DSW 333136

STLCOPCB4079713

Discussions have been held with representatives of Monsanto Enviro-Chem Systems regarding disposal of Aroclors, solids containing Aroclors and water containing Aroclors. Proposals for the testing at the St. Charles unit of disposal by pyrolysis were requested. Further work on water effluents is planned following the analysis of samples from various customers' plants.

Action - Continue biodegradation work of existing and substitute products at both Ruabon and St. Louis to establish degree of degradation possible and optimum conditions required.

Responsibility - Manager, Research & Development
Functional Fluids Group

Date - October 1, 1970

Action - Evaluate alternate methods of disposal by incineration - Monsanto operated vs. contract.

Responsibility - Engineering Manager, Functional Fluids Group, CED

Date - July 1, 1970

Action - Continue the work at Anniston, Krummrich and Dayton on the removal of PCB from water streams.

Responsibility - Manager, Research & Development, Functional Fluids Group

Date - September 1, 1970

Action - Evaluate the merits of applying for a government grant to install a prototype unit for removal of PCB's from plant effluents at one of our plants.

Responsibility - Manager, Environmental Control
Manager, Research & Development
Functional Fluids Group

Date - September 1, 1970

DSW 333137

Action - Pursue possible contribution by Monsanto Enviro-Chem Systems, Inc. to disposal of Aroclor wastes.

Responsibility - Manager, Environmental Control

Date - September 1, 1970

6. Objective - Develop methods for reclaiming and re-using off-grade fluids containing PCB.

Status - Limited reclaiming has been achieved by Findett, Inc. Arrangements have been made for the reworking of a tank car of material at W. G. Krummrich plant. Initial efforts will be concentrated on returned material from large electrical customers. Meanwhile, customers are holding material for further instructions or are dumping in authorized land fills.

Action - Develop procedures for processing of returned material.

Responsibility - Manager, Research & Development
Functional Fluids Group
Manufacturing Manager

Date - May 1, 1970

Action - Select and modify as necessary, the required equipment at the W. G. Krummrich plant.

Responsibility - Manufacturing Manager

Date - Appropriation Request by June 1, 1970
Fully operational by January 1, 1971

7. Objective - Determine effects of PCB's on birds, aquatic life, animals and humans.

Status - Toxicity studies are being made for Monsanto by Industrial Bio-Test Laboratories. Studies include two year oral toxicity on rats, three generation reproduction study on rats, two year oral toxicity on dogs and studies on egg production, hatchability and survival on chickens. The Aroclors used in these studies are Aroclor 1242, Aroclor 1254 and Aroclor 1260.

STLCOPCB4079715

Results to date indicate the following: Liver enlargement in male rats at 100 ppm; body weight loss in dogs by higher chlorinated Aroclors; rat reproduction effected by 100 ppm Aroclor 1242 or Aroclor 1254; chicken reproduction effected by lower chlorinated Aroclors. It appears that PCB's could be classified as moderately toxic to humans.

Studies on fish were attempted, but were discontinued when cross contamination was discovered. These studies will be resumed.

Action - Continue studies now underway. Evaluate need for extending studies to include chlorinated terphenyls, hydrogenated terphenyls, alkylated biphenyls and Porocel treated chlorinated biphenyls. Resume fish toxicity studies.

Responsibility - Medical Department

Date - Complete by mid-1971.

8. Objective - Establish and maintain favorable relationships with customers, the press, governmental agencies, other worldwide producers, the public and the universities.

Status - Relationships are excellent. We have expressed interest in studying the problem and indicated that we wish to cooperate to help identify and solve it. Pressure to divulge more information will continue to increase.

Action - Appropriate Monsanto personnel will continue to participate in activities related to the PCB problem in a manner which will maintain our excellent relationship.

Responsibility - All personnel

Date - Continuing

STLCOPCB4079716

V. COSTS

Costs for the program for 1970 have been budgeted as follows:

Program	Budget $ M
Develop Analytical Procedures	$ 80
Toxicity Studies	105
Plant Effluent Studies	105
Biodegradability Studies	40
Develop Disposal Methods	50
Reclaiming Systems Design	30
Substitute Products	150
Overall Administration	115
Total	$675

STLCOPCB4079717