ROUGH DRAFT

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. Increasing evidence has been noted that indicates PCB in 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. Some of our efforts are being expended seeking information to help better understand and control the problem and some effort is being expended to find alternate products which we may or may not require as indicated by new research data or other developments.

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. transformers, the manufacture of Aroclor 1254 and 1260 should be continued. The advantages of using these Aroclors, particularly where safety is a prime consideration, far outweigh

the potential threat to the environment.

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.

Objectives supporting the overall objective are as follows:

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 attheir plants or by their products.

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 the press, governmental agencies, 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 taken action to lower PCB's in the effluent. Target of 10 ppb not yet achieved.

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

Responsibility - Manufacturing Manager

Date - By September 1, 1970

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 Fluid and Plasticizer customers in the U.S. have been informed. Customers in Canada, U.K., South America and Continental Europe have not been informed.

Action - Inform customers in Canada and U.K. 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 Plasticizer Groups

MONS 057411

Date - Canada and U.K. 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 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, phenyl ether with biphenyl, chlorinated paraffins, and fractionated Aroclor 1242 are all under study for Functional Fluids application. Alkylated biphenyls and HB-40 (hydrogenated terphenyls) appear promising for NCR Paper applications.

Action - Accelerate efforts to develop acceptable substitute products.

Responsibility - Managers, Research and Development, Functional Fluids and Plasticizer Groups.

Date - Major needs by year end.

4. Objective - Develop relaible 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 with aclimatized micro-organisms 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. Stack gas samples were taken for analysis to determine degree of destruction.

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 is being studied.

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

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

Responsibility - Manager, Research and 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, 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 and Development Functional Fluids Group

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 procedure for processing of returned material.

Responsibility - Manager, Research and Development Functional Fluids Group.

Date - May 1, 1970

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

Responsibility - Manufacturing Manager

Date - September 1,1970

7. Objective - Determine effects of PCB's on birds, aquatic life, animals and humans. MONS 057416

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.

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.

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. Resume fish toxicity studies.

Responsibility - Medical Department

Date - Complete by mid-1971.

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

MONS 057417

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

V. COSTS

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

Program	Budget $ M
Develop Analytical Procedures	$ 80
Toxicity Studies	100
Plant Effluent Studies	105
Biodegradability Studies	40
Develop disposal methods	50
Reclaiming Systems design	30
Substitute Products	150
Overall Administration	115
	$670