Monsanto

FROM (NAME & LOCATION) JOHN MASON - B2SA

File PCB-SP.

DATE November 1, 1971 CC

SUBJECT UPDATE ON PCB STORY

REFERENCE

TO : WASHINGTON 1920
Mr. Sam Pickard

Dear Sam:

Somewhat belatedly, I regret, I am sending you an up-dated version of the Monsanto story on PCB's.

You should feel free to use this for your senator friend in California, or any other interested parties.

Best regards.

JOHN MASON

/jf

Attachment

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Monsanto

MONSANTO INDUSTRIAL CHEMICALS CO.
800 N. Lindbergh Boulevard
St. Louis, Missouri 63166
Phone: (314) 694-1000

POLYCHLORINATED BIPHENYLS

CONTROL OF ESCAPE TO THE ENVIRONMENT

Manufacture

The PCB's are manufactured by the chlorination of biphenyl produced by cracking benzene. The process is a relatively simple, high-yield reaction which takes place in a closed system with no inherently difficult emission problems. There are no stack gases or water streams which are in contact with the product during the manufacturing process. Control of emissions is therefore concerned with the prevention of leakage and spillage and safe disposal of any material which escapes in this way.

High priority is given to maintenance of all equipment and curbs and drip pans have been provided to collect leaks where they occur. We have constructed catch basins in the main sewer of each of our PCB plants as an added safety measure.

Air emissions are virtually non-existent as the boiling point of the PCB's is extremely high and they can only be distilled under vacuum. This means that vapors are easy to control and they are returned to the system by means of condensers.

A special high-temperature incinerator has been developed for the destruction of PCB residues collected from the process. The flue gases produced contain CO_2, H_2O and HCl which is scrubbed out, neutralized and passed through our normal waste treatment plant.

The above actions have resulted in our PCB losses to the environment being reduced to the parts per billion level, but we are still not satisfied and are carrying out research work on a tertiary treatment process designed to remove even

these minute traces from our waste water streams. We expect to complete this program prior to year-end when the additional equipment will be installed in our plants.

Industrial Usage

The PCB's as a group exhibit many interesting properties:

Fire Resistance
Chemical Resistance
Adhesivity
Resistance to Oxidation
Low Volatility
Resistance to Hydrolysis

These properties together with their compatibility with a wide range of natural and syntehtic polymers and copolymers have made the PCB's extremely useful components in many industrial formulations such as specialty paints, adhesives and coating compounds.

Major volume uses for the PCB's, however, are as fire resistant fluids in closed system applications such as:

Transformers
Capacitors
Heat Transfer Systems
Industrial & Hydraulic Applications (usage now terminated)

where their excellent dielectric properties, fire resistance, inertness and stability at elevated temperatures make them key factors in maintaining a high level of safety in many industrial operations.

In view of the possible threat to the environment posed by the polychlorinated biphenyls, Monsanto has taken the position that it will restrict sales of PCB's only to those applications where their unique fire resistant properties are important and where it is possible to control collection and regeneration or incineration of spent material. We have therefore taken the following actions:

1) Discontinued sales of PCB's for all general plasticizer applications.

2) Phased out the PCB's as components of industrial and hydraulic fluids where control of spillage and collection of spent material is not possible.

3) We are continuing to sell PCB's as dielectric fluids for transformers and capacitors, cooperating with customers collecting spent and arced fluid for regeneration and/or incineration.

4) We are continuing to sell PCB's as fire resistant heat transfer fluids in non-food and feed applications. However, we are restricting our sales to replacement fluid for existing systems, and are refusing to supply fluid for new systems.

5) We are continuing research efforts to develop alternatives to the PCB's and modify PCB's to make them biodegradable in conventional secondary waste treatment facilities.

Other Work

In addition to these major actions, we are continuing to study analytical techniques for accurately determining the PCB's in air, water and animal tissues--the biodegradation of the PCB's--the toxicity of the PCB's to mammals, birds and fish. Detailed information on our analytical techniques and procedures is attached, and also brief summaries on the status of biodegradation and toxicity studies.

We are also cooperating closely with the joint agency task force, under the direction of the Office of Science and Technology, and the special committee appointed by OST to study the PCB problem.

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THE POLYCHLORINATED BIPHENYLS

BIODEGRADATION STUDIES

Monsanto is currently involved in research studies on the biodegradation of PCB's both in the U.S.A. and in the U.K. where we are working closely with Professor E. C. Evans of the University of North Wales.

This work is aimed firstly at establishing the degree of biodegradability of the commercially produced PCB's, and secondly to develop ways and means of modifying these products to enable them to be broken down into harmless by-products in a conventional secondary treatment waste plant.

As anticipated, the PCB's have proven extremely resistant to biodegradation under conditions which normally exist in the environment. This is particularly true of those products containing isomers with high chlorine content; i.e., those containing 5 or more chlorine atoms. However, progress has been made in developing strains of microorganisms which are effective in degrading isomers containing 2, 3, and 4 chlorine atoms. Work is continuing in this area with the aim of finding new and more effective cultures which are capable of degrading the higher chlorine containing isomers.

As a result of this initial work, we are currently developing commercial PCB products where the higher chlorinated isomers have been removed. Although the resultant reduction in chlorine content reduces fire resistance and affects dielectric properties, we are hopeful that we can develop satisfactory products which can be broken down into harmless by-products, when passed through conventional waste treatment facilities. The first product in our line known as MCS1016 is now in commercial usage by the capacitor industry.

It should be clearly understood that we have no intention of trying to develop PCB compounds which will degrade in the environment. Our aim is to keep the PCB's out of the environment, but by making them degradable in conventional waste treatment facilities we hope to add an extra safety measure should spills and leakages escape the other safety measures we have already established

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SUMMARY--INTERIM STATUS

CHRONIC TOXICITY WITH AROCLORS

In June of 1971 two-year feeding studies were completed with *Aroclors 1242, 1254, and 1260. The materials were fed to rats and dogs at levels of 1, 10, and 100 parts per million in the diet.

After 24 months there were no clinical effects observed in the rats in the Aroclor 1242 study. Animals sacrificed at 6, 12, and 24 months showed negative micropathology. There were no clinical effects in the dogs and blood and urine chemistry studies at all intervals were negative.

In the case of Aroclor 1254, rats sacrificed at 6, 12, and 24 months showed increased liver weights in males of the animals on the 100 ppm diet. Micropathology was negative at all levels at 6 and 12 months. In the dogs there have been depressed weight gains in the females at all levels fed and at the 100 ppm level in the males. Blood and urine chemistry was negative.

With Aroclor 1260 there was increased liver and kidney weights in male rats at the 100 ppm level in the animals sacrificed at 12 months and 24 months. Micropathology was negative at 12 months. In the dogs there was depressed weight gains in the females at 10 and 100 ppm and in the males at 100 ppm. Twelve month clinical determinations revealed a moderate increase in serum alkaline phosphatase in five of six animals on the 100 ppm diet.

The above data indicate that these materials are no more and possibly less toxic than DDT in rats and dogs. This is reassuring in that DDT is probably the least toxic insecticide to mammalian species. Further, there is general agreement that DDT has not presented a hazard in animals or man in spite of its presence in the environment.

Interim or progress reports such as above have been provided periodically to the U. S. Food and Drug Administration, the U. S. Department of Agriculture and other governmental agencies.

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* Aroclors 1242, 1254, and 1260 are polychlorinated biphenyls containing 42%, 54%, and 60% of chlorine respectively.