

SUMMARY

Background

Following discussions between officers of Amdel and Dr W. Grant Inglis, Chairman of the Packaging, Waste, and Recycling Sub-Committee of the Australian Environment Council, a request (72/1675-2, dated 15 January 1974) was received for Amdel to prepare a proposal for research into the incidence and methods of disposal of polychlorinated biphenyls and polychlorinated terphenyls (collectively abbreviated as 'PCBs') in Australia.

Project Proposal No. 5/0/2374, entitled 'Environmental Behaviour of PCBs', was submitted for approval in February 1974. Approval was received in a letter dated 10 October 1974.

Objectives

The objectives of the investigation were:

- (1) To identify materials containing polychlorinated biphenyls and polychlorinated terphenyls being imported into Australia.
- (2) To trace the flow of such substances throughout Australia.
- (3) To provide an indication of the growth in the inventory of such substances.
- (4) To conduct a literature search on the degradability and disposability of polychlorinated biphenyls and terphenyls in their many isomeric forms.

Summary of Work Done

The literature on PCBs has been surveyed and a review dealing with the following aspects has been prepared:

- (i) The nature of PCBs.
- (ii) The production and consumption of PCBs - including details of producing countries, estimates of quantities produced and consumed, and patterns of consumption.
- (iii) The use of PCBs - including commercial uses, replaceability, methods of handling, reuse, incineration, and other methods of disposal.
- (iv) PCBs and the environment - concentrating on rates and routes of transport of PCBs into the environment and the natural

degradability of PCBs. Some attention is paid to toxicological aspects of PCBs, methods of analysis and detection of PCBs, and measured levels of PCBs in the environment.

- (v) Control of PCBs - including steps taken in various countries to control the dispersal of PCBs into the environment.

An information survey has been carried out through correspondence and personal visits to gather information on the following aspects of PCBs in Australia:

- (i) The supply of PCBs in Australia - including details of production, imports, exports, and the suppliers of PCBs.
- (ii) The use of PCBs in Australia - by manufacturers of electrical equipment, in electrical equipment by electricity authorities, in electrical equipment by other organisations, and in non-electrical applications.
- (iii) The disposal of PCBs in Australia - including details of the disposal service provided by Monsanto Australia Limited, and a brief review of the control of PCB waste-disposal in each State.
- (iv) The detection and measurement of PCBs in Australia - giving details of measured PCB levels in food and environmental samples.

Conclusions and recommendations regarding the use and disposal of PCBs in Australia, their present and future potential hazard, and possible measures required to obtain essential information, or to exercise control, have been prepared.

Conclusions

The following are the principal conclusions of this investigation into PCBs in Australia:

- (1) The use of PCBs in Australia has almost exclusively been confined to electrical applications. Despite numerous enquiries, no definite evidence was found of PCBs being currently used in Australia in non-flammable hydraulic fluids, or heat-transfer fluids, or as plasticiser in Australian-made materials.

- (ii) The current rate of consumption of PCBs in Australia is approximately 300 tonnes per annum. Of this, approximately half is used in the manufacture of small capacitors. Of the remainder, approximately one-third is used in large capacitors and two-thirds in transformers.
- (iii) The use of PCBs in electrical applications in Australia is likely to decline in the future. Providing the plans of the manufacturer are realised, the use of PCBs in the manufacture of small capacitors will be eliminated by 1978. Furthermore, there is a growing reluctance amongst manufacturers and users to continue the use of PCBs in transformers. Many view the dry-type (or air-cooled) transformer as a likely replacement for PCB-filled transformers, but this view is not universally held. The only area where it is not currently thought that use of PCBs will decline is in large (power) capacitors. Work on substitutes for PCBs in this application is understood to be proceeding overseas, however.
- (iv) There is good general awareness of the hazards associated with PCBs amongst manufacturers and users of electrical equipment and there are an adequate number of standards, guidelines, etc., on their use. Where handling procedures are not adequate, this seems to have been the result of habits developed during many years of experience with PCBs prior to the time when they became widely recognised as environmental contaminants. Growing unrest in trade unions about handling PCBs is evidence that former casual attitudes to PCBs may be disappearing.
- (v) One of the major problems associated with the use of PCBs in Australia is the disposal of PCB wastes. It is widely recognised that incineration at high temperatures is the only way to completely destroy PCBs, but no commercial facility for this purpose exists in Australia. Some organisations have sent their PCB wastes to the USA for this purpose, but many others are reluctant to do so and are at present storing their wastes or disposing of them by burial in sealed containers in dumps. Many organisations contacted in this investigation asked for guidance or information on PCB-waste disposal.

- (vi) A possible threat to the Australian environment is posed by the indiscriminate disposal of electrical equipment filled with PCBs as it reaches the end of its useful life. Contributing to this threat is the fact that much PCB-filled equipment is in use which does not have a warning attached indicating the hazards to the environment posed by the contained fluid. It is felt that this factor, together with the fact that most PCB-filled electrical equipment has a long life, could lead to a situation where such equipment is disposed of by people unaware of the hazards.
- (vii) Only limited work has been done on the detection and measurement of PCBs in food and environmental samples in Australia. What evidence there is suggests that detected contamination of food and feed by PCBs may have been the result of the use of PCBs in applications which have now been eliminated. While there is some evidence that PCBs have entered the marine environment in and around industrial centres, it is not possible to say whether significant contamination of the environment has occurred. Many individuals spoken to during the course of this investigation were of the opinion that PCBs are not significant contaminants of the Australian environment, but evidence in support of this view is limited. However, it is likely that, with decreasing use of PCBs in Australia and the rest of the world, and with increasing awareness of the hazards of PCBs, the threat posed by PCBs to the environment will diminish.

Recommendations

The following recommendations are made on the basis of the findings of this investigation:

- (1) In regard to the use of PCBs in various applications:
 - (a) The trend towards substitution of air-cooled (dry-type) transformers for PCB-filled transformers should be encouraged. However, the use of PCBs in transformers should not be prohibited.
 - (b) The use of PCBs in (large) power capacitors should not be prohibited. However, capacitor manufacturers should be encouraged to keep abreast of latest overseas devel-

opments in capacitor dielectric research with a view to early adoption of a less toxic substitute.

- (c) The efforts of Plessey-Ducon Pty Limited to eliminate its use of PCBs in small capacitors should be encouraged and assisted where possible.
 - (d) The permission given to Brown and Dureau Ltd under the Customs (Prohibited Imports) Regulations to import a polychlorinated terphenyl plasticiser named Cloresil should be reconsidered.
- (2) Measures should be taken to ensure that all electrical equipment containing PCBs that is manufactured and/or sold in Australia has attached an approved warning about the environmental hazards associated with the contained fluid. Where possible, owners of PCB-filled electrical equipment already in use should be encouraged to ensure that their equipment has such a warning attached.
 - (3) Priority should be given to investigation of the possibility of establishing facilities for the destruction of PCBs in Australia. If necessary this should be done in conjunction with efforts being made to establish disposal facilities for other chlorinated hydrocarbons.
 - (4) The possibility of obtaining more comprehensive information about the level of PCBs in the Australian environment should be considered. It is suggested that this could be carried out in conjunction with work already being done on the detection and measurement of DDT and other pesticides by various Australian Government and State Government Departments, and other organisations such as the Universities and CSIRO. Since the measurement of pesticide levels requires the prior removal of PCBs from samples, further work to determine PCB levels may not be prohibitively expensive.
 - (5) Measures should be taken to ensure the regular collection of information relating to the importation and use of PCBs in Australia. The facilities for doing this are already in existence under the provisions of the Customs (Prohibited

- Imports) Regulations. Under these regulations, importers and users of PCBs are required to keep records of the quantity of PCBs imported or purchased, the organisations to which PCBs are sold, the quantity of PCBs sold to each organisation, the quantity of PCBs disposed of and the method of disposal. This information, together with information supplied to the Department of Police and Customs in support of requests for permission to import PCBs, could be collected regularly through existing channels and compiled into a report. It is possible that further information on individual users of PCBs could be supplied on a regular basis by State Government Public Health inspectors. Finally, information relating to the quantity of PCBs imported, and the country of origin, should be listed under a separate classification in 'Overseas Trade' statistics compiled and published by the Australian Bureau of Statistics.

X.C. PG&B. PCB *Switzerland*

MONSANTO INDUSTRIAL CHEMICALS COMPANY, EUROPE

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PROCESS AND PRODUCT TECHNOLOGY DEPARTMENT

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J.N. Haggart, Brussels
S. Turover, Brussels
T. Fischer, Dottikon,
B.E. Cox, Brussels
H.A. Vodden, Rnabon

R.A. Baxter, Rnabon
W.B. Papageorge, St. Louis
W.R. Richard, St. Louis
~~P. Eaton, St. Louis~~
B.G. Tibbatts, St. Louis
J.T. Garrett, St. Louis

TCR
J.C.P.
CONTACT REPORT

- 1) Visit to: Swiss Federal Dept. of Public Health (Toxic Products), Bern.

Date: April 17th, 1973

Present: Dr. B. Stoll) Dept. of Public Health
Dr. (Miss) Piado)
J.N. Haggart - Brussels
T. Fischer - Fab.Suisse Dottikon
R.A. Baxter - Rnabon

Objective: To review present position of Swiss authorities on PCBs and Pentachlorophenol.

Introduction:

Previous contacts with the Swiss authorities (see report by S. Turover Feb. 22nd, 1972) had been through Dr. Meyer who had now been replaced by Dr. Stoll. Dr. Stoll had only recently taken up his appointment and did not know the detailed background to some of the Swiss decisions relating to PCBs. Miss Piado is the Swiss representative on the OECD subcommittee dealing with unwanted chemicals in the environment. They were both concerned with the operation of the new Swiss law which requires that all chemicals used by the public should be registered and categorized according to their toxicity.

MONS 044115

DETAILS

Dr. Stoll explained that the use of PCBs in Switzerland had been completely prohibited since Dec. 23rd 1971. They now realized that this restriction was too severe and a new draft regulation proposed

1. That chlorinated biphenyls containing not more than 2 chlorine atoms would be permitted for any application.
2. PCBs containing 3 or more chlorine atoms would continue to be prohibited except for
 - a) in apparatus used for research purposes
 - b) transformers and large capacitors
 - c) small capacitors until December 1976
 - d) aviation lubricants.

*Who?
for what?
Prozil's
by follow?*

This revised regulation was expected to be approved by mid year. Miss Pindo agreed that these regulations differed in some respects from the OECD proposals. These later had been agreed by the sub-committee and were now to be put to the main committee. If agreed they then required ratification by the Council of OECD. At that time it would become mandatory for member countries to observe the OECD regulations but if their own requirements were more severe then this would be acceptable. It seems likely that the Swiss proposal to ban small capacitors after 1976 will therefore stand. The position on the dichloro biphenyls is not so clear cut. The Swiss regard them as presenting an environmental hazard on the advice of Dr. Roschardt and seem to have accepted their free use on the basis of industry representations. OECD have made no distinction so far between different PCBs and it is not clear how the Swiss expect to be free to use dichloro diphenyls.

PCBs will continue to be placed in category 1, the most toxic category even though it is agreed that their acute oral toxicity might have suggested a much lower category. The basis of the classification was claimed to include assessment of environmental and other long term hazards and benzene was quoted as another compound that was placed in a higher category than its acute toxicity would suggest. However, they regard the classification of PCBs as being of little significance because of the other restrictions which they are imposing. They regard their current measures as being capable of change in the light of experience and future developments. They expect new products will be produced to replace the PCBs and apparently the Japanese OECD delegate stated that they had replacement products for all applications.

On the application of the new law generally they are clearly overwhelmed by the paper work but will expect to work through the backlog making suitable modifications as they go along in consultation with industry.

Pentachlorophenol

Pentachlorophenol is presently placed in category 3 which is in line with the LD₅₀. The Swiss authorities are considering what restrictions to place on the dioxin content but have not yet reached any decisions. They will be guided by Dr. Bosshardt's comments and expect to reach some preliminary conclusions by the end of 1973.

- 2) Visit to: Der Eidgenössischen Forschungsanstalt (Plant Protection laboratory), Wädenswil

Present: Dr. H.P. Bosshardt, Chef de Lab.

R.A. Baxter

Dr. Bosshardt had recently published an article in the *Zürcher Zeitung* calling for a very low level of tetrachlorodibenzo-dioxin 0.05 ppm in 2:4:5 T and other chlorophenol derivatives including pentachlorophenol. He is concerned with analyses and setting of levels of pesticide residues and became involved in PCBs and now PCP largely through analyses of chlorinated bodies in Swiss cheese. Apparently in 1968 FDA pointed out that Swiss cheese imported into the U.S.A. contained unduly high levels of chlorinated hydrocarbons. Bosshardt eventually tracked this down to the use of Dieldrin as an insecticide applied to cowhairs to prevent attack by wood boring insects. Through this work he became advisor to the Swiss Federal Dept. of Public Health on possible hazards associated with PCBs and more latterly dioxins. On his advice (he claims) the Swiss imposed their 1971 ban on PCBs. From a study of the literature he now feels that the lower chlorinated PCBs are biodegradable although he has done no experimental work himself. He was interested in Monsanto work confirming the view and recognised the importance of experimental demonstration of biodegradability under natural conditions, e.g. pond experiments.

On dioxins he had proposed a low level of 0.05 ppm for TCDD in 2:4:5T on the basis of high toxicity and likely persistence. He did not regard TCDD in penta as a real problem but was much more concerned about hexachlorodibenzo-dioxin. He feels that a level for hexachloro should be set which takes into account the relative toxicity and stability. He was not ready to propose a figure at present because of lack of data on stability and persistence but expects to put forward a figure shortly which may be modified later in the light of experience. It seems likely that this maximum level will be a few parts per million. Dr. Bosshardt knows the Dow group at Morigen which is a few miles away and may well be giving them support in introducing their low dioxin pentachlorophenol.

MONS 044117

Dr. Bosshardt was not able to give complete details of his analytical methods for dioxins but described in general terms that he separated out a neutral fraction, cleaned up an alumina column or TLC plate and then ran G.L.C. with confirmation of peak identity by mass spectrometry. Most of his work had been concerned with 2,4,5-T and he agreed that his claim to be able to detect 0.01 ppm TCDD in pentachlorophenol was optimistic although 0.05 ppm was quite possible.

Bosshardt is a very approachable and engaging character who admits that he overstates his case in order to achieve some action. He probably has a good deal of influence with the Bern authorities but no great international standing. His laboratories appear well equipped and his analytical work generally sound. It will be worthwhile maintaining contact with him.


H.A. WATER

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