The Pond Experiment.

Objective:

To demonstrate, to the satisfaction of regulatory authorities, that Aroclor 1016 will not accumulate significantly in the environment.

Significance.

Laboratory studies, with selected cultures of micro-organisms, have shown that all significant isomers in Aroclor 1016 can be degraded. With more highly chlorinated Aroclors, like 1254, significant residues remain after 50 days exposure to these cultures. For Aroclor 1242, laboratory studies indicate that, whilst all significant isomers can be degraded, the time-scale for many of them is longer than for those in Aroclor 1016.

The question at issue, therefore, is not so much whether a biodegradable product can be produced, but whether the rate of degradation is fast enough to prevent accumulation, particularly through a food chain. The pond experiment is intended to demonstrate that, in an aquatic environment, accumulation through a natural food chain will range from zero in the case of Aroclor 1016 to significant in the case of Aroclor 1254.

A satisfactory demonstration that Aroclor 1016 and perhaps Aroclor 1242 will not accumulate significantly in an aquatic environment would ensure that such products could continue to be used worldwide as capacitor impregnants.

Scope.

Accumulation of persistent chemicals can occur from assimilation through a food chain. If the rates of degradation produced by metabolism at various stages of the food chain are less than the rate of intake, accumulation may occur and will show most effect at the top of the food chain. For PCBs the main sources of wild-life pollution appear to be the marine and aquatic environments. PCB isomers may be taken up by low forms of aquatic life and the more persistent may accumulate through successive links in the food chain, reaching significant levels in fish and dramatic levels in fish-eating birds.

The pond experiment aims to study the build-up from the water-borne state to levels in fish at the top of the aquatic food chain. It is assumed that the material introduced to the pond will be taken up by small aquatic animals which will in turn be consumed by larger pond-life and eventually by the fish.

Preliminary studies indicate that four ponds will be needed for this experiment, each of about 120 square feet surface area and two or three feet in depth. These ponds would be stocked with a balanced mixture of plants and water snails and allowed to equilibrate. During this period, which would take about two months in Spring, a build up of micro-fauna and small aquatic animals would occur naturally. The ponds could then be stocked with fish, probably carp, and would rapidly reach a self-sustaining equilibrium.

One of these ponds would be kept as a blank control; the other three would be dosed with Aroclor 1016, 1242 and 1254 respectively. The Aroclor would be mixed with sand which could be distributed on the bed of the pond. 10 grammes of Aroclor in each pond would provide a level above that required for saturation, assuming full solubility, and would simulate a situation where the product source was sand or mud near an industrial effluent outfall, contaminated at a very high level.

About 50 fish in each pond wouldprobably be sufficient for significant analyses to be made over a period of several months. Analyses of 5 fish from each pond each month should generate data on the nature and extent of accumulation in fish in each pond. Hopefully, a period of 5 - 6 months, perhaps less, will indicate the pattern of accumulation for the various products.

The details of the experiment will be discussed with experts nominated by the regulatory authorities and modifications suggested by them would be incorporated if practicable. The success of the project will depend on agreement with these authorities as to the validity of the method and prior discussion will be essential.

Projected Costs.

The estimated cost for the construction and stocking of ponds with plants & etc.	$2,800
Cost of fish	$ 300
Additional analytical equipment	$1,000
Miscellaneous supplies	$1,000
Travel (Part of which is budgetted for other purposes.)	$1,000
Total	$6,100

Manpower requirements, already budgetted Grad. 1 month. Tech. 3 months.

Timing.

If this project is approved we would aim to have the ponds ready by March 1972 and results available for discussion by September 1972. Subsequent work would be dependent on these results.