PCB 9

FUNCTIONAL FLUIDS

AROCLOR ENVIRONMENTAL PROGRAM

A second set of plant and stream water samples from G.E., Pittsfield, Massachusetts, have been analyzed for PCB's. The results (<1 ppm) were similar to the first set analyzed in early December. Additional samples of milk have been received from G.E. for PCB analysis.

The monthly monitoring of the JFQ Plant composite effluent continues. The PCB level found for November was 19 ppb calculated as Aroclor 1248. This level is lower than found for September and October by a factor of about 4X, part of which can be attributed to the current very low laboratory blanks.

The analysis of all samples taken during the recent Enviro-Chem PCB solid waste disposal tests have been completed and the results reported for correlation with engineering data. A second sampling of the pond associated with the Enviro-Chem incinerator demonstrated that the PCB disposal tests did not contaminate the site (<10 ppb).

GC/Mass analysis of a composite sample of the materials extracted by water from eleven current Aroclor 5442 lots has been completed. No highly toxic components, furans, dioxins, etc., were identified which could account for the higher toxicity of Aroclor 5442 to Daphnia over chlorinated biphenyls. Chlorinated biphenyls and terphenyls were identified as the major constituents of the composite.

Previous work had shown that an impurity in Aroclor 5442 gave a low resolution mass spectrum similar to the spectrum of tetrachlorodibenzofuran. It was later found that tetrachloromethylbiphenyl has a similar mass spectrum.

To determine which of these compounds is present, a high resolution mass spectrum was obtained at the Physical Sciences Center on a concentrate containing the impurity. This spectrum indicated the empirical formula of the impurity to be $C_{10}H_{12}O_2Cl_4$. The empirical formulae of tetrachlorodibenzofuran and tetrachloromethylbiphenyl are $C_{12}H_4O_2Cl_4$ and $C_{13}H_8Cl_4$, respectively. No reasonable structure has been found for the indicated empirical formula. Another sample has been concentrated and is scheduled for high resolution mass spectrometry to verify the empirical formula of the impurity.

BIODEGRADATION TESTING

The expansion of the semi-continuous activated sludge (SCAS) testing facilities from 16 to 26 units has been completed. This will now allow us to study 24 products, including 10 new ones. Additionally, early in January, a fractional replicate of a factorial experiment will be initiated. This preliminary experimental design will be used to determine the effect that seven variables have on the observed SCAS disappearance rates of three model compounds. The model compounds to be studied during the eight week duration of the test are biphenyl (degradable), 2,4'-dichlorobiphenyl (intermediates - degradable), and 2,2',4,4',6,6'-hexachlorobiphenyl (non-degradable).

BIODEGRADATION TESTING (Cont'd)

A staggered schedule for all SCAS units has also been laid out which will allow one-third of the 24 units devoted to degradation to be sampled and analyzed (20 data points) during each month of operation. The compounds to be studied during January include TCB, MIPB, HB-40, 2,2'-dichlorodiphenyl ether and Aroclor 1221 as well as the three units devoted to the statistical experiment. The other compounds being fed, but not sampled and analyzed, to the remaining units are MCS 1043, MCS 1016, Aroclor 1242, Aroclor 1254, Arobromoclor 1232, ONCB, PNCB, p-chloroaniline, nitrated orthene, Santicizer 711M, hexabromobiphenyl, Aroclor 5432, Aroclor 5442, Aroclor 5460, and Arobrom 5465. Analysis and sampling of these units will begin in February and March. In the meantime, the effects that these materials have on the normal characteristics (pH, growth rate, and settling time) of the activated sludge will be monitored on a daily basis.

The two remaining units are being used to maintain special cultures, a C_2 biphenyl culture from MCL, and a biphenyl culture grown in our laboratories. Very rapid growth on biphenyl as the sole carbon source has been observed with the MCL-C_2 culture.

River die-away tests with Aroclor 1242, Aroclor 1254, MCS 1016, MCS 1043, Arobromoclor 1232 and TCB at the 100 ppb level were discontinued after several weeks. The highly scattered data obtained indicated that the 100 ppb level was too low to achieve meaningful disappearance rates due to procedural problems and/or losses by non-degradation routes (volatilization, adsorption, etc.). Further experimentation is planned during the first quarter.

A brief sampling period of the HB-40 and MIPB semi-continuous activated sludge (SCAS) units was completed 11-28-70. UV analysis of the hexane extracts gave mean disappearance rates of 58%/cycle for MIPB and 44%/cycle for HB-40 based on the total material present. A 3X cycle gave disappearance rates of 66% and 55%, respectively while a 5X cycle gave 77% and 62%, respectively. SCAS work with these materials will be concluded with an extended sampling period.

Feeding of the Aroclor 1221 SCAS unit continues but with only limited sampling. No quantitative data is available yet but qualitatively there appears to be a rapid disappearance of the lower homologs with a build up of the higher ones. This unit is scheduled to be sampled for an extended period in January.

River die-away tests on HB-40 and MIPB are nearing completion. After a three-week exposure at the 1 ppm level to the normal level of micro-organisms in Meramec River water the MIPB concentration has decreased by a total of 85%, of which 54% can be attributed to microbial degradation. Similarly for HB-40, the total concentration has decreased by 66% of which 57% can be attributed to microbial degradation.

BIODEGRADATION TESTING (Cont'd)

The liquid-liquid chromatography method for the analysis of SCAS samples containing Aroclor 5432 has been optimized. The liquid-liquid system consists of a 3 ft. column packed with Zipar Permaphaze as the stationary phase and water/methanol (75%/25%,v/v) as the mobile phase. The ultraviolet detector response is linear between 0 and 50 ug of Aroclor 5432, absolute, with a lower detection limit of about 1 ug absolute. Analysis time is 40 minutes. Optimization of the system to other halogenated terphenyls will be made.

AROCLOR 1260

Analysis of current biphenyl used in the manufacture of Aroclor 1260 at the WGK Plant was carried out to determine if impurities in the biphenyl are responsible for manufacturing problems. No significant differences were noted between current and past biphenyl, using gas chromatographic trace analysis.

AROCLOR 1242

Aroclor 1242 from various stages of chlorination in the WGK Plant process was analyzed by GC for isomer distribution.

AROCLOR PRODUCTS

Organic impurities in WGK Plant Department 246 chlorine were trapped on charcoal and isolated. GC/MS and NMR showed that this material was a mixture of highly chlorinated aliphatic hydrocarbons.

CAPACITOR DIELECTRICS

The capacitor life-testing equipment was modified by installation of a test jack at each capacitor position. The jacks were arranged to permit connection of a bridge for measurement of capacitance and dissipation factor without interruption of the life-testing schedule.

An experimental capacitor fluid, n-butyl-2,4-dichlorophenyl ether, containing 0.01% Santowhite Powder (an anti-oxidant) was analyzed by a colorimetric procedure to determine if the Santowhite was removed after treatment of the fluid with Porocel. Results show that 75% of the Santowhite is removed.