Monsanto

FROM (NAME & LOCATION) Dept. of Medicine & Environmental Health B. W. Eley

DATE: November 10, 1975 (Update 2/24/76) CC: Jack T. Garrett

SUBJECT: Summary of PCB Air Monitoring

REFERENCE: WGK and Newport Plants

TO File (Aroclors)

This memo summarizes the recent industrial hygiene activities in the Aroclor departments at the W. G. Krummrich and Newport, South Wales plants. Described are air monitoring procedures, analytical technique, and resulting atmospheric levels of polychlorobiphenyls to which workers are exposed.

A short discussion of analyzing PCB's in body fluids is also included.

W. G. KRUMMRICH SAMPLING PROGRAM:

The first series of PCB air samples were collected on August 21, 1974 by Harvey Zar, a summer student working in the Environmental Control Group at the WGK Plant. The air samples were collected in 6" x 0.093" I.D. resin tubes filled with "Tenax" gas chromatographic packing material which has since been used for sampling and analyzing high boiling compounds in the vapor state. The vacuum source used consisted of an empty 11-Liter Freon-12 cylinder which was evacuated to 30" (Hg) in the laboratory prior to sampling. A vacuum gauge and needle valve were installed on the cylinder in order that the sample volume (as related to differential pressure) could be calculated.

In the field the U-type resin tubes are connected to the vacuum source and the needle sample is then opened to collect the sample. Sample volumes ranged from 2 - 5 liters of air in this study.

The used resin tubes were analyzed by Jim Francis in the WGK Laboratory using a Varian Gas Chromatograph with a FID (flame ionization detector) unit. The sample tubes are connected in-line with a 24" x 0.092" I.D. separation column packed with 60 - 80 mesh Tenax resin. After thermally desorbing the vapors entrained within the sample tube, carrier gas sweeps them into the GC column for separation and further quantitative analysis by the FID unit. This analytical technique is sensitive down to 0.5 micrograms of polychlorobiphenyls. Therefore, given a

IN-10M 12/75

5 liter sample volume, the lower limit of PCB detective would approximate 0.1 mg/M^3 in air.

The resulting atmospheric levels of Aroclor 1242 were detected during the August, 1974 study.

Sampling Location (Dept. 246)	mg/M^3 Aroclor 1242
1) 2nd level near chlorinators	0.37
2) Ground level by fume scrubber	0.42
3) 2nd level by South walkway	0.50
4) Ground level under chlorinators	0.56

These levels are below the current TLV of 1.0 mg/M^3 for the lower chlorinated material but do borderline or exceed the "action level" at two locations.

A more recent sampling program completed in October, 1975 utilized a different collection procedure and more sensitive analytical technique. A group of six (6) air samples were taken using two midget impingers containing 10 mL. of toluene each as the collection media. The impingers were connected in series to an electric bellows type pump operating at a flow rate of 545-580 mL/minute. Collection periods ranged from 3 - 4 hours per sample. During the actual sampling, the impingers were immersed in an ice batch to lessen the loss of solvent through volatilization.

After absorbing the PCB's in the impingers the toluene was evaporated in the laboratory to milliliter amounts for analysis of solubilized PCB. The analytical technique consisted of the injection of a μ-liter quantity of toluene into a gas chromatograph, separation of the sample components on a GC column, and final detection of the PCB's using a high temperature Ni^{63} electron capture cell. A more detailed description of the exact procedure used along with temperature and column conditions is available from J. H. Francis in the WGK Analytical Group.

The following results were obtained from the October sampling program.

Date	Location	Concentration mg/M^3 Aroclor 1242
10-9-75	2nd level near batch chlorinators	0.022
10-9-75	2nd level (continuous chlorinators)	0.012

continued..

Date	Location	Concentration mg/M^3 Aroclor 1242
10-13-75	2nd level (near batch chlorinators)	0.057
10-13-75	2nd level (continuous chlorinators)	0.058
10-14-75	Directly above a sewer sampler on the east side of department	0.006
10-14-75	Ground floor at scrubber discharge	0.338

As shown all exposure level are well below the current TLV of 1.0 mg/M^3. It is of interest to note that the detection sensitivity using electron capture is in the nanogram range or about 1/1000th of the FID sensitivity.

The exposure levels as determined by the October, 1975 study were much lower than those detected in the Aroclor Department last year. These differences could be accounted for by the general upgrading of working conditions that has been instituted within the department over the past year and by the use of a more sensitive analytical approach. I expect the latter cause to be the more significant.

NEWPORT SAMPLING PROGRAM:

During the periods October-November, 1974 and July-August, 1975 the Technical Services Departmental staff of the Newport, Wales plant collected air samples in the Aroclor Department and analyzed the PCB content by electron capture gas chromatography. The attached Progress Report provides detailed methodology used and results obtained.

The exposure levels at Newport compare favorably with those reported at Krummrich during October, 1975.

BIOLOGICAL MONITORING:

In talking with Scott Tucker, Jim Mieure, and Bob Kaley in the MICC Applied Sciences Group, they indicated that some work had been done several years ago at WGK in analyzing PCB's in blood. The PCB in blood samples wereextracted with hexane followed by a gas chromatography-electron capture detection analysis similar to that used in analyzing air samples. I do not know what PCB levels were obtained from that study but I was told that Dr. Kelly received a copy of the results. Evidently this information should be available somewhere in our medical files.

Jim Mieure stated that Monsanto has to date done no PCB analytical work with urine. However, based on a study in the

literature in which PCB content in rat urine had been determined, he felt we did presently have the capability of analyzing PCB in urine down to a sensitivity of 1-10 ppb. The technique would be similar to that used for blood. I think Jim would be interested in pursuing the methods development if Medical considered it worthwhile.

Bruce W. Eley

Addendum: On January 22, 1976, two general area samples were collected by WGK in the Aroclors Department. The material, polychlorinated biphenyl, was collected in impingers containing toluene. The results follow.

Location	PCB(mg/M^3) in Air
At batch chlorinators on 2nd level	0.18
At continuous chlorinators on 2nd level	0.08

The current TLV for chlorodiphenyl (42% CL_2) is 1.0 mg/M^3. The results shown concentrations well below the established limit.