TITLE: Polyurethane Foam Adsorption of PCB's from the Southwest Settling Basin in the Aroclor Department

I. WORK DONE TO DATE

Table I on Page 3 lists the major differences between the two runs conducted at the W. G. Krummrich Plant. Data obtained during the experimentation is presented on Page 4.

II. CONCLUSIONS

1. Ground polyurethane foam plugs packed in a large column will not remove PCB's from waste water as effectively as carbon, based on carbon test data obtained at the Anniston Plant.

2. An intact circular piece of polyurethane foam appears to remove PCB's from waste water as well as carbon.

3. A prefilter should be used before feeding department sump water to the adsorbing agent.

4. Further work needs to be conducted with the foam.

III. WORK TO BE DONE

A. Objective: To find the level to which polyurethane foam will remove PCB's from waste water.

B. Based on the above objective, the following work will be undertaken:

   1) Various combinations of two small glass columns in series packed with carbon or foam will be tested in the lab, to find the arrangement of the columns and the type of foam which will reduce the PCB level of the department sump water to the lowest level attainable. (See Table 2, Page 5)

   2) Plant runs using the optimum PCB removal system found in the lab to assess the performance of the system at the plant level.

IV. SUGGESTED WORK

If polyurethane foam is to be used to remove PCB's from waste water work will be needed to obtain:

1. Engineering data consisting of the loading capacity, size of the loading zone, and optimum feed rate so that the optimum PCB removal system for plant operation can be designed. The loading capacity of the foam should be determined in the lab since the temperature, solids level and PCB's of the feed can be controlled more precisely than in the plant.

DSW 329924

STLCOPCB4076567

IV. SUGGESTED WORK (Continued)

2. A non-flammable mode of regeneration of the foam unless economics or other reasons dictate disposal of the spent foam to be the more practical route to take.

Bernie Bose
Technical Services Department
W. G. Krummrich Plant

DSW 329925

TABLE I

POLYURETHANE FOAM ADSORPTION OF PCB's

RUN I	RUN II
1. The glass column was packed with polyurethane foam plugs, 22 mm. x 38 mm ground in a Waring blender to approximately 1/4 in. pieces.	1. The glass column was packed with one circular section 5 ft. long and 3 in. in diameter consisting of a central octahedral shaped core surrounded by a 1/2 in. sheet.
2. Waste water was fed directly to the column, i.e. no prefilter was used.	2. Waste water was passed through a prefilter before being fed to the column. The prefilter was a glass column having a length of 1 ft. and an inside diameter of 1.75 in. packed loosely with glass wool.
3. PCB concentrations of the column effluent ranged from .5 ppm to 10.7 ppm while the PCB concentration of the column feed was 36 ppm.	3. PCB concentrations of the column effluent were consistently less than 10 ppb while the average column feed PCB concentration was 214 ppb.

NOTES:

1. The glass adsorption column had a length of 5 ft. 3 in. and an inside diameter of 3 in.
2. The glass adsorption column was packed to a bed depth of 5 ft. with polyurethane foam.
3. Flow was directed upward through the prefilter and downward through the foam adsorption column.

DSW 329926

DSW 329927

STLCOPCB4076570

POLYURETHANE FOAM ADSORPTION: DATA SHEET; RUN 2

DATE	TIME	FEED TEMP.	FEED RATE	TOTAL HOURS OF OPERATION	PCB's IN COLUMN FEED, PPB	PCB's IN COLUMN EFFLUENT, PPB	COMMENTS
9/23/74	9 A.M.	35°C	.24 gpm	1	269.8	3.6	
9/23/74	Noon	35°C	.24 gpm	4		5.1	Feed sample not take
9/23/74	4 P.M.	35°C	.24 gpm	8	66.2	3.6	
9/24/74	8 A.M.	35°C	.24 gpm	8	161.8	Sample not taken	Clear sump
9/24/74	Noon	35°C	.24 gpm	12	Samples not taken		Column shutdown
9/25/74	1 P.M.	50°C	.25 gpm	13	103.0	10	Turbid feed & effluent
9/25/74	2:30 P.M.	50°C	.25 gpm	14.5	103.0	Trace	Turbid feed & effluent
9/25/74	4 P.M.	35°C	.24 gpm	16	163.8	.2	
9/26/74	12:25 A.M.	35°C	.24 gpm	24.5			Column shutdown
9/26/74	8 A.M.	35°C	.26 gpm	24.5			Sump H_2O Still & Clear
9/26/74	10:30 A.M.	35°C	.25 gpm	27			
9/26/74	11:00 A.M.	35°C	.25 gpm	27.5			
9/26/74	Noon	35°C	.25 gpm	28.5	629	5.9	
9/26/74	4 P.M.	50°C	.25 gpm	32.5	6,840	2,490	Soapy feed & effluent

NOTES: 1. Analytical work revealed that the PCB's in the samples were primarily of the lower chlorinated form.

2. Variables: a) flow of liquid into sump
   b) solids in the sump
   c) temperature of the sump. The higher the temperature the more turbid the sump was.

TABLE II

TESTS TO BE CONDUCTED IN THE LABORATORY WITH POLYURETHANE FOAM

TEST NUMBER	ADSORBENT IN COLUMN I	ADSORBENT IN COLUMN II
1	Carbon	Carbon
2	Polyurethane Foam	Polyurethane Foam
3	Carbon	Polyurethane Foam
4	Polyurethane Foam	Carbon

NOTES:

1. Glass columns having a length of 1 ft. and a diameter of 1 in. will be used for the laboratory work.

2. The tests will be done on a volumetric basis, i.e. equal volumes of carbon and foam will be used in the columns.

3. Foam will be supplied for the lab work by various fabricators in single continuous sections which will fill the entire column. Carbon to be used will be obtained from the Muriatic Acid Department at the plant (Type Cal).

4. Waste water from the Aroclor settling basin will be used in the work. Feed to the column will be large enough so that low PCB levels in the column effluent can be detected.

DSW 329928

Results of meeting at the county between Bosse, Bucher, Engman, Rhemsch, Richard and Savage

1) Various supplies of Polyurethane Foam have been contacted and samples have been obtained. Screening tests will be conducted at the county to determine the loading capacity and the best foam for PCB removal. Samples consist of Polyether and Polyester Polyurethane Foam of different porosities.

2) Tests will be conducted at the plant. The tests will consist of feeding sumps material through a carbon and foam column in series. Feed rate will be varied weekly, and the foam cut into sections at the end of the tests in an attempt to determine the length of the adsorption zone. The objective of the plant test will be to reduce the PCB level of the sumps material to <.03 ppb. (.03 ppb is the lowest level that our lab can analyze for.) The carbon used will be type CAL used in the Muriatic acid department. Polyether Polyurethane Foam will be the foam used.

Bernie Bosse

DSW 329929

STLCOPCB4076572