The potential environmental hazards of biphenyl with low levels of chlorination are different than biphenyl with high levels of chlorination and, therefore, should receive different effluent limits. It is possible to define PCBs for the purpose of setting effluent limits, as mono, di, tri, tetra, penta and hexachlorobiphenyl, the major isomer groups of all PCBs. Cl_7 to Cl_{10} biphenyl compounds may be too non-volatile for conventional GC-MS analysis (See attachment, "Polychlorinated Biphenyl (PCB) Analysis.") Individual isomers within each group should be treated alike unless future data regarding environmental hazard shows specific isomers to be significantly different from the group.

Table I provides data from which an alternative approach to establishing effluent limits for these PCB groups has been derived according to their bioconcentration factors. Values for partition coefficients in Table I were calculated according to the method of Leo, et al.* The bioconcentration factor for tetrachlorobiphenyl in rainbow trout has been experimentally determined (preprint by Branson, et al. attached). Bioconcentration factors for the other chlorinated biphenyls were calculated according to the method of Neely, et al. (Preprint attached.).

The water levels that impact unsafe residues in fish can be estimated from the relative bioconcentration factor at steady state as follows:

$$\frac{C_F}{BF} = C_w$$

C_F = Concentration of chemical in fish flesh that is unsafe, e.g. 5 ppm for PCB

BF = Bioconcentration Factor

C_w = Concentration of chemical in water

The water quality criteria for PCB's shown in Table I were calculated using this approach. Thus, water of acceptable quality for a fish habitat should be realized if the concentration of PBC isomers ($C_{w_1} \cdots C_{w_6}$) satisfy the equation:

*A. Leo, C. Hansch, and D. Elkins, Chem Rev., 71, 525 (1971).

$$590\ C_{w_1} + 1400\ C_{w_2} + 3400\ C_{w_3} + 12{,}300\ C_{w_4} + 19{,}000\ C_{w_5}$$

$$+ 47{,}000\ C_{w_6} \leq 5\ mg/l$$

After designation of acceptable levels of PCB's in the receiving water, allowable discharges from point sources should be set in individual NPDES permits.

How does this alternative approach differ from that proposed by the EPA, 40 CFR Part 129?

1. The concept of pounds per day in effluents of PCB's like Aroclor 1242 or 1254, etc. would be discontinued.

2. The bioconcentration factors, and, therefore, water quality criteria and effluent limitations, are based on the properties of individual PCB isomer groups. The bioconcentration factor of 200,000 used to calculate effluent limits in the proposed regulations is not characteristic of all members of this class of compounds.

3. The effluent limits are based on water quality criteria. The allowable discharge from each point source would be set at the local level and stipulated in the NPDES permit.

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TABLE I. WATER QUALITY CRITERIA FOR CHLOROBIPHENYLS

Chemical	Log Partition Coefficient[a]	Bioconcentration Factor C_F/C_W	Concentration (µg/l) of PCB in water leading to 5 ppm in trout flesh
Chlorobiphenyl	4.9	590[b]	8.5
Dichlorobiphenyl	5.6	1,400[b]	3.6
Trichlorobiphenyl	6.3	3,400[b]	1.5
Tetrachlorobiphenyl	7.0	12,300 ± 2,300[c]	0.40
Pentachlorobiphenyl	7.7	19,000[b]	0.26
Hexachlorobiphenyl	8.4	46,000[b]	0.11

[a] Calculated according to the method of Leo, et al. (Chem Rev., 71, 525 (1971)) assuming $\pi = 0.7$ for each aromatic chlorine, and confirmed by adding π values for chlorobenzenes.

[b] Calculated value from Log BF = 0.56 Log P oct + 0.124 (See attached preprint by Neely, et al.).

[c] Measured value (See preprint by Branson, et al.).

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