ILLINOIS POLLUTION CONTROL BOARD
September 29, 1977

IN THE MATTER OF:	)	
	)	
WATER QUALITY AMENDMENTS, HEXANE (FREON) SOLUBLES	)	R74-1, -8, -9
	)	

OPINION OF THE BOARD (by Mr. Goodman):*

The original proposal in this matter (R74-1) was filed by the Associated Milk Dealers, Inc., on January 9, 1974, requesting amendment of existing standards in Rule 408(a) of Chapter 3: Water Pollution, as they apply to "Oil (hexane solubles or equivalent)." Two additional proposals were received on August 2, 1974, from Borden, Inc., and the Soap and Detergent Association (R74-8 and R74-9, respectively).

At its meeting of August 29, 1974, the Board consolidated the three proposals and authorized hearings. An Interim Order was then entered on July 24, 1975, however, granting proponents' motion to cancel hearings which had been set. Pursuant to a further motion by the Associated Milk Dealers, filed October 3, 1975, hearings were reset, with the first two held on March 8, 1976, in Chicago and April 5, 1976, in Springfield.

On April 8, 1976, the Board entered another Interim Order denying the Environmental Protection Agency's motion of March 29, 1976, for dismissal. An additional hearing was held on April 26, 1976, in Chicago.

Proposed amendments to the original proposals were then received from the Environmental Protection Agency (November 13, 1976) and the original proponents (December 9, 1976). These amended proposals were the subject of a prehearing conference held on December 7, 1976, (open to the public), and an additional public hearing held Jaunary 24, 1977, in Chicago.

*The Board wishes to thank Vincent P. Flood, Jr., Attorney, Hearing Officer in this matter, for his assistance in the preparation and drafting of this Opinion.

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An Economic Impact Study, as required under P.A. 79-790, was filed by the Institute for Environmental Quality on May 13, 1977, I.I.E.Q. Doc. No. 77/17, Economic Impact of Proposed Amendment to Water Pollution Regulations for Hexane Extractable Materials, R74-1, -8, -9. Hearings on that study were held in Chicago on June 6, 1977, and in Springfield on June 7, 1977. In addition, the Board briefly reopened the record on the technical merits of the various proposals at the June 7, 1977 Springfield hearing.

THE PROPOSALS

The three original proposals were published in Board Newsletter #91, dated September 11, 1974, with a summary of the supporting rationale. Because all the proponents concurred in later amended proposals, we need not repeat them here; instead, we note simply that each of the original proposals would have effectively de-regulated "polar hexane extractable material", alleged to be biodegradable, compatible with treatment in publicly owned treatment works, and adequately regulated by the allegedly parallel standard in Rule 404 of Chapter 3 for deoxygenating wastes (BOD_5). The existing standards would have been kept only for "non-polar hexane extractable material," (allegedly refractory or mineral oil).

The amended proposals as published in Environmental Register #138 (December 14, 1976) would, without totally de-regulating polar hexane extractables, accomplish the same final result. The Agency's proposal of November 15, 1976, would allow discharges at existing (15 mg/l) levels for both polar and non-polar hexane extractable materials:

"Constituent	Storet Number	Concentration (mg/l)
....		
Oil (Hexane Extractable Material)	00550, 00556 00560	15.0**
....		

....

**Oil may be analytically separated into its polar and non-polar components. If such separation is done, neither of the components may exceed 15 mg/l (i.e. 15 mg/l polar hexane extractable materials and 15 mg/l non-polar hexane extractable materials)."

The proponents' amended proposal is much the same as the Agency's, but adds additional language adopted from another regulatory proposal, R76-21, submitted by the Institute for Environmental Quality, with regard to testing and averaging for compliance determination:

"Constituent	Storet Number	Concentration (mg/l)
....		
Oil (Hexane Extractable Material)	00550, 00556 00560	15.0*
....		

*Oil may be analytically separated into its polar and non-polar components. If such separation is done, neither of the components may exceed 15 mg/l (i.e., 15 mg/l polar hexane extractable materials and 15 mg/l non-polar hexane extractable materials). Compliance with this numerical standard shall be determined on the basis of 24 hours composite samples, averaged over any consecutive 30 day period; provided, however, no single 24 hour composite shall be greater than 2 times the numerical standard and no grab sample shall be greater than 5 times the numerical standard."

Additional proposals were submitted by the National Renderers Association (R.637) and Mr. Clark Rose, an interested private citizen, (R.668). In essence, these proposals would have called for individual determinations of biodegradability for each discharger's effluent. While the concept behind these proposals may be superior to the less-precise, general classifications of "polar" and "non-polar", such individual testing was generally conceded to be unworkable, (e.g., R.651). The participants in this matter contested strongly a definition of biodegradability; an adequate test for biodegradability (see discussion below) is simply not supported by the record.

THE ISSUES

Surprisingly, none of the original proponents, and few members of the Associated Milk Dealers or the Soap and Detergent Association, would be directly affected by the proposed regulatory change.* Instead, with the notable exception of the Metropolitan Sanitary District of Greater Chicago (MSD), most of those participating in this matter either discharge to sewers tributary to publicly owned treatment works, or represent such sewer dischargers. (In addition

*Inasmuch as nearly all participants in this proceeding concurred in the Amended Proposal of December 9, 1976, set forth above, we shall limit our discussion to that proposal, unless noted otherwise.

to the proponents, MSD and the National Renderers Association submitted considerable testimony and documentary evidence.) In fact, there are few major direct dischargers of waste water by firms using fats and oils. See, Ex. E-1, IIEQ Doc. No. 77/17, at 64, Table 11.

The reason why indirect dischargers brought these proposals to the Board, and carried the burden at hearing, was set forth in the original proposals: our limitations on hexane soluble discharges by municipal treatment works require that the operators of such treatment works stringently limit, in turn, discharges into tributary sewers. For example, MSD's ordinance limits hexane extractable sewer discharges to 100 mg/l; other municipalities or sanitary districts have even lower limitations, (id., Table 9, at 57). Such sewer discharge limitations, the proponents claim, result in expensive, unnecessary pretreatment requirements, of little or no benefit to the quality of the waterways to which the treatment works ultimately discharge. The only reason such pretreatment standards are needed, it is argued, is to allow municipal dischargers to meet Board Regulations; it is alleged that they serve no other purpose.

The proponents argued that polar hexane solubles (or their equivalent, as will be discussed below) are made up primarily of fats, grease and oils of animal or vegetable origin, and are biodegradable. Being biodegradable, and allegedly analogous to BOD_5 influents for treatment purposes, polar hexane solubles are alleged by the proponents to be more properly treated in municipal treatment plants, and not by sewer dischargers. At the initial hearings on the original proposals, the existing BOD_5 limitation was claimed to provide adequate protection for the receiving waters; although they later accepted the Agency's proposed limit of 15 mg/l for polar hexane solubles, the proponents never abandoned this contention.

In light of these contentions, the following issues must be resolved:*

1. What is the present state of water quality with regard to hexane extractable materials?

2. Would a regulatory amendment increase either allowed or actual discharges?

3. How would such increases, if found likely, affect water quality?

*It should be noted that existence or availability of technology for treatment or pretreatment was not an issue, and was not seriously raised during these proceedings; the issue was cost.

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4. What would be the economic effects, including pretreatment costs for sewer dischargers, of enforcing the existing regulation, as compared to the economic impact of the amended proposal?*

5. In light of the above, what regulatory action (unchanged, amended proposal, or some other) is warranted?

6. How should compliance with the adopted standard -- if any -- be measured?

MEASUREMENT

Turning first to the last of those issues, there was a general consensus that "oil (hexane solubles or equivalent)", as presently limited in Rule 408(a), does not constitute a single, discrete, identifiable pollutant. Rather, the pollutants limited are defined by the test procedure.

"Oil", as presently regulated, covers a wide spectrum of chemicals, compounds and physical states. Hexane solubles include "hydrocarbons, high molecular weight fatty acids, sterols, and lipids. The major fractions...in sewages have been found to be comprised of glycerides and fatty acids or salts of fatty acids [citation omitted]. The long chain fatty acids would include lauric, palmitic, stearic, oleic and linoleic acids." Lue-Hing and Lordi, Hexane Extractable Materials and Problems at Municipal Treatment Plants, Report No. 75-9, Metropolitan Sanitary District of Greater Chicago, May, 1975, at 1. As noted in Standard Methods for the Examination of Water and Waste Water, Thirteenth Edition (1971),

> unlike some constitutents -- which represent distinct chemical elements, ions, compounds or groups of compounds -- greases are in effect defined by the method used for their determination. (Part 209.)

*It was argued that the Board should not consider the potential economic effects of changes in pretreatment standards or costs, based on the contention that such standards are not before us; a change in the Board's standards will not necessarily entail commensurate changes in ~~pretreatment~~ requirements by municipal dischargers. We disagree: (1) the Board welcomes anyone with relevant, properly presented data to participate in Regulatory matters; and (2) while changes in ~~pretreatment~~ standards may not be required by Board action on direct discharge limits, such changes constitute a real possibility, and have a valid connection to the presentation of a range of economic and/or environmental potential effects for Board consideration. See, e.g., Ex. E-1.

In that same passage, Standards Methods notes that grease may "be said to include fatty acids, soaps, fats, waxes, oils and any other material which is extracted by these solvents from an acidified sample and which is not volatilized during evaporation of the solvent ...." id.

The problem of definition here is further complicated by the fact that "hexane solubles" may be further separated into polar and non-polar components. As noted above, it is the crux of the proponents case that polar hexane solubles are alleged to be, generally, of animal or vegetable origin and readily biodegradable; the acronym FOG (fats, oils and grease) was generally used to indicate the polar, "biodegradable" fraction.

However, "organic substances other than grease and oil are recovered by the techniques suggested in Standard Methods...long chain carbon compounds used by industry as lubricants and emulsifiers may not be completely recovered, and short chain hydrocarbons and simple aromatics may be lost by the partition gravimetric method of recovery." (Ex. E-1, at 8). There was considerable discussion on this issue at hearing, and witnesses for the proponents agreed that the polar/non-polar distinction is not perfect in this regard. The distinction is, however, generally valid.

Further muddling the measurement issue is the fact that the Agency's amended proposal, and the proponents amended proposal, both would allow the use of three different test procedures, none involving hexane extraction; instead, freon (trichlorotrifluoroethane) extraction is used.

Finally, in this regard, Dr. James W. Patterson testified on behalf of the Illinois Effluent Standards Advisory Group (IESAG) on the subject of averaging. As noted above, the amended proposals before the Board would allow compliance to be based on 24-hour composite samples averaged over any consecutive 30-day period, with individual 24-hour composites limited to two times the numerical standard, and grab samples limited to five times the numerical standard. As Dr. Patterson noted, (R.699), the "proposed averaging procedure does represent a relaxation [of the standard] to an extent." However, while such averaging would allow half the composite samples to be "quite high", at least half would also have to be quite low, "to average out." (id.)

With some reservations, (as noted below), we feel that the proposed testing methods and compliance standards are acceptable.

With regard to the two new STORET numbers proposed (00550 being

presently used), the Board has previously stated that,

> The STORET materials themselves are clear that alternative methods are allowed, and our Rule 105 expressly so states. The STORET reference serves only to aid in definition and to facilitate comparison of data....In the Matter of Water Quality Standards Revisions, R70-8, 71-14, -20, 3 PCB 401, 403 (1972).

By specifying additional STORET numbers in the regulation, the Board will, in effect, merely be adding additional pollutants to those already potentially defined under STORET number 00550; as noted above, the testing procedure defines the pollutant in this case, rather than the reverse. Rule 105, Analytical Testing, would allow the use of standard methods, or "other generally accepted procedures." While the Board has generally stated that, "we cannot agree to give such decisive authority to one party to a controversy," the Board has generally allowed the Agency to determine analytical testing standards. 3 PCB at 403; see, In the Matter of NPDES Regulations, R73-11 and 12, 14 PCB 661, 675 (1974).

While it is obvious from the record that the different STORET numbers give different testing results, (e.g., R.628, 649, 662-3, 667; Ex. E-1 at 8), it is assumed that a discharger will use that testing method quantifying all -- as nearly as is ascertainable -- of its discharges; i.e., that method giving the least favorable results for the discharger.

With regard to the averaging issue, testimony by Dr. Patterson (January 24, 1977) indicates that the requested change is indeed good engineering practice, for design, economic and regulatory purposes. Because influents exhibit strong variability, (e.g., R.696; Lue-Hing and Lordi, supra), the present averaging system requires extreme overdesign of treatment plants to avoid violation, with little resultant benefit to the receiving stream; it seems impractical to require that treatment plant design to prevent violation be aimed, because of such variability, at a much lower figure than our effluent standard.

With regard to a distinction between "polar" and "non-polar" materials, the record also supports change in this regard. While the test is far from perfect, inasmuch as some polar material is not biodegradable, (e.g., R.662), the presence of such other, harmful compounds in the types of wastes likely to be measured is not expected, (R.601).

In general, the polar materials are "more readily biodegradable." (R.612-614). Despite apparent opposition at the early hearings, even the Agency agreed with proponents contention as to biodegradability before the close of the record, (id.). Testimony to that effect constituted much of the Petitioners' case, (e.g., R.158, 408, 560, 51, 183-190). While there was opposition to this contention (e.g., Lue-Hing and Lordi, supra, at 59; but see, id. at 84), the bulk of the evidence indicates a valid correlation between polar (as v. non-polar) content and biodegradability. Some measurement distinction between the two is justified.

WATER QUALITY

There is no water quality standard for hexane -- or freon -- solubles. Instead, Rule 203(a) prohibits, "...visible oil...unnatural or turbidity, or matter in concentrations or combinations toxic or harmful to human, animal, plant or aquatic life...". To assure compliance with this standard, the Board enacted (in addition to Rule 402, prohibiting violation of water quality standards), Rule 403, offensive discharges, which requires that, "...visible oil, grease, scum....color, odor and turbidity must be reduced to below obvious levels."

The existing 15 mg/l limitation on oil (hexane solubles or equivalent) was adopted because, "[t]he nuisance value of oil in a stream, together with its adverse effects on aquatic life, require that oil discharges be kept to a minimum." 3 PCB 417. Inasmuch as the record was clear that such "nuisance value" is not a problem in the absence of oil spills or plant malfunctions, the issue is then whether present discharges or those under the proposed amendment would cause damage to aquatic life.

The actual quantity of hexane-or-freon solubles in Illinois waterways is not known; sampling is not performed by the U.S. Geological Survey, the Agency, U.S. EPA or the Illinois State Water Survey. Uncontested Testimony by Dr. Bates cited studies to the effect that freon extractable materials are not considered to be a problem in Illinois. Dr. Booman, assuming that BOD_5 limitations would be adequate to cover freon soluble discharges, stated that, "at the levels present...[in question]...oils and greases of an animal or vegetable origin have no other adverse effects on aquatic life..." (R.475). Similar testimony was received from Dr. Patterson.

There was little valid testimony with regard to the quantitative water quality effects of a regulatory change. Dr. Bates, at the

economic impact hearings, stated that the maximum expectable increase in freon soluble levels in Illinois waterways would be 1 mg/l. Although non-polar freon solubles might be toxic to some aquatic life forms at this level, most freon extractable materials discharges are polar, (R.12, Economic Impact).

There is also a stronger water quality-based argument supporting the Proposals. In fact, many (if not most) municipal and direct dischargers are not in compliance with existing FEM standards; that being the case, it is unlikely that FEM levels in waterways would increase by anywhere near the maximum amounts propounded by the Institute's contractor. In essence, the proposal can be justified as an attempt to legitimize the present situation, there being no indicated environmental damage occurring under the present situation.

This analysis was also supported by testimony for MSD by Dr. Lue-Hing. He stated that present discharges by the MSD are not causing a water quality problem, (R.691), and would be in compliance under the proposed regulation, (R.690). Such testimony was supported by MSD data and witnesses for the proponents showing that municipal sewage is largely composed of polar HEM (FEM).

That being the case, there is no information before the Board indicating that the proposed regulation would harm water quality or prove detrimental to aquatic life.

ECONOMIC EFFECTS

The Institute's economic impact study, Ex. E-1, supported the regulatory proposal. The data on which such support was based, however, was also valuable for analysis because it presented a range of potential economic and environmental effects.

The Institute's study presented the cost and benefits associated with three potential Board decisions: (1) dismissal of the Proposals; (2) enactment of the amended proposal, with subsequent elimination of local ordinances limiting discharge of oils into sewer systems (but assuming primary treatment required and adequate biological capacity at receiving treatment works); and (3) enactment of the amended proposal, without relaxation of sewer discharge ordinances by municipal dischargers.

Under the first of those scenarios, incremental capital, operating and maintenance costs were expected to be $800,000-1,700,000 per year, with neglible benefits. Under scenario two, estimated

savings would be between $20,000,000 and $22,000,000 the first year, and $12,000,000 per year thereafter. Under the third set of assumptions, benefits from reduced operating costs of direct dischargers were estimated between $31,000 and $110,000 per year (in addition to elimination of the $800,000-$1,700,000 cost under scenario one).

Because we cannot assume that municipal dischargers will in fact eliminate sewer discharge ordinances, it is likely that the actual benefits which might be realized would fall somewhere between those presented in scenario two and scenario three.

The impact on individual firms, whether direct dischargers or sewer dischargers, would vary greatly, often depending on firm size. While the net increase in profits for large firms would be "in the realm of 1%", and as much as 5% for "medium size establishments", the profits from small firms could rise as much as 20%, and "extra small establishments" might increase profits by as much as 100% (based on extremely low profit levels at present). The study found that enactment of the amended proposal would tend to increase competition and "keep prices from rising as rapidly as they otherwise would..." (Dr. Bates, R.25-26, June 6, 1977).

With regard to the various factors set forth in Section 6(b) of the Act, the study specifically discussed each, covering potential benefits and costs. For both scenario 1 and scenario 2, the study found that damages to the environment and related social activities, in connection with each economic segment, would be either "none" or "insignificant". Increased costs would result only from increased testing expenditures (as much as $47,000 annually) and increased sewer use charges, (up to $2,137,000).

While the study's environmental findings or assumptions are of course not conclusive, they parallel closely the evidence available to the Board. Our analysis of those factors supports the study's economic findings, and - in turn - the amended proposal.

THE REGULATION

As can be seen from the analysis above, enactment of the amended proposal would result in little, if indeed any, damage to the environment. On the other hand, the positive economic impact of a regulatory change would be significant. A change in the regulation is, therefore, warranted.

The proposal which we will adopt today as the Board's Proposed Final Draft is that filed by the proponents on December 9, 1976. As was the intention of the proponents, it is supported by the testimony presented before that date, and the testimony subsequently brought was designed solely to provide further support. The only question raised with regard to the amended proposal was the propriety of using "30-day" averaging periods, as opposed to "monthly" averaging periods; the MSD alleged, (R.6, Economic Impact), that a monthly averaging period would be more consistent with existing reporting requirements. MSD has also raised this issue in R76-21, the source of the provision here. Since MSD's contentions are essentially unrebutted, we shall adopt a "monthly average" provision. If that term should be adopted in R76-21, consistency would be maintained; if the term "30-day average" is adopted there, it would be a simple matter to change this provision. At any rate, it is expected that the final sentence of the proposal adopted here would be dropped, were R76-21's similar provision be adopted.

We shall also, consistent with the testimony, use "freon extractables" rather than "hexane extractables."

The original proponents, the Agency, the National Renderers Association, the Metropolitan Sanitary District of Greater Chicago, and all other participants are to be commended for the quality of their presentations, in an area which has not heretofore been widely studied.

This Opinion constitutes the findings of fact and conclusions of law of the Board in this matter.

I, Christan L. Moffett, Clerk of the Illinois Pollution Control Board, hereby certify the above Opinion of the Board was adopted on the 29th day of September, 1977 by a vote of 4-0.

Christan L. Moffett, Clerk
Illinois Pollution Control Board

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