ILLINOIS POLLUTION CONTROL BOARD

January 16, 1975

MOBIL OIL CORPORATION, Petitioner,	)	
v.	)	PCB 74-393
ENVIRONMENTAL PROTECTION AGENCY, Respondent.	)	

OPINION AND ORDER OF THE BOARD (by Dr. Odell)

On October 29, 1974, Mobil Oil Corporation filed its Petition for Variance with the Pollution Control Board (Board). Mobil Oil sought a one-year extension of the variance granted in Mobil Oil Corporation v. Environmental Protection Agency PCB 73-452, 13 PCB 179 (July 25, 1974). In that case, this facility was granted a six-month variance subject to certain conditions from Rule 408(a) of the Water Pollution Regulations (Chapter Three) for cyanide discharges into the Des Plaines River. Here the Petitioner also sought a variance from Rule 1002 of Chapter Three, which relates to the filing of a project completion schedule with the Environmental Protection Agency (Agency).

Mobile owns and operates a petroleum refinery in Will County, near Joliet on Interstate 55. Cyanide is formed in the refinery fluid catalytic cracking unit (FCC). High temperatures "crack", or break down the large molecules into smaller ones. It is estimated that 90% of the cyanide formed comes from the cracking unit; the other 10% is formed in the coker unit. Cyanide enters the waste water system when FCC pipes are washed to remove accumulated salt deposits. 80% of the cyanide is removed at the sour water stripper. A total of 2.6 mgd of wastewater is released into the Des Plaines River. The refinery processes 175,000 barrels of oil per day into liquid petroleum gas, motor gasolines, jet and diesel fuel, heating oils, and coke.

Initial sampling in February 1973 of refinery effluent showed a cyanide concentration of 1.30 mg/l. Rule 408(a) sets a limit for cynanide discharge at 0.025 mg/l. While Mobil Oil felt that unsophisticated sampling procedures were responsible for the high discharge concentration, it nevertheless admitted that its effluent exceeded the cyanide standard under Rule 408(a).

Oil refinery cyanide discharge problems are not unique to Mobil Oil's Joliet refinery. Similar variance requests have been made in the past by other Illinois refineries. The list of these variance cases includes Texaco Oil Company v. Environmental Protection Agency PCB 73-6, 8 PCB 537 (July 19, 1973) where the variance was denied; Union Oil Company v. Environmental Protection Agency PCB 72-447, 10 PCB 217 (December 6, 1973) where the variance

was granted and later extended in PCB 74-333, 14 PCB _____ (December 5, 1974); Clark Oil Company v. Environmental Protection Agency PCB 73-238, 9 PCB 449 (October 11, 1973) where the variance was granted, but an extension for cyanide was later denied in PCB 74-283, 14 PCB _____ (October 31, 1974). As we noted in granting PCB 73-452, several factors contribute to the need for variances by oil refineries for cyanide discharges:

"1. Recent water conservation measures by refineries are largely responsible for increased cyanide concentrations in refinery effluents.

"2. Cyanide in refinery wastewater is not amenable to traditional cyanide treatment (e.g., alkaline chlorination process) because of the presence of relatively stable inorganic and organic cyanide complexes in addition to the existence of excessive oxidizable substances (e.g., ammonia and residual organic matter not removed in secondary wastewater treatment).

"3. Methods for reducing refinery cyanide problems are still in the research stage."

In granting PCB 73-452, we made the Order subject to the following conditions:

"1. Petitioner's cyanide effluent concentration shall not exceed a monthly average of 0.5 mg/l during the period of this variance.

"2. At no time shall Petitioner's effluent exceed 0.8 mg/l cyanide.

"3. Petitioner shall utilize any methods it may find useful to keep its effluent at the lowest possible cyanide level.

"4. Petitioner shall continue to diligently pursue its program of research and development in regards to cyanide reduction.

"5. Petitioner shall, starting in 30 days after the entry of this Order, file with the Agency bi-monthly reports. Said reports shall include, but not be limited to:

(a) Progress on all methods being pursued by Petitioner regarding cyanide reduction.

(b) Future work anticipated or methods being pursued by Petitioner.

(c) Any and all records of cyanide concentration in Petitioner's effluent. At least one determination of cyanide shall be run per week.

(d) What methods if any are being used to comply with (3) of this Order.

"6. As soon as a technologically feasible program for cyanide reduction has been found, Petitioner shall commence on a compliance plan to implement this program."

Effluent cyanide levels for Mobil Oil for January through October 1974 indicate that, except for March 28, 1974, conditions 1 and 2 of the Board's Order in PCB 73-452 have been complied with:

Monthly Average Effluent Cyanide Levels

Month 1974	Total cyanide mg/l	Simple cyanide mg/l	Simple cyanide % of total
January	0.182	-	-
February	0.276	0.061	22.1
March	0.49 *	0.08	16.3
April	0.17	0.03	17.6
May	0.10	0.10	100.0
June	0.18	0.08	61.1
July	0.09	0.11	122.2
August	0.074	0.086	116.2
September	0.078	0.059	75.6
October	0.302	0.223	73.8

* This unusually high average is due primarily to one high analysis (0.96) for a sample taken on March 28. If results from this analysis are omitted the average for March would be 0.33.

Tests are continuing at Mobil Oil on several control methods discussed in PCB 73-452:

1. Parson's HCN Destruction Process: additional tests to be run.
2. Procon's Cyanide Removal Method: method abandoned.
3. Ultraviolet Radiation: more extensive tests possible.
4. Powdered Activated Carbon: bench scale studies slated for January 1975.
5. FCC Process Improvements: addition of steam to FCC feed has shown cyanide reduction.

New methods of cyanide control now being investigated by Mobil Oil include FCC Sour Water Stripping and Sulfating of Cyanides. In the first procedure, tests will be made to determine the feasibility of segregating the cyanide-bearing FCC stream and stripping (removing the cyanide) this stream independently in a

small stripper. The sulfate procedure involved methods of converting CN^- to other less toxic compounds by contact with elemental sulfur to form thiocyanate.

Also included in the Variance Petition - as required in PCB 73-452 - were data on water quality standards at the edge of the refinery effluent mixing zone. Mixing zone samples obtained on August 30, 1974, and again on October 4, 1974, contained 0.021 mg/l and 0.067 mg/l of cyanide, respectively. During the second sampling, a cyanide sample was obtained from the center of the river upstream of the refinery as a reference for the mixing zone analyses. Analyses of this upstream sample indicated 0.065 mg/l cyanide, but this seems questionable if it was properly sampled unless there is cyanide pollution upstream. Future samples at Petitioner's mixing zone and upstream should be taken carefully to insure that they are representative. Mobil Oil proposes to continue to sample the refinery mixing zone every two to three weeks to comply with the Board's Opinion and Order, but questioned the value of continued testing because the total cyanide test method specified in the regulation (Storet No. 00720) is only sensitive to levels of 0.02 mg/l.

The Agency filed its Recommendation on December 16, 1974. Exhibit A (by Dr. M.J. Carter, US EPA), which accompanied the Agency Recommendation, indicates that Mobil Oil cyanide testing results during early 1974 were two to three times less precise than they should have been and, therefore, they can and should be improved. The Agency recommended that the variance from Rule 408(a) be granted for one year subject to certain conditions, including lower cyanide effluent concentrations, continued reduction efforts to meet the standards, and the continued filing of reports. The Agency "believes that Petitioner does possess the requisite hardship to warrant an extension of its original variance, provided certain conditions are met. The essence of Petitioner's hardship, which existed at the time of its original petition, and which continues to the present, is that no technologically feasible method has been found which enables cyanide concentration levels to be accurately measured in the sub-parts per million ranges; nor, has any technologically feasible method been discovered which would permit the reduction of cyanide levels down to the prescribed 0.025 mg/l. . . . The Agency still believes, however, that the results of Petitioner's tests, conducted over a ten month period, so clearly indicate that Petitioner is able to meet requirements more stringent than a monthly average of 0.5 mg/l, with a 0.8 mg/l excursion, that to permit continuation of these interim cyanide levels might cause Petitioner to become less active in its efforts to resolve its cyanide problem. The Agency feels that by setting the interim cyanide level at 0.3 mg/l, with an excursion of 0.5 mg/l Petitioner will be both protected from an enforcement proceeding, and motivated to continue its research programs. . . . The Agency believes that Mobil has

made good faith efforts at eliminating its cyanide effluent problems; the Agency further believes that continuation of these efforts must be a condition of an extension of Mobil's variance."

The impact of the continued discharge of cyanide from the Mobil Oil Refinery on the receiving stream, the Des Plaines River, is difficult to assess. According to the Agency, the threshold limit of toxicity at infinite time for fish appears to be 0.1 mg/l as CN^- (Reference "Standard Methods", APHA, AWWA, WPCF, 1971). More information is needed on the cyanide compounds present, and their toxicity levels. Considering the dilution effect of the Des Plaines River (275 to 1), the concentrations in the river should not exceed the water quality standard of .025 mg/l.

We grant the variance subject to terms and conditions suggested by the Agency. This variance will not necessitate compliance with Rule 408(a); we believe that the Petitioner has established that control technology is not yet available. By setting lower cyanide effluent limits than in PCB 73-452, we are encouraging continued research and development and also limiting the environmental impact of the discharges. In light of all the facts, including Mobil Oil's good faith efforts to achieve compliance, it would create unreasonable hardship to deny the variance in this case.

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

ORDER

IT IS THE ORDER of the Pollution Control Board that Mobil Oil Corporation is hereby granted a Variance from Rule 408(a) for cyanide only and from Rule 1002 of Chapter Three for one year from January 25, 1975, through January 24, 1976, subject to the following conditions:

(a) Petitioner's cyanide effluent concentration shall not exceed a monthly average of 0.3 mg/l or a maximum of 0.5 mg/l at any time, during the period of this Variance.

(b) The Petitioner shall continue its efforts of developing a cyanide effluent control program to reduce the cyanide concentration to 0.025 mg/l.

(c) The Petitioner shall continue to file bi-monthly progress reports with the Agency, said reports to include but not limited to:

1. Progress in all methods being pursued by Petitioner;
2. Any and all records of cyanide concentration in the Petitioner's effluent; at least four determinations shall be run per week;

3. Any and all records of cyanide concentrations at the edge of the mixing zone and upstream; at least one determination at the mixing zone and upstream shall be made per week; and
4. At least one study shall be made during each bi-monthly period of reporting indicating the characteristics of the cyanide wastes, including the relative percentage of flow of dissociated toxic ions, moderately complexed cyanide ions that are amenable to alkaline chlorination, highly complexed cyanide ions that are not amenable to alkaline chlorination destruction, and cyanide ions associated with organic compounds.

(d) As soon as a technically feasible program for meeting an effluent level of 0.025 mg/l of cyanide is developed, Petitioner shall commence on a compliance plan to implement this program.

I, Christan L. Moffett, Clerk of the Illinois Pollution Control Board, hereby certify that the above Opinion and Order was adopted on the 16th day of January, 1975, by a vote of 4 to 0.

Christan L. Moffett