

Job Segment Report

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Marine Chemist

Project No. MP - 2R -1

Date: April 1, 1959.

Name of Project: Pollution Abatement in Regions M-4 through M-9.

Period Covered: June 15, 1958 - December 31, 1958. Job No.: F - 3b

Abstract: Sinclair Refinery at Corpus Christi empties wastes into a cove adjoining the Nueces Bay harbor. The sulfide concentration, retained in the separated water at the outfall entering the bay, is toxic and detrimental to aquatic life. However, the cove is of little biological value. The water draining from the cove into the harbor has a toxic concentration of sulfides present, but the dilution is so great that there may be no immediate damage to aquatic life.

Objective: To determine the effects of Sinclair Refinery's effluent on aquatic life in Nueces Bay harbor.

Procedure: In conjunction with other jobs in this area samples were collected from three stations.

Station 1 - effluent outfall;

Station 2 - 25 feet away from the outfall; and

Station 3 - at mouth of cove..

The toxic pollutants were determined by chemical analysis and the effect on aquatic life was found by toxicity studies.

Findings: Corpus Christi harbor was originally constructed to permit an exchange of water from Nueces Bay and Corpus Christi Bay. There was an opening at the North end of the harbor on the east side. The ebbing of the tide circulated the Nueces Bay water through the harbor and out into Corpus Christi Bay. When the tide came in the Corpus Christi Bay water was carried through the harbor and into Nueces Bay. By this procedure the harbor could be flushed and an exchange of water diluted to help clean out some of the industrial toxic pollutants now existing in the harbor. Construction of a roadway closed this connection to the bay and the harbor has to depend on Corpus Christi Bay to dispose of the toxic pollutants. This is not sufficient and cumulative toxic effects are created in the harbor. The dissolved oxygen content is decreased during the hot months, thus weakening aquatic life, which becomes susceptible to a negligible amount of toxicant. Fish kills result.

There are several industries that contribute to these fish kills, Sinclair Refinery being one. The company manufactures petroleum products, and uses the bay water in the process as a coolant and as a route for disposal of waste products. Sinclair is equipped with API separators to retain the oil wastes that accumulate. These separators are also used to receive ballast water from the ships that must retain it during bad weather to pass through the bascule bridge safely. After the water is emptied into the separators the soluble salts disassociate into sulfide ions which in turn react with the hydrogen ions in the water to create hydrogen sulfide in the form of HS or H₂S, the proportion depending on the pH value of the water. In order for aquatic life to inhabit the water, the sulfide content, H₂S or HS and not the ion, must be below 2.0 parts per million at the pH of the bay water (7.6).

The sulfide content depends on production and how much water is taken from the ships. The ballast water is siphoned into four inch lines into the separators. All the materials that have a density of greater than or less than water are skimmed off. The sulfides, through agitation, remain in suspension and are not retained in the separators. The wastes go into a twenty-four inch line underground. It empties into a twenty-foot wooden flume which discharges into a cove connected to the harbor. Samples collected at the outfall and at the mouth of the cove have indicated a toxic concentration of sulfides. The concentration averaged 17.0 parts per million at Station I. Toxicity studies indicated the water has a 15% median tolerance limit dilution volume. If the flow of wastes averages 80 gallons per minute this would require approximately 4500 gallons of water to dilute the wastes enough for aquatic life. To keep this standard the cove would have to be completely flushed every twelve hours. The tidal effects are negligible at this location and there is very little exchange of water. The effluent water enters the harbor from the cove only after filling the cove. The cove is not of biological importance and its principal function is that of a harbor. The sulfide value at Station III averaged 4.0 parts per million concentration and had a toxicity value of 35% TLM dilution volume. The water flowing from the cove to the harbor is toxic and detrimental to aquatic life. However, the dilution and settling actions are so great that the detrimental effects are minute and fish have time to escape the polluted area. However, even under those conditions pollution still exists. Because of the complexities involved in this problem, it is recommended that additional time be allocated to this job so that the existing source of pollution now in the harbor can be isolated and pollution abatement be put to practice.

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Approved, by: Howard T. Lee
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Date Approved: 7 August 1959

TOXICITY COMPUTED IN AVERAGE KILLS FROM JULY 1 - DECEMBER 31.

	Station I	Station II	Station III
100%	10 perch dead in five minutes.	10 perch dead in one hour.	9 perch dead in four hours; one weak.
80%	10 perch dead in ten minutes.	10 perch dead in one hour.	10 perch dead in five and one-half hours.
60%	10 perch dead in seven-teen minutes.	10 perch dead in two hours.	8 perch dead in five hours; two weak.
40%	10 perch dead in thirty minutes.	8 perch dead in four hours; 2 weak.	6 perch dead in four-teen hours; 2 weak; 2 O.K.
30%	8 perch dead in one and one-half hours; 2 weak.	7 perch dead in ten hours; 3 weak.	5 perch dead in twenty four hours, 5 O.K.
20%	7 perch dead in four hours; 3 weak.	6 perch dead in twenty hours; 4 weak.	5 perch weak in forty hours; 5 O.K.
15%	5 perch dead in twenty hours; 5 weak.	10 perch O.K.	10 perch O.K.

CHEMICAL ANALYSIS (H_2S or HS)

Date	Station I	Station II	Station III	pH
7-7-58	15.0 ppm	5.0 ppm	3.0 ppm	8.2
7-20-58	17.0 ppm	8.0 ppm	2.0 ppm	7.6
8-10-58	19.0 ppm	6.0 ppm	4.0 ppm	8.2
8-24-58	21.0 ppm	9.0 ppm	6.0 ppm	8.4
9-12-58	22.0 ppm	9.0 ppm	5.0 ppm	8.3
10-2-58	16.0 ppm	8.0 ppm	4.0 ppm	8.1
11-5-58	17.0 ppm	7.0 ppm	3.0 ppm	7.9
12-3-58	16.0 ppm	6.0 ppm	4.0 ppm	8.0