Job Report

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Project Name: Pollution Abatement in Region V

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Investigation of Howell Refinery's Effluent and Disposal Area

Abstract: Howell Refinery processes only sweet crude at the rate of 2500 barrels per day. A stripper is used to strip light crude of butadiene, kerosene, diesel, gasoline and distillate. There are no toxic chemicals present in the waste which has a 100 per cent 48-hour TLm at all stations (Table 1).

The waste flows from a gravity type separator into a shallow five acre retention pond filled with cattails. The sandy flats and cattails (Typha sp.) filter 95 per cent of the oil found in the waste prior to disposal into the harbor.

Objectives: To detect, measure and evaluate the toxic conditions of Howell Refinery's effluent and promote a better pollution abatement program.

Procedure: Four stations were established in the disposal area and effluent flow route as follows: Station 1 is in the effluent route after leaving the gravity separator; Station 2 is in the effluent route prior to disposal into the retention pond; Station 3 is in the ditch after leaving the retention pond; and Station 4 is at the entrance of Corpus Christi harbor. Samples were collected twice a month in polyethylene jars, chemically preserved and analyzed for phenols, sulfides, mercaptans, oil and oxygen consumed in the laboratory according to the procedure as given in Standard Methods for the Examination of Water, Sewage and Industrial Waste, Eleventh Edition. After it was evident that no toxic chemicals were present in the waste, analysis was restricted to oil concentration.

Toxicity studies were conducted on the effluent using bay water as the dilution medium. Samples of the effluent were collected in 5-gallon containers and stored until the sample reached room temperature. Test concentrations of effluent were mixed in 10-liter glass containers in a logarithmic series of 100, 32, 10 and 3.2 per cent. After an acclimatization period of 24 hours, five pinfish, Lagodon rhomboides, were placed in each of the containers and observed for a 24-hour period. When the per cent strength was established for 100 per cent deaths and no deaths, this range was reduced on a logarithmic scale, five fish added and observed for 48 hours. A median tolerance limit (TLm) the concentration in which 50 per cent of a marine index (pinfish) can survive for a 48-hour period was then determined by plotting the dilution strength on the logarithmic scale of semi-log graph paper and per cent deaths on the arithmetic scale. A straight line was drawn through the maximal concentration (100 per cent deaths) and minimal concentration (no deaths) interpolating the TLm at the 50 per cent death level. Aeration was supplied by stone diffusers on tygon tubing connected to air lines.

Information on plant operations, production and waste disposal, was obtained from plant personnel and observation.

Findings and Discussion: Howell Refinery is a small refinery that processes 2500 barrels of sweet crude daily. A stripper is used to strip butadiene, kerosene, diesel, gasoline and distillate from light crude. A cracking unit is not used in the refining process.

Water from the stripping plant flows into a 3-by 5-by 3-foot gravity separator. Two baffles extending to six inches from the bottom separate the oil and cooling water. A suction line siphons the water from the last compartment into a small drainage ditch. This ditch empties into a five-acre retention pond that has a maximum depth of three feet and is filled with cattails (Typha sp.). The waste then flows for one mile through a drainage ditch before emptying into the harbor.

The only toxic component present in the waste, discharging at the rate of 100 gallons per minute, is oil. Samples collected at Station 1 shows that 64 per cent of the samples contained oil; samples collected at Station 2 shows 10 per cent of the samples contained oil; and samples collected at Station 3 shows 1.0 per cent contained oil. There was no oil present at any of the samples collected at Station 4.

The waste leaving the plant flows over a sandy flat for approximately 50 yards before emptying into the retention pond. Seventy-four per cent of the waste oil leaving the gravity separators is filtered out of the water by this sandy flat. The remaining 26 per cent is filtered out by the cattails.

Toxicity tests run from samples collected at Station 2 and 3 proved the waste to be safe to a marine index (pinfish) after 48 hours.

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Table 1
Chemical Analysis of Samples Collected from Howell Refinery Waste

Month	Station	Oil (ppm)	48hrTLm(%)
January	1	41.6	100
	2	25.6	100
	3	2.3	100
February	1	33.4	---
	2	0.0	---
	3	0.0	---
March	1	---	---
	2	0.0	---
	3	0.0	---
April	1	21.6	100
	2	3.9	---
	3	0.0	---
May	1	29.2	---
	2	5.4	---
	3	0.0	100
June	1	10.3	---
	2	0.0	---
	3	0.0	---
July	1	---	---
	2	7.2	100
	3	0.0	---
August	1	62.5	100
	2	19.7	---
	3	3.1	---
September	1	---	---
	2	0.0	---
	3	0.0	---
October	1	19.8	---
	2	6.1	---
	3	0.0	---
November	1	31.4	---
	2	14.5	---
	3	0.0	---