

## JOB REPORT

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Project No. MP-1-R-2 Date June 30, 1960.  
Project Name: Industrial Waste Control in Region MP-1.  
Period Covered: June 11, 1958 - May 11, 1960. Job No. F3-9-10

Bio-Assay and Chemical Analysis of Jefferson Chemical, Texas-U.S. Chemical Goodrich Gulf, and Neches Butane Waste Waters, Port Neches, Texas.

Objectives: (1) To determine which of the four plants are contributing to the pollution load on the Neches River; (2) To determine toxic chemicals and its effect on fish life; (3) Encourage company officials to correct any pollution problems they might have.

Procedures: (1) Collect waste water samples at various points on the waste canal and segregate the four plants' effluents before they are mixed in the waste canal; (2) Meet with representatives of the four chemical plants to discuss our laboratory findings and encourage pollution abatement practices.

Findings: The waste water system of Jefferson Chemical, Texas-U.S. Chemical, Goodrich-Gulf and Neches Butane is a complex one. All four plants discharge their waste waters to the Neches River (approximately  $1\frac{1}{2}$  miles above the Port Arthur - Orange high bridge) via a common waste ditch.

During World War II the plant or plants now owned by Texas-U.S. Chemical, Goodrich-Gulf and Neches Butane were constructed by the government to manufacture synthetic rubber. The waste waters were combined from the three plants via underground sewers within the plants and finally ended up at what is now Neches Butane. A standard A.P.I. separator was installed to trap the waste oils from the three plants. It is difficult to segregate the wastes from the government built plants; since the sewer collecting system is mostly underground. Company officials advised us that samples could be collected from the many units within the plant before the wastes went to the sewer system; however, it would then be impossible to mix the samples as a representative sample since the flow data from the various units was not known. It was then decided to run our tests on the combined effluents from the three plants before it joined Jefferson Chemical's effluent further down the waste ditch.

Toxicity tests run on the combined effluents from Texas-U.S., Goodrich-Gulf, and Neches Butane on four different dates (See Tables 1, 2, 3 and 8) showed very little toxicity with the exception of that of May 4, 1959. See Table 2.

Jefferson Chemical Company's two waste effluents enter the common waste ditch approximately  $1\frac{1}{2}$  miles below the three above mentioned plants. Jefferson's waste water was found to be highly toxic to fish life and contained a large concentration of oils and solids with a pH of over 10. See Tables 4 through 9. Bottom sludges taken from various points in the waste ditch and from the Neches River shows a considerable build-up of the oily matter on the bottom. See Tables 5, 6, and 9.

One mile above the mouth of the waste ditch in the Neches River a five minute plankton trawl yielded an abundance of different species of plankton. Slightly below and opposite the mouth of the waste ditch the Neches River was almost void of planktonic life.

Results: Several meetings have been held with Jefferson Chemical Company officials and results of our findings were discussed. Two pollution notices have been issued to Jefferson and a pollution complaint was filed in Jefferson County in May, 1960. An informal hearing on the pollution charge was held in the Jefferson County District Attorney's office with Jefferson Chemical's manager and legal staff. It was decided to hold the pollution complaint in abeyance for six months to allow the chemical firm time to come up with some form of treatment of their waste. If no solution to the waste problem has been presented to the state within the six month period the court will go ahead and proceed with the pollution charge.

Jefferson Chemical has employed the Walter Kidde Consulting firm to study their waste water problem and the results of their findings so far seem promising. Jefferson officials showed us a set of plans drawn up by the Walter Kidde Company on an oil recovery system. They assured the state that construction of the oil recovery system would start as soon as possible. A preliminary investigation of the solids problem showed that the solids could be precipitated by treatment with waste carbon dioxide from their flue stacks.

Prepared by R. Marek, Jr.

Accepted by

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Date

4 November 1960

#### REFERENCES

American Public Health Association, American Water Works Association, Federation of Sewage and Industrial Wastes Associations. Standard Methods for the Examination of Sewage and Industrial Wastes. 10th Edition, 1955.

ASTM Special Technical Publication No. 148-C Manual on Industrial Water pp. 385-396, 1957 Printing.

State Water Pollution Control Board, Sacramento, California. Water Quality Criteria (including addendum no. 1) Second Printing, 1957.

Table 1

Combined Wastes from Texas-U.S. Chemical, Goodrich-Gulf, Neches Butane, and Jefferson Chemical,  
 Port Neches, Texas  
 pH ..... 9.6      Total Solids ..... 3800 ppm

Test Animals	Concentration of Waste	Physiological Observations
5 sailfin mollys ( <u>Mollienisia latipinna</u> )	Control	All okay after 48 hours.
"	3%	"
"	6%	"
"	14%	"
"	33%	Slight discomfort noted for first few minutes. All okay after 48 hours.
"	50%	Slight discomfort noted but all survived 48 hours.
"	75%	Fish became irritated after 1 hour. Respiration increased. No deaths in 48 hours but fish appeared weak.
"	100%	Extreme discomfort noted for first 4 hours. Two dead within 4 hours. One dead within 8 hours. Two survived 48 hours.

Table 2

Combined Waste Waters from Texas-U.S. Chemical, Goodrich-Gulf Chemical, and  
Neches Butane - May 14, 1959.

Type Test Animal: Silverside (Menidia beryllina)

No. Animals per Concentration: Three (3).

Concentration	Physiological Observations
Control	All animals alive and okay after 48 hours.
1.0%	Slight discomfort noted for first few minutes. All survived 48 hours.
2.0%	Irritation noted after 5 minutes. All animals lost equilibrium within 50 minutes. All dead within 3 hours.
3.0%	Extreme discomfort noted after 5 minutes. Animals tried to jump out of test aquaria. Swam with jerky motion. Loss of equilibrium within 40 minutes. All dead within 75 min.
Routine analysis of waste waters:	
	Phenols ..... Neg.
	Chlorides ..... 242
	Oxygen Consumed ..... 108
	pH ..... 6.8
	Oils ..... Trace.

Table 3

Combined Waste Waters from Texas-U.S. Chemical, Goodrich-Gulf Chemical,  
and Neches Butane.

Neches Butane Ditch - September 15, 1959

Fish	Concentration	Observations
Mollies, Shrimp, Silversides	50%	All alive and well after 48 hours.
Mollies, Shrimp, Silversides	70%	Slight discomfort noted. All alive after 48 hours.

Table 4  
Industrial Waste Analysis

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<u>Location:-</u>	Neches River where Jefferson Chemical Company - Neches Butane Waste Canal Engers.
<u>Date:-</u>	December 17, 1958.
<u>Type Sample:-</u>	Bottom Sludge, Grab.
<u>Collected by:-</u>	R. Marek, and Wardens Finchum and Gentry.
<u>Oils:-</u>	750 ppm
<u>Odor:-</u>	Very strong "Dripalene".

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Table 5  
Industrial Waste Analysis

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<u>Location:-</u>	Jefferson Chemical Company. (Waste Ditch 100 feet Above Where Groves Sewage Enters).
<u>Date:-</u>	February 26, 1959.
<u>Collected by:-</u>	R. Marek and Warden R.Z. Finchum.
<u>Bottom Sludge:-</u>	Oils ..... 1450 ppm Odor ..... Very Strong "Dripalene"
<u>Surface:-</u>	Oils ..... 26 ppm Odor ..... Very Strong "Dripalene"

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Table 6

## Industrial Waste Analysis

Location: Jefferson Chemical Company, Port Neches.

Date: April 1, 1959. Collected by: Warden R.Z. Finchum.

Sample	Station	Type Sample	Oil (ppm)	pH	1 hr. Setttable Solids 'Imhoff'	Odor
Jeff. Chem. Co. ditch where Groves Sewage enters.		Bottom Sludge	1400	11.4	----	Very strong "Dripalene"
Jeff. Chem. Co. ditch where Groves Sewage enters.		Surface	200	11.4	----	Very strong "Dripalene"
Jeff. Chem. Co. ditch at railroad bridge.		Surface Grab.	123,000	11.4	----	Very strong "Dripalene"
Jeff. Chem. Co. Hot Lime Water Discharge Pipe.		Grab	Neg.	11.6	160 ml/liter	-----

Table 7

Bio-Assay on Jefferson Chemical Company's Waste Waters,  
May 14, 1959

Type Specimen: Silverside (Menidia beryllina)

No. Specimens per concentration: Three (3)

Concentration	Physiological Observations
Control	All alive and healthy after 48 hours.
0.10%	Some discomfort noted for 1 hour. Respiration increased Fish swam in circles near the surface. All fish recovered and survived after 48 hours.
0.20%	"
0.50%	Discomfort noted immediately. Respiration increased. One fish lost equilibrium after 40 mins. and died within 1 hr. Other 2 fish in weakened condition but survived 48 hrs.
0.70%	All specimens showed signs of irritation. Fish swam in circles near surface. 1 death within 1 hr. Other fish lost equilibrium after 1 hr. but recovered & survived 48 hours.
1.00%	All fish showed extreme signs of discomfort. All lost equilibrium within 30 mins. All dead within 1½ hours.
2.00%	All animals died within 40 mins.

Analysis of Waste Waters: Phenols .... 1 ppm; Oxygen Consumed ... 98 ppm;  
pH ..... 11.8; Oils ..... 72 ppm.

Table 8

Jefferson Chemical Company, Port Neches, Texas, Bio-Assay of Waste.  
May 10, 1960.

Source of Sample	Animal Species	Concentration of Wastes	Physiological Observations
Control	5 Shrimp, <u>Palaemonetes</u> sp.	Control	All alive and healthy after 48 hours.
Junction of Waste Canal and Neches R.	"	100%	All test animals dead within 45 mins.
Oily matter from Waste ditch leaving Jeff. Chem. Company property	"	1%	All test animals dead within 25 mins.
Oily sludge from bottom of Neches R. 1/8 mi. below Jeff. Waste Canal.	"	1%	All test animals dead within 30 mins.
Neches Butane, Goodrich-Gulf, Tex.-U.S. Chem. waste canal before it joins Jeff. Chemical.	"	100%	All alive after 48 hours.
1 mi. above mouth of Jeff. Chem. waste canal in Neches River.	"	100%	All alive and healthy after 48 hours.

Table 9

Jefferson Chemical Company, Port Neches, Texas, April 10, 1960.

Station Location	Oily Matter - ppm	Settleable Solids	pH	Temp. °C	DO
In ditch leaving Jefferson property line.	11,890				
Wooden Bridge	1,503	83 ml/l	10.5		
Mouth of ditch at Neches R.		21 ml/l	8.8	35.5	
1½ mi. above mouth of ditch					5.3
1 mi. above mouth of ditch	Neg.		6.7	22.0	4.7
1/8 mi. below mouth of ditch in Neches River.	10,629 (in sludge)		7.5	34.5	3.9