Technical Service Report

Conoco Inc.
Research and Development Department
Corporate Services Section
Ponca City, Oklahoma

Report No. 34-80-804-8/839-0

To H. J. Neeld, LCCP, Westlake, Louisiana

From Charles A. Bleckmann, Environmental Group, Ponca City, OK
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Date December 31, 1980

Subject An Interim Test Report: Assessment of Lake Charles Chemical Plant (LCCP) and the VCM Plant Wastes for Their RCRA Hazard and Organic Carbon Leachability

NOTE: This is an interim report and has been issued to a limited distribution because the data generated to date is needed immediately. A final report will be issued upon completion of remaining tests. Distribution has been limited to those designated by H. J. Neeld. We strongly suggest that no other copies be generated. The final report will replace this one and receive appropriate distribution.

OBJECTIVE

1. Determine if the 42 solid waste samples are hazardous according to RCRA criteria.

2. Determine the leachability of organic carbon from these same wastes.

BACKGROUND

On May 19, 1980, the U. S. EPA published interim final rules covering identification of hazardous wastes as well as standards for generators, storers, transporters, treaters and disposers of such wastes. These RCRA (Resource Conservation and Recovery Act) guidelines state that for a facility to continue its hazardous waste operations, three requirements must be met:

1. A facility must be defined as "existing;"

2. By August 18, 1980, all facilities handling hazardous wastes must notify the EPA of their wastes and activities pertaining to those wastes; and

3. By November 19, 1980, an application for a RCRA permit must be made.

Meeting these requirements will allow a facility to operate under interim final status until a permit is granted or denied. These requirements have been met by the LCCP and the VCM plants.

RCRA defines a hazardous waste in general as a "solid" waste (includes liquids) that may cause substantial hazard to health or the environment when improperly managed. In addition to many specific wastes which the EPA has decided are hazardous and so listed in the May, 1980 publication, wastes which possess certain characteristics are defined as hazardous.

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These characteristics are:

1. ignitability - posing a fire hazard during routine management;

2. corrosivity - ability to corrode standard containers or to dissolve toxic components of other wastes;

3. reactivity - tendency to explode under normal management, to react violently when mixed with water, or to generate toxic gases; and

4. EP toxicity - after a prescribed extraction procedure (EP), the presence of specified concentrations of certain toxic materials.

If a waste has one or more of these characteristics it is considered hazardous and must be managed accordingly.

SUMMARY

Evaluation of RCRA hazard was performed on 29 waste samples from the LCCP and 13 from the VCM plant. All appropriate tests have been conducted except for steel corrosion rate on 32 waste samples and ignitability on one. Ten samples -- 6 from the LCCP and 4 from the VCM plant -- must be classified as hazardous based on RCRA criteria tested to date. Listed below are these four characteristics of hazard and the number of samples for each plant failing standard tests.

RCRA Hazard Characteristic	Number of Wastes Failing	
	LCCP	VCM
Ignitability	6	4
Corrosion (by pH only)*	0	1
Reactivity	0	0
EP Toxicity	0	0

*Corrosion data is incomplete except for wastes which are completely solid in nature (10 of the 42 wastes samples) and the one waste which has already been found to test corrosive by pH assessment.

A pH 5 water extraction of the wastes was performed to quantify leachability of organic compounds as measured by TOC. Ten wastes were found to represent potential leaching problems. Their disposal will have to be managed accordingly.

CONCLUSIONS

1. Final RCRA hazard evaluation has been completed on 10 of the 42 wastes sampled. These wastes and their RCRA hazard test results are:

LCCP Wastes	Sample No.	Ignitable	Corrosive	Reactive	EP Toxic
Charge Gas Dry Mol Sieve	13	YES	NO	NO	NO
Spent F-1 Al Catalyst	23	NO	NO	NO	NO
CDR Sieves	25	YES	NO	NO	NO
Anthracite Filter	27	NO	NO	NO	NO
Ethoxylate Water (Viking)	28	NO	NO	NO	NO
N-Paraffin Drier Sieves	29	YES	NO	NO	NO
Methyl Chloride Carbon	31	NO	NO	NO	NO
VCM Plant Wastes					
Copper Chloride Catalyst	1	NO	NO	NO	NO
T-1 East Pit Sludge	5-1	YES	YES	NO	NO
Quench Column Coke	I-80-157	NO	NO	NO	NO

2. Of the 32 remaining wastes, 6 have been found to be hazardous based on ignitability criteria. These wastes are:

LCCP Wastes	Sample No.
Holding Pond (Inlet Boxes)	6
Barometric Cooling Tower	20
Incinerator Distribution Box	30
VCM Plant Wastes	
T-2 West Pit Sludge	5
T-500 Pit Sludge	5-2
Tars	12

3. Final RCRA hazard evaluation of the remaining liquid wastes cannot be made until a steel coupon corrosion test is completed.

4. Insufficient sample of LCCP waste #32 (Debutanizer-Depropanizer solids) was available for ignitability and reactivity assessment.

5. Three wastes, when mixed with 16 volumes of distilled water, had a pH of less than 2. These wastes are:

   a) LCCP Sample #27 (Anthracite Filter)

   b) LCCP Sample #31 (Methyl Chloride Carbon)

   c) VCM Plant Sample #12 (Tars)

   These wastes should be handled as corrosive materials regardless of their RCRA corrosion hazard classification.

6. Ten wastes contain large amounts of leachable organic material. These are:

LCCP		VCM	
Sample #10	Methylene Chloride Acid Neutralization Basin	Sample #5	T-2 West Pit Sludge
Sample #16	Oil Emulsion Solids	Sample #11	EDC Tar Tank Bottoms
Sample #18	Alcohol Emulsion TK553	Sample #12	Tars
Sample #18C	Alcohol Emulsion TK540		
Sample #19	Alcohol Acid Pit-Solids		
Sample #25	CDR Sieves		
Sample #28	Ethoxylate Water (Viking)		

7. The prescribed ignitability test (Pensky-Martens Method) could not be satisfactorily used (waste particle size too large) for three of the wastes. While all three wastes tested "hazardous" using the "Open Cup" method of measuring flash point, there is no doubt that the same conclusion would have been reached using the prescribed method.

RECOMMENDATIONS

1. When equipment arrives tests should be conducted to measure corrosivity on steel as prescribed in RCRA regulations.

2. Additional material for LCCP #32 - Debutanizer-Depropanizer Solids should be obtained for ignitability, reactivity and organic carbon leachability assessment.

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INTRODUCTION

At your request we sampled 39 solid wastes -- 27 at the LCCP and 12 at the VCM plant -- during the week of October 6-9. Three additional samples (2 from the LCCP and 1 from the VCM Plant) were collected by plant personnel and subsequently submitted to us. All 42 samples were to be tested for their RCRA hazard and organic carbon leachability. This information will aid in choosing proper treatment/disposal methods and provide contractors with required information.

As discussed with you before the study began, following EPA procedures for multiple samples, chain of custody and replicate testing would be unnecessary and impractical. However, should you want to exempt a listed waste, further testing would have to be conducted using strict EPA protocol.

EXPERIMENTAL METHODS

After collection, samples were transported to Ponca City and held at room temperature in the closed sample containers until analyses were begun.

RCRA Hazard Evaluation

Methods for testing ignitability, corrosivity, reactivity and EP toxicity are referenced in Attachment I -- Analytical Research Section TSR #155-80-839-0/804-8.

Organic Carbon Leachability

Fifty grams of each waste were thoroughly mixed with 45 grams of distilled water. The resulting mixture was adjusted to pH 5± 0.2 with either 1.0 N or concentrated HCl. Flasks containing the wastes were then shaken at 200 rpm on a gyratory shaker at 25°C for 24 hours. After 3-4 hours on the shaker the pH was checked and readjusted if necessary. After shaking, centrifugation was used to separate solids from the liquid. The water fractions were decanted, filtered through 0.45 µm Millipore filters, and preserved with HNO_3 at pH <2.0. These filtrates were analyzed for TOC with an Oceanographic Carbon Analyzer.

RESULTS AND DISCUSSION

The results of the RCRA hazard evaluations are summarized in Tables 1 and 2. The analytical results are presented in attached Analytical Research Section TSR #155-80-839-0/804-8.

Ignitability

A waste with a flash point less than or equal to 140°F is classified as hazardous. Because several of the samples were coarse solids, they were run using the "open cup" method rather than the prescribed Pensky-Martens method. Since use of the "open cup" method generally gives higher results than the Pensky-Martens, any samples that tested as hazardous by the "open cup" method would also have been classified as hazardous by the Pensky-Martens test. Insufficient sample was sent for determining the flash point of the LCCP Waste #32 - Debutanizer-Depropanizer Solids.

Corrosivity

RCRA criteria define a corrosive hazardous waste as one that: (1) is aqueous and has a pH ≤ 2 or ≥ 12.5 of (2) is a liquid that corrodes steel at $\geq 1/4$ inch per year. Solid samples need not be tested for corrosivity. Only one aqueous sample -- VCM #5-1 - T-1 East Pit Sludge failed the pH test. Corrosion tests using steel coupons will be run on the samples as soon as the equipment is available. Until that work is done assessment of the RCRA corrosive hazard for 21 LCCP and 11 VCM Plant liquid samples cannot be completed.

During the extraction procedure (EP) test, three non-aqueous samples were found to have pH's ≤ 2 when mixed with 16 volumes of distilled water. These samples - VCM Waste #12-Tars (organic liquid), LCCP Waste #27-Anthracite Filter (solid), and LCCP Waste #31-Methyl Chloride Carbon (solid) - did not fail the specified pH criterion for corrosivity. However, we suggest that these wastes by handled as corrosive substances to avoid potential adverse environmental or safety problems.

Reactivity

RCRA reactivity is established by application of specified EPA criteria as listed below.

"A solid waste exhibits the characteristic of reactivity if a representative sample of the waste has any of the following properties:

1. It is normally unstable and readily undergoes violent change without detonating.

2. It reacts violently with water.

3. It forms potentially explosive mixtures with water.

4. When mixed with water, it generates toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.

5. It is a cyanide or sulfide bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.

6. It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement.

7. It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.

8. It is a forbidden explosive as defined in 49 CFR 173.51, or a Class A explosive as defined in 49 CFR 173.53 or a Class B explosive as defined in 49 CFR 173.88.

For the 42 wastes studied, only criterion #5 was deemed to be potentially relevant. Sulfide was found in 4 LCCP and 2 VCM plant wastes. Cyanide was also detected in one LCCP sample. However, in all cases these two compounds were found to be present in concentrations too low (2 ppm or less) for the wastes to be classified as hazardous due to reactivity.

Extraction Procedure (EP) Toxicity

If a waste or waste extract contains any of the following materials at or above the concentration listed, the waste is considered hazardous by RCRA.

	(mg/l)		(mg/l)
Arsenic	5	Silver	5
Barium	100	Endrin	0.02
Cadmium	1	Lindane	0.4
Chromium	5	Methoxychlor	10
Lead	5	Toxaphene	0.5
Mercury	0.2	2,4-D	10
Selenium	1	2,4,5-TP (Silvex)	1

Since it is our understanding that none of the wastes tested contain any of the listed pesticides or herbicides, only analyses for the metals were conducted. In no case were any of the specified metal limits exceeded.

Organic Carbon Leachability (Not required for RCRA hazard testing)

An acidified water leach of the wastes was conducted to provide an estimate of the amount of organic material that could potentially leach from wastes after disposal, especially landfill disposal. The results of these leach tests are shown in Table 3. Small amounts of organic carbon leached from all samples, but only ten waste leachates contained $\geq$700 mg/l TOC and six $\geq$3,000 mg/l TOC. One waste proved to contain a large amount of leachable carbon producing a leachate containing more than 10,000 mg/l TOC (LCCP - Waste #28 - Ethoxylate Water). This particular waste was found to be a solid at room temperature but liquid at slightly elevated temperatures. It forms a thick emulsion upon shaking. Other wastes found to possess unusually high leaching potentials were LCCP Wastes #18 and #18C, both alcohol emulsions.

TABLE 1

SUMMARY OF RCRA HAZARD CHARACTERISTICS
FOR LCCP WASTES

Sample Number	Sample Designation	Waste[1] Form	Ignitability	Corrosivity by pH	Reactivity	EP Toxicity
1	North Lagoon (Sludge)	Liquid	OK	OK	OK	OK
2	South Lagoon (Sludge)	Liquid	OK	OK	OK	OK
3	Polishing Pond	Liquid	OK	OK	OK	OK
4	Digester Pond	Liquid	OK	OK	OK	OK
5	Storm Water Diversion Basin	Liquid	OK	OK	OK	OK
6	Holding Pond (Inlet Boxes)	Liquid	Hazardous	OK	OK	OK
7	Holding Pond (Middle Sect)	Liquid	OK	OK	OK	OK
8	Normal Paraffin (API Sep)	Liquid	OK	OK	OK[4]	OK
9	Ethylene/Alcohol (API Sep)	Liquid	OK	OK	OK[5]	OK
10	Methylene Chloride Acid Neutralization Basin	Liquid	OK	OK	OK	OK
11	DAF Solids	Liquid	OK	OK	OK[4]	OK
12	Aluminum Hydroxide	Liquid	OK	OK	OK	OK
13	Charge Gas Dry Molecular Sieve	Solid	Hazardous[3]	OK	OK	OK
16	Oil Emulsion Solids	Liquid	OK	OK	OK	OK
18	Alcohol Emulsion Tk 553	Liquid	OK	OK	OK	OK
18C	Alcohol Emulsion Tk 540	Liquid	OK	OK	OK	OK
19	Alcohol Acid Pit-Solids	Liquid	OK	OK	OK	OK
20	Barometric Cooling Tower	Liquid	Hazardous	OK	OK	OK
21	Ethylene Cooling Tower	Liquid	OK	OK	OK[4]	OK
22	Alcohol Cooling Tower	Liquid	OK	OK	OK[4]	OK
23	Spent F-1 Alumina Catalyst	Solid	OK	OK	OK	OK
25	CDR Sieves	Solid	Hazardous[3]	OK	OK	OK
26	Lime from Steam Pit	Liquid	OK	OK	OK	OK
27	Anthracite Filter	Solid	OK	OK[6]	OK	OK
28	Ethoxylate Water (Viking)	Solid	OK	OK	OK	OK
29	Normal Paraffin Drier Sieves	Solid	Hazardous[3]	OK	OK	OK
30	Incinerator Distribution Box-Head of Polishing Pond	Liquid	Hazardous	OK	OK	OK
31	Methyl Chloride Carbon	Solid	OK	OK[6]	OK	OK
32	Debutanizer-Depropanizer Solids	Solid	*[2]	OK	*[2]	OK

[1] "Liquids" were generally sludges and contained large quantities of solids. "Solids" had no liquid phase.
[2] Insufficient sample for analysis.
[3] Flash point analysis by "open cup" method.
[4] Sulfide detected at low levels.
[5] Cyanide detected at low levels.
[6] Waste should be treated as corrosive. See text for explanation.

TABLE 2

SUMMARY OF RCRA HAZARD CHARACTERISTICS
FOR VCM PLANT WASTES

Sample Number	Sample Designation	Waste[1] Form	Ignitability	Corrosivity by pH	Reactivity	EP Toxicity
1	Copper Chloride Catalyst	Solid	OK	OK	OK	OK
3	T-981 Sludge East	Liquid	OK	OK	OK	OK
4	T-982 Sludge West	Liquid	OK	OK	OK	OK
5	T-2 West Pit Sludge	Liquid	Hazardous	OK	OK	OK
5-1	T-1 East Pit Sludge	Liquid	Hazardous	Hazardous	OK	OK
5-2	T-500 Pit Sludge	Liquid	Hazardous	OK	OK	OK
6	West Equalization Basin Sludge	Liquid	OK	OK	OK	OK
7	South Equalization Basin Sludge	Liquid	OK	OK	OK	OK
8	ASU Sludge Bottoms	Liquid	OK	OK	OK[2]	OK
9	Biosolids ASU Sludge Waste Tank	Liquid	OK	OK	OK[2]	OK
11	EDC Tar Tank Bottoms	Liquid	OK	OK	OK	OK
12	Tars	Liquid	Hazardous	OK[3]	OK	OK
I-80-159	Quench Column Coke	Solid	OK	OK	OK	OK

[1] "Liquids" were generally sludges and contained large quantities of solids. "Solids" had no liquid phase

[2] Sulfide detected at low levels.

[3] Waste should be treated as corrosive. See text for explanation.

TABLE 3

TOTAL ORGANIC CARBON FOUND IN WASTE LEACHATES (pH5)

LCCP Chemical Plant			VCM Plant		
Sample Number	Description	Leachate TOC (ppm)	Sample Number	Description	Leachate TOC (ppm
1	North Lagoon (Sludge)	295	1	Copper Chloride Catalyst	375
2	South Lagoon (Sludge)	285	3	T-981 Sludge East	50
3	Polishing Pond	255	4	T-982 Sludge West	45
4	Digester Pond	160	5	T-2 West Pit Sludge	950
5	Storm Water Diversion Basin	140	5-1	T-1 East Pit Sludge	380
6	Holding Pond (Inlet Boxes)	180	5-2	T-500 Pit Sludge	420
7	Holding Pond (Middle Sect.)	80	6	West Equalization Basin Sludge	85
8	Normal Paraffin (API Sep)	70			
9	Ethylene/alcohol (API Sep)	125	7	South Equalization Basin Sludge	115
10	Methylene Chloride Acid Neutralization Basin	3,015	8	ASU Sludge Bottoms	50
11	DAF Solids	35	9	Biosolids ASU Sludge Waste Tank	295
12	Aluminum Hydroxide	65			
13	Charge Gas Dry Molecular Sieve	115	11	EDC Tar Tank Bottoms	2,090
			12	Tars	1,180
16	Oil Emulsion Solids	3,435	I-80-159	Quench Column Coke	5
18	Alcohol Emulsion Tk553	7,630			
18C	Alcohol Emulsion Tk 540	6,745			
19	Alcohol Acid Pit-Solids	3,670			
20	Barometric Cooling Tower	435			
21	Ethylene Cooling Tower	75			
22	Alcohol Cooling Tower	25			
23	Spent F-1 Alumina Catalyst	80			
25	CDR Sieves	700			
26	Lime From Steam Pit	40			
27	Anthracite Filter	215			
28	Ethoxylate Water (Viking)	>10,000			
29	Normal Paraffin Drier Sieves	355			
30	Incinerator Distribution Box-Head of Polishing Pond	95			
31	Methyl Chloride Carbon	.100			
32	Debutanizer-Depropanizer Solids	*			

* Insufficient Sample