STAPPA / ALAPCO
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#136 12/17/86
800064

81

PARTICULATE EMISSION TESTS
TOWN OF VERNON
MUNICIPAL SLUDGE INCINERATOR
FEBRUARY 10-11, 1981
VERNON, CONNECTICUT

ENVIRONMENTAL
CONSULTANTS, INC.

EDWARD D. ASTLE
ENVIRONMENTAL ENGINEER

MARCH 20, 1981

TRC PROJECT NO. 1438-E53

125 SILAS DEANE HIGHWAY
WETHERSFIELD
CONNECTICUT 06109
(203) 563-1431

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1.0 INTRODUCTION

TRC-Environmental Consultants, Inc. was retained by Zimpro, Inc. to determine the particulate emission rate from the Town of Vernon Sewage Sludge Incinerator located in Vernon, Connecticut. This test program was conducted to satisfy the requirements of the Connecticut Department of Environmental Protection.[1]

All tests were conducted in the breeching of the incinerator using methods and procedures described in the Intent to Test Form 800064, approved by the Department of Environmental Protection of the State of Connecticut on July 28, 1980. A copy of the Source Test Plan and letter of acceptance are included in Appendix A. The completed DEP test report data forms are in Appendix B. The test methods and procedures are also presented in Section 4.0 of this report.

The tests were conducted on February 10 and 11, 1981 by TRC's Edward D. Astle, Environmental Engineer; and Susan M. Reynolds, Technical Assistant. Incinerator operation was initiated and monitored by Mr. Jim Torreano of Zimpro, Inc., Rothschild, Wisconsin. Mr. David Sattler from the Connecticut DEP witnessed the testing.

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[1]Particulate: Section 19-508-18(d)(1) of the State of Connecticut Department of Environmental Protection Administrative Regulations for the Abatement of Air Pollution.

2.0 SUMMARY AND CONCLUSION

Three particulate emission tests were conducted on February 10 and 11, 1981. The average rate of emission was 0.32 pounds/ton of dry sludge for this testing program.

The results show that the incinerator is in compliance with the Connecticut Department of Environmental Protection Regulation of 1.3 pounds per ton of dry sludge.[1]

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[1] ibid.

3.0 RESULTS AND DISCUSSION

Table 3-1 summarizes the particulate emissions for the three tests run on the incinerator. Table 3-2 presents the process data - sludge and fuel oil consumption. The average particulate emission concentration from the incinerator was 0.315 pounds per ton of dry sludge, which is less than 25% of the allowable emission for sludge incinerators.

Test Number 3 was not included in the calculation of the average emission rate. A power outage in the town of Vernon during this test caused the test to be terminated at minute 117 of the 128 minute test. Mr. George Miller of the Connecticut Department of Environmental Protection was notified of the incomplete test and he agreed to waive the specification requiring three complete tests, if the remaining two tests met the specifications for sample size and sampling rate. A letter documenting the waiver is contained in Appendix A of this report.

TABLE 3-1

SUMMARY OF PARTICULATE TEST RESULTS
ON VERNON MUNICIPAL SEWAGE SLUDGE
INCINERATOR IN VERNON, CONNECTICUT
FEBRUARY 10-11, 1981

Test No.	Date	Time Period	Isokinetic Percentage	Volume Sampled (DSCF)[1]	Sampling Time Min.	Percent Moisture In Stack Gas	Particulate Emissions: Air Flow ACFM	Grains/ ACF	LB/HR	Lbs/Ton of Dry Sludge	Emission Standard[2]
1	2/10/81	1409-1631	99.1	102.70	128	2.6	6910	0.0058	.368 ~~0.341~~	~~0.374~~ .4095	1.3
2	2/11/81	1004-1225	100.9	84.17	128	3.7	5760	0.0043	.230 ~~0.215~~	~~0.256~~ .2611	1.3
3*	2/11/81	1413-1637	106.4	69.03	113.5	3.7	5140	0.0036	.171 ~~0.152~~	~~0.221~~ .2421	1.3
	Average**			93.43	128	3.2	6340	0.0051	0.277	~~0.315~~ .340 **	

10/11.
Dry Tons Sludge/Hr

per George Muller, CT DEP, Sludge recalculated these numbers from the raw data

[1]Standard Conditions: 68°F, 29.92 inches Hg, dry.

[2]Connecticut Department of Environmental Protection Air Laws, Section 19-508-18(d)(1).

*Test No. 3 test time was shortened by 10.5 minutes because of a power outage in the town of Vernon.

**Test No. 3 was not included in the average.

TABLE 3-2

SUMMARY OF FUEL CONSUMPTION AT
VERNON MUNICIPAL SEWAGE SLUDGE INCINERATOR
IN VERNON, CONNECTICUT
FEBRUARY 10-11, 1981

Test No.	Wet Sludge Consumption Tons/Hr	Percent Moisture of Sludge	Tons of Dry Sludge/Hr	Gal/Hr
1	2.72	66.5	0.911	43.2
2	2.38	65.0	0.833	44.0
3	1.75	65.9	0.597	37.6

4.0 DESCRIPTION OF SAMPLING AREA

TRC sampled two test ports located 90° apart in the 23.5" ID breeching. The ports were approximately three diameters downstream from the last direction change and approximately one diameter upstream from the discharge into the stack.

Zimpro bridged the four foot space between the roof's end and the stack with a platform that extended eight feet on either side of the breeching (See Figure 5-1). The platform was fitted with upper and lower safety rails. The upper rails were positioned 35"-44" above the platform.

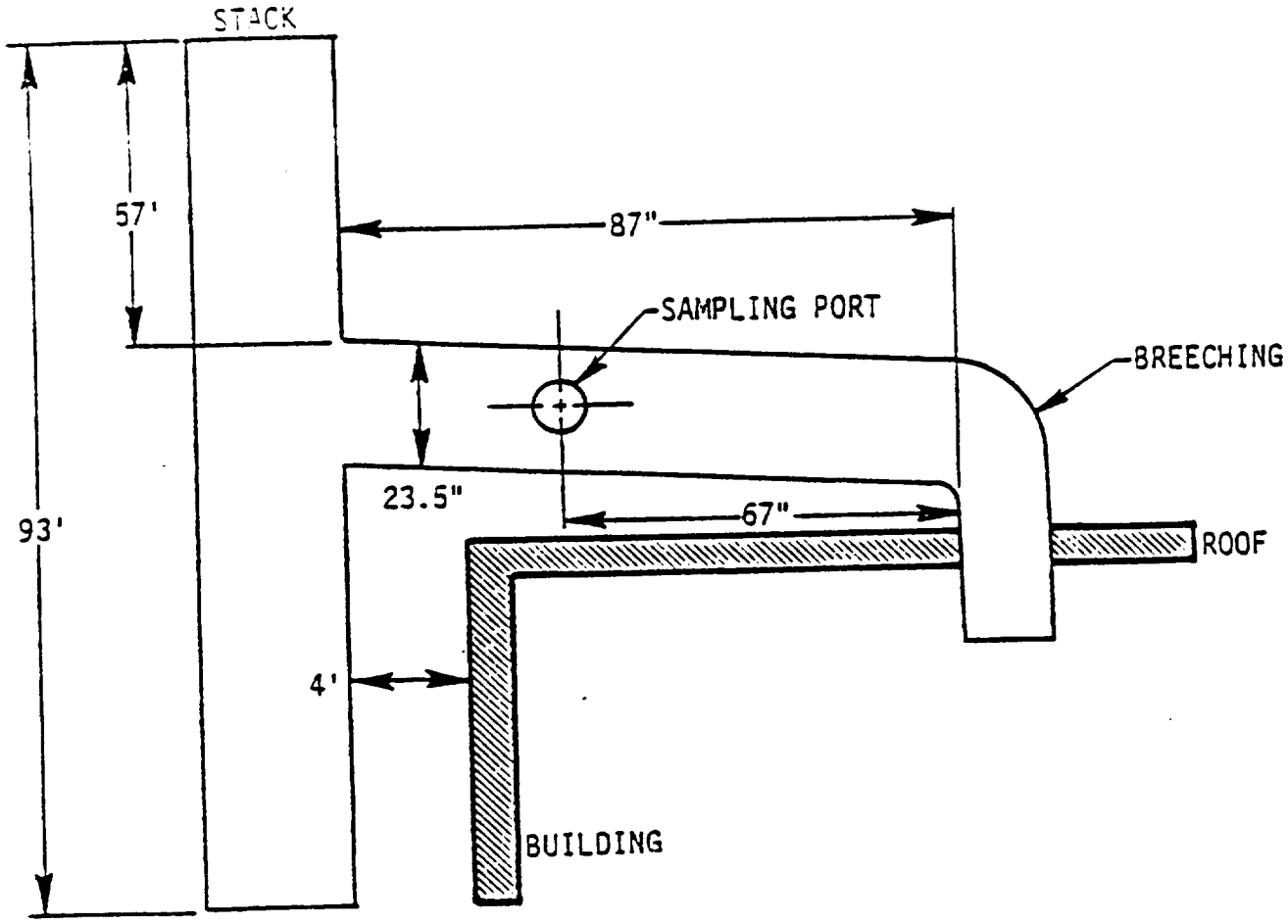

FIGURE 4-1

SAMPLING PORT LOCATIONS

TRAVERSE POINT LOCATIONS

TABLE 4-1

POINT NUMBER	DISTANCE-INSIDE WALL TO TRAVERSE POINT (INCHES)
1	0.38
2	1.15
3	2.00
4	2.94
5	3.94
6	5.17
7	6.65
8	8.81
9	14.69
10	16.85
11	18.33
12	19.53
13	20.56
14	21.50
15	22.35
16	23.12

5.0 PARTICULATE SAMPLING AND ANALYSIS METHODOLOGY

Complete sampling train calibrations were performed before the test program. The inside diameter of each nozzle was measured to the nearest 0.0001 in. with a micrometer. The probe pitot tubes were calibrated against a reference standard pitot tube in a 20" ID wind tunnel capable of velocities ranging from 0 to 100 fps. The dry gas meters and orifice meters were calibrated against a wet test meter. The chromelalumel thermocouples and indicators were calibrated electronically.

Particulate sampling was accomplished by using the modified EPA collection train, Method 5, described in the August 18, 1977 edition of the Federal Register. It is shown schematically in Figure 5-1 and consists of a nozzle, probe, filter, four impingers, vacuum pump, dry gas meter, and an orifice flow meter. TRC manufactures their own sampling train.

The nozzle (1) was attached to a stainless steel, glass-lined probe (2) that is wrapped with nichrome heating wire and jacketed to prevent condensation. Following the probe, the gas stream impacts on a 4-1/2 inch glass filter holder (3). Gelman Spectro Grade No. 64948 glass fiber filter media were used. The filter assembly is enclosed in a heated box (4) to maintain temperatures at 248° ± 25°F. An ice bath containing four impingers (5) was attached to the back end of the filter via a flexible umbilical cord. The first two impingers contained distilled water, the third was dry, and the fourth contained silica gel to remove any remaining moisture. Leaving the fourth impinger, the sample stream flows through a flexible tubing (6), a vacuum gauge (7) needle valve (8), a leakless vacuum pump (9) in parallel with a bypass valve (10) and a dry gas meter (11). A calibrated orifice and inclined manometer (12) completes the sampling train. The stack velocity pressure was measured using a pitot tube and inclined manometer (13). The stack temperature was monitored by a thermocouple that is attached to the pitot and connected to a potentiometer (14).

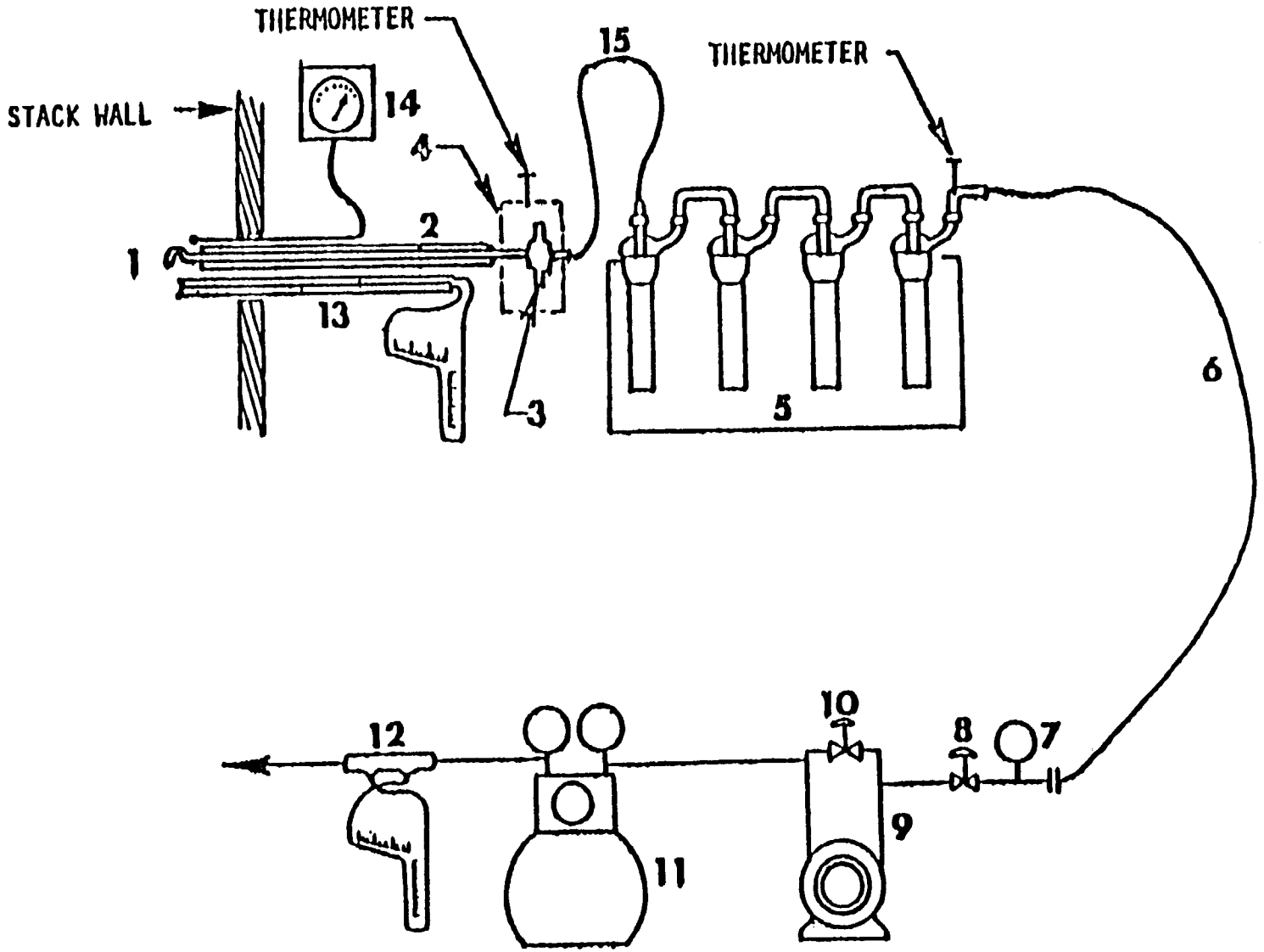

FIGURE 5-1 : MODIFIED EPA PARTICULATE SAMPLING TRAIN
AUGUST 18, 1977, FEDERAL REGISTER

A nomograph was used to quickly determine the orifice pressure drop required for any pitot pressure and stack temperature in order to maintain isokinetic sampling conditions. Sampling flow was adjusted by means of a bypass valve. Before and after each particulate test run the sampling train was leak checked.

The data, test time, sampling duration at each traverse point, pitot pressure, stack pressure, was recorded at each sampling point. At the end of each test, three sample containers were used as follows:

- o Container No. 1 - Filter;
- o Container No. 2 - Acetone wash of probe and front half of filter. The probe and nozzles are washed and brushed three times; and,
- o Container No. 3 - Silica gel from the fourth impinger.

The samples were then transported to TRC's laboratory and the following analyses were performed:

- o Container No. 1 - Transfer the filter, and any loose particulate matter from the sample container to a tared glass weighing dish, desiccate and dry to a constant weight. Report results to the nearest 0.1 mg.
- o Container No. 2 - Transfer the acetone washings to a tared beaker and evaporate to dryness at ambient temperature and pressure. Desiccate and dry to a constant weight. Report results to the nearest 0.1 mg.
- o Container No. 3 - Weigh silica gel to the nearest 0.5 g. The weight of the moisture entrapped in the silica gel, along with the volume of moisture which is condensed in the impingers, is used to calculate the moisture content of the flue gas.

A calculator program developed by TRC was used to calculate mass emission rates in pounds per dry standard cubic foot and also pounds per hour. The program also calculated percent moisture, molecular weight of stack gas at stack conditions and the percent isokinetics.

APPENDIX A

SOURCE TEST PLAN AND COMMUNICATIONS WITH CONNECTICUT DEP

TRC Environmental Consultants, Inc.

125 Silas Deane Highway
Wethersfield CT 06109
(203) 563-1431

July 11, 1980

Mr. Tony Calvo
Air Pollution Control Engineer
Air Quality - Enforcement
Department of Environmental Protection
State Office Building
Hartford, Connecticut 06115

Re: TRC Project #1438-E53-00

Dear Tony:

Enclosed is TRC's Source Test Plan for Particulate Emissions Tests for Vernon Sewage Incinerator in Vernon, Connecticut for your review and approval.

If there are any questions, please contact Will Wade or myself.

Yours truly,

TRC-Environmental Consultants, Inc.

Edward D. Astle
Environmental Engineer

EDA/jjs

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

STATE OFFICE BUILDING HARTFORD, CONNECTICUT 06115

July 28, 1980

Mr. Edward D. Astle
Environmental Engineer
TRC Environmental Consultants, Inc.
125 Silas Deane Highway
Wethersfield, Conn, 06109

Dear Mr. Astle:

You are hereby notified that "Intent to Test" form #800064 which describes a test plan for sampling emissions from a sewage sludge incinerator, owned and operated by the Town of Vernon and located on Windsorville Road, Vernon, Connecticut, is acceptable subject to the following conditions and meets the test criteria required by the State of Connecticut, Department of Environmental Protection:

1. Sampling shall be conducted at a minimum of four minutes per point.

2. A calibration shall be performed on the sludge weighing system.

3. If a bypass stack exists, complete closure shall be demonstrated.

As part of a quality control program to assess weighing accuracy, the Department has instituted a procedure whereby six wafers of unknown weight are to be weighed coincidental with the various weight determinations specified by the "Method 5" test procedures. Three wafers are to be clearly identified as having been weighed during the filter tare weight determinations, and the remaining three are to be weighted concurrently with final filter and probe wash weight determinations and identified as having been weighed at that time. Please return the wafers with the report submittal.

The field tests will be observed by myself unless you are otherwise notified. I should be informed of progress and problems that may alter the test program. If you have any questions concerning the contents or intent of this letter, do not hesitate to contact either myself or Carl Dodge at 566-3310. Please complete the enclosed forms and include them in your test report,

Sincerely,

George T. Miller
Sr. Air Pollution Control Engineer

GTM:jr
Encs.

TRC THE RESEARCH CORPORATION of New England
125 SILAS DEANE HIGHWAY, WETHERSFIELD, CONNECTICUT 06109
203 563-1431
Environmental Consultants To Management

December 1, 1978

Mr. Carleton L. Dodge
Principal Air Pollution Engr.
Air Quality-Monitoring
Dept. of Env. Protection
State Office Bldg.
Hartford,CT. 06115

re: TRC Project #51995

Dear Mr. Dodge:

Please find enclosed a copy of the "Source Test Plan for the Vernon Sewage Sludge Incinerator". I will meet with you and Mr. James Torreano of Zimpro, Inc. on Friday, December 8, 1978 at 9:00am in your office to review the plan.

If you have any questions, please contact Willard Wade or me.

Yours truly,

TRC-THE RESEARCH CORPORATION
of New England

Benjamin F. Brown

Benjamin F. Brown
Senior Technical Specialist
Project Manager

BFB/jp

enc: Source Test Plan

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

STATE OFFICE BUILDING HARTFORD, CONNECTICUT 06115

December 12, 1978

Mr. Benjamin F. Brown
The Research Corp. of New England
125 Silas Deane Highway
Wethersfield, Conn. 06109

Dear Mr. Brown:

You are hereby notified that "Intent to Test" form #780062 which describes a test plan for sampling emissions from a sewage sludge incinerator, owned and operated by the Town of Vernon and located on Windsorville Road, Vernon, Connecticut, is acceptable subject to the following conditions and meets the test criteria required by the State of Connecticut, Department of Environmental Protection:

1. Sampling shall be conducted at a minimum of four (4) minutes per point.

2. In future Source Test Plans, please use revised Source Test Form #1 (enclosed).

The field tests will be observed by myself unless you are otherwise notified. I should be informed of progress and problems that may alter the test program. Please complete the enclosed forms and include them in your test report.

Very truly yours,

George T. Miller

George T. Miller
Air Pollution Control Engineer
Telephone 566-3310

GTM:jr
Encs.

cc: Mr. James Torreano
Vernon Sewage Sludge Incinerator

SOURCE TEST PLAN FOR THE VERNON SEWAGE SLUDGE INCINERATOR

ENVIRONMENTAL CONSULTANTS, INC.

EDWARD D. ASTLE
PROJECT MANAGER

TRC PROJECT #1438-E53-00
JULY 10, 1980

125 SILAS DEANE HIGHWAY
WETHERSFIELD
CONNECTICUT 06109
(203) 563-1431

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SOURCE TEST PLAN

CLIENT NAME: Zimpro, Inc.

TEST LOCATION: Vernon, Connecticut

SOURCE TO BE TESTED: Vernon Municipal Sewage Sludge Incinerator

PREPARED BY: Edward D. Astle

SCHEDULED TEST DATE: July 28, 1980

1.0 PURPOSE OF TESTS

The Town of Vernon has added a newly constructed, sewage sludge incinerator to their Wastewater Treatment Plant.

The New Source Performance Standards of the Clean Air Act require that a new sewage sludge incinerator comply with the emissions standard of 1.3 lb/ton of dry sludge input.

These tests will measure the particulate emissions from the incinerator to determine their compliance with emission and acceptance standards.

2.0 SCOPE OF TESTS

Triplicate particulate and flue gas composition measurements will be conducted on the incinerator gases after they exit the two stage, emissions impingement scrubber. Each particulate test will consist of two traverses across the 23.5" breeching duct with 16 points on a traverse. Each traverse point will be sampled for four (4) minutes in order to obtain a minimum sample volume of 30 DSCF. (The sampling interval per point may be increased if four (4) minutes per point does not provide a sufficient sample volume.)

An integrated gas sample will be collected during each particulate test and analyzed with an ORSAT for carbon dioxide and oxygen. The gas samples will be collected at the same locations that the particulate tests are being conducted.

During the tests the sewage sludge will be fed into the incinerator at the rate of 5,690 wet lb/hr with 20% solids and characteristics specified by the Town of Vernon.

Zimpro personnel will obtain sludge and oil samples in accordance with EPA Regulations on Standards of Performance for New Stationary Sources[1] for sewage treatment plants.

TRC will composite and have the sample analyzed in accordance with EPA Regulations[1] (see Sludge Sampling and Analysis, Page 10).

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[1]EPA Regulations On Standards of Performance For Stationary Sources, Part 60, Subpart O, Sewage Treatment Plants, Section 60.152.

3.0 DESCRIPTION OF OPERATION

The sewage sludge furnace at the Vernon, Connecticut facility is a Zimpro, Multiple Hearth, F-11C Incinerator. The sludge is conveyed into the top of the furnace and passes through a succession of six hearths which measure 16' 9" in diameter. This passage drives off residual moisture until the dry sludge ignites and burns. Ash from the furnace is carried via screw conveyors and a bucket elevator to a hopper. Another screw conveyor unloads the ash from the hopper into trucks.

Effluent gases exit the furnace and pass through a venturi and a two-stage impingement scrubber. After the scrubber, the gases are drawn through an ID fan and exhausted into a breeching and finally discharged up the stack.

Center shaft cooling is used to heat combustion air. The center shaft cooling can be diverted directly to the stack to heat the exhaust gases to a temperature of 1800°F.

The incinerator is designed for a feed rate of 5,690 lb/hr of wet filter cake with an 80% moisture content.

Gas pilots provide ignition for the incinerator which has auxiliary burners fired with number two fuel oil on each hearth level.

4.0 OPERATIONAL PARAMETERS

During the tests, Zimpro personnel will determine or monitor and record the following parameters:

1. Sludge feed rate (to be kept at approximately 5,690 lb/hr wet).
2. Fuel meter readings GPM (every 30 minutes).
3. All hearth and furnace outlet temperatures (every 30 minutes).
4. Scrubber inlet and outlet temperatures (every 30 minutes).
5. Venturi Delta Pressure and Scrubber Delta Pressure (every 30 minutes).
6. All scrubber water flow rates in GPM (every 30 minutes).
7. Burner conditions (on/off - every 30 minutes).

TRC will monitor and record:

1. Exhaust stack temperatures.
2. Ambient temperatures.
3. Barometric pressures.
4. Stack gas flow.
5. Visual checks of stack exhaust.
6. Test instruments.

5.0 DESCRIPTION OF SAMPLING AREA

TRC will sample at two test ports located 90° apart in the 23.5" ID breeching. The ports will be approximately 3 diameters downstream from the last direction change and approximately 1 diameter upstream from the discharge into the stack.

Zimpro will bridge the four foot space between the roof's end and the stack with a platform that will extend eight feet on either side of the breeching (See Figure 5-1). The platform will be fitted with upper and lower safety rails. The upper ones are to be positioned 35"-44" above the platform.

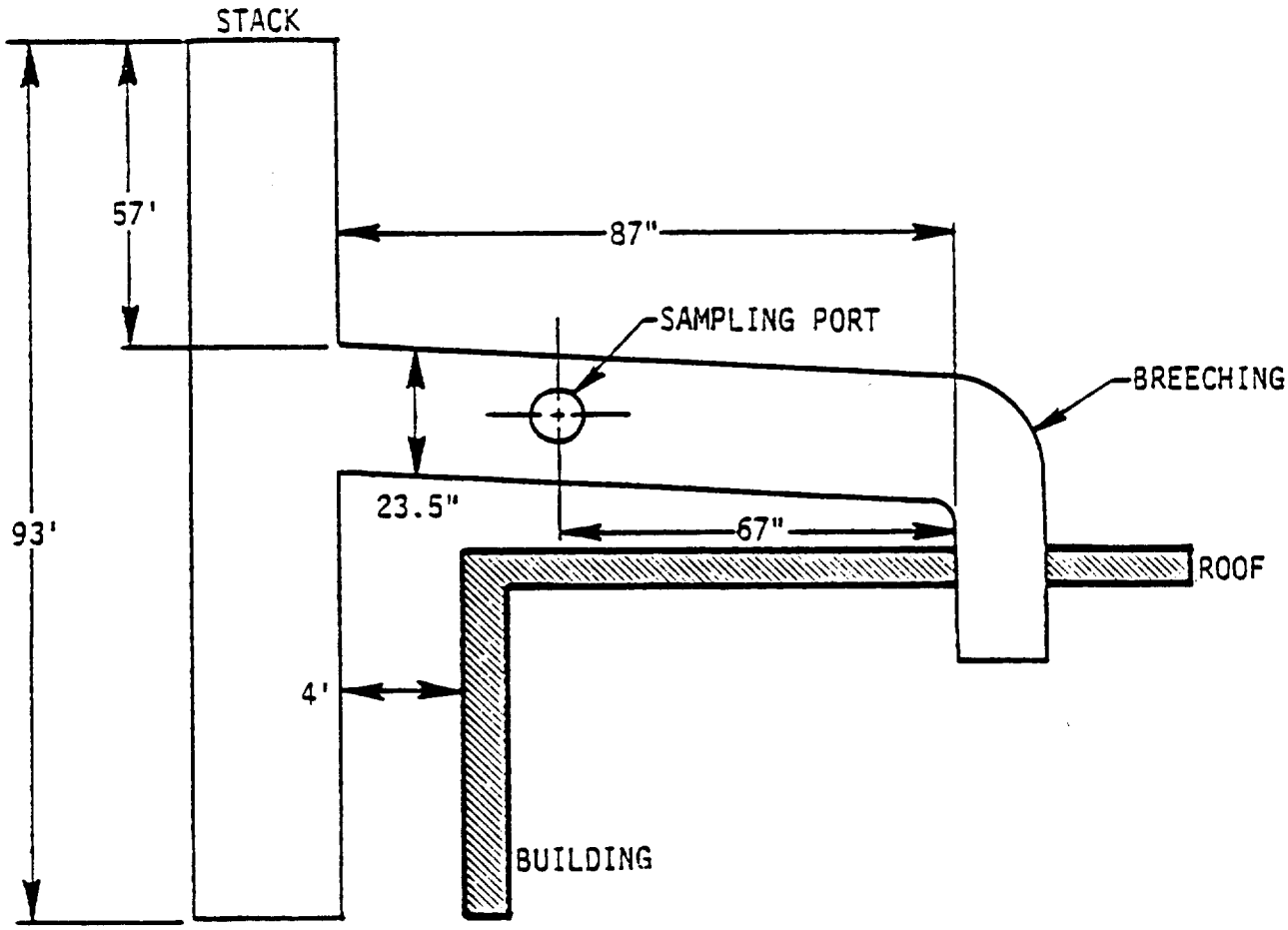


FIGURE 5-1

TABLE 5-1

POINT NUMBER	DISTANCE-INSIDE WALL TO TRAVERSE POINT (INCHES)
1	0.38
2	1.15
3	2.00
4	2.94
5	3.94
6	5.17
7	6.65
8	8.81
9	14.69
10	16.85
11	18.33
12	19.53
13	20.56
14	21.50
15	22.35
16	23.12

6.0 SAMPLING AND ANALYSIS METHODOLOGY

6.1 Particulate

Particulate sampling will be accomplished by using the modified EPA collection train, Method 5, described in the August 18, 1977 edition of the Federal Register. It is shown schematically in Figure 6 and consists of a nozzle, probe, filter, four impingers, vacuum pump, dry gas meter, and an orifice flow meter.

The nozzle (1) is stainless steel glass-lined probe (2) that is wrapped with nichrome heating wire and jacketed. This prevents condensation of the sampled gas. Following the probe, the gas stream impacts on a 4 1/2" glass filter holder. Reeve Angel filter paper is used. Enclosing the whole filter assembly is a heated box (4) to maintain temperatures above 250°F. Again, condensation is prevented. An ice bath containing four impingers (5) is attached to the back end of the filter via a flexible umbilical cord. All condensible material in the sample stream is collected here. The first two impingers contain distilled water, the third is dry and the fourth contains silica gel to remove any remaining moisture. Leaving the fourth impinger, the sample stream flows through flexible tubing (6), a vacuum gauge (7) needle valve (8), a leakless vacuum pump (9) in parallel with a bypass valve (10) and a dry gas meter (11). A calibrated orifice and inclined manometer (12) complete the sampling train. The stack velocity pressure is measured using a pitot tube and inclined manometer (13) and stack temperature is monitored by a thermocouple attached to the pitot and connected to a potentiometer (14).

A nomograph is used to quickly determine the orifice pressure drop required for any pitot velocity pressure and stack temperature in order to maintain isokinetic sampling conditions. Sampling flow is adjusted by means of the bypass valve.

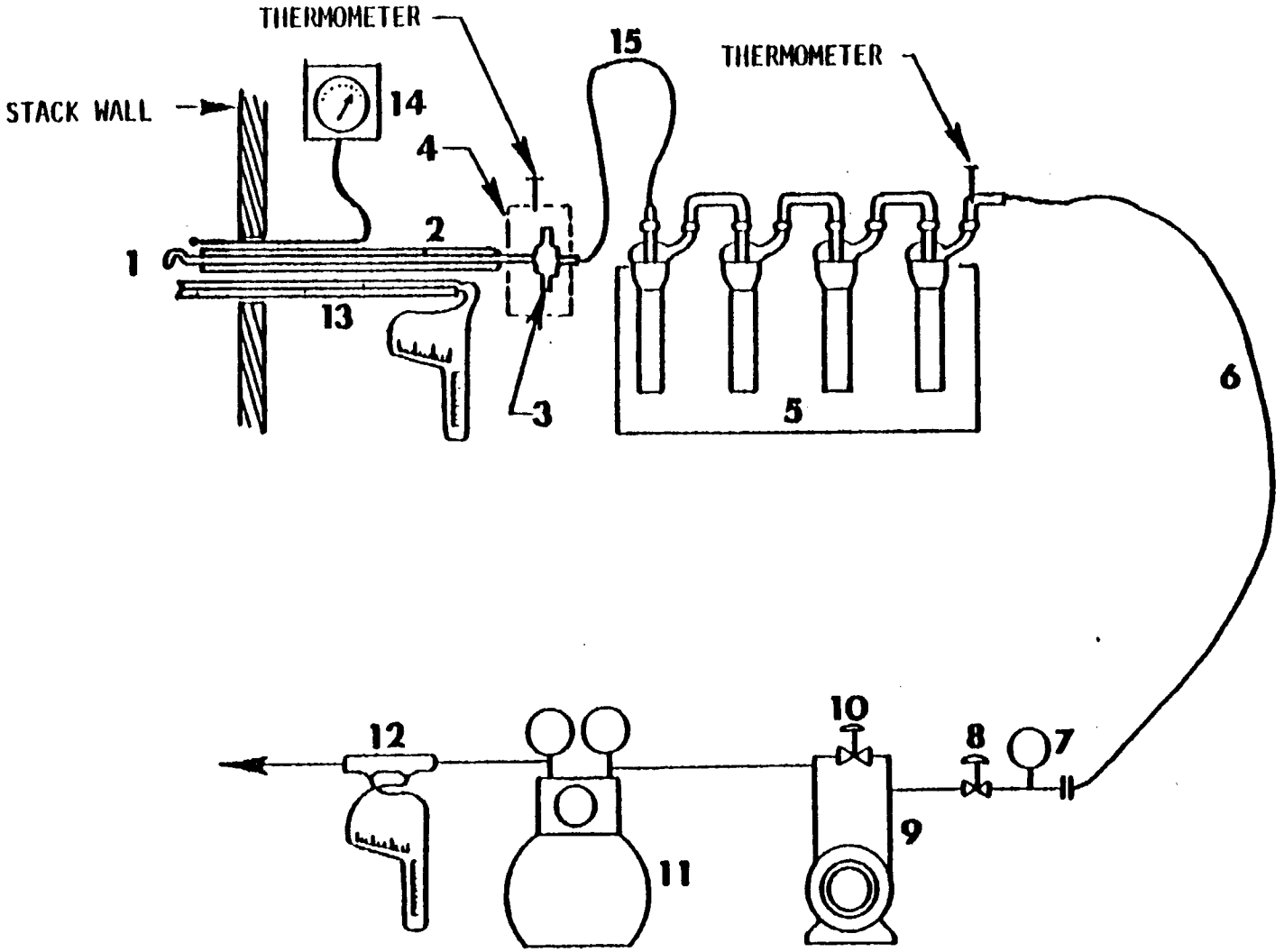


FIGURE 6-1: MODIFIED EPA PARTICULATE SAMPLING TRAIN
AUGUST 18, 1977, FEDERAL REGISTER

Test data recorded will include test time, sampling duration at each traverse point, pitot pressure, stack temperature, meter volume, meter inlet-outlet temperature and orifice pressure drop. A sample field data sheet is included in Appendix A. At the end of each test, three sample containers will be used as follows:

Container #1 - Filter

Container #2 - Acetone wash of probe and front half of filter.

Container #3 - Silica gel from the fourth impinger.

The samples will be transported to TRC's laboratory and the following analyses performed:

Container #1 - Transfer the filter and any loose particulate matter from the sample container to a tared glass weighing dish, desiccate and dry to a constant weight. Report re-results to the nearest 0.1 mg.

Container #2 - Transfer the acetone washings to a tared beaker and evaporate to dryness at ambient temperature and pressure. Desiccate and dry to a constant weight. Report results to the nearest 0.1 mg.

Container #3 - Weigh silica gel to the nearest 0.5 g. The weight of the moisture entrapped in the silica gel, along with the volume of moisture which is condensed in the impingers, is used to calculate the moisture content of the flue gas.

A computer program developed by TRC is used to calculate mass emission rates in lb/hr, grain loading in grains per actual and grains per standard cubic foot, and the volume flow in the duct stack.

6.2 Flue Gas Sampling and Analysis

An integrated flue gas sample will be collected in a Saran bag during each test. The sampling apparatus consists of a probe which is attached to the particulate sampling probe to obtain a flue gas sample from the same locations in the stack from whence the particulate sample is withdrawn. An air cooled condenser is used to remove the water from the flue gas. The flue gas is pumped by a metal bellows (leakless) pump through a flow meter to the Saran or other inert, impervious bag.

Upon completion of the test run, the bag sample is analyzed by the use of an Orsat to determine the percentage composition of CO_2, O_2, and (by difference) N_2.

6.3 Sludge and Ash Sampling and Analysis

A sludge sample will be composited from the sludge burned during each of the three tests and analyzed in accordance with EPA regulations (Page 2) for moisture content by an outside contract laboratory. A portion of the sample will be given to the DEP test observer for any additional analyses that the enforcement agency deems necessary.

6.4 Oil Sampling and Analysis

A sample of the No. 2 fuel oil, which is fired in the auxiliary burners while the incinerator is in operation will be composited from the oil fired during the tests. The oil will be analyzed by an outside contract laboratory using ASTM methods for the following:

PROXIMATE ANALYSIS	ULTIMATE ANALYSIS
API 60°F	Carbon
BTU/lb	Sulfur
BTU/gal	Ash
Specific Gravity	Hydrogen
	Nitrogen

APPENDIX A

SOURCE TEST FORM #1

NUMBER ASSIGNED _____

I SOURCE INFORMATION

Name Vernon Sewage Sludge Incinerator

Address Windsorville Rd
Vernon, Connecticut

Person or Persons Responsible for tests
Name James Torreano
Telephone 872-3472

II TESTER INFORMATION

Name TRC-Environmental Consultants, Inc.

Address 125 Silas Deane Hwy
Wethersfield, CT

Signature Edward D. Astle
Person Responsible for Tests

Date July 9, 1980

Person or Persons Responsible for Tes
Name Edward D. Astl
Telephone 563-1431

III. IDENTIFY EQUIPMENT AND STACK TO BE TESTED

Stack # 187-65-P6-02

Proposed Test Date July 28, 1980

IV. Gas Stream Sampling Information. Identify all gas stream components to be sampled.

	Component	Sampling Duration minutes per point	Sampling Duration total test time	Number of tests (Minimum of 3)	Expected Concentrations	Brief description of the test method to be used fo each pollutant
1.	Particulate	3	96	3	~ .75 lb/ton	EPA Method 5
2.	CO_2	3	96 (Integrated sample)	3	3-4%	ORSAT EPA Method 3
3.	O_2	3	96 (Integrated sample)	3	10-12%	ORSAT EPA Method 3
4.						
5.						

V. Stack Information:

1. Approx. gas temp. 120 °F
2. Approx. gas flow 8,000 A.C.F.M.
3. Approx. percent moisture 6 % (percent by volume)
4. Approx. gas density .07 lb/ft^3 (at stack conditions

VI. Is equipment or process to be tested:

1. Presently under State Order? Yes ___ No x Order No. _____
2. Been issued a Notice of Violation? Yes ___ No x Notice No. _____
3. applying for a permit to construct ___? operate x ? 4. testing to comply with 100 ton source test reg? Yes ___ No
5. testing to prove compliance Yes x No ___ 6. other (specify) _____

VII. Identification of documents requested on attached sheets

VIII _____ X _____ XII _____ XIV _____
IX _____ XI _____ XIII _____

APPENDIX B

FIELD DATA SHEET

Firm Name _____ Pump No. _____ Pro Diameter _____ in. C Factor _____

Plant Location _____ Orifice No. _____ Assumed Moisture _____ % Pitot Coefficient _____

Test No. _____ Ambient Temp _____ °F Test Duration _____ min. Orifice ΔH_A _____

Sampling Location _____ Bar Press _____ "Hg Traverse Point Interval _____ min. Test Start Time _____

Purpose of Test _____ Probe Ident. No. _____ Probe Heater Setting _____ amps Test End Time _____

Date _____ Filter Ident. No. _____ Box Temp Setting _____ Leak Test Start _____ CFM@ _____ "Hg

Tester _____ Leak Test Final _____ CFM@ _____ "Hg

Port	Point	3 4 5 Time Min	6 7 8 9 10 Velocity ΔP in H_2O	12 13 14 15 ΔH in H_2O	18 19 20 T_M in °F	23 24 25 T_M Out °F	26 27 28 29 30 P_{STACK} in H_2O	32 33 34 35 T_{STACK} °F	40 41 42 43 44 45 Initial Meter Volume cu. ft.	50 Probe	Pump Vac. in Hg	Heater Box Temp.	Temp. of Gas Leaving Condenser	REMARKS

Probe Wash _____ Cleaning Patch _____

Silica Gel _____ H_2O Collected _____

Silica Gel Cond. _____ H_2O Condition _____

ORSAT Measurements

	Time	CO_2	O_2	CO	N_2
1					
2					
3					

ORSAT Bag Sample

CO_2	O_2	CO	N_2

APPENDIX B

COMPLETED DEP TEST REPORT DATA FORMS AND FUEL ANALYSIS

I.T.T. # 800064 _ Test Report Data Form #1-

Process Information: SEWAGE SLUDGE INCINERATORS

I. Results

	TEST NUMBER 1	2	3	
1. Particulates lb/ton of	0.374	0.256	0.221	Avg. 0.284
dry sludge				Avg.

II. Description

1. Maximum Feed Rate (lb/hr) 5690 lb/hr of wet filter cake
2. Normal Feed Rate 5690 lb/hr of wet filter cake
3. Method of Feeding conveyed into top
4. Method of Stoking oil burner
5. Fuel:
   maximum firing rate (gal/hr, CFH) 148 gal/hr
   type - ultimate and proximate analysis
6. Dampers:
   method of activation Pneumatic
   location

III. Operating Parameters During Test

1. Actual Burner Firing Rate (gal/hr, CFH) 39 gal/hr
2. Material Incinerated: Municipal sludge
   % moisture 65.8%
   feed rate (lb/hr)
   incineration outlet temperature (s) (°F)

IV. Normal Operating Times

1. Hrs/Day - 8
2. Days/Week - 4
3. Weeks/Month - 1 96 hr/month
4. Shut Down Period (If Applicable) -

ANY ADDITIONAL INFORMATION AVAILABLE:

THIS FORM MUST BE COMPLETED AND INCLUDED IN FINAL REPORT.

A.T.T. # 800064

Test Report Data Form #2-5

ontrol Equipment Information: SCRUBBER

I. Description

1.	Scrubber Type (e.g. cyclone, orifice, mechanical, venturi, packed tower)	venturi scrubber with a quencher inlet impingement cooling
2.	Maximum Gas Volume Capacity (CFM)	24036 cfm
3.	Scrubber Diameter (Ft)	Quencher dia. 2'5" square impingement cooling dia. 4'6" ID cir.
4.	Manufacturer	Air Pollution Industries
5.	Model Number	Venturi scrubber with impingement coolir

II. Operating Parameters

1.	Inlet Gas Temperature (^{o}F)	1400
2.	Outlet Gas Temperature (^{o}F)	90
3.	Gas Pressure Drop Across Unit (In. H_2O)	27" H_2O
4.	Outlet Gas Flow Rate (CFM)	5837
5.	Fan Horsepower	45
6.	Liquid Flow Rate (GPM)	130 ppm
7.	Injection Pressure (PSI)	15 psi

III. For Packed Tower Scrubbers:

1.	Type of Packing	-
2.	Packing Depth (Ft)	-
3.	Per Cent Free Volume of Packing	-
4.	Packing Surface Area (Ft^2)	-

ANY ADDITIONAL INFORMATION AVAILABLE:

THIS FORM MUST BE COMPLETED AND INCLUDED IN FINAL TEST REPORT.

I.T.T. # 800064

Test Report Data Form #1-7

I. Test Data (Particulate - E.P.A. Method 5)	TEST NUMBER 1	2	3
1. Volume Water Collected (ML):			
impingers	38	52	42
silica gel	19.73	16.27	13.88
2. Stack Pressure - Absolute (IN. HG)	30.28	29.82	29.64
3. Avg. Stack Temp. (^{o}F)	134	136	143
4. Meter Volume (Actual Cubic Feet)	94.92	82.07	68.11
5. Avg. Meter Temperature (^{o}F)	40.76	57	60
6. Atmospheric Press. (IN. HG)	30.55	29.94	29.78
7. Avg. Orifice Press. Drop (IN. H_2O)	1.99	1.39	1.10
8. Pitot Coefficient	0.84	0.84	0.84
9. Stack Area (Ft^2)	2.76	2.76	2.76
10. Nozzle Diameter (IN.)	0.2591	0.2591	0.2591
11. Total Test Time (Min.)	128	128	113.5
12. Heat Input (MBTU/HR)	-	-	-
13. Total Particulate Collected (MG)	43.3	27.5	16.0
14. Avg. Stack Temperature (^{o}F)	134	136	143
15. Avg. Velocity Press. Drop (IN. H_2O)	0.507	0.343	0.268
II. ORSAT Analysis:			
per cent CO_2	5.6	6.6	6.5
per cent O_2	14.2	12.2	12.8
per cent CO	-	-	-
III. Moisture Content (Per Cent H_2O)	2.58	3.68	3.67

Fuel Engineering Company of New York

Energy and Environmental Services

30 CLAIRMONT AVENUE • THORNWOOD, N.Y. 10594 • (914) 769-7900

Test Report # 317180

Date Received 2/18/1981

P.O. # 7728

Sample Identification #2 Fuel Oil
Project #1438-E53-20 Composite Oil Sample

Sampled by: (You) ~~(Us)~~ **Date:** _____

CERTIFICATE OF OIL ANALYSIS

Approved by _____

Date Mailed 2/23/1981

TRC
125 Silas Deane Highway
Wethersfield, Connecticut 06109

Degrees API @60°F	35.3
Specific Gravity @60°F	0.8483
Flash Point °F	
Bottom Sediment (incl water)	
Sulfur %	0.38
BTU per pound	19402
BTU per gallon	137056
Viscosity @ °F	
@ °F	
@ °F	
@ °F	
Ash	0.006
Carbon	86.12
Hydrogen	12.89
Sulfur	0.38
Nitrogen	0.03
Oxygen	0.57
Water by Distillation	
Sediment by Extraction	
Pour Point	
Fire Point	
Freezing Point	

CHEMICAL ANALYSIS

Sodium	
Vanadium	
Potassium	
Iron	
Lead	
Nickel	
Copper	
Magnesium	
Calcium	
Manganese	

Carbon Residue _____

Neutralization No. _____

Gilbert/Commonwealth engineers and consultants

LABORATORY SERVICES
30 NOBLE STREET, READING PA 19611

GILBERT ASSOCIATES, INC., P. O. Box 1498, Reading, PA 19603/Tel. 215 775-2600

CERTIFICATE OF ANALYSIS

LABORATORY NO: 6563 RECEIVED: 2/24/81 REPORTED: 3/6/81

CLIENT: TRC Environmental Consultants, Inc.
125 Silas Deane Highway, Wethersfield, CT 06109

SAMPLE DESCRIPTION: Sludge Analysis
Project No. 1438-E53-20
Test No. 3
No sampling date

- - - - - - - - - - -

	AS RECEIVED	DRY BASIS
% TOTAL MOISTURE	65.9	
% VOLATILE MATTER	13.9	40.7
HEATING VALUE - Btu/lb	1646	4828

Respectfully submitted,

R. M. Large - Chemist
Laboratory Services

OMD
cc: Ed Astle (3)

Gilbert/Commonwealth engineers and consultants

LABORATORY SERVICES
33 NOBLE STREET, READING PA 19611

GILBERT ASSOCIATES, INC., P. O. Box 1498, Reading, PA 19603/Tel. 215 775-2600

CERTIFICATE OF ANALYSIS

LABORATORY NO: 6562 RECEIVED: 2/24/81 REPORTED: 3/6/81

CLIENT: TRC Environmental Consultants, Inc.
125 Silas Deane Highway, Wethersfield, CT 06109

SAMPLE DESCRIPTION: Sludge Analysis
Project No. 1438-E53-20
Test No. 2
No sampling date

- - - - - - - - - - -

	AS RECEIVED	DRY BASIS
% TOTAL MOISTURE	65.0	
% VOLATILE MATTER	14.1	40.2
HEATING VALUE - Btu/lb	1698	4851

Respectfully submitted,

R. M. Large

R. M. Large - Chemist
Laboratory Services

OMD
cc: Ed Astle (3)

Gilbert/Commonwealth engineers and consultants

LABORATORY SERVICES
33 NOBLE STREET, READING PA 19611

GILBERT ASSOCIATES, INC., P. O. Box 1498, Reading, PA 19603/Tel. 215 775-2600

CERTIFICATE OF ANALYSIS

LABORATORY NO: 6561 RECEIVED: 2/24/81 REPORTED: 3/6/81

CLIENT: TRC Environmental Consultants, Inc.
125 Silas Deane Highway, Wethersfield, CT 06109

SAMPLE DESCRIPTION: Sludge Analysis
Project No. 1438-E53-20
Test No. 1
No sampling date

- - - - - - - - - - -

	AS RECEIVED	DRY BASIS
% TOTAL MOISTURE	66.5	
% VOLATILE MATTER	13.1	39.2
HEATING VALUE - Btu/lb	1636	4829

Respectfully submitted,

R. M. Large - Chemist
Laboratory Services

OMD
cc: Ed Astle (3)

APPENDIX C

FIELD DATA SHEETS

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Town of Vernon Sludge Incinerator
DATE 8/16/80
SAMPLING LOCATION Breeching
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) _____
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) _____
STACK I.D., (DISTANCE A - DISTANCE B) 23 1/4"
NEAREST UPSTREAM DISTURBANCE _____
NEAREST DOWNSTREAM DISTURBANCE _____
CALCULATOR EDA

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOC/ FROM OUTSIDE OF NIP (SUM OF COLUMNS 4 &
1	0016	23.25	~~0372~~ 1.00	13.5	14.5
2	0.049		1.139		14.64
3	0.085		1.98		15.48
4	0.125		2.91		16.41
5	0.169		3.93		17.43
6	0.220		5.11		18.61
7	0.283		6.58		20.08
8	0.375		8.72		22.22
9	0.625		14.531		28.03
10	0.717		16.67		30.17
11	0.780		18.13		31.63
12	0.831		19.32		32.82
13	0.875		20.34		3384
14	0.915		21.27		34.77
15	0.951		22.11		35.61
16	0.984		~~22.88~~ 22.25		35.75

EPA (Dur) 232

PRELIMINARY VELOCITY TRAVERSE

PLANT ZENRRC
DATE 2-10-91
LOCATION
STACK I.D. 22.5
BAROMETRIC PRESSURE, in. Hg 30.00
STACK GAUGE PRESSURE, in. H_2O -.23
OPERATORS EDT / SMR
Cp 0.84

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	~~.75~~	131
2	.72	129
3	.7	133
4	.69	131
5	.66	136
6	.6	141
7	.55	145
* 8	.54	149
9	.47	157
10	.50	155
11	.52	154
12	.55	155
13	.52	153
14	.52	154
15	.47	147
16	.47	146
AVERAGE	~~.0.757~~ 0.573	146

SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	.50	139
2	.62	137
3	.65	134
4	.60	145
5	.62	134
6	.57	146
7	.56	147
* 8	.54	147
9	.57	147
10	.61	149
11	.61	140
12	.68	136
13	.62	137
14	.6	137
15	.62	132
16	.54	127
AVERAGE	.593	140

T_d .583 T_s 143

EPA (Dur) 233
4/72

TRC ENVIRONMENTAL CONSULTANTS, INC. FIELD DATA SHEET

Firm Name ZIMPRO
Plant Location VERNON
Test Number 1
Sampling Location STACK Breeching
TRC Project No. 1438-E53
Date 2/10/91
Tester EDDY BUE

Orifice No. T-1
Ambient Temp. 40 °F
Bar. Press. 30.55 "Hg
Probe Ident. No. 29
Filter Ident. No. 10225
Duct Area 2.76 ft²

Nozzle No. & Dia. 0.259 in.
Assumed Moisture 5 %
Test Duration 120 min.
Traverse Point Interval 4 min.
Probe Heater Setting 250±25 °F
Filter Temp. Setting 250±25 °F
Dry Gas Meter Y 1.00

Nomograph C Factor 095
Pitot Coefficient 0.84
Orifice ΔH@ 1.83
Test Start Time 1109
Test Final Time 1631
Leak Test Start 0.000 CFM -10 "Hg
Leak Test Final 0.000 CFM -10 "Hg

PAGE #1 OF 2

Port	Point	3 4 5 Time Min.	6 7 8 9 10 Velocity ΔP in H_2O	12 13 14 15 ΔH in H_2O	18 19 20 T_M in °F	23 24 25 T_M out °F	26 27 28 29 30 P_{Stack} in H_2O	32 33 34 35 T_{Stack} °F	40 41 42 43 44 45 Gas Sample Volume cu. ft.	50 PROBE	52 53 Cyc. Angle	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
1	1	4	72	275	41	41	-027	129	879100	1		290	48	3.5	261		
4	2		70	270	42	41		132	882660			282	48	3.5	250		
8	3		58	225	42	41		134	886044			284	48	3.0	250		
12	4		53	205	42	41		137	889366			280	48	3.0	260		
16	5		62	235	41	41		133	892277			284	48	3.0	260		
20	6		63	240	42	41		140	895477			276	48	3.5	250		
24	7		055	215	42	41		139	898722			281	48	3.0	250		
28	8		052	200	42	41		143	901844			282	48	3.0	250		
32	9		050	195	42	42		147	904855			284	48	3.0	260		
36	10		047	185	41	42		150	907799			277	48	3.0	250		
40	11		048	185	42	41		151	910688			280	48	3.0	250		
44	12		048	185	42	41		152	913555			269	48	3.0	250		
48	13		036	180	42	41		139	916433			294	48	2.5	251		
52	14	4	041	160	42	41		140	919000			276	48	2.5	250		
Average			$\leq\sqrt{\Delta P}$														

H_2O Collected 38 ml
SG Condition
SG Weight 19.73 gm
Total Volume Collected 57.73 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2
5.6	14.2	0	80.2
5.6	14.2	0	80.2

COMMENTS:

TRC ENVIRONMENTAL CONSULTANTS, INC. FIELD DATA SHEET

Firm Name Zimpro
Plant Location Vernon Ct
Test Number 1
Sampling Location Stack Breeching
TRC Project No. 1438-E53
Date 2/10/81
Tester EDA/BMP

Orifice No. T-1
Ambient Temp. 40 °F
Bar. Press. 30.65 "Hg
Probe Ident. No. 29
Filter Ident. No. 10225
Duct Area 2.76 ft²

Nozzle No. & Dia. 0.259" in.
Assumed Moisture 5 %
Test Duration 128 min.
Traverse Point Interval 4 min.
Probe Heater Setting 250±25 °F
Filter Temp. Setting 250±25 °F
Dry Gas Meter Y 1.00

Nomograph C Factor 0.93
Pitot Coefficient 0.84
Orifice ΔH@ 1.85
Test Start Time 1409
Test Final Time 1637
Leak Test Start 0.000 CFM @ -10 "Hg
Leak Test Final 0.000 CFM @ -10 "Hg

PAGE #2 of 3

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ϕ	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
1	15	4	0.40	1.55	41	41	-0.27	149	921.66	1		273	48	2.5	258		
	16	4	0.40	1.55	41	41		137	924.80			286	48	2.5	250		
									926.93								
2	1	4	0.61	2.35	40	40	-0.27	129	926.93			285	48	3.5	250		
	2	4	0.62	2.35	40	40		121	930.14			280	48	3.5	250		
	3	4	0.63	2.40	40	40		124	933.36			278	48	3.5	260		
	4	4	0.58	2.25	40	40		124	936.63			278	48	3.5	250		
	5	4	0.57	2.20	41	40		123	939.78			284	48	3.5	253		
	6	4	0.54	2.10	40	40		126	942.99			277	48	3.5	250		
	7	4	0.56	2.20	40	40		126	945.96			275	48	3.5	250		
	8	4	0.55	2.15	41	40		126	949.07			275	48	3.5	254		
	9	4	0.54	2.30	41	40		127	952.15			280	48	3.5	254		
	10	4	0.65	2.50	41	40		128	955.34			280	48	3.5	250		
	11	4	0.45	1.75	41	40		126	958.67			280	48	3.5	262		
Average			$\Sigma\sqrt{\Delta P}$														

3.13

H_2O Collected 38 ml
SG Condition
SG Weight 19.73 gm
Total Volume Collected 57.73 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2
5.6	14.2	0	80.2
5.6	14.2	0	80.2

COMMENTS:

TRC ENVIRONMENTAL CONSULTANTS, INC. — FIELD DATA SHEET

Firm Name: ZIMPRO
Plant Location: VANNUC.
Test Number: 1
Sampling Location: STACK / BEECHING
TRC Project No.: 1438-E63
Date: 2/10/81
Tester: EDA

Orifice No.: T-1
Ambient Temp.: 40 °F
Bar. Press.: 30.55 "Hg
Probe Ident. No.: 29
Filter Ident. No.: 10225
Duct Area: 2.76 ft²

Nozzle No. & Dia.: 0.259 in.
Assumed Moisture: 5 %
Test Duration: 128 min.
Traverse Point Interval: 4 min.
Probe Heater Setting: 250 ± 25 °F
Filter Temp. Setting: 250 ± 25 °F
Dry Gas Meter Y: 1.00

Nomograph C Factor: 0.93
Pitot Coefficient: 0.84
Orifice ΔH_A: 1.83
Test Start Time: 1409
Test Final Time: 1631
Leak Test Start: 0.000 CFM @ -10 "Hg
Leak Test Final: 0.000 CFM @ -10 "Hg

Page 3 of 3

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ∅	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
2	12	4	037	145	40	40	-027	139	96153			250	48	2.0	252		
	13		033	130	40	40		137	96410			270	48	2.0	250		
	14		034	135	40	40		134	96654			275	48	2.0	250		
	15		034	135	40	40		131	96904			280	48	20	250		
	16		034	135	39	40		131	97162			280	48		250		
									97402								
									94492								
Average			$\Sigma\sqrt{\Delta P}$ 4.712	199			-027	134									

40.76

H_2O Collected: 38 ml (238 - 200 = 38 ml)
SG Condition:
SG Weight: 19.73 gm
Total Volume Collected: 57.73 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2
5.6	14.2	0	80.2
5.6	14.2	0	80.2

COMMENTS:

TRC ENVIRONMENTAL CONSULTANTS, INC. FIELD DATA SHEET

Firm Name Zimpro
Plant Location Vernon Co
Test Number #2
Sampling Location Stack Breeching
TRC Project No. 1438-E53
Date 2/11/81
Tester EDA/SMP

Orifice No. T-1
Ambient Temp. 50 °F
Bar. Press. 29.94 "Hg
Probe Ident. No. 29
Filter Ident. No. 10206 ?
Duct Area 2.76 ft²

Nozzle No. & Dia. 0.2591 in.
Assumed Moisture 3.0 %
Test Duration 128 min.
Traverse Point Interval 4 min.
Probe Heater Setting 260±25 °F
Filter Temp. Setting 280±25 °F
Dry Gas Meter Y 1.00

Nomograph C Factor 0.73
Pitot Coefficient 0.84
Orifice ΔH_A 1.83
Test Start Time 10:04
Test Final Time
Leak Test Start 0.000 CFM@ -6 "Hg
Leak Test Final 0.000 CFM@ -4 "Hg

PAGE #1 of 3

	Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ∅	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
	1	1	4	049	195	53	53	-010	117	97474			260	56	3.0	250		
4		2		040	160	53	53		121	97776			260	56	3.0	261		
8		3		039	155	53	53		121	98052			275	56	2.5	250		
12		4		037	145	54	54		125	98321			287	54	2.0	255		
16		5		012	049	55	54		127	98585			285	54	1.0	250		
20		6		012	049	55	54		121	98769			276	54	1.0	250		
24		7		044	175	55	54		121	98927			280	54	3.0	250		
28		8		046	180	56	55		139	99198			284	54	3.0	260		
32		9		035	140	56	55		139	99487			285	54	3.0	253		
36		10		035	140	56	56		144	99749			282	54	3.0	257		
40		11		036	140	56	56		148	100006			273	54	3.0	261		
44		12		033	130	56	56		151	10[illegible]264			283	54	3.0	261		
48		13		031	125	57	57		155	100514			281	54	3.0	261		
52		14		030	120	57	66		158	100759			279	54	2.0	260		
	Average			Σ√ΔP														

H_2O Collected 52 ml
SG Condition
SG Weight 16.27 gm
Total Volume Collected 68.27 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2
6.6	12.2	0	81.2
6.6	12.2	0	81.2
6.6	12.3	0	81.1

COMMENTS: ~~[illegible]~~ Operator and they are running 3 ton sludge
Probe started all the way inside

TRC ENVIRONMENTAL CONSULTANTS, INC. FIELD DATA SHEET

Firm Name	Zimpro
Plant Location	Vernon Ct
Test Number	#2
Sampling Location	Stack Breeching
TRC Project No.	1428-E53
Date	2/4/81
Tester	EDA/SMR
Orifice No.	T-1
Ambient Temp.	50 °F
Bar. Press.	29.94 "Hg
Probe Ident. No.	29
Filter Ident. No.	~~10239~~ 10206
Duct Area	2.76 ft²
Nozzle No. & Dia.	6.2591 in.
Assumed Moisture	3.0 %
Test Duration	128 min.
Traverse Point Interval	4 min.
Probe Heater Setting	250 ± 25 °F
Filter Temp. Setting	250 ± 25 °F
Dry Gas Meter Y	1.00
Nomograph C Factor	0.13
Pitot Coefficient	0.84
Orifice ΔH_A	1.83
Test Start Time	10:04
Test Final Time	
Leak Test Start	0.000 CFM @ -6 "Hg
Leak Test Final	0.000 CFM @ -4 "Hg

Page #2 of 3

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ø	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
1	15	4	030	120	57	57	-010	157	101000			271	54	2.0	261		
	16		030	120	57	57		145	101240			274	54	2.0	260		
									101474								
2	1	4	37	145	57	57	-014	140	101474			267	54	2.0	253		
	2		42	165	58	58		136	101742			273	54	2.0	256		
	3		43	170	58	58		130	102020			276	54	3.0	256		
	4		43	170	58	58		132	102305			276	54	3.0	256		
	5		38	150	58	58		136	102591			264	54	3.0	257		
	6		44	175	58	58		130	102862			268	54	3.0	256		
	7		39	155	58	58		138	103149			268	54	3.0	255		
	8		43	170	58	58		134	103423			263	54	3.0	256		
	9		34	135	59	58		141	103706			262	54	3.0	260		
	10		31	125	59	59		145	103974			284	54	3.0	261		
	11		29	115	59	59		130	104212			262	54	8.0	259		
Average			$\Sigma\sqrt{\Delta P}$														

H_2O Collected 52 ml

SG Condition

SG Weight 16.27 gm

Total Volume Collected 68.27 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2
6.6	12.2	0	81.2
6.6	12.2	0	81.2
6.6	12.3	0	81.1

COMMENTS: [struck out] Ash was dumped at traverse point

TRC ENVIRONMENTAL CONSULTANTS, INC. FIELD DATA SHEET

Page #3 of 3

Firm Name Zimpro
Plant Location Vernon Ct
Test Number 2
Sampling Location STACK BREECHING
TRC Project No. 1436-E53
Date 2/11/81
Tester EDA/SMR

Orifice No. T-1
Ambient Temp. 50 °F
Bar. Press. 29.94 "Hg
Probe Ident. No. 29
Filter Ident. No. 1224?
Duct Area 2.76 ft²
DIA 22.5"

Nozzle No. & Dia. 0.2591 in.
Assumed Moisture 20 %
Test Duration 128 min.
Traverse Point Interval 4 min.
Probe Heater Setting 250±25 °F
Filter Temp. Setting 250±25 °F
Dry Gas Meter Y 1.00

Nomograph C Factor 0.93
Pitot Coefficient 0.84
Orifice ΔH_A 1.83
Test Start Time 10:04
Test Final Time 12:25
Leak Test Start 0.000 CFM @ -6 "Hg
Leak Test Final 0.000 CFM @ -4 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle β	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
2	12	4	32	125	59	59	-.014	138	104452			262	54	2.0	257		
	13		31	125	59	59		134	104695			267	54	2.0	256		
	14		31	125	59	59		132	104943			267	54	2.0	256		
	15		31	125	59	59		130	105200			266	54	2.0	257		
	16	↓	31	125	59	59	↓	130	105438			273	54	2.0	257		
									105681					↓			
Average			$\Sigma\sqrt{\Delta P}$														

H_2O Collected 52 ml ml
SG Condition Orange - blue, little bits
SG Weight 16.27 gm
Total Volume Collected 68.27 ml

116 + 6 / 52 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2
6.6	12.2		
6.6	12.2		
6.6	12.3		

COMMENTS:

TRC ENVIRONMENTAL CONSULTANTS, INC. FIELD DATA SHEET

Page #1 of 3

Firm Name Zimpro
Plant Location Rhinelander WI
Test Number 3
Sampling Location Stack Reading
TRC Project No. 1438-E53
Date 12/11/84
Tester ESA / SMP

Orifice No. T-1
Ambient Temp. 50 °F
Bar. Press. 29.78 "Hg
Probe Ident. No. 29
Filter Ident. No. 10227
Duct Area 2.76 ft²

Nozzle No. & Dia. 0.2591 in.
Assumed Moisture 3 %
Test Duration 113.5 min.
Traverse Point Interval 4 min.
Probe Heater Setting 250±25 °F
Filter Temp. Setting 250±25 °F
Dry Gas Meter Y 1.00

Nomograph C Factor 0.98
Pitot Coefficient 0.84
Orifice ΔH_A 1.83
Test Start Time 1413
Test Final Time 1637
Leak Test Start 0.000 CFM @ -8 "Hg
Leak Test Final 0.000 CFM @ -8 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	PROBE	Cyc. Angle ∅	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
2	1	4	0.31	1.50	60	61	-0.14	120	571.16			286	54	2.5	250		
	2		0.33	1.40	60	61		121	599.96			286	56	2.5	250		
	3		0.29	1.20	61	60		127	625.71			283	60	2.5	250		
	4		0.32	1.30	60	61		137	650.21			283	52	2.0	250		
	5		0.28	1.15	60	61		144	675.53			280	52	1.5	250		
	6		0.26	1.05	60	60		150	699.33			282	52	1.5	250		
	7		0.24	0.97	60	61		152	721.19			285	52	1.5	250		
	8		0.24	0.97	60	60		145	743.99			280	50	1.0	250		
	9		0.24	0.97	60	60		135	766.68			281	50	1.0	250		
	10		0.29	1.20	60	60		135	787.77			277	50	1.5	250		
	11		0.22	0.88	59	60		130	812.03			276	50	1.5	250		
	12		0.27	1.10	60	60		140	833.33			272	50	1.5	250		
	13		0.25	1.00	59	60		144	856.63			276	50	1.5	250		
	14		0.26	1.05	59	60		134	878.55			276	50	1.5	250		
Average			$\Sigma\sqrt{\Delta P}$														

H_2O Collected 42 ml
SG Condition 13.84
SG Weight gm
Total Volume Collected 55.84 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2
6.5	13.2		80.3
6.5	13.0		80.5
6.5	12.3		81.2

COMMENTS:

TRC Environmental Consultants, Inc. — FIELD DATA SHEET

Firm Name Zimpro
Plant Location Vernon CT
Test Number 3
Sampling Location Stack Breeching
TRC Project No. 1438-E53
Date 2/11/81
Tester FDD/BWR

Orifice No. T-1
Ambient Temp. 60 °F
Bar. Press. 29.78 "Hg
Probe Ident. No. 29
Filter Ident. No. 10227
Duct Area 2.76 ft²
DIA 22.5

Nozzle No. & Dia. 4 0.2591 in.
Assumed Moisture 3 %
Test Duration 113.5 min.
Traverse Point Interval 4 min.
Probe Heater Setting 250 ± 25 °F
Filter Temp. Setting 250 ± 25 °F
Dry Gas Meter Y 1.00

Nomograph C Factor 0.98
Pitot Coefficient 0.84
Orifice ΔH@ 1.83
Test Start Time 1413
Test Final Time 1637
Leak Test Start 0.000 CFM @ -8 "Hg
Leak Test Final 0.000 CFM @ -8 "Hg

Page # 2 of 3

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	Probe	Cyc. Angle	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
2	15	4	025	180	59	60	-014	145	9011	1		276	50	1.5	250		
	16		025	100	60	60		169	9233			276	50	1.5	250		
									9458								
1	1	4	034	140	60	60	-015	136	9459			280	50	2.0	250		
	2		040	165	60	60		135	9728			250	50	2.0	250		
	3		030	120	61	61		131	10008			298	50	2.0	250		
	4		128	115	60	61		138	10253			273	50	2.0	250		
	5		029	115	60	61		120	10491			260	50	2.0	250		
	6		025	100	60	60		135	10728			281	50	2.0	250		
	7		025	100	61	61		143	10951			261	50	2.0	250		
	8		026	105	61	60		145	11173			276	52	2.0	250		
	9		024	097	61	61		154	11400			274	52	2.0	250		
	10		022	088	61	61		163	11620			284	54	2.0	250		
	11		023	093	61	61		145	11831			270	54	2.0	250		
Average			Σ√ΔP														

H_2O Collected 42 ml
SG Condition
SG Weight 13.88 gm
Total Volume Collected 55.88 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2
6.5	13.2	0	80.3
6.5	13.0	0	80.5
6.5	12.3	0	81.2

COMMENTS: There are feeding towards Sludge 37 lb/hr. The Draft Fan keeps going on and off.

TRC ENVIRONMENTAL CONSULTANTS, INC. — FIELD DATA SHEET

Page #3 of 3

Firm Name Zimpro
Plant Location Vernon, CA
Test Number 3
Sampling Location Stack / Preheating
TRC Project No. 1438-E53
Date 2/11/81
Tester Ed Kemp

Orifice No. I-1
Ambient Temp. 50 °F
Bar. Press. 29.78 "Hg
Probe Ident. No. 29
Filter Ident. No. 10227
Duct Area 2.76 ft²

Nozzle No. & Dia. 4- 0.2591 in.
Assumed Moisture 3 %
Test Duration 113.5 min.
Traverse Point Interval 4 min.
Probe Heater Setting 250±25 °F
Filter Temp. Setting 250±25 °F
Dry Gas Meter Y 1.00

Nomograph
C Factor 0.98
Pitot Coefficient 0.84
Orifice ΔH_A 1.83
Test Start Time 1413
Test Final Time 1637
Leak Test Start 0.000 CFM @ -8 "Hg
Leak Test Final 0.000 CFM @ -8 "Hg

Port	Point	Time Min.	Velocity ΔP in H_2O	ΔH in H_2O	T_M in °F	T_M out °F	P_{Stack} in H_2O	T_{Stack} °F	Gas Sample Volume cu. ft.	Probe	Cyc. Angle	Heater Box Temp.	Temp. of Gas Leaving Condenser °F	Pump Vac. in Hg	Probe Temp. °F	O_2 %	CO_2 %
2	12	4	020	082	61	61	-015	140	120747	1		276	52	2.0	250		
	13		021	085	60	61		136	122954			276	52		250		
	14							122	124662								
	15								125277								
	16																
Average			$\Sigma\sqrt{\Delta P}$														

9/58

H_2O Collected 42 ml
SG Condition
SG Weight 13.88 gm
Total Volume Collected 55.88 ml

Orsat Bag Sample Triplicate Analysis, %

CO_2	O_2	CO	N_2
6.5	13.2	0	80.3
6.5	13.0	0	80.5
6.5	12.3	0	81.2

COMMENTS:

APPENDIX D

CALIBRATION DATA, FILTER PREWEIGHTS AND LAB REPORT ON FILTER AND PROBE WASH

Procedure No. T/S-811
Revision No. 1
Date December 9, 1980
Page _____ of _____

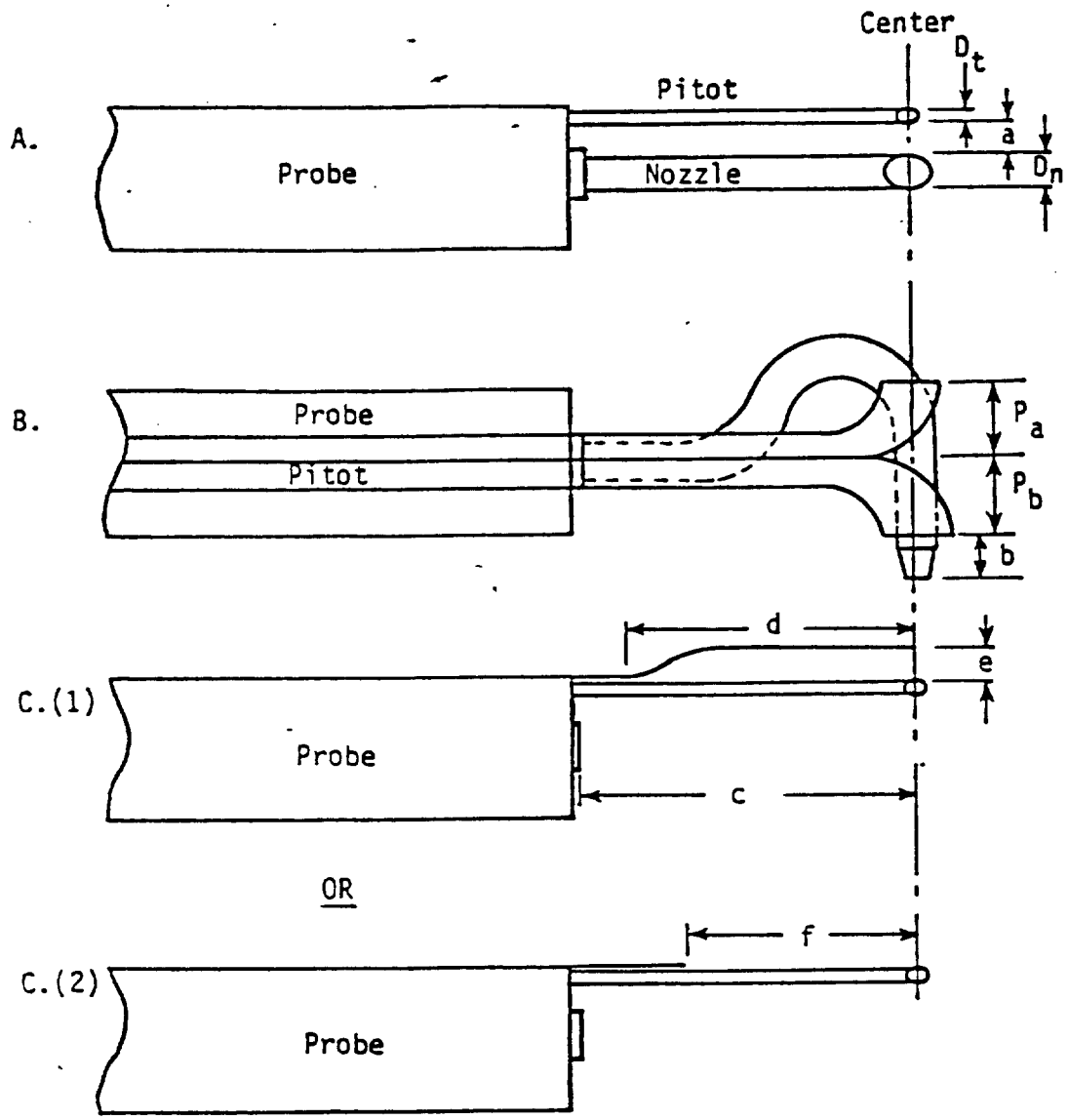
S-TYPE PITOT GEOMETRIC CALIBRATION

PART 1 - PROBE CONFIGURATION

TRC Probe Identification 29 Pitot Identification _____

Technical Specialist LAG

Date 2/9/01



D_t 0.250

D_n 0.500

a 0.859

P_a 0.560

P_b 0.560

b 0.841

c _____

d _____

e _____

OR

c 0.625

f NA

Specifications (EPA Method 2)

D_t = 3/16" to 3/8"
D_n = 1/2"
$a \geq 3/4"$
$b \geq 0$

$c \geq 3"$
$d \geq 3"$
$e \geq 3/4"$
$f \geq 2"$

$P_a = P_b$;

$1.05\ D_t \leq P \leq 1.50\ D_t$

If these specifications are met, proceed with Part 2 Pitot alignment.

Procedure No. T/S-811
Revision No. 1
Date December 9, 1980
Page _____ of _____

S-TYPE PITOT GEOMETRIC CALIBRATION

PART 2 - PITOT ALIGNMENT

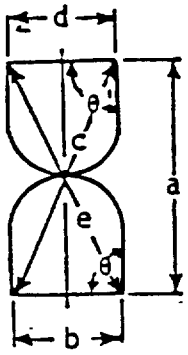
TRC Probe Identification 29 Pitot Identification _____

Technical Specialist LAG

Date 2/9/81

A.

Transverse Tube Axis



a 1.120
b 0.386
c 1.159
d 0.386
e 1.160

θ 86.6
θ' 86.2

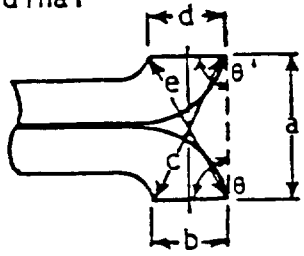
$\frac{a^2 + b^2 - c^2}{2ab} = \cos\theta$

$\frac{a^2 + d^2 - e^2}{2ad} = \cos\theta'$

$(80^\circ < \theta < 100^\circ)$
$(80^\circ < \theta' < 100^\circ)$

B.

Longitudinal Tube Axis



a 1.125
b 0.550
c 1.252
d 0.550
e 1.255

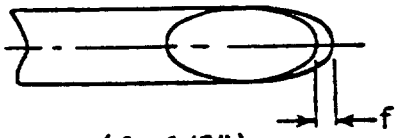
θ 90.0
θ' 90.3

$\frac{a^2 + b^2 - c^2}{2ab} = \cos\theta$

$\frac{a^2 + d^2 - e^2}{2ad} = \cos\theta'$

$(85^\circ < \theta < 95^\circ)$
$(85^\circ < \theta' < 95^\circ)$

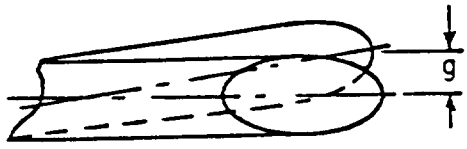
C.



f < 1/8"

$(f < 1/8")$

D.



g < 1/32"

$(g < 1/32")$

NOTE: values in parentheses are EPA Method 2 specifications.

PROBE THERMOCOUPLE CALIBRATION

		Tolerances
Expected Stack Temperature (T_s)	_____ $^\circ R$	
Mercury Thermometer (T_{ref})	_____ $^\circ R$	($T_s \pm 10\%$)
Thermocouple Readout	_____ $^\circ R$	($T_{ref} \pm 1.5\%$)

Probe Identification _____

Technician _____ Date _____

DATE 02/05/81 ORIFICE J T-1 NAME GAMMIE

BAROMETRIC PRESSURE 30.27 IN HG DRY GAS METER NO 1

ORIFICE MANOMETER SETTING IN WATER	GAS VOLUME WET TEST METER CU FT	GAS VOLUME DRY GAS METER CU FT	TEMPERATURE WET TEST METER F	TEMPERATURE DRY GAS METER INLET F	TEMPERATURE DRY GAS METER OUTLET F	TEMPERATURE DRY GAS METER AVERAGE F	TIME MIN	RATIO	DHO
0.5	5.0	5.05	72.0	80.0	79.0	79.5	12.6	1.00	1.75
1.0	5.0	5.05	72.0	80.0	79.0	79.5	9.2	1.00	1.85
2.0	10.0	10.07	72.0	80.0	80.0	80.0	13.0	1.00	1.85
3.0	10.0	10.10	72.0	80.0	80.0	80.0	10.7	1.00	1.88
						AVERAGE		1.00	1.83

(4)

DATE 11/29/77

INSPECTION REPORT

ELFRED MACHINE COMPANY

CUSTOMER TRC - THE RESEARCH CORP. CUSTOMER P.O. NO. 9964

S.O. NUMBER —— PURCHASED FROM ELFRED P.O. NO. ——

PART NO. 4-2 NO. PIECES ORDERED 1 NO. PIECES RECEIVED 1

TOOL NO. SET #4 PART NAME ST/STL NOZZLE

TOOL NAME ——

Actual in 3 Places	Average	Date/Initls	Actual in 3 Places	Average	Date/Initls.
.2551-.2550-.2550	.2550	11/30/77			
.2557-.2558-.2558	.2558	8/11/78			
.2574-.2575-.2575	.2575	12/28/78			
.2580-.2582-.2583	.2582	1/24/79			
.2583-.2585-.2587	.2585	5/17/79			
.2599-.2600-.2600	.2600	7/11/79			
.2600-.2601-.2601	.2601	2/5/80			
.2591 .2591-.2592	.2591	9/20/80			

1st PIECE INSPECTION ☐

PARTIAL INSPECTION ☐ ACCEPTED ☑

COMPLETE INSPECTION ☑ REJECTED ☐

INSPECTOR

ELFRED MACHINE COMPANY
165 JORDAN LANE
WETHERSFIELD, CONN. 06109

FILTER WEIGHTS

Client: HEALTHTEX

Project No.: 1533-E32

☐ Put in Oven
☐ Not put in Oven
☑ Pre-weight
☐ Post-weight

Date					
Time	1000	5:30			
Temp.	70°	70°			
Humidity	18%	15%			
Initials	SMR	SMR			
Filter Number	Wt. 1(g)	Wt. 2(g)	Wt. 3(g)	Wt. 4(g)	Final Ave. Weight
10191	0.8549 ✓	0.8546 ✓			0.85475
10192	0.8518 ✓	0.8518 ✓			0.8518
10193	0.8497 ✓	0.8493 ✓			0.8495
10194	0.8532 ✓	0.8529 ✓			0.85305
10195	0.8475 ✓	0.8474 ✓			0.84745
✓ 2-17-81 EMS 10196 Stanley Work	0.8253	0.8248	0.8251	0.8249 ✓	0.82495
10197	0.8264 ✓	0.8262 ✓			0.8263
10198	0.8355 ✓	0.8355 ✓			0.8355
10199	0.8284 ✓	0.8284 ✓			0.8284
10200	0.8185 ✓	0.8183 ✓			0.8184
10201	0.8334	0.8333			0.83335
10202	0.8311 ✓	0.8309 ✓			0.8310
10203	0.8406	0.8444	0.8421	0.8410	
10204	0.8407 0.8381 ✓	0.8406 0.8378 ✓			0.83795
10205	0.8528	0.8420 ✓	0.8423 ✓		0.84225
✓ Finpio EMS 2-18-81 10206	0.8364 ✓	0.8362 ✓			0.8363
10207	0.8303 ✓	0.8305 ✓			0.8304
10208	0.8269 ✓	0.8269 ✓			0.8269
10209	0.8317 ✓	0.8315 ✓			0.8316
10210	0.8224 ✓	0.8224 ✓			0.8224
10211	0.8657	0.8656			0.86568

FILTER WEIGHTS

Client: Getty

Project No.: 1427-E31

☐ Put in Oven
☐ Not put in Oven
☑ Pre-weight
☐ Post-weight

Date	1-8-81	1-20-81			
Time	0900	3:30			
Temp.	68°	~~20~~ 72°			
Humidity	17%	20%			
Initials	SMR	SMR			

	Filter Number	Wt. 1(g)	Wt. 2(g)	Wt. 3(g)	Wt. 4(g)	Final Ave. Weight
✓	~~10223~~ Stanley Works	0.8506 ✓	0.8502 ✓		0.8500	0.8501
	10224	0.8403	0.8484 ~~0.8530~~	0.8443	0.8398	
✓	Zimpro ~~10225~~ 2-18-81	0.8479 0.8559 ✓	0.8559 ✓			0.8559
	10226	0.8574	0.8544	0.8594	0.8566	
✓	Zimpro ~~10227~~ 2-18-81	0.8461 ✓	0.8461 ✓			0.8461
✓	10228 Stanley Works	0.8590 ✓	0.8588 ✓	0.8589		0.8589
✓	~~10229~~ Eaton 1/81	0.8598 ✓	0.8599 ✓	0.8598	ck wt	0.85985
✓	~~10230~~ Eaton 8/11/81	0.8575 ✓	0.8575 ✓	0.8576		0.85755
✓	10231 ✓	0.8610 ✓	0.8610 ✓	0.8612		0.8610
	10232	0.8513 ✓	0.8513 ✓			0.8513
	10233	0.8546 ✓	0.8545 ✓			0.85455
	10234	0.8543 ✓	0.8543 ✓			0.8543
	10235	0.8498 ✓	0.8497 ✓			0.84975
	10236	0.8496 ✓	0.8496 ✓			0.8496
	10237	0.8469 ✓	0.8469 ✓			0.8469
	10238	0.8519 ✓	0.8521 ✓			0.8520
	10239	0.8545 ✓	0.8542 ✓			0.85435
	10240	0.8524	0.8678			

TRC — THE RESEARCH CORPORATION

Report of Chemical Analysis

Client: Zimpro

Contract No: 1438-E53-30

Reviewed by: M. Ford

Report to: Ed Astle

Laboratory No: 019-81 (2)

Date Received: 2-12-81

Date Reported: 2-20-81

Source	Test No.	Sample No.	mg Total Particulate	g Moisture	mg Organic	Condensibles mg Inorganic	mg Particulate Acetone Wash	Total ug NO_x as NO_2	SO_2 $(V_t - V_{tb})(N)(V_{soln}/V_a)$	Others
stack	1	Filter 10225	87.5							
		AW1	15.8							
	2	Filter N206	17.2							
		AW2	10.3							
	3	Filter 10827	11.4							
		AW3	4.6							

APPENDIX E

FUEL RATES (TIME, WEIGHT, RATE)

Vernon Innovator 2/11/81

Time	Sludge wt (lbs)	0.1 (gallons)	Wier Soil Water (gpm)	Vernon Scrubber Soil Water (gpm)
0900	219.625	62781	41	125
0930	220.615	62935	39	130
1000	221.515	62958	37	130
1030	223.030	63004	42	130
1100	224.370	63046	42	130
1130	225.610	63028	42	130
1200	226.718	63045	42	130
1230	227.774	63068	42	130
1300 *	229.017	63089	40	130
1330	229.589	63103	39	130
1400	230.750	63132	40	130
1430	231.803	63157	40	130
1500 **	233.030	63175	40	130
1530	233.816	63194	40	126
1600	234.774	63211	40	125
1630	235.119	63226	40	130
1700	Test ended at 1630 due to power fail			

* Took the filter at 1305. Filter back on line at 1335.

** took filter for 10 minutes

Vernon Innovator Test 2/19/81

Time	Sludge wt (lbs)	0.1 (gallons)	Wier Soil Water (gpm)	Vernon Scrubber Soil Water (gpm)
1400	185140	61959	40	125
1430	186515	61976	40	125
1500	187830	61994	40	125
1530	189125	62017	40	125
1600	190310	62040	40	126
1630	190392	62067	40	125
1700	191.090	62095	40	125
1730	192,187	62127	40	129
1800	192680	62141	40	125
1830	193689	62173	42	125
1900	194783	62205	42	125
1930	195791	62234	42	125
2000	196813	62263	42	125
2030	197841	62286	42	125
2100	198855	62311	42	125
2130	199891	62336	42	125
2200	200669	62361	42	125
2230	201507	62378	42	125
2300	202201	62414	42	125

APPENDIX F

INCINERATOR OPERATING DATA

Operator: _____

INCINERATOR CONTROL PANEL, SHEET 1, FOR VERNON, CONN.

Date: 2/10/81

Acceptance Test

Take Readings every ½ hour

Time	Temperature Recorder (TJR-10)								System Controllers										Water		Temperature Indicators				Draft
	Hearth No. 1 TE1	Hearth No. 2 TE2	Hearth No. 3 TE3	Hearth No. 4 TE4	Hearth No. 5 TE5	Hearth No. 6 TE6	Shaft Cooling Air TE7	Scrubber Gas Discharge TE8	Off Gas Oxygen AIC 11	Sludge Comb. Air Fan Damper FIC17	Venturi Scrubber ΔP PDI C18	Incinerator Draft PIC 10	Hearth No. 1 Temp. TIC 11	Hearth No. 2 Temp. TIC 12	Hearth No. 4 Temp. TIC 14	Hearth No. 5 Temp. TIC 15	Impingement Scrubber FI 20A	Venturi Scrubber FI 22A	Hearth No. 1 TI 11	Hearth No. 2 TI 12	Hearth No. 4 TI 14	Hearth No. 5 TI 15	Incinerator Draft Press. PI 10
1400	1340	1360	1420	1430	660	240	350	80	3.5	9	3.0	-.15	1400	1390	1400	700	460	130	1400	1400	1400	725	-.15
1430	1240	1380	1420	1410	700	290	360	90	4.1	9	2.5	-.2	1420	1380	1400	700	460	130	1400	1500	1475	750	-.15
1500	1290	1430	1490	1410	740	310	340	90	2.6	10	2.6	-.15	1400	1380	1420	700	460	130	1500	1400	1400	700	-.1
1530	1400	1470	1400	1430	660	370	300	90	1	10	2.6	-.15	1500	1380	1460	700	460	120	1500	1400	1380	650	-.15
1600	1440	1780	1290	1330	640	260	380	90	—	10	2.6	-.1	1500	1380	1460	700	460	120	1400	1400	1400	650	-.1
1630	1440	1330	1260	1340	560	240	370	90	=	10	2.6	-.1	1500	1380	1460	700	460	120	1500	1500	1450	600	-.05
1700	1430	1340	1260	1360	550	220	380	90	=	10	2.6	-.1	1500	1380	1460	700	460	120	1500	1350	1350	550	-.05
1730	1410	1420	1380	1420	540	220	360	90		10	2.6	-.1	1500	1380	1480	700	460	120	1500	1450	1450	550	-.05
1800	1480	1360	1375	1300	540	210	365	95		10	2.5	-.1	1500	1400	1420	700	460	120	1500	1500	1500	550	-.1
1830	1505	1379	1320	1385	540	210	385	95		10	2.6	-.2	1500	1400	1420	700	460	155	1500	1600	1500	575	-.15
1900	1470	1440	1395	1430	585	220	385	95		10	2.6	-.2	1500	1400	1420	700	460	155	1500	1525	1500	600	-.1
1930	1530	1500	1440	1430	585	230	395	95		10	2.6	-.1	1460	1400	1420	700	460	155	1500	1550	1500	600	-.1
2000	1530	1420	1390	1440	630	230	385	95		10	2.6	-.1	1500	1400	1420	700	460	155	1500	1520	1500	600	-.1
2030	1485	1540	1460	1455	610	220	390	90		10	2.6	-.1	1500	1400	1420	700	460	155	1500	1500	1500	600	-.1
2100	1530	1460	1390	1430	625	230	390	90		10	2.6	-.1	1500	1400	1420	700	460	155	1500	1500	1450	600	-.1
2130	1420	1430	1360	1410	595	222	390	90		10	2.6	-.1	1500	1400	1420	700	460	155	1500	1500	1450	550	-.12
2200	1540	1420	1350	1400	600	220	390	90		10	2.6	-.1	1500	1400	1420	700	465	155	1500	1460	1450	550	-.12
2230	1490	1405	1330	1460	570	210	390	90	11.0	10	2.6	-.1	1500	1400	1420	700	465	155	1500	1400	1400	550	-.12
1300	1230	1350	1260	1350	530	205	380	92	11.6	10	2.6	-.1	1500	1400	1420	700	465	155	1500	1400	1400	550	-.12
20																							
21																							
22																							
23																							
24																							

Burners #1-3-5-6

OIL METER Finish 11214
Start 11160
Total 934

* subtract 30 gpm from reading

Operator: Larry / ~~[illegible]~~ Jim / Gary
John L. Elder

INCINERATOR CONTROL PANEL, SHEET 1, FOR VERNON, CONN.

Date: 2/11/81

Acceptance Test
Record every ½ hour

Time	Temperature Recorder (TJR-10): Hearth No. 1 (TE1)	Hearth No. 2 (TE2)	Hearth No. 3 (TE3)	Hearth No. 4 (TE4)	Hearth No. 5 (TE5)	Hearth No. 6 (TE6)	Shaft Cooling Air (TE7)	Scrubber Gas Discharge (TE8)	System Controllers: Off Gas Oxygen (AIC 11)	Sludge Comb. Air Fan Damper (FIC17)	Venturi Scrubber ΔP (PDI C18)	Incinerator Draft (PIC 10)
900	1440	1440	1480	1420	[illegible]	250	380	90	9	10	25	-.15
930	1450	1420	1380	1410	690	240	390	95	11	10	25	-.05
1000	1400	1400	1400	1420	610	240	380	90	10	10	25	-.1
1030	1420	1400	1410	1430	610	250	360	95	10	10	25	-.05
1100	1500	1320	1520	1440	710	260	370	90	8	10	25	-.02
1130	1440	1440	1510	1440	780	260	380	95	7.5	9	25	-.01
1200	1510	1520	1440	1440	650	270	395	95	12.5	9	25	-.01
1230	1480	1450	1420	1400	630	250	380	96	8	10	25	-.05
1300	1410	1440	1460	1410	640	250	340	100		10	25	-.02
1330	1500	1430	1340	1320	660	220	360	95		9	25	-.1
1400	1410	1350	1350	1340	640	200	350	95		9	20	-.1
1430	1430	1560	1480	1400	620	200	350	95		—	20	-.05
1500	M/C	1490	1470	1400	610	230	310	95		—	18	-.05
1530	1530	1460	1360	1340	540	230	390	95		—	15	-.02
1600	1510	[illegible]	1230	1270	320	210	380	95		9	13	[illegible]
1630	Power WENT OUT				EMERGENCY				SHUTDOWN			
1700												
16												
19												
20												
21												
22												
23												
24												

Time	System Controllers: Hearth No. 1 Temp. (TIC 11)	Hearth No. 2 Temp. (TIC 12)	Hearth No. 4 Temp. (TIC 14)	Hearth No. 5 Temp. (TIC 15)	Water: Impingement Scrubber (FI 20A)	Venturi Scrubber (FI 22A)	Temperature Indicators: Hearth No. 1 (TI 11)	Hearth No. 2 (TI 12)	Hearth No. 4 (TI 14)	Hearth No. 5 (TI 15)	Draft: Incinerator Draft Press. (PI 10)
900	1450	1410	1425	700	470	130	1450	1525	1475	650	-.05
930	1460	1400	1425	700	470	130	1475	1500	1400	600	-.07
1000	1460	1400	1425	700	470	130	1425	1450	1450	600	-.05
1030	1500	1400	1425	700	470	130	1400	1500	1475	600	-.05
1100	1460	1400	1400	700	470	130	1500	1625	1525	725	-.025
1130	1460	1400	1410	700	520	130	1500	1600	1500	775	-.01
1200	1460	1400	1400	700	500	130	1475	1500	1375	700	-.05
1230	1450	1400	1410	700	510	130	1325	1550	1450	625	-.05
1300	1460	1400	1400	700	440	130	1425	1575	1450	675	-.05
1330	1500	1400	1400	700	440	130	1550	1450	1375	650	-.05
1400	1500	1400	1400	700	400	130	1500	1475	1375	650	-.02
1430	1500	1400	1400	700	420	130	1500	1550	1450	650	-.02
1500	1500	1400	1400	700	420	130	1525	1550	1450	650	-.07
1530	1500	1400	1400	700	420	130	1600	1650	1375	550	-.02
1600	1500	1400	1400	600	420	150	1500	1400	1300	500	-.1
1630											
1700											
16											
19											
20											
21											
22											
23											
24											

OIL METER
Finish ______
Start 62452 ______
Total ______

1400 Lit #2   1430 off #2   Center shaft 12
1430 off #3

1600 1-5-6 Burners
1615 1 3 5 6 "   Center shaft 10

APPENDIX G

EMISSION CALCULATIONS

INCINERATOR TEST DATA

TEST 1 TIME 1409-1631
LOCATION STACK BREECHING DATE 2-10-81
FIRM ZIMPRO PROJECT NO. 1438-553

Input A		
P bar	Barometric Pressure - in. Hg	30.55
As	Stack Area - Ft^2	2.76
Dn	Nozzle Diameter - in.	0.259
Time	Total Sampling Time - min.	128
Y	Calibration Factor	1.00
Cp	Pitot Coefficient	0.84
$(\Delta P)^{1/2}$	Average Square Root of Vel. Head $\sqrt{in.\ H_2O}$	.712
ΔH	Average Orifice Pressure Drop	1.99
Tm	Average Meter Temperature - °F	40.76
P stk	Average Stack Pressure - in H_2O	-.87
T stk	Average Stack Temperature - °F	134
Vm	Meter Volume at Meter Conditions - Ft^3	94.92
Vl	Total Water Vapor Collected	57.73
CO_2	% CO_2 in Stack Gas (Dry)	5.6
O_2	% O_2 in Stack Gas (Dry)	14.2
CO	% CO in Stack Gas (Dry)	0
Input B		
Mn	Total Particulate Catch	43.3
Input C		
% H	% Hydrogen in Fuel	
% C	% Carbon in Fuel	
% S	% Sulfur in Fuel	
% N	% Nitrogen in Fuel	
% O	% Oxygen in Fuel	
GCV	Gross Califoric Volume - lb/BTU	
Calculated		
Vm (std)	Meter Volume at Standard Conditions (Dry) - Ft^3	102.70
% H_2O	% Moisture in Stack Gas	2.57
Mw	Molecular weight of Stack Gas (wet)	29.17
Dst	Average Duct Gas Density - lb/Ft^3	0.06866
EA	Percent Excess Air	203.65
Vs	Average Velocity of Stack - Ft.min	2505
Q	Actual Stack Gas Flow Rate - ACFM	6910
Qs	Stack Gas Flowrate Corrected to dry stan. cond.-DSCFM	6115
% I	% Isokinetic (Avg. Nozzle Vel/Avg. Stack Vel.)	99.1
Cs	Particulate Concentration - Gr/DSCF	0.00651
C	Actual Particulate Concentration - Gr/ACF	0.00575
ER	Particulate Emission Rate - lb/hr	0.341
Cs@12%CO_2	Particulate Concentration-Gr/DSCF @12% CO_2	0.0139
Cs@50%EA	Particulate Concentration-Gr/DSCF @ 50% EA	0.0260
Clb	Particulate Concentration-lbs/1000-lbs duct gas uncorrected	0.0132
Clb@12%CO_2	Particulate Concentration-lbs/1000-lbs dry corrected to 12% CO_2	0.0246
Clb@50%EA	Particulate Concentration-lbs/1000-lbs dry corrected to 50% EA	0.01196
F	F-Factor - DSCF/MM BTU	

INCINERATOR TEST DATA

TEST: 2 TIME: 10:04 to 12:25

LOCATION: Stack Breeching DATE: 2-11-81

FIRM: Zimpro PROJECT NO. 1438-E53

Input A		
P bar	Barometric Pressure - in. Hg	29.94
As	Stack Area - Ft^2	2.26
Dn	Nozzle Diameter - in.	0.2591
Time	Total Sampling Time - min.	128
Y	Calibration Factor	1.00
Cp	Pitot Coefficient	0.84
$(\Delta P)^{1/2}$	Average Square Root of Vel. Head $\sqrt{\text{in. } H_2O}$	0.586
ΔH	Average Orifice Pressure Drop	1.39
Tm	Average Meter Temperature - °F	57
P stk	Average Stack Pressure - in H_2O	-0.12
T stk	Average Stack Temperature - °F	136
Vm	Meter Volume at Meter Conditions - Ft^3	82.07
Vl	Total Water Vapor Collected	68.27
CO_2	% CO_2 in Stack Gas (Dry)	6.6
O_2	% O_2 in Stack Gas (Dry)	12.2
CO	% CO in Stack Gas (Dry)	0
Input B		
Mn	Total Particulate Catch	27.5
Input C		
% H	% Hydrogen in Fuel	
% C	% Carbon in Fuel	
% S	% Sulfur in Fuel	
% N	% Nitrogen in Fuel	
% O	% Oxygen in Fuel	
GCV	Gross Califoric Volume - lb/BTU	
Calculated		
Vm (std)	Meter Volume at Standard Conditions (Dry) - Ft^3	84.17
% H_2O	% Moisture in Stack Gas	3.68
Mw	Molecular weight of Stack Gas (wet)	29.12
Dst	Average Duct Gas Density - lb/Ft^3	0.068
EA	Percent Excess Air	132.0
Vs	Average Velocity of Stack - Ft.min	2088
Q	Actual Stack Gas Flow Rate - ACFM	5763
Qs	Stack Gas Flowrate Corrected to dry stan. cond. - DSCFM	4919
% I	% Isokinetic (Avg. Nozzle Vel/Avg. Stack Vel.)	100.8
Cs	Particulate Concentration - Gr/DSCF	0.00504
C	Actual Particulate Concentration - Gr/ACF	0.00430
ER	Particulate Emission Rate - lb/hr	0.213
Cs@12%CO_2	Particulate Concentration-Gr/DSCF @12% CO_2	0.00917
Cs@50%EA	Particulate Concentration-Gr/DSCF @ 50% EA	0.0170
Clb	Particulate Concentration-lbs/1000-lbs duct gas uncorrected	0.00780
Clb@12%CO_2	Particulate Concentration-lbs/1000-lbs dry corrected to 12% CO_2	0.0145
Clb@50%EA	Particulate Concentration-lbs/1000-lbs dry corrected to 50% EA	0.00918
F	F-Factor - DSCF/MM BTU	

INCINERATOR TEST DATA

TEST 3 TIME 1413 to 1637

LOCATION STACK BREECHING DATE 2-11-81

FIRM ZIMPRO PROJECT NO. 1438-153

Input A		
P bar	Barometric Pressure - in. Hg	29.78
As	Stack Area - Ft^2	2.76
Dn	Nozzle Diameter - in.	~~13.5~~ .2591
Time	Total Sampling Time - min.	113.5
Y	Calibration Factor	1.00
Cp	Pitot Coefficient	0.84
$(\Delta P)^{1/2}$	Average Square Root of Vel. Head $\sqrt{in.\ H_2O}$	0.518
ΔH	Average Orifice Pressure Drop	1.10
Tm	Average Meter Temperature - °F	60
P stk	Average Stack Pressure - in H_2O	-0.145
T stk	Average Stack Temperature - °F	143
Vm	Meter Volume at Meter Conditions - Ft^3	68.11
Vl	Total Water Vapor Collected	55.88
CO_2	% CO_2 in Stack Gas (Dry)	6.5
O_2	% O_2 in Stack Gas (Dry)	12.8
CO	% CO in Stack Gas (Dry)	0
Input B		
Mn	Total Particulate Catch	16
Input C		
% H	% Hydrogen in Fuel	
% C	% Carbon in Fuel	
% S	% Sulfur in Fuel	
% N	% Nitrogen in Fuel	
% O	% Oxygen in Fuel	
GCV	Gross Califoric Volume - lb/BTU	
Calculated		
Vm (std)	Meter Volume at Standard Conditions (Dry) - Ft^3	69.03
% H_2O	% Moisture in Stack Gas	3.67
Mw	Molecular weight of Stack Gas (wet)	29.13
Dst	Average Duct Gas Density - lb/Ft^3	0.066
EA	Percent Excess Air	150.5
Vs	Average Velocity of Stack - Ft.min	1861
Q	Actual Stack Gas Flow Rate - ACFM	5137
Qs	Stack Gas Flowrate Corrected to dry stan. cond. - DSCFM	4310
% I	% Isokinetic (Avg. Nozzle Vel/Avg. Stack Vel.)	106.4
Cs	Particulate Concentration - Gr/DSCF	0.00358
C	Actual Particulate Concentration - Gr/ACF	0.00300
ER	Particulate Emission Rate - lb/hr	0.132
Cs@12%CO_2	Particulate Concentration-Gr/DSCF @12% CO_2	0.00660
Cs@50%EA	Particulate Concentration-Gr/DSCF @ 50% EA	0.0123
Clb	Particulate Concentration-lbs/1000-lbs duct gas uncorrected	0.00597
Clb@12%CO_2	Particulate Concentration-lbs/1000-lbs dry corrected to 12% CO_2	0.0111
Clb@50%EA	Particulate Concentration-lbs/1000-lbs dry corrected to 50% EA	0.00651
F	F-Factor - DSCF/MM BTU	

APPENDIX H

WEIGHT BELT CALIBRATION

TEST REPORT

USER Jerome Wastewater plant (Titan Northeast) MODEL DS-1-460 SERIAL # 15610

Rate Display: ☐ % Or ☒ Engl Units

Integrator Registration: Tons Mult. Reading By: .001

Set Point ☐ % Or ☐ Eng. Units

Test Wght or Chain Equiv. Electronic Calibration

Measured Belt Length 141.75 ft

100% Capacity 15 TPH

Measured Time 1 Revolution of Belt 1.37 min

100% Speed 120 FPM

Measured Conveyor Belt Speed 103.467 FPM

Design Load 4.17 PPF

Set Speed To 100% For 1 Belt Rev.

Calibration Time 92 Sec.

Counts/Ft. 500 Analog Rate Output 4.20

Pre-Amp Input 2.813 MV

LC Excitation 10.152 V LC Tare Output 0 MV

DSP 6 BRM Number 08818 Gear Ratio 1-1

Electronic Calib. Output 2.8 MV (As Found) 2.8 MV (After Adjustment)

A. Lbs	Tons	Long Tons	Metric Tons	Kilograms
F. 1.00	2000	2240	2205	2.205

COMPUTATION I (Test Chain or Wt. must be in position)

70215 Belt Meas. Test Results ÷ 500 Counts/Ft. = 140.43 Ft. of Belt

COMPUTATION II (Number of Totalized Lbs. for Calibration)

140.43 Ft. of Belt × 4.17 Test Chain Equivalent = 585.5931 Total Lbs.

COMPUTATION IIA

585.5931 Total Lbs. ÷ .001 (F) ÷ 2000 Integrator Registration = 292.797 Counts

COMPUTATION III (Theoretical Wt. Display with Load)

4.17 PPF Test Chain Equivalent ÷ 4.17 PPF Design Load × 100 = 100% % Test Load

Parts Used From Merrick Stock:

TEST CHAIN OR WEIGHT CALIBRATION

	As Found	Test 1	Test 2	Test 3
Tare	542	3	26	3
Calib. Counts	291	293	293	293
Rate Display	12.5	12.9	12.3	12.7
WL Display	100	99.5	99.7	101.0
Speed Display	86.1	85.8	85.7	86.0
% Error	.6149%	.0699%	.0699%	.0699%
Adjusted		½ T CCW		

MATERIAL TEST

	Test 1	Test 2	Test 3
Material Wght.			
Integrator Total			
% Error			
Adjusted			

Reported By Richard Hallwell Date 12/29/80

MERRICK SCALE MFG. COMPANY

GENERAL REPORT

JC D. PATTERSON

USER Vernon Wastewater Treatment Plant Weighing Machine Type and Serial No. 05-1-460- 15612

Location Vernon CT Purchase Order No. VTP-126-2

Date Arrived 12/29/80 Date Departed 12/29/80 Hrs.

Persons Interviewed	Title
Mr R Marquam	Superintendent
Mr J Booth	Worker

REPORT

Make note of any features of Conveyor design, drive, take-up, structure, uniformity of weight of empty conveyor, condition of same, material adhering to belt or puileys, water or foreign substance, general conditions around conveyor, loading, weighing or feed location or others unmentioned that would be detrimental to accurate weighing.

12/29/80 Unit 05-15618. Inspected the scale head & weigh bridge. The customer swapped the cards & power supply from unit 05-1-460-16147 to 05-1-460-15612. Measured & timed the belt. Aligned the weighbridge idlers Ran a tare test & adjusted the fine tare pot. Ran span tests & adjusted the P1 pot. See test report for results.

Mr. A. Ward,

The unit is accurate within the accuracy shown on the attached calibration report using the electronic calibration method.

Date 12/30/80 Reported By Richard Elliott