MAY 10 1996 (21) Sta. 21

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 615722

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
	WHC Environmental Services	n/a
5. Proj./Prog./Dept./Div.:	6. Cog. Engr.:	7. Purchase Order No.:
ETF/2025E/ETF/PSO	J. S. Hill	n/a
8. Originator Remarks:		9. Equip./Component No.:
This document provides the approved VOC test plan for the ETF and the results of the test.		n/a
		10. System/Bldg./Facility:
		2025E/ETF
11. Receiver Remarks:		12. Major Assm. Dwg. No.:
		n/a
		13. Permit/Permit Application No.:
		n/a
		14. Required Response Date:
		n/a

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	WHC-SD-LEF-TRP-001		0	242-A Evaporator/Plutonium Uranium Extraction (PUREX) Effluent Treatment Facility (ETF) Nonradioactive Air Emissions Test Report	n/a	3	n/a	

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval 4. Review 2. Release 5. Post-Review 3. Information 6. Dist. (Receipt Acknow. Required)	1. Approved 4. Reviewed no/comment 2. Approved w/comment 5. Reviewed w/comment 3. Disapproved w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.
1	1	Cog.Eng. J.S. Hill		4/25/96	H6-25	Document Processing Center			A3-94	3	n/a
1	1	Cog.Mgr. E.M. Greager	E.M. Greager	4/26/96	H6-20	Central Files			A3-88	3	n/a
		QA									
		Safety									
		Env.									
1	1	ETF: D.L. Flyckt		4/26/96	S6-71						

18.	19.	20.	21. DOE APPROVAL (if required)
Signature of EDT Originator — Date: 5/3/96	Authorized Representative for Receiving Organization — Date	See block 17 above for E.M. GREAGER signature — Cognizant Manager — Date	Ctrl. No. [] Approved [] Approved w/comments [] Disapproved w/comments

BD-7400-172-2 (04/94) GEF097

BD-7400-172-1

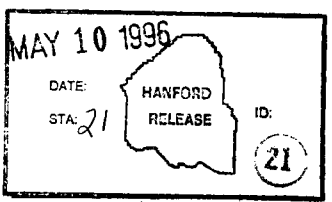
242-A Evaporator/Plutonium Uranium Extraction (PUREX) Effluent Treatment Facility (ETF) Nonradioactive Air Emissions Test Report

J. S. Hill
Westinghouse Hanford Company, Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-87RL10930

EDT/ECN: 615722 UC: 630
Org Code: 01870 Charge Code: A2100
B&R Code: EW3130020 Total Pages: 72

Key Words: Volatile Organic Compound, Total Non-Methane Hydrocarbons, Emission Rate, Dimensional Analysis Rate.

Abstract: This report shows the methods used to test the stack gas outlet concentration and emission rate of Volatile Organic Compounds as Total Non-Methane Hydrocarbons in parts per million by volume, grams per dry standard cubic meter, and grams per minute from the PUREX ETF stream number G6 on the Hanford Site. Test results are shown in Appendix B.1



U. L. Burkland 5/8/96
Release Approval Date

Release Stamp

Approved for Public Release

CONTENTS

TABLES

LIST OF TERMS

CEM	continuous effluent monitor
DAS	data acquisition system
DSCF/M	dry standard cubic feet per minute
Ecology	Washington State Department of Ecology
EPA	Environmental Protection Agency
ETF	Effluent Treatment Facility
FID	Flame Ionization Detection
gm/dscm	grams per dry standard cubic meter
gm/m	grams per minute
ppm_v	parts per million by volume
PUREX	Plutonium Uranium Extraction Facility
TNMHC	total non-methane hydrocarbons
VOC	Volatile Organic Compounds
VRI	VALID RESULTS, INC.
WHC	Westinghouse Hanford Company

242-A EVAPORATOR/PLUTONIUM URANIUM EXTRACTION (PUREX) EFFLUENT TREATMENT FACILITY (ETF) NONRADIOACTIVE AIR EMISSIONS TEST REPORT

1.0 PURPOSE

The purpose of this test is to quantify the stack gas outlet concentration and emission rate of Volatile Organic Compounds (VOC) as Total Non-Methane Hydrocarbons (TNMHC) in parts per million by volume (ppm_v), grams per dry standard cubic meter (gm/dscm) and grams per minute (gm/m) from the PUREX ETF stream number G6 located on the Hanford Site near Richland, Washington.

2.0 PROCEDURE

VALID RESULTS, INC., will perform the following Environmental Protection Agency (EPA) Title 40 Code of Federal Regulations Part 60 (40CFR60) Chapter I, Appendix A Test Methods. Test Methods 1, 2C, 3 and 4 will be performed to determine the stack gas volumetric flow rate in dry standard cubic feet per minute (DSCF/M) as required to calculate a representative emission rate. Test Method 25A will be performed to determine the concentration in parts per million by volume (ppm_v) of gaseous Total Non-Methane Hydrocarbons (TNMHC) by Flame Ionization Detection (FID).

2.1 EPA Test Procedures

The EPA Test Procedures are as follows:

Test Method	Test Parameter	Individual Test Description
• EPA 1	Sample Point Locations	Up & Down stream distances from flow disturbances
• EPA 2C*	Volumetric Flow Rate	Standard Pitot Tube & Type-K Thermocouple (Small Ducts)
• EPA 3	Molecular Weight	3 integrated bag samples, FYRITE Analysis O_2, CO_2
• EPA 4	Moisture Content	3 one-half-hour test runs, H_2O impinger weight gain
• EPA 25A	TNMHC	3 one-hour continuous effluent monitor (CEM) tests, FID

The process vent to be monitored (PUREX ETF stream number G6) contains a single 7.6-cm (3-inch) sample port. EPA test methodology requires two sample ports located 90 degrees from each other to determine volumetric flow rate, which is necessary to calculate an emission rate for this facility. However, the process vent to be tested does contain a calibrated Rosemount "Critical Orifice" Flow Meter (Identification Number FIT 45D 005), which is monitored directly in the process control room. Westinghouse Hanford Company (WHC) requests permission from the Washington State Department of Ecology (Ecology) to accept measurements from this calibrated flow meter for determination of emission rate. A single traverse Method 2C will be performed to verify the "critical orifice" flow rate measurements. The technical difficulties that would be encountered to retrofit the effluent stream with a second test port are prohibitive.

2.2 Source Test Methods

METHOD 1: *Selection of Traverse Points*

EPA Method 1 is used to determine the location of sample points for a velocity traverse. The number of sample points used and their specific locations are determined by the number of equivalent inside stack diameters that the sample port is located from the nearest upstream and downstream flow disturbances.

METHOD 2C: *Stack Gas Velocity and Volumetric Flow Rate (Small Diameter Ducts)*

EPA Method 2C is used to determine the stack gas velocity and volumetric flow rate of the effluent gas stream in small diameter ducts. Pressure and temperature readings are taken at the sample points determined by Method 1. Pressure readings are measured using a "Standard-type" Pitot tube and an inclined manometer connected to the Pitot tube through quarter-inch tubing. Pitot tube leak checks are performed before and after every test run. The stack gas temperature is measured using a calibrated (+/- 1 degree Fahrenheit) type-K thermocouple attached to the Pitot to provide the sampling point temperature simultaneously with the velocity measurement.

During the velocity traverse, a stack static pressure is taken by turning the pitot perpendicular to the gas flow (zero delta P) and removing the appropriate side of the pitot from the manometer (+ or -).

The other data necessary for the calculation of the volumetric flow rate are the barometric pressure, moisture content of the effluent, and the stack gas composition (O_2 and CO_2).

METHOD 3: *Molecular Weight Determination*

EPA Method 3 (grab sample - FYRITE analysis) is used to determine the percentage by volume of oxygen (O_2) and carbon dioxide (CO_2) in the effluent stream. These concentrations are used to determine the dry and wet stack gas molecular weights utilized in the volumetric flow rate calculation.

METHOD 4: *Stack Gas Moisture Content Determination*

EPA Method 4 is used to determine the moisture content of the stack gas. A condenser assembly comprised of four glass impingers set in an ice bath is used to extract and collect the moisture from the effluent gas sample. The first two impingers contain 100 ml of deionized water. The third impinger is tare weighed and left empty to collect any potential condensate carryover, and the fourth impinger contains a pre-weighed amount of silica gel to act as the "absolute" collector of residual condensate.

A known volume of effluent gas, as measured by a calibrated metering system connected to the extraction pump, is passed through a stainless steel sample probe and 3/8-inch Teflon[1] tubing to the condenser assembly for a specific period of time. After the extraction is complete, the amount of liquid (condensate) in the impingers is measured gravimetrically and the net gain determined. The total condensate gain of the condenser assembly is determined and recorded with the calculated volume of gas that is directed through the system. The subsequent moisture content of the stack gas is then determined from these collected variables.

[1]Teflon in a trademark of E.I. duPont de Nemours & Company, Wilmington, Delaware.

METHOD 25A: *Total Non-Methane Hydrocarbon Determination*

EPA Method 25A is used to determine TNMHC emissions by flame ionization. For each test run conducted, the end of a stainless steel sample probe is located at the point of average stack flow and pollutant concentration. A stratification check is performed to verify the presence of uniform pollutant concentrations.

The sample is drawn through a probe with a glass or quartz wool filter into a heated Teflon sample line and through a Teflon head diaphragm pump with a heated recirculation bypass assembly. The hydrocarbon analyzer has an internal sample pump that draws from the heated recirculation bypass at a constant pressure and flow rate. The analyzer output voltage is recorded by a data acquisition system and a backup strip chart, which are operated continuously during the test.

The TNMHC is fueled with a compressed gas mixture of hydrogen and helium to minimize the effects of "oxygen synergism" at low levels of detection. Compressed ultrapure zero air (low hydrocarbons) is utilized as combustion air.

External calibrations are performed by saturating the sampling system from the back of the sample probe (without pressurization) before and after each test run with three separate concentrations of EPA Protocol 1 calibration gas and a zero gas. The hydrocarbon analyzer is calibrated using a "zero gas" consisting of "oxygen-free" nitrogen. Propane/nitrogen (C_3H_8 /N_2) blends are used to provide span concentrations in the approximate ranges of 25 to 35%, 45 to 55%, and 80 to 90% of the analyzer's full scale range. All zero and span checks are annotated on the strip chart recording.

3.0 APPARATUS

VALID RESULTS, INC., utilizes test equipment designed to meet EPA source test and quality assurance specifications.

3.1 Gaseous Analyzers

The gaseous analyzers are as follows:

Parameter	*Method*	*Analyzer*	*Technology*
VOC	25A	TECO 51-HT	Flame Ionization

4.0 DATA

Copies of all field data sheets, strip chart recordings, quality assurance checklists and source operating conditions data sheets (recorded by the client) will be included in the final test report (Appendix B).

5.0 CALCULATIONS

All calculations associated with this project will be performed in accordance with the applicable EPA testing and analysis methodology. A dimensional analysis summary of all equations used will be included in the final test report (Appendix B). All emission rate values will be reported with three significant figures as listed on the statement of work dated August 14, 1995. The list of equations and dimensions are included in Tables 1 to 3 of this report.

6.0 RESULTS

Test results will be presented in concentration units of parts per million by volume ($ppm_{/v}$) and grams per dry standard cubic meter (gm/dscm) and mass emission rate units of grams per minute (gm/m).

Draft calibration and bias corrected M25A test results will be provided onsite. A comprehensive "draft" copy of the test report will be provided for review and comment by WHC within 21 days of testing. Upon approval, five (5) edited, revised, and corrected "final" copies of the test report will be submitted to WHC. The total time required for test report submittal shall be less than forty-five (45) days.

7.0 QUALITY ASSURANCE

VALID RESULTS, Inc., has developed procedural outline checklists (equipment preparation, field sampling, sample chain of custody, equipment calibration and manual emission rate calculation sheets) for each test method designed to document adherence to the applicable test protocols in accordance with the quality assurance guidelines outlined in document EPA-600/4-77-027b *Quality Assurance Handbook for Air Pollution Measurement Systems*, Volume 3. Mr. Prevo of VALID RESULTS, INC., completed the EPA Air Pollution Training Institute Course #SI:414, *Quality Assurance for Source Emission Measurements* (EPA 1993) in March 1993.

CEM analyzers will be calibrated externally before and after every test run by introducing EPA Protocol One calibration gas standards to the front of the sample probe while maintaining a constant sample rate and recording each analyzer's response on a data acquisition system (DAS), strip chart recorder and field data sheet.

CEM analyzer output voltages are in alignment with and correspond to the DAS and the strip chart recorder settings.

A manual calculation verifying each step of the emission rate calculation for one test run of each of the test methods will be provided in the final test report (Appendix B).

8.0 SOURCE OPERATIONS

Facility personnel will be responsible for recording source operating conditions throughout the source test and for providing a source operating conditions report to be included in the final test report.

9.0 TEST REPORT AND PLAN APPROVAL

A letter of approval from Ecology (Ecology 1995), stating that the proposed plan is acceptable, is in Appendix A. The *Air Emissions Compliance Test Report* (VRI 1996) that was prepared by VALID RESULTS, INC., is in Appendix B.

10.0 REFERENCES

40 CFR 60, "Standards of Performance for New Stationary Sources," Code of Federal Regulations, as amended.

Ecology, 1995, "Approval for the Plan Required Under Condition 2 of NOC-93-3," Letter to H.M. Rodriguez of DOE-RL from R.C.H. King of Ecology, Letter #9600225, November 1, 1995, Washington State Department of Ecology, Olympia, Washington.

EPA, 1993, *Quality Assurance for Source Emission Measurements*, Air Pollution Training Institute Course #SI:414, Environmental Protection Agency, Washington, DC.

EPA, 1987, *Quality Assurance Handbook for Air Pollution Measurement Systems*, Volume 3, EPA-600/4-77-027b, Office of Research and Development, Environmental Monitoring and Support, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina.

VRI, 1996, *Air Emissions Compliance Test Report, Continuous Total Organic Carbon (TOC) Emission Monitoring*, January 23, 1996, VALID RESULTS, INC., Seattle, Washington.

Table 1. Equations

Equation:	Dimension:
Dry Gas Molecular Weight Md = 0.44*(%CO2)+0.32*(%O2)+0.28(100-((%CO2)+(%O2)))	*gm/gm-mole*
Stack gas Moisture Content Bws = (Vwc + Vwsg)/(Vwc + Vwsg + Vmstd)	*decimal fraction*
Impinger Volume Gain Vwc = 0.04707*(Final Volume - Initial Volume)	*milliliters*
Silica Gel Weight Gain Vwsg = 0.04715*(Final Weight - Initial Weight)	*grams*
Method 4 Corrected Sample Volume Vm(std) = (Vm*Y*((Tstd+460)/(Tm+460))*(Pm/Pstd)	*dscf*
Wet Gas Molecular Weight Ms = Md*(1-Bws) + 18.0*Bws	*gm/gm-mole*
Stack Gas Velocity Vs = 85.49*Cp*SQRT(DeltaP)*SQRT((Ts+460)/((Pbar+(Pstatic/13.6))*Ms))	*feet/second*
Corrected Stack Gas Volumetric Flow Rate Qs(corr) = 60*(1-Bws)*((Tstd+460)/(Ts+460))*((Pbar+(Pstatic/13.6))/Pstd)	*dscf/m*
Stack Area As = ((1/4)*(3.1416)*(Inside Stack Diameter)^2)/144	*square feet*
Actual Stack Gas Volumetric Flow Rate Qs(actual) = 60*Vs*As	*acf/m*
Gaseous Concentration XX mg/dscm = (XX *ppm*)*((MW$_{pollutant}$ *g/g-mole*)*(41500))/(1,000,000 *ng/mg*)	*mg/dscm*
Gaseous Concentration XX gm/dscm = (XX *mg/dscm*)/(1000 *mg/gm*)	*gm/dscm*
Gaseous Emission Rate XX grains/dscf = (XX *mg/dscm*)*(0.0154 *grains/mg*)/(35.32 *cubic feet/cubic meter*)	*gr/dscf*
Gaseous Emission Rate XX lb/hr = ((XX *gr/dscf*)*(Qs(std) *dscf/m*)*(60 *min/hr*)/(7000 *grains/lb*))	*lb/hr*
Gaseous Emission Rate XX gm/m = ((XX *lb/hr*)*(7000 *grains/lb*)/((15.4 *grains/gm*)*(60 *min/hr*)))	*gm/m*
Gaseous Emission Rate XX tons/year = ((XX *lb/hr*)*(24 *hr/day*)*(365 *days/year*)/(2000 *lb/ton*))	*tons/year*
Bias Calibration Correction ppm$_{ac}$ = (ppm$_{/v}$ - Co)*Cma/(Cm-Co)	*ppm*

Table 2. Symbols

Symbol:	Name:	Dimension:
%CO2	stack gas carbon dioxide content	*percent*
%O2	stack gas oxygen content	*percent*
Vwc	impinger water volume gain	*milliliters*
Vwsg	silica gel weight gain	*milligrams*
Vm(std)	Method 4 corrected dry gas meter volume	*cubic feet*
Y	dry gas meter correction coefficient	*dimensionless*
Bws	stack gas moisture content	*decimal fraction*
Cp	pitot tube coefficient	*dimensionless*
SQRT(Delta P)	the average square root of the pitot tube pressure drop	*inches water*
Ts	stack gas temperature	*degrees Fahrenheit*
Pbar	barometric pressure	*inches Mercury*
Pstatic	stack static pressure	*inches water*
Tstd	standard temperature (68)	*degrees Fahrenheit*
Pstd	standard pressure (29.92)	*inches Mercury*
Vm	Method 4 dry gas meter volume	*cubic feet*
Tm	measured meter temperature	*degrees Fahrenheit*
π	ratio of circle circumference to diameter	*dimensionless*
Vs	stack gas velocity	*feet per second*
Qs(std)	standard flow rate	*dscf/m*
Qs(act)	actual flow rate	*acf/m*
MW(pollutant)	molecular weight of pollutant	*g/g-mole*
C	average reference method value	*% or ppm*
Co	average measured bias calibration zero value	*% or ppm*
Cm	average measured bias calibration value	*% or ppm*
Cma	actual bias calibration gas value	*% or ppm*

Table 3. Nomenclature

Nomenclature:	Description:
gm/gm-mole	*gram per gram-mole*
dscf/m	*dry standard cubic feet per minute*
acf/m	*actual cubic feet per minute*
dscm	*dry standard cubic meter*
dscf	*dry standard cubic feet*
gm	*grams*
mg	*milligram*
ml	*milliliter*
ppm_{v}	*parts per million by volume*
gm/dscm	*grams per dry standard cubic meter*
mg/dscm	*milligrams per dry standard cubic meter*
gr/dscf	*grains per dry standard cubic foot*
lb/dscf	*pounds per dry standard cubic foot*
gm/m	*grams per minute*
lb/hr	*pounds per hour*
$\%_{v}$	*percent by volume*
ft/s	*feet per second*

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APPENDIX A
APPROVAL LETTER FROM WASHINGTON STATE DEPARTMENT OF ECOLOGY

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Incoming:9600225

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
P.O. Box 47600 • Olympia, Washington 98504-7600
(360) 407-6000 • TDD Only (Hearing Impaired) (360) 407-6006

November 1, 1995

Mr. Hector M. Rodriguez
Environmental Assurance, Permits,
and Policy Division
Department of Energy
P.O. Box 550
Richland, Washington 99352

Dear Mr. Rodriguez:

RE: Approval for the Plan Required Under Condition 2 of NOC-93-3

A letter dated October 16, 1995, from Mr. James Rasmussen to Mr. Joseph S. Stohr regarding the 200 Area Effluent Treatment Facility's NOC Permit Condition 2 has been received and reviewed. After reviewing, Ecology believes that the proposed plan is acceptable, therefore, the plan is approved for use.

Mr. Oliver Wang might be interested in attending the testing activities. If he is, he should call Mr. Stan Hill directly. If you have any questions, please call me at (360) 407-7147.

Sincerely,

Robert C. H. King, P.E.
Chemical Engineer
Nuclear Waste Program

RHCK:djb

CORRESPONDENCE DISTRIBUTION COVERSHEET

Author	Addressee	Correspondence No.
R. C. H. King, Ecology (J. S. Hill, WHC)	H. M. Rodriguez, RL	Incoming:9600225 Xref:9555361D

Subject: APPROVAL FOR THE PLAN REQUIRED UNDER CONDITION 2 OF NOC-93-2

INTERNAL DISTRIBUTION

Approval	Date	Name	Location	w/att
		Correspondence Control	A3-01	
		N. A. Ballantyne	S6-71	
		B. L. Curn	H6-25	
		L. P. Diediker	S3-95	
		A. J. DiLiberto	H6-10	
		W. T. Dixon, Sr. Staff	H6-21	
		D. L. Flyckt	S6-71	
		J. S. Hill	H6-25	
		J. J. Luke, Assignee	H6-25	
		P. J. Martell	S3-95	
		M. W. Peres	S6-71	
		B. D. Williamson	B3-15	
		JSH File/LB	H6-25	

APPENDIX B
AIR EMISSIONS COMPLIANCE TEST REPORT

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Air Emissions Compliance Test Report

Continuous Total Organic Carbon (TOC) Emission Monitoring

1/23/96

Westinghouse Hanford Company
P. O. Box 1970, H6-25
Richland, WA 99352
(509) 372-1617

Prepared By:

VALID RESULTS, INC.
5223 22nd Ave. N.E., Suite B
Seattle, WA 98105-5746
Tel (206) 522-5665
Fax (206) 524-4710

Air Emission Compliance Test Report

Continuous Total Organic Carbon Emission Monitoring

Westinghouse Hanford Company
P. O. Box 1970, H6-25
Richland, WA 99352
(509) 372-1617

SOURCE:

Main outlet stack of the 242-A PUREX Effluent Treatment Facility located in Richland, Washington.

TEST PARAMETERS:

Stack Gas Volumetric Flow Rate and Volatile Organic Compounds as Total Organic Carbon (TOC).

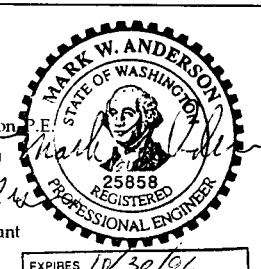
TEST PURPOSE: Compliance Air Emissions Testing.

TEST DATE: January 23, 1996

TEST RESULTS:

EPA Test Method	Test Parameter	Applicable Limit	Test Result <Average>	Test Result (Dimension)
25A	TOC	0.55	**<0.012>**	(grams/dscm)
25A	TOC	0.50	**<0.35>**	(grams/minute)

CERTIFICATION:



Mr. Mark W. Anderson, P.E.
Independent Consultant
AERCO, INC., P.S.

Mr. Tracy A. Prevo
Project Manager
VALID RESULTS, INC.

We certify that the information contained within is accurate and complete to the best of our knowledge.

TABLE OF CONTENTS

PURPOSE:

On January 23rd, 1996, Valid Results, Incorporated performed Environmental Protection Agency (EPA) air emissions tests to quantify the concentration and emission rate of Volatile Organic Compounds (VOCs) (measured as Total Organic Carbon (TOC) and Methane (CH_4)) and the opacity (visible emissions) from effluent stream number G6 located at the 242-A Evaporator /Plutonium Uranium Extraction (PUREX) Effluent Treatment Facility (ETF) in Richland, Washington.

PROCEDURE:

Valid Results, Inc. performed EPA Title 40 Code of Federal Regulations Part 60 (40CFR60) Chapter I Appendix A Test Methods 1, 2C, 3, 4, 9 and 25A. Test Methods 1, 2C, 3 and 4 were performed to determine the stack gas volumetric flow rate in dry standard cubic meters per minute (dscm/m) as required to calculate a representative Volatile Organic Compounds (VOCs) emission rate. Test Method 9 was performed to determine the visible emissions from the source in terms of opacity. Test Method 25A was performed to determine the parts per million by volume (ppm_v) concentration of VOCs as Total Organic Carbon (TOC) and Methane (CH_4) by Flame Ionization Detection (FID). The concentration of Total Non-Methane Hydrocarbons (TNMHC) (VOC equivalent) was determined by subtracting the Methane (CH_4) fraction from the Total Organic Carbon (TOC) concentration measured by Method 25A.

Test Method	Test Parameter	Individual Test Description
• EPA 1	Sample Point Locations	Up & Down stream distances from flow disturbance (One Traverse)
• EPA 2C*	Volumetric Flow Rate	Standard Pitot Tube & Type-K Thermocouple (Small Ducts)
• EPA 3	Molecular Weight	3 integrated bag samples, ORSAT Analysis O_2, CO_2
• EPA 4	Moisture Content	3 three-quarter-hour test runs, H_2O impinger weight gain
• EPA 9	Opacity	24 consecutive 15-second visible emissions readings
• EPA 25A	TNMHC (TOC-CH_4)	3 one-hour CEM tests, Flame Ionization Detection

*The process vent to be monitored (PUREX ETF stream number G6) contains a single three inch sample port. EPA test methodology requires two sample ports located ninety degrees from each other to determine volumetric flow rate. However, the process vent tested contains a calibrated Rosemount "Critical Orifice" Flow Meter (Identification Number FIT 45D 005) which is monitored directly in the process control room. The operating conditions reports contained in Appendix D include graphs of the flow rate measured by this "critical orifice" flow meter along with the process feed rate over each of the three one hour test intervals. Method 2C flow rate values were consistently higher than the critical orifice values. TOC emission rates in this report have been calculated from the volumetric flow rate determined by the single traverse Method 2C.

Source Test Methods:

METHOD 1: *Selection of Traverse Points*

EPA Method 1 was used to determine the location of the sample points for the velocity traverses. The number of sample points used was determined by the number of eight inch (8") equivalent inside stack diameters that the sample ports were located from the nearest upstream and downstream flow disturbances. The sample port was located 37.5 inches downstream from the "critical orifice" flow meter and 24 inches upstream from a bend allowing for eight point velocity traverses. The specific sample point locations were determined by splitting the stack into a number (determined above) of equal concentric areas and locating each sample point at the centroid of the respective area.

METHOD 2C: *Stack Gas Velocity and Volumetric Flow Rate (Small Ducts)*

EPA Method 2C was used to determine the effluent stack gas velocity and volumetric flow rate from the small diameter (8") main outlet stack. Pressure and temperature reading were taken at the sample points determined by Method 1. Pressure readings were measured using a "Standard-type" Pitot tube and an inclined manometer connected to the Pitot tube through quarter inch tubing. Pitot tube leak checks were performed before and after every test run. The stack gas temperature was measured using a calibrated (+/- 1 degree Fahrenheit) type-K thermocouple attached to the Pitot to provide the sampling point temperatures simultaneously with the velocity measurements.

During the velocity traverse a stack static pressure was taken by turning the pitot perpendicular to the gas flow (zero delta P) and removing the appropriate side of the pitot from the manometer (+ or -).

The other data necessary for the calculation of the volumetric flow rate are the barometric pressure, moisture content of the effluent, and the stack gas composition (O_2 and CO_2).

METHOD 3: *Molecular Weight Determination*

EPA Method 3 was used to determine the percentage by volume of oxygen (O_2) and carbon dioxide (CO_2) in the effluent stream by integrated bag sampling and ORSAT analysis. These concentrations were used to determine the dry and wet stack gas molecular weights.

METHOD 4: *Stack Gas Moisture Content Determination*

EPA Method 4 was used to determine the moisture content of the stack gas. A condenser assembly comprised of four glass impingers set in an ice bath was used to extract and collect the moisture from the effluent gas sample. The first two impingers contained 100 ml of deionized water. The third impinger was left empty to collect any potential condensate carryover, and a fourth impinger contained a pre-weighed amount of silica gel to act as the "absolute" collector of residual condensate.

A known volume of effluent gas, as measured by a calibrated metering system connected to an extraction pump, was drawn through a stainless steel "rake-type" sample probe into the condenser assembly for a specific period of time. After the extraction was complete, the amount of liquid (condensate) in the first three impingers was measured volumetrically. The amount of liquid collected in the silica gel was determined gravimetrically. The total condensate gain of the condenser assembly was determined and recorded along with the calculated volume of gas that was directed through the system. The subsequent moisture content of the stack gas was then determined from these collected variables.

METHOD 9: *Visual Opacity Determination*

EPA Method 9 was used to visually determine the opacity of the effluent exhaust stream. Twenty four consecutive readings were taken at fifteen second intervals by an individual with a current certification from the Washington State Department of Ecology.

METHOD 25A: *Total Non-Methane Hydrocarbon Determination*

EPA Method 25A was used to determine the parts per million by volume concentration of "VOC equivalent" total gaseous non-methane hydrocarbons (TNMHC) as Total Organic Carbon (TOC) and Methane (CH_4) by continuous Flame Ionization Detection (FID). A stainless steel "rake-type" sample probe was utilized to provide simultaneous measurement from three locations (16.7%, 50.0% and 83.3% of the inside stack diameter) across the stack.

The sample was drawn through the stainless steel "rake-type" probe into a heated glass wool filter and heated Teflon® sample line, through a Teflon® head diaphragm pump with a heated recirculation bypass into the FID analyzer. The heated internal pump inside the FID analyzer drew "hot" and "wet" sample from the heated recirculation bypass at a constant pressure and flow rate. The analyzer output voltage was recorded on a strip chart which was operated continuously throughout the test.

The calibration of the THC analyzer was verified before and after each test run by external calibration with three different concentrations of EPA Protocol 1 calibration gas. The hydrocarbon analyzer was calibrated using a "zero gas" consisting of "hydrocarbon-free" ultra pure zero air. Propane in air (C_3H_8 / Air) blends were used to provide span concentrations in the approximate ranges of 25-35%, 45-55%, and 80-90% of the analyzer's 10 parts per million (ppm_v) full scale range. Initial and final zero and span checks and test run interval start and stop times are annotated on the strip chart recording contained in Appendix C.

APPARATUS:

Valid Results, Inc. utilizes equipment designed to meet EPA source test and quality assurance specifications.

Valid Results' Stack Gas Volumetric Flow Rate sampling train conforms to the requirements of EPA 40CFR60 Appendix A Method 2C and consists of a Standard-type stainless steel Pitot tube with an attached Type-K thermocouple, an umbilical with quarter inch Pitot tube and thermocouple lines, a Type-K thermocouple readout and an inclined water manometer.

Valid Results' Stack Gas Moisture Content sampling train conforms to the requirements of EPA 40CFR60 Appendix A Method 4 and consists of a stainless steel "rake-type" probe with a glass wool plug, two impingers containing 100.0 ml distilled water, a third empty impinger, a fourth impinger full of silica gel, a Teflon® head diaphragm pump with a recirculation bypass and an on-off valve, a dry gas meter with a critical orifice and inlet and outlet thermocouples, an inclined manometer, and a Type-K thermocouple readout.

Gaseous Analyzers

Parameter	*Method*	*Analyzer*	*Technology*
VOC	25A	TECO 51-HT	Flame Ionization

DATA:

Copies of all field data sheets and strip chart recordings are included in Appendix B.

CALCULATIONS:

All calculations associated with this project have been performed in accordance with the applicable EPA testing and analysis methodology. A list of the equations and dimensions utilizes are included in Tables 1 - 3. Calculation tables for the stack gas volumetric flow rate (SDCM/M), stack gas moisture content (Bws), TOC analyzer bias calibration correction and TOC concentration and emission rate are included in Appendix A.

TABLE 1

Equations:	Dimensions:
Dry Gas Molecular Weight $M_d = 0.44*(\%CO_2)+0.32*(\%O_2)+0.28(100-((\%CO_2)+(\%O_2)))$	*gm/gm-mole*
Stack gas Moisture Content $B_{ws} = (V_{wc} + V_{wsg})/(V_{wc} + V_{wsg} + V_{mstd})$	*decimal fraction*
Impinger Volume Gain V_{wc} = 0.04707*(Final Volume - Initial Volume)	*milliliters*
Silica Gel Weight Gain V_{wsg} = 0.04715*(Final Weight - Initial Weight)	*grams*
Method 4 Corrected Sample Volume $V_{m(std)} = (V_m*Y*((T_{std}+460)/(T_m+460))*(P_m/P_{std})$	*dscf*
Wet Gas Molecular Weight $M_s = M_d*(1-B_{ws}) + 18.0*B_{ws}$	*gm/gm-mole*
Stack Gas Velocity $V_s = 85.49*C_p*SQRT(DeltaP)*SQRT((T_s+460)/((P_{bar}+(P_{static}/13.6))*M_s))$	*feet/second*
Corrected Stack Gas Volumetric Flow Rate $Q_{s(corr)} = 60*(1-B_{ws})*V_s*A_s*((T_{std}+460)/(T_s+460))*((P_{bar}+(P_{static}/13.6))/P_{std})$	*dscf/m*
Stack Area A_s = ((1/4)*(3.1416)*(Inside Stack Diameter)2)/144	*square feet*
Actual Stack Gas Volumetric Flow Rate $Q_{s(actual)} = 60*V_s*A_s$	*acf/m*
Gaseous Concentration XX mg/dscm = (XX *ppm*)*((MW$_{pollutant}$ *g/g-mole*)*(41,500))/(1,000,000 *ng/mg*)	*mg/dscm*
Gaseous Concentration XX gm/dscm = (XX *mg/dscm*)/(1000 *mg/gm*)	*gm/dscm*
Gaseous Emission Rate XX grains/dscf = (XX *mg/dscm*)*(0.0154 *grains/mg*)/(35.32 *cubic feet/cubic meter*)	*gr/dscf*
Gaseous Emission Rate XX lb/hr = ((XX *gr/dscf*)*(Qs(std) *dscf/m*)*(60 *min/hr*)/(7000 *grains/lb*))	*lb/hr*
Gaseous Emission Rate XX gm/m = ((XX *lb/hr*)*(7000 *grains/lb*)/((15.4 *grains/gm*)*(60 *min/hr*)))	*gm/m*
Gaseous Emission Rate XX tons/year = ((XX *lb/hr*)*(24 *hr/day*)*(365 *days/year*)/(2000 *lb/ton*))	*tons/year*
Bias Calibration Correction $ppm_{BC} = (ppm_{/v} - C_o)*C_{ma}/(C_m-C_o)$	*ppm*

TABLE 2

Symbols:	Names:	Dimensions:
$\%CO_2$	stack gas carbon dioxide content	*percent*
$\%O_2$	stack gas oxygen content	*percent*
V_{wc}	impinger water volume gain	*milliliters*
V_{wsg}	silica gel weight gain	*milligrams*
$V_{m(std)}$	Method 4 corrected dry gas meter volume	*cubic feet*
Y	dry gas meter correction coefficient	*dimensionless*
B_{ws}	stack gas moisture content	*decimal fraction*
C_p	pitot tube coefficient	*dimensionless*
SQRT(Delta P)	The average square root of the pitot tube pressure drop	*inches water*
T_s	stack gas temperature	*degrees Fahrenheit*
P_{bar}	barometric pressure	*inches Mercury*
P_{static}	stack static pressure	*inches water*
T_{std}	standard temperature (68)	*degrees Fahrenheit*
P_{std}	standard pressure (29.92)	*inches Mercury*
V_m	Method 4 dry gas meter volume	*cubic feet*
T_m	measured meter temperature	*degrees Fahrenheit*
π	ratio of circle circumference to diameter	*dimensionless*
V_s	stack gas velocity	*feet per second*
$Q_{s(std)}$	standard flow rate	*dscf/m*
$Q_{s(act)}$	actual flow rate	*acf/m*
$MW_{(pollutant)}$	molecular weight of pollutant	*g/g-mole*
C	average reference method value	*% or ppm*
C_o	average measured bias calibration zero value	*% or ppm*
C_m	average measured bias calibration value	*% or ppm*
C_{ma}	actual bias calibration gas value	*% or ppm*
C_{avg}	average measured value minus C_o	*% or ppm*

TABLE 3

Nomenclature

Nomenclature:	Description:
gm/gm-mole	*gram per gram-mole*
dscf/m	*dry standard cubic feet per minute*
acf/m	*actual cubic feet per minute*
dscm	*dry standard cubic meter*
dscf	*dry standard cubic feet*
gm	*grams*
mg	*milligram*
ml	*milliliter*
ppm_{dv}	*parts per million by volume*
gm/dscm	*grams per dry standard cubic meter*
mg/dscm	*milligrams per dry standard cubic meter*
gr/dscf	*grains per dry standard cubic foot*
lb/dscf	*pounds per dry standard cubic foot*
gm/m	*grams per minute*
lb/hr	*pounds per hour*
$\%_{dv}$	*percent by volume*
ft/s	*feet per second*

VALID RESULTS, INC.: Air Emission Test Result Summary

Client:	Westinghouse Hanford Company
Date:	1/23/96
Operator:	T. Prevo
Plant Location:	Richland, WA
Source:	Effluent Treatment Facility
Standard Pressure (Pstd):	29.92
Standard Temperature (Tstd):	68

Volatile Organic Carbon (VOC) Testing (reported as total organic carbon)

Concentration VOC limit (grams/dscm)	0.55
Average Reference Method Value*	< 0.012 >
Emission Rate VOC limit (grams/minute)	0.5
Average Reference Method Value**	<0.35>

** 0.012 is 2.2 percent of the applicable concentration standard*

*** 0.35 is 70 percent of the applicable emission rate standard*

EPA Test Method	Test Parameter (Total Organic Carbon)	Test Run #1	Test Run #2	Test Run #3	Test Average
2	Velocity	51.4	52.3	52.3	<52.0>
2	Volumetric Flow Rate (acf/m)	1,076	1,095	1,095	<1,089>
2	Volumetric Flow Rate (sdcf/m)	1,038	1,040	1,024	<1,034>
3	Wet Molecular Weight (Ms)	28.69	28.68	28.69	<28.69>
4	Moisture Content (Bws/100)	1.9	2.1	1.9	<2.0>
25A	TOC (grams/dscm)	0.014	0.010	0.012	< 0.012 >
25A	TOC (grams/minute)	0.41	0.30	0.35	<0.35>
25A	TOC (pounds/hour)	0.054	0.039	0.046	< 0.046 >
25A	TOC (tons/year)	0.24	0.17	0.20	<0.20>

TEST RESULTS:

Test results are presented in concentration units of parts per million by volume (ppm_v) and grams per dry standard cubic meter (gm/dscm), and mass emission rate units of grams per minute (gm/m).

The average volatile organic compound concentration was determined to be 0.012 grams per dry standard meter (gm/dscm) which is 2.2 percent of the applicable 0.55 gm/dscm standard. The average volatile organic compound emission rate was determined to be 0.35 grams per minute (gm/m) which is 70.0 percent of the applicable 0.50 gm/m standard. There was no methane present in the effluent stream.

The source did not exhibit any opacity during twenty four consecutive readings taken at 15 second intervals. This is consistent with the exhaust stack being downstream of multiple High Efficiency Particulate (HEPA) filters.

The volumetric flow rates determined by "modified" Method 2C (single traverse) were consistently higher than the "critical orifice" flow rates. Mass emission rate calculations are based upon the higher volumetric flow rates measured by "modified" Method 2C.

All calculations in this report have been made in accordance with the applicable equations as listed in the EPA 40CFR60 Appendix A Test Methods 1, 2C, 3, 4 and 25A.

QUALITY ASSURANCE:

VALID RESULTS follows the applicable test protocols in accordance with the quality assurance guidelines outlined in document EPA-600/4-77-027b "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume 3". Mr. Prevo completed the EPA Air Pollution Training Institute (APTI) Course #SI:414 "Quality Assurance for Source Emission Measurements" in March of 1993.

CEM analyzers were calibrated externally before and after every test run by introducing EPA Protocol One calibration gas standards to the front of the sample probe (in front of the filter) while maintaining a constant sample rate and recording the FID analyzer's response on a strip chart recorder and field data sheet. CEM analyzer output voltages were in alignment with and corresponded to the strip chart recorder settings.

A manual calculation verifying each step of the emission rate calculation for test run two is contained in Appendix E.

Calibration data sheets for the EPA Protocol One (1) Calibration Gas Concentrations, type-K stack thermocouple and Method 4 dry gas meter are contained in Appendix A.

These air emission test results have also been verified independently by Mr. Mark Anderson, P. E. with AERCO, INC, P. S..

SOURCE OPERATIONS:

Mr. Jeff Hugh (facility contact) provided the graph of process feed rate and effluent flow rate (measured by the "critical orifice" flow meter) contained in Appendix D.

APPENDIX A:

Calculations

Method 25A TOC Emission Rate
Method 2-Volumetric Flow Rate
Method 3-Molecular Weight
Method 4-Moisture Content
R.M. Calibration Bias Corrections
M25A TOC Test Run Averages

VALID RESULTS, INC.: EPA Method 25A: Total Organic Carbon (TOC) Emission Rate Calculation Sheet

Client: Westinghouse Hanford Company
Date: 1/23/96
Operator: T. Prevo
Plant Location: Richland, WA
Source: Effluent Treatment Facility
Standard Pressure (P_{std}): 29.92
Standard Temperature (T_{std}): 68

Test Run Number	Barometric Pressure (P_{bar}) "Hg	Stack Gas Volumetric Flow Rate (dscf/m)	TOC Concentration (ppm) @Carbon	**TOC Concentration (grams/dscm)**	TOC Emission Rate (grains/dscf)	TOC Emission Rate (lb/hour)	**TOC Emission Rate (grams/minute)**	TOC Emission Rate (tons/year)
1	30.88	1,038	7.7	0.014	0.0061	0.054	0.41	0.24
2	30.90	1,040	5.7	0.010	0.0044	0.039	0.30	0.17
3	30.94	1,024	6.3	0.012	0.0052	0.046	0.35	0.20
<Average>	<30.91>	<1,034>	<6.6>	<0.012>	<0.0052>	<0.046>	<0.35>	<0.20>

Stack Gas Volumetric Flow Rate (dscf/m) = calculated on Volumetric Flow Rate Calculation Sheet — *dry standard cubic feet per minute*

*TOC Concentration (ppm) @Carbon = (bias calibration corrected value (measured as propane)*3 by 40CFR60, Appendix A, Test Method 25A, Section 8, Equation 25A-1* — *parts per million as carbon*

TOC Concentration (grams/dscm) = ((ppm)(44.0 g/g-mole)*(41,500)/((1,000,000)*(1,000))) by 40CFR60, Subpart A, Section 60.45, Paragraph F(2)* — *grams per dry standard cubic meter*

TOC Concentration (grains/dscf) = ((gm/dscm)(1,000 mg/gm)*(0.0154 grains/mg)/(35.32 cubic feet/cubic meter))* — *grains per dry standard cubic feet*

TOC Emission (lb/hr) = ((grains/dscf)(dscf/m)*(60 min/hr)/(7000 grains/lb))* — *pounds per hour*

TOC Emission (gm/m) = ((lb/hr)(7,000 grains/lb)/((15.4 grains/gram)*(60 min/hr)))* — *grams per minute*

TOC Emission (tons/yr) = ((lb/hr)(24 hr/day)*(365 day/yr)/(2000 lb/ton))* — *tons per year*

VALID RESULTS , EPA Method 2: Volumetric Flow Rate Determination

Client:	Westinghouse Hanford	Barometric Pressure (Pbar):	30.88	Pitot Tube Coeff. (Cp):	0.99
Date:	1/23/96	Standard Temperature (Tstd):	68	% Oxygen (%O2):	20.90
Operator:	T. Prevo	Standard Pressure (Pstd):	29.92	% Carbon Dioxide (%CO2):	0.40
Plant Location:	Richland, WA	Static Pressure (Pstatic):	-1.7	Moisture Content (%H2O):	1.94
Source:	Effluent Treatment Facility	Fuel Type:	N/A	Stack Diameter (De\Ds):	8.0
Run #:	1	Time : 0:15	Load (gpm): 105.1	Stack Area (As):	0.349

Port ID#	Point #	% Stack Inside Diam.	Port Depth (inches)	Probe Marks	Cyclonic Zero Angle	Pitot Tube (Delta P)	Stack Temp. (Ts) Deg F	SQRT (Delta P)
	8	3.2%	2	2.26	<5	0.460	**99**	**0.6782**
	7	10.5%	2	2.84	<5	0.580	**97**	**0.7616**
	6	19.4%	2	3.55	<5	0.590	**95**	**0.7681**
	5	32.3%	2	4.58	<5	0.790	**93**	**0.8888**
	4	67.7%	2	7.42	<5	0.700	**90**	**0.8367**
	3	80.6%	2	8.45	<5	0.560	**87**	**0.7483**
	2	89.5%	2	9.16	<5	0.560	**87**	**0.7483**
	1	96.8%	2	9.74	<5	0.510	**87**	**0.7141**
<Average>							**<91.9>**	**<0.7680>**

Molecular Weight Wet (MWs) = ((0.44(%CO2) + 0.32(%O2) + 0.28(%CO + %N2))*(100-%H2O) + 0.18(%H2O))

MWs = **28.69** Lb/Lb-Mole

Stack Gas Velocity (Vs) = (85.49*Cp*(SQRT(Delta P))*(SQRT((Ts + 460)/((Pbar + Pstatic/13.6)*MWs)))

Vs = **51.4** Feet per Second

Corrected Stack Gas Volumetric Flow Rate (Qs) = (60*((100-%H2O)/100)*Vs*As*((Tstd + 460)/(Ts + 460))*(Ps/Pstd))

Qs(corr) = **1,038** Standard Dry Cubic Feet per Minute

Actual Cubic Feet per Second = 60*Vs*As

Qs(actual) = **1,076** Actual Cubic Feet per Minute

VALID RESULTS , EPA Method 2: Volumetric Flow Rate Determination

Client:	Westinghouse Hanford	Barometric Pressure (Pbar):	30.90	Pitot Tube Coeff. (Cp):	0.99
Date:	1/23/96	Standard Temperature (Tstd):	68	% Oxygen (%O2):	20.90
Operator:	T. Prevo	Standard Pressure (Pstd):	29.92	% Carbon Dioxide (%CO2):	0.40
Plant Location:	Richland, WA	Static Pressure (Pstatic):	-1.74	Moisture Content (%H2O):	2.06
Source:	Effluent Treatment Facility	Fuel Type:	N/A	Stack Diameter (De\Ds):	8.0
Run #:	2	Time : 1:50	Load (gpm): 108.9	Stack Area (As):	0.349

Port ID#	Point #	% Stack Inside Diam.	Port Depth (inches)	Probe Marks	Cyclonic Zero Angle	Pitot Tube (Delta P)	Stack Temp. (Ts) Deg F	SQRT (Delta P)
	8	3.2%	2	2.26	<5	0.470	**98**	**0.6856**
	7	10.5%	2	2.84	<5	0.530	**98**	**0.7280**
	6	19.4%	2	3.55	<5	0.660	**99**	**0.8124**
	5	32.3%	2	4.58	<5	0.760	**101**	**0.8718**
	4	67.7%	2	7.42	<5	0.680	**101**	**0.8246**
	3	80.6%	2	8.45	<5	0.630	**101**	**0.7937**
	2	89.5%	2	9.16	<5	0.580	**102**	**0.7616**
	1	96.8%	2	9.74	<5	0.530	**101**	**0.7280**
<Average>							**<100.1>**	**<0.7757>**

Molecular Weight Wet (MWs) = ((0.44(%CO2) + 0.32(%O2) + 0.28(%CO + %N2))*(100-%H2O) + 0.18(%H2O))

MWs = **28.68** Lb/Lb-Mole

Stack Gas Velocity (Vs) = (85.49*Cp*(SQRT(Delta P))*(SQRT((Ts + 460)/((Pbar + Pstatic/13.6)*MWs)))

Vs = **52.3** Feet per Second

Corrected Stack Gas Volumetric Flow Rate (Qs) = (60*((100-%H2O)/100)*Vs*As*((Tstd + 460)/(Ts + 460))*(Ps/Pstd))

Qs(corr) = **1,040** Standard Dry Cubic Feet per Minute

Actual Cubic Feet per Second = 60*Vs*As

Qs(actual) = **1,095** Actual Cubic Feet per Minute

VALID RESULTS , EPA Method 2: Volumetric Flow Rate Determination

Client:	Westinghouse Hanford	Barometric Pressure (Pbar):	30.94	Pitot Tube Coeff. (Cp):	0.99
Date:	1/23/96	Standard Temperature (Tstd):	68	% Oxygen (%O2):	20.90
Operator:	T. Prevo	Standard Pressure (Pstd):	29.92	% Carbon Dioxide (%CO2):	0.40
Plant Location:	Richland, WA	Static Pressure (Pstatic):	-1.72	Moisture Content (%H2O):	1.90
Source:	Effluent Treatment Facility	Fuel Type:	N/A	Stack Diameter (De\Ds):	8.0
Run #:	3	Time : 3:15	Load (gpm): 101.0	Stack Area (As):	0.349

Port ID#	Point #	% Stack Inside Diam.	Port Depth (inches)	Probe Marks	Cyclonic Zero Angle	Pitot Tube (Delta P)	Stack Temp. (Ts) Deg F	SQRT (Delta P)
	8	3.2%	2	2.26	<5	0.440	**110**	**0.6633**
	7	10.5%	2	2.84	<5	0.520	**110**	**0.7211**
	6	19.4%	2	3.55	<5	0.600	**110**	**0.7746**
	5	32.3%	2	4.58	<5	0.710	**111**	**0.8426**
	4	67.7%	2	7.42	<5	0.720	**111**	**0.8485**
	3	80.6%	2	8.45	<5	0.650	**111**	**0.8062**
	2	89.5%	2	9.16	<5	0.590	**111**	**0.7681**
	1	96.8%	2	9.74	<5	0.530	**110**	**0.7280**
<Average>							**<110.5>**	**<0.7691>**

Molecular Weight Wet (MWs) = ((0.44(%CO2) + 0.32(%O2) + 0.28(%CO + %N2))*(100-%H2O) + 0.18(%H2O))

MWs = **28.69** Lb/Lb-Mole

Stack Gas Velocity (Vs) = (85.49*Cp*(SQRT(Delta P))*(SQRT((Ts + 460)/((Pbar + Pstatic/13.6)*MWs)))

Vs = **52.3** Feet per Second

Corrected Stack Gas Volumetric Flow Rate (Qs) = (60*((100-%H2O)/100)*Vs*As*((Tstd + 460)/(Ts + 460))*(Ps/Pstd))

Qs(corr) = **1,024** Standard Dry Cubic Feet per Minute

Actual Cubic Feet per Second = 60*Vs*As

Qs(actual) = **1,095** Actual Cubic Feet per Minute

VALID RESULTS, INC.: M3A O_2 Field Data Averages

Client: Westinghouse Hanford Company
Date: 1/23/96
Operator: T. Prevo
Plant Location: Richland, WA
Source: Effluent Treatment Facility

Percent Oxygen Concentration

Run 1

Time: 00:00-00:45

		Average Measured Value	20.9
	Initial	Final	
1-1	48.2	27.3	20.9
1-2	47.8	26.9	20.9
1-3	45.5	24.5	21.0

Run 2

Time: 01:45-02:30

		Average Measured Value	20.9
	Initial	Final	
2-1	48.6	27.7	20.9
2-2	48.2	27.3	20.9
2-3	46.4	25.5	20.9

Run 3

Time: 03:05-03:50

		Average Measured Value	20.9
	Initial	Final	
3-1	39.6	18.6	21.0
3-2	44.8	23.9	20.9
3-3	23.9	3.0	20.9

Average of Test Runs 1, 2, & 3.	<20.9>

VALID RESULTS, INC.: M3A CO_2 Field Data Averages

Client: Westinghouse Hanford Company
Date: 1/23/96
Operator: T. Prevo
Plant Location: Richland, WA
Source: Effluent Treatment Facility

Percent Carbon Dioxide Concentration

Run 1

Time: 00:00-00:45

		Average Measured Value	0.4
	Initial	Final	
1-1	27.3	26.9	0.4
1-2	26.9	26.5	0.4
1-3	24.5	24.2	0.3

Run 2

Time: 01:45-02:30

		Average Measured Value	0.4
	Initial	Final	
2-1	27.7	27.4	0.3
2-2	27.3	26.9	0.4
2-3	25.5	25	0.5

Run 3

Time: 03:05-03:50

		Average Measured Value	0.4
	Initial	Final	
3-1	18.6	18.3	0.3
3-2	23.9	23.5	0.4
3-3	3.0	2.6	0.4

Average of Test Runs 1, 2, & 3. **<0.40>**

VALID RESULTS, INC.: EPA Method 4 Stack Gas Moisture Determination

Westinghouse Hanford Company
Richland, WA
Effluent Treatment Facility

Date: 1/23/96	Load (gpm): 105.1
Time: 00:00-00:45	Test Run: 1

1. Uncorrected Meter Volume (V_m)	18.768 cubic feet
2. Meter Factor (Y_d)	1.0334
3. Barometric Pressure (Pb)	30.88 " Hg
4. Meter Pressure (^H)	0.6 " H_2O
5. Meter Temperature (T_m)	62.6 F°
6. Std. Temperature (T_{std})	68.0 F°
7. Impinger H_20 Gain (V_w)	4.5 ml
8. Silica Gel Wt. Gain (V_w)	4.0 gm
9. Moisture Vapor ($V_{w\,std}$)	0.400 cubic feet
Std. Meter Volume ($V_{m\,std}$)	**20.253 cubic feet**
Percent of H_2O in Stack (% H_2O)	**1.94 %**

WHERE,

Hg = Mercury
F = Degrees Fahrenheit
ml = milliliters
gm = grams
% = Percent
gpm = gallons per minute

CALCULATIONS,

Moisture Vapor = ((0.04707* ml H_2O) + (0.04715* mg Silica))

Std. Meter Vol. = $V_m \times Y_d \times (T_{std} + 460) \times (P_b + {}^{\wedge}H/13.6) / ((T_m + 460) \times 29.92)$

Stack Moisture = Moisture Vapor / Moisture Vapor + Std. Meter Vol.

VALID RESULTS, INC.: EPA Method 4 Stack Gas Moisture Determination

Westinghouse Hanford Company
Richland, WA
Effluent Treatment Facility

Date:	1/23/96	Load (gpm):	108.9
Time:	01:45-02:30	Test Run:	2

1. Uncorrected Meter Volume (V_m)	19.646 cubic feet
2. Meter Factor (Y_d)	1.0334
3. Barometric Pressure (Pb)	30.90 " Hg
4. Meter Pressure (^H)	0.7 " H_2O
5. Meter Temperature (T_m)	61.6 F°
6. Std. Temperature (T_{std})	68.0 F°
7. Impinger H_20 Gain (V_w)	6.0 ml
8. Silica Gel Wt. Gain (V_w)	3.5 gm
9. Moisture Vapor ($V_{w\,std}$)	0.447 cubic feet
Std. Meter Volume ($V_{m\,std}$)	**21.260 cubic feet**
Percent of H_2O in Stack (% H_2O)	**2.06 %**

WHERE,

Hg = Mercury
F = Degrees Fahrenheit
ml = milliliters
gm = grams
% = Percent
gpm = gallons per minute

CALCULATIONS,

Moisture Vapor = ((0.04707* ml H_2O) + (0.04715* mg Silica))
Std. Meter Vol. = V_m x Y_d x (T_{std} + 460) x (P_b + ^H / 13.6) / ((T_m + 460) x 29.92)
Stack Moisture = Moisture Vapor / Moisture Vapor + Std. Meter Vol.

VALID RESULTS, INC.: EPA Method 4 Stack Gas Moisture Determination

Westinghouse Hanford Company
Richland, WA
Effluent Treatment Facility

Date:	1/23/96	Load (gpm):	101.0
Time:	03:05-03:50	Test Run:	3

1. Uncorrected Meter Volume (V_m)	19.113 cubic feet
2. Meter Factor (Y_d)	1.0334
3. Barometric Pressure (Pb)	30.94 " Hg
4. Meter Pressure (^H)	0.7 " H_2O
5. Meter Temperature (T_m)	62.8 F°
6. Std. Temperature (T_{std})	68.0 F°
7. Impinger H_20 Gain (V_w)	5.0 ml
8. Silica Gel Wt. Gain (V_w)	3.5 gm
9. Moisture Vapor ($V_{w\,std}$)	0.400 cubic feet
Std. Meter Volume ($V_{m\,std}$)	**20.662 cubic feet**
Percent of H_2O in Stack (% H_2O)	**1.90 %**

WHERE,

Hg = Mercury
F = Degrees Fahrenheit
ml = milliliters
gm = grams
% = Percent
gpm = gallons per minute

CALCULATIONS,

Moisture Vapor = ((0.04707* ml H_2O) + (0.04715* mg Silica))

Std. Meter Vol. = $V_m \times Y_d \times (T_{std} + 460) \times (P_b + {}^{\wedge}H/13.6) / ((T_m + 460) \times 29.92)$

Stack Moisture = Moisture Vapor / Moisture Vapor + Std. Meter Vol.

VALID RESULTS, INC.: M25A TOC Raw Field Data Averages and Bias Calibration Corrections

Client: Westinghouse Hanford Company
Date: 1/23/96
Operator T. Prevo
Plant Loc Richland, WA
Source: Effluent Treatment Facility

Parts per Million Total Organic Carbon Concentration

Actual Calibration Value		3.3	Test Runs 1 and 3
Actual Calibration Value		9.67	Test Run 2
Zero	0.2		
Calibration	3.7		

Run 1

Time: 23:55-00:55		2.57	Bias Corrected Average @ Propane
Avg. Meas	<2.74>	7.71	Bias Corrected Average @ Carbon
Zero	-0.4	-<0.10>	Average Zero Bias
Calibration	3.4	<3.55>	Average Cal. Bias
Re-Zero	0		
Re-Calibration	9.7		

Run 2

Time: 01:40-02:40		1.89	Bias Corrected Average @ Propane
Avg. Meas	<1.68>	5.67	Bias Corrected Average @ Carbon
Zero	-0.5	-<0.25>	Average Zero Bias
Calibration	9.5	<9.60>	Average Cal. Bias
Re-Zero	0.0		
Re-Calibration	3.4		

Run 3

Time: 03:05-04:05		2.09	Bias Corrected Average @ Propane
Avg. Meas	<2.28>	6.27	Bias Corrected Average @ Carbon
Zero	0	<0.00>	Average Zero Bias
Calibration	3.8	<3.60>	Average Cal. Bias

Bias Corrected Average of Test Runs 1, 2, & 3. **<6.55>** carbon

VALID RESULTS, INC.: M25A Average Parts per Million TOC Concentration Calculation

Client:	Westinghouse Hanford Company
Date:	1/23/96
Operator:	T. Prevo
Plant Location:	Richland, WA
Source:	Effluent Treatment Facility

Average Parts per Million Total Organic Carbon Concentration

Test Run Number One

Test Interval (see strip chart recording)	Average TOC Concentration (6 minute interval averages)
1.1	4.0
1.2	3.6
1.3	3.05
1.4	2.75
1.5	2.57
1.6	2.4
1.7	2.3
1.8	2.2
1.9	2.3
1.10	2.2

Average of Test Run 1 **<2.74>** propane

VALID RESULTS, INC.: M25A Average Parts per Million TOC Concentration Calculation

Client:	Westinghouse Hanford Company
Date:	1/23/96
Operator:	T. Prevo
Plant Location:	Richland, WA
Source:	Effluent Treatment Facility

Average Parts per Million Total Organic Carbon Concentration

Test Run Number Two

Test Interval (see strip chart recording)	Average TOC Concentration (6 minute interval averages)
2.1	2.2
2.2	1.9
2.3	1.72
2.4	1.65
2.5	1.75
2.6	1.6
2.7	1.6
2.8	1.6
2.9	1.45
2.10	1.35

Average of Test Run 2 **<1.68>** propane

VALID RESULTS, INC.: M25A Average Parts per Million TOC Concentration Calculation

Client:	Westinghouse Hanford Company
Date:	1/23/96
Operator:	T. Prevo
Plant Location:	Richland, WA
Source:	Effluent Treatment Facility

Average Parts per Million Total Organic Carbon Concentration

Test Run Number Three

Test Interval (see strip chart recording)	Average TOC Concentration (6 minute interval averages)
3.1	2.2
3.2	2.1
3.3	2.23
3.4	2.4
3.5	2.3
3.6	2.3
3.7	2.3
3.8	2.25
3.9	2.25
3.10	2.45

Average of Test Run 3 **<2.28>** propane

APPENDIX B:

Field Data

Method 2 Volumetric Flow Rate
Method 4 Stack Gas Moisture
CEM Bias Calibrations
CEM Strip Chart Recordings
Method 9 Opacity

VALID RESULTS, INC., EPA Method 2: Volumetric Flow Rate Determination

Client: Westinghouse Hanford Company		Barometric Pressure (Pbar):	30.58	Pitot Tube Coeff. (Cp):	0.99 ~~0.84~~
Date: 9/23/96		Standard Temperature (Tstd):	68	% Oxygen (%O2):	20.9
Operator: T. Rivera		Standard Pressure (Pstd):	29.92	% Carbon Dioxide (%CO2):	0.4
Plant Location: Richland, WA		Stack Static Pressure (Pstatic):	-1.7	Moisture Content (%H2O):	~ 2%
Source: ETF Z42-A		Fuel Type:	N/A	Stack Diameter (De\Ds):	8"
Run #: 1	Time: 1245 - 00:15	Load Rating: N/A		Stack Area (As):	0.349 ft2

Port ID#	Point #	% Stack Inside Diam.	Port Depth	Probe Marks	Cyclonic Zero Angle	Pitot Tube (Delta P)	Stack Temp. (Ts) Deg F	SQRT (Delta P)
						0.46	99	
						0.58	97	
						0.59	95	
						0.79	93	
						0.70	90	
						0.56	87	
#2	0150					0.58	87	
static	-1.74					0.51	87	
Pbar	30.90						<91.875>	<0.7680>
						0.47	98	
						0.53	98	
						0.66	99	
						0.76	101	
						0.68	101	
						0.63	101	
						0.58	102	
						0.53	101	
							<100.125>	<0.7751>
#3	0315					0.44	110	
static	-1.72					0.52	110	
Pbar	30.94					0.60	110	
						0.71	111	
						0.72	111	
						0.65	111	
						0.59	111	
						0.53	110	
							<110.5>	<0.7691>
<Average>								

Probe Marks Repeated

Molecular Weight Wet (MWs) = ((0.44(%CO2) + 0.32(%O2) + 0.28(%CO + %N2))*(100-%H2O) + 0.18(%H2O))

MWs = _____ Lb/Lb-Mole

Stack Gas Velocity (Vs) = (85.49*Cp*(SQRT(Delta P))*(SQRT((Ts + 460)/((Pbar + Pstatic/13.6)*MWs)))

Vs = _____ Feet per Second

Corrected Stack Gas Volumetric Flow Rate (Qs) = (60*((100-%H2O)/100)*Vs*As*((Tstd + 460)/(Ts + 460))*(Ps/Pstd))

Qs(corr) = _____ Standard Dry Cubic Feet per Minute

Actual Cubic Feet per Second = 60*Vs*As

Qs(actual) = _____ Actual Cubic Feet per Minute

FIELD DATA SHEET

METHOD # 4

CLIENT: Westinghouse Hanford LOCATION: ETF 242-A FUEL: N/A

DATE: 1/23/96 LOAD: 7.60% OPER: T.P. METER #: 16947116 METER Yd: 1.033

RUN (#)	POINT	TIME	GAS METER ft³	METER TEMP. (°F) INLET	METER TEMP. (°F) OUTLET	STACK TEMP (°F)	METER RATE (cfm)	IMP TEMP (°F)	PUMP VAC ("Hg)	
	START	00:00	300.848	50	50	91°	~0.5	<63	~2"	Barometric Press. 30.88
		00:10	305.004	68	62					
		00:30	313.352	68	65					
	END	00:45	319.616	71	70					Corrected Volume / Moisture %
	AVG.	45m	18.768							ΔH = 0.6

1 — SAMPLE PURGE: Int. Time @ ; Final @

	FINAL	INITIAL	NET	
IMPINGER #1	104.0	100	4.0	INITIAL LEAK CHECK: 0.005 cfm @ 15 "Hg
IMPINGER #2	100.5	100	0.5	FINAL LEAK CHECK: 0.004 cfm @ 15 "Hg
IMPINGER #3	Ø	Ø	Ø	
IMPINGER #4				Total Wgt/Vol H2O Collected
SILICA GEL WT	404.0	400	4.0	4.5 + 4.0

RUN (#)	POINT	TIME	GAS METER ft³	METER TEMP. (°F) INLET	METER TEMP. (°F) OUTLET	STACK TEMP (°F)	METER RATE (cfm)	IMP TEMP (°F)	PUMP VAC ("Hg)	
	START	0145	319.938	50	50	100°	~0.5	<63	~2"	Barometric Press. 30.90
		0200	326.484	62	60					
		0215	333.042	67	65					
	END	0230	339.584	70	69					Corrected Volume / Moisture %
	AVG.	45m	19.646							ΔH = 0.7

2 — SAMPLE PURGE: Int. Time @ ; Final @

	FINAL	INITIAL	NET	
IMPINGER #1	108.0	104.0	4.0	INITIAL LEAK CHECK: 0.006 cfm @ 15 "Hg
IMPINGER #2	102.0	101.5	1.5	FINAL LEAK CHECK: 0.008 cfm @ 15 "Hg
IMPINGER #3	0.5	Ø	0.5	
IMPINGER #4				Total Wgt/Vol H2O Collected
SILICA GEL WT	403.5	400	3.5	6.0 + 3.5

RUN (#)	POINT	TIME	GAS METER ft³	METER TEMP. (°F) INLET	METER TEMP. (°F) OUTLET	STACK TEMP (°F)	METER RATE (cfm)	IMP TEMP (°F)	PUMP VAC ("Hg)	
	START	0305	339.886	52	52	~~70.5~~	108.0	~~1.5~~		Barometric Press. 30.94
		0320	346.261	63	62	109.0	~~102.0~~	2.0		
		0335	352.637	67	65	Ø		Ø		
	END	0350	358.999	71	70	110°	~0.5	<63	~2	Corrected Volume / Moisture %
	AVG.	45m	19.113							ΔH = 0.7

3 — SAMPLE PURGE: Int. Time @ ; Final @

	FINAL	INITIAL	NET	
IMPINGER #1	109.5	108.0	1.5	INITIAL LEAK CHECK: 0.002 cfm @ 15 "Hg
IMPINGER #2	104.0	102.0	2.0	FINAL LEAK CHECK: 0.005 cfm @ 15 "Hg
IMPINGER #3	0.5	Ø	0.5	
IMPINGER #4				Total Wgt/Vol H2O Collected
SILICA GEL WT	403.5	400	3.5	5.0 + 3.5

GASEOUS DATA SHEET

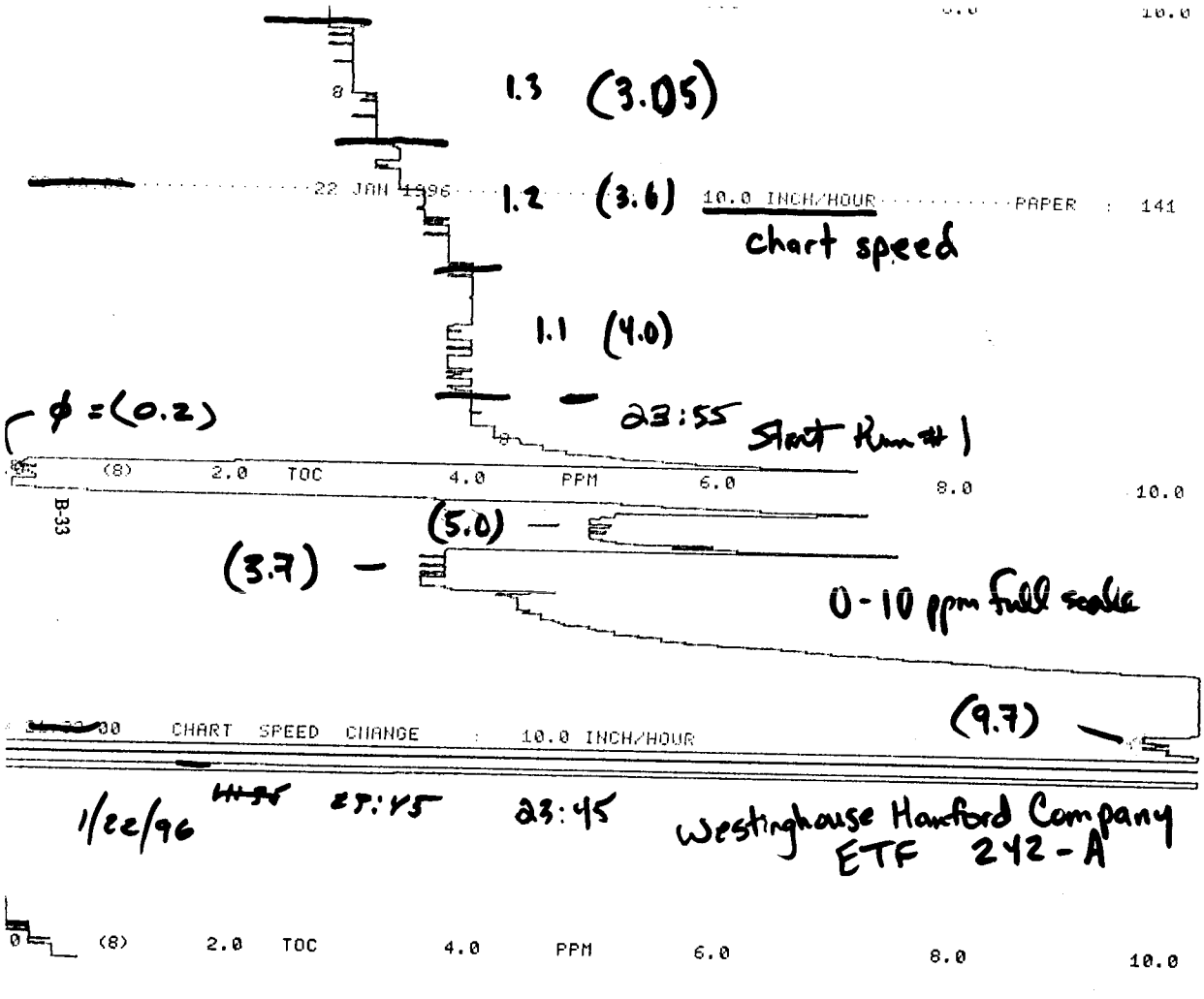
Date: 1/22/96
Client: Westinghouse Hanford Co
Facility: ETF J 242A

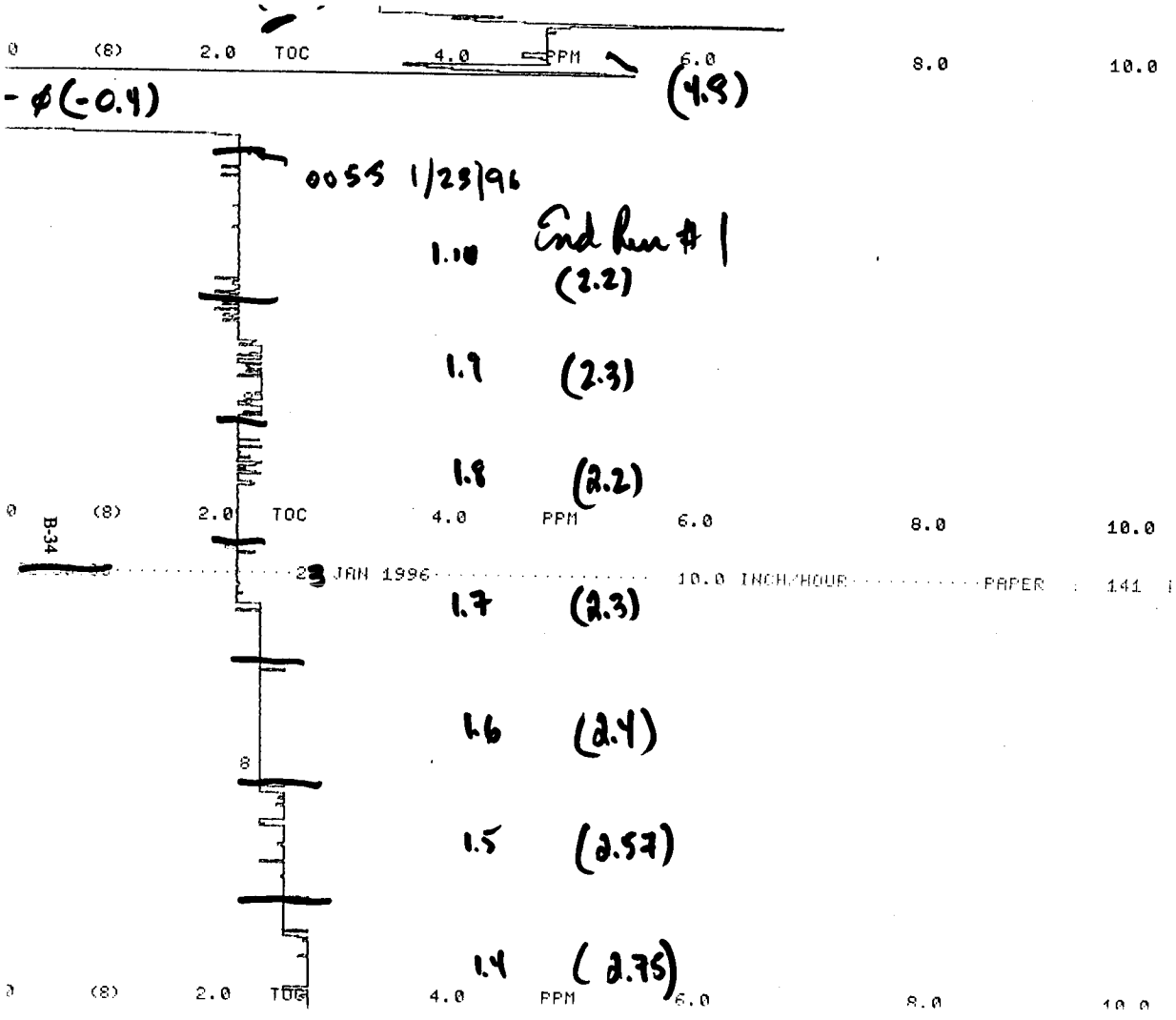
Fuel: N/A
Load: 760
Unit: VOG

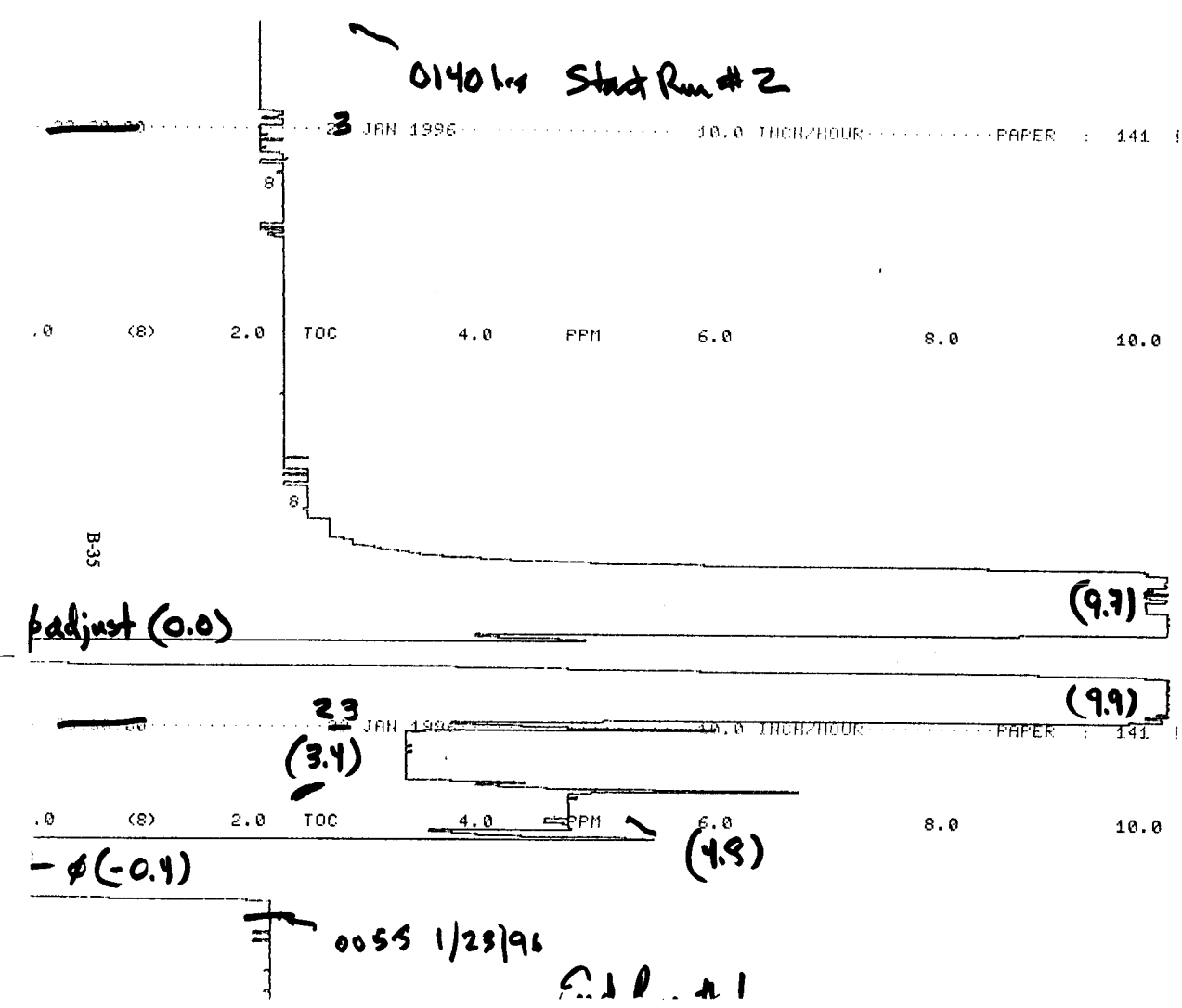
Analyzer Span:							0-10 ppm
CALIBRATION GASES							3.3 / 4.79 / 9.67

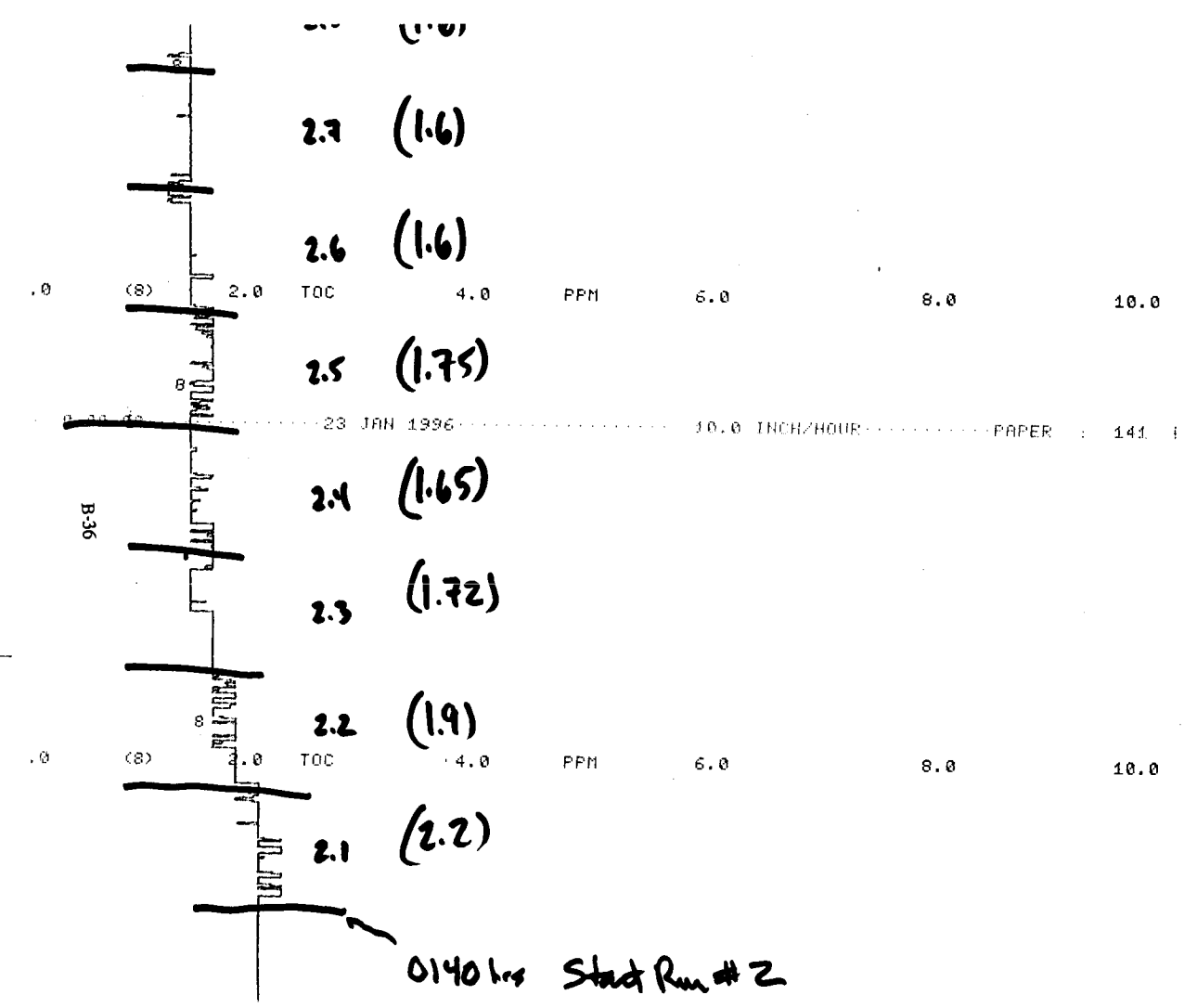
		INITIAL CAL	TIME	O,	CO,	CO	NO,	SO,	THC (TDC)
I N S T		Zero							
		Low Span							
		Mid Span					(5 ppm)		
		High Span							
S Y S T		Zero	11:30						0.0 / 0.2
		Low Span				(9 ppm)			5.7
		Mid Span							5.0
		High Span	11:50						9.7
START - END TIME 23:55-0055 1/23/96 RUN # 1	S A M P L E	1	23:55			184	842		3.8
		2				116.5	867		3.2
		3				103	875		2.8
		4				90	876		2.6
		5				152	841		
		6	0055			80	847		
		7				105	840		
		8							
		Average				(105.1)	(855.4)		(2.74)
S Y S T		Zero							-0.7
		Low Span							3.4
		Mid Span							4.8
		High Span							9.9
RE-SPAN		Zero							0.0
		Mid Span							
		High Span							9.7
START - END TIME 0140-0240 RUN # 2	S A M P L E	1	01:40			98	846		2.1
		2				128	838		
		3				143	836		
		4				82	831		1.5
		5				74	855		
		6				108	866		1.4
		7	02:40			129	873		
		8							
		Average				(108.9)	(849.3)		(1.68)
S Y S T		Zero							-0.5
		Low Span							2.4
		Mid Span							4.3
		High Span							9.5
RE-SPAN		Zero							0.0
		Mid Span							3.4 4.7
		High Span							9.7
START - END TIME 0305-0405 RUN # 3	S A M P L E	1	03:05			124	840		2.2
		2				82	840		
		3				127	839		2.2
		4				78	860		
		5				159	870		
		6				67	849		2.3
		7	04:05			70	846		
		8							
		Average				(101.0)	(851.4)		(2.28)
S Y S T		Zero							0.0
		Low Span							3.8
		Mid Span							5.2
		High Span							10.4

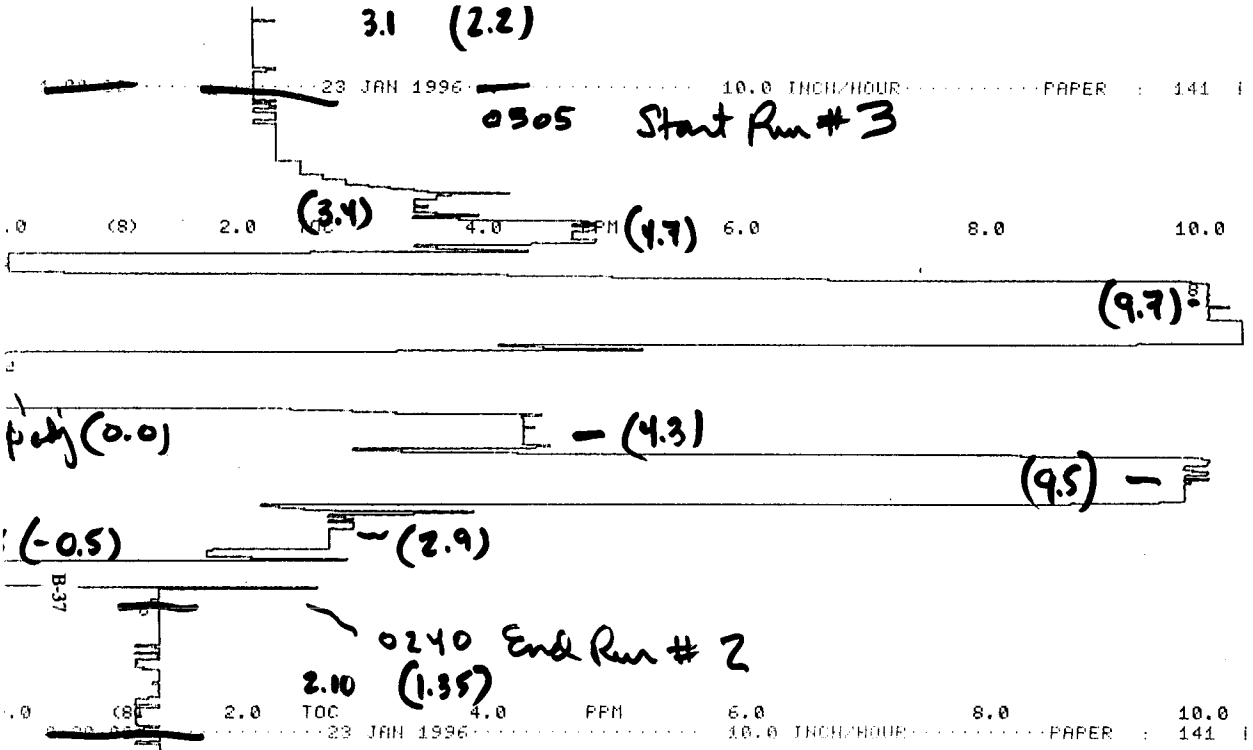
		FINAL CAL	TIME	O,	CO,	CO	NO,	SO,	THC
I N S T		Zero							
		Low Span							
		Mid Span							
		High Span							


1.3 (3.05)
22 JAN 1996
1.2 (3.6)
10.0 INCH/HOUR
PAPER : 141
chart speed
1.1 (4.0)
ϕ = (0.2)
23:55 Start Run #1
(8) 2.0 TOC 4.0 PPM 6.0 8.0 10.0
B-33
(5.0)
(3.7)
0-10 ppm full scale
(9.7)
CHART SPEED CHANGE : 10.0 INCH/HOUR
1/22/96
23:45
Westinghouse Hanford Company
ETF 242-A
(8) 2.0 TOC 4.0 PPM 6.0 8.0 10.0

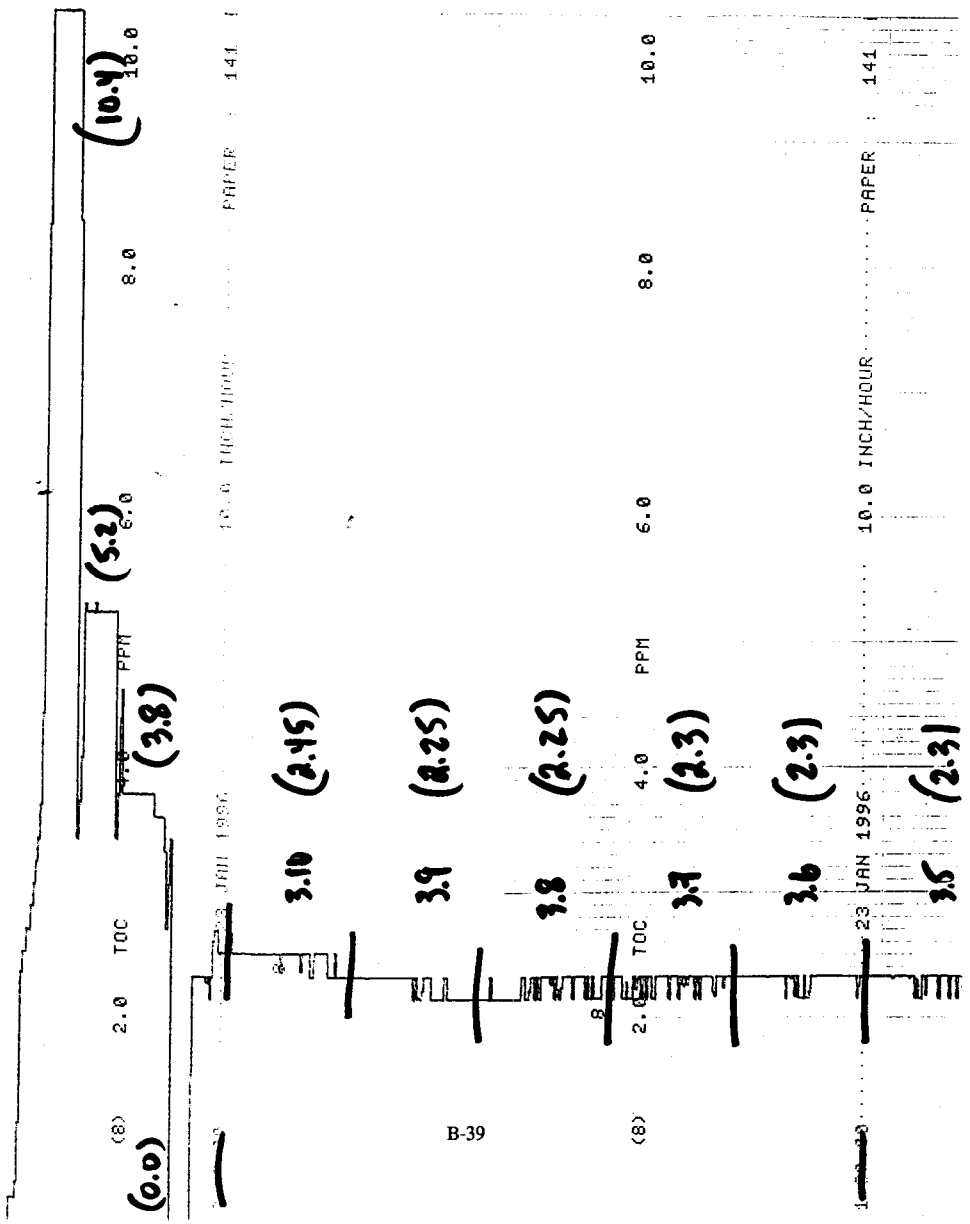

0 (8) 2.0 TOC 4.0 PPM 6.0 8.0 10.0
- ϕ(-0.4)
(4.8)
0055 1/25/96
1.10 End Run # 1
(2.2)
1.9 (2.3)
1.8 (2.2)
0 (8) 2.0 TOC 4.0 PPM 6.0 8.0 10.0
B-34
25 JAN 1996 10.0 INCH/HOUR PAPER 141
1.7 (2.3)
1.6 (2.4)
8
1.5 (2.57)
1.4 (2.75)
(8) 2.0 TOC 4.0 PPM 6.0 8.0 10.0

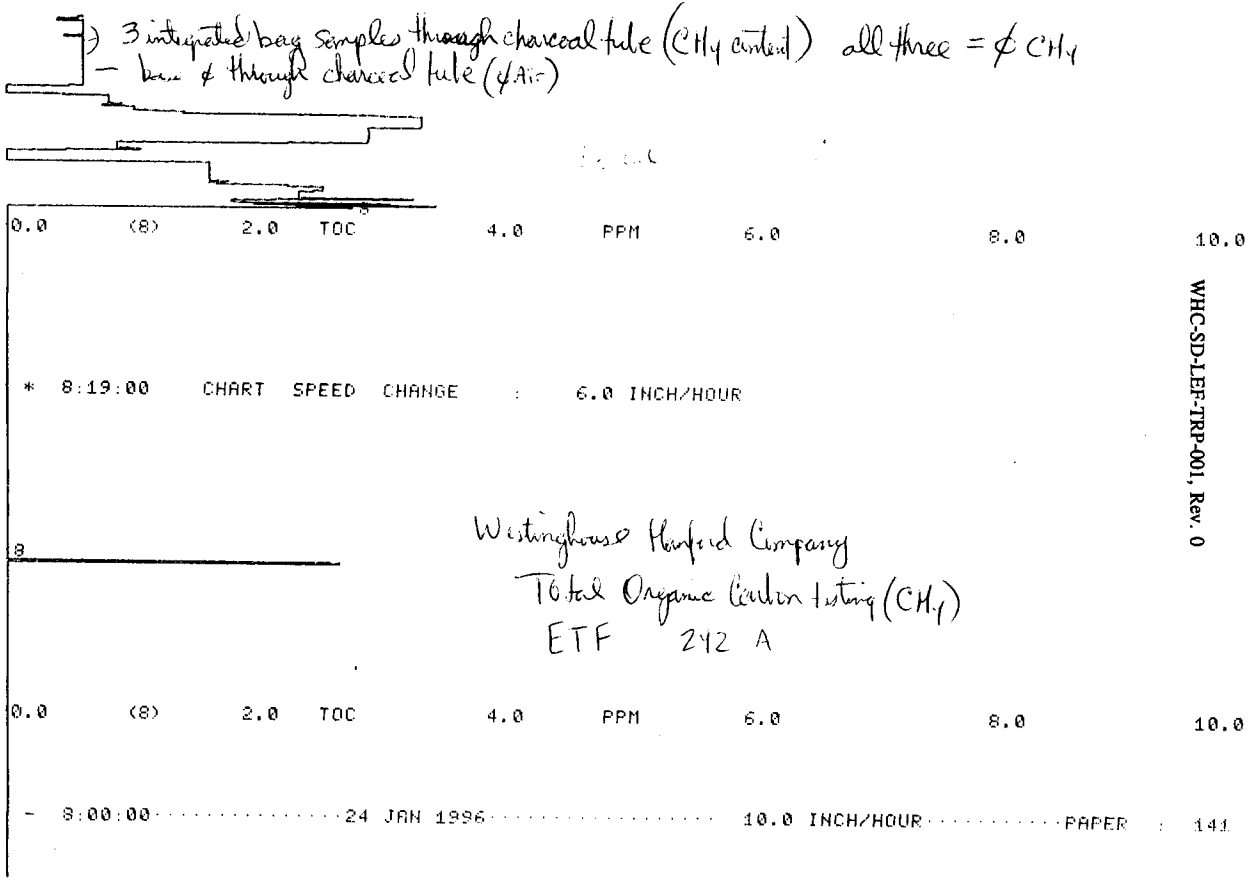

0140 hrs Start Run #2
3 JAN 1996
10.0 INCH/HOUR
PAPER : 141
.0 (8) 2.0 TOC 4.0 PPM 6.0 8.0 10.0
B-35
adjust (0.0)
(9.7)
(9.9)
23
JAN 1996
10.0 INCH/HOUR
PAPER : 141
(3.4)
.0 (8) 2.0 TOC 4.0 PPM 6.0 8.0 10.0
(4.9)
- ϕ (-0.4)
0055 1/23/96


2.7 (1.6)
2.6 (1.6)
.0 (8) 2.0 TOC 4.0 PPM 6.0 8.0 10.0
2.5 (1.75)
23 JAN 1996 10.0 INCH/HOUR PAPER : 141
B-36
2.4 (1.65)
2.3 (1.72)
2.2 (1.9)
.0 (8) 2.0 TOC 4.0 PPM 6.0 8.0 10.0
2.1 (2.2)
0140 hrs Start Run #2


3.1 (2.2)
23 JAN 1996
10.0 INCH/HOUR
PAPER : 141
0305 Start Run #3
(3.4)
(8)
2.0
4.0
PPM
(1.7)
6.0
8.0
10.0
(9.7)
(0.0)
(4.3)
(9.5)
(-0.5)
(2.9)
B-37
0240 End Run # 2
2.10 (1.35)
TOC
2.9 (1.45)
2.8 (1.6)

3.4 (2.25)
3.8 (2.25)
3.7 (2.3)
3.6 (2.3)
3.5 (2.31)
3.1 (2.4)
3.3 (2.23)
3.2 (2.1)
3.1 (2.2)
TOC
TOC
2.0
2.0
4.0
4.0
6.0
6.0
8.0
8.0
10.0
10.0
PPM
PPM
23 JAN 1996
10.0 INCH/HOUR
PAPER
141


(0.0)
(5.2)
(10.4)
(3.8)
2.0 TOC
6.0
8.0
10.0
PPM
PAPER
141
(8)
23 JAN 1996
3.10
(2.45)
3.9
(2.25)
3.8
(2.25)
4.0
(2.3)
3.7
(2.3)
3.6
(2.3)
3.5
10.0 INCH/HOUR


3 integrated bag samples through charcoal tube (CH4 content) all three = ∅ CH4
– bag ∅ through charcoal tube (∅ Air)
0.0 (8) 2.0 TOC 4.0 PPM 6.0 8.0 10.0
* 8:19:00 CHART SPEED CHANGE : 6.0 INCH/HOUR
8
Westinghouse Hanford Company
Total Organic Carbon Testing (CH4)
ETF 242 A
0.0 (8) 2.0 TOC 4.0 PPM 6.0 8.0 10.0
- 8:00:00 24 JAN 1996 10.0 INCH/HOUR PAPER : 141

RECORD OF VISUAL DETERMINATION OF OPACITY

COMPANY Westinghouse Hanford Company
LOCATION Richland, WA
TEST NUMBER 9-1
DATE 1/22/96
TYPE FACILITY Effluent Treatment
CONTROL DEVICE HEPA Filters

HOURS OF OBSERVATION 24
OBSERVER T. Reid
OBSERVER CERTIF. WA Dept Ecology
OBSERVER AFFILIATION VALID RESULTS
POINT OF EMISSIONS Main Exhaust
HT OF DISCHARGE PT ~35'

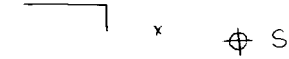
	Initial			Final
CLOCK TIME	16:00			16:06
OBSERVER LOCATION Distance to Discharge	~70'			
Direction from Discharge	SW			
Height of Observation Pt.	¢			
BACKGROUND DESC.	White overcast clouds			
WEATHER CONDITIONS Wind Conditions	~5mph - steady from West			
Wind Speed				
Ambient Temperature	~30°F			
SKY CONDITIONS (Clear, overcast, % clouds, etc.)	Overcast			
PLUME DESCRIPTION Color	None			
Distance Visible	None			
OTHER INFORMATION	Ambient Air - discharged after passing through multiple HEPA filters			

SUMMARY OF AVERAGE OPACITY

Set No.	TIME Start-End	OPACITY Sum	OPACITY Average
9-1	1600 - 1606	¢	¢

Readings ranged from: ¢ to ¢ % opacity.

The source (was/was not) in compliance with Dept Ecology at the time evaluation was made.



ET016.PF (061391)

OBSERVATION RECORD

COMPANY Westinghouse Hanford Company
LOCATION Richland, WA
TEST NUMBER 9-1
DATE 1/22/96
OBSERVER T. Pren
TYPE OF FACILITY ETF
POINT OF EMISSIONS Main Exhaust Stack

Hr	Min	Seconds				Steam plume (check if applicable)		Comments
		0	15	30	45	Attached	Detached	
1600	0	ϕ	ϕ	ϕ	ϕ			
	1	ϕ	ϕ	ϕ	ϕ			
	2	ϕ	ϕ	ϕ	ϕ			
	3	ϕ	ϕ	ϕ	ϕ			
	4	ϕ	ϕ	ϕ	ϕ			
	5	ϕ	ϕ	ϕ	ϕ			
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							
	26							
	27							
	28							
	29							

APPENDIX C:

Calibrations

Calibration Gas Certifications
Method 4 - Dry Gas Meter
Type K Stack Thermocouple

SO-CAL Airgas

SPECIALTY GAS DIVISION
11711 S. Alameda Street
Los Angeles, CA 90059
(213) 564-5711

ANALYTICAL REPORT - PRODUCT CERTIFICATION

TO:
Byrne Specialty Gas Co.

Date: 12 May 1995

P.O.: SP-4147-51604

+/- 1 Percent Analytical,
EPA Traceability Protocol For Assay And Certification
of Gaseous Calibration Standards Procedure G-1.

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
CC45548	Propane	3 PPM	3.3 PPM
	Air	Balance	Balance

Certification Period (months) : 36
Expiration Date : 10 May 1998
Cylinder Pressure: 2000 psia
DO NOT USE BELOW 150 PSIG

Claude J. Vahle
ANALYST

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (714) 653-6780 • FAX (714) 653-2430

REPORT OF ANALYSIS
NIST TRACEABLE GAS MIXTURES

ENVTE1
TO: RALPH MOLTZAU
ENVIRONMENTAL TECHNOLOGIES
2298 ALAHAO PLACE
BAY Q
HONOLULU, HI 96819-

DATE: 04/01/93

CUSTOMER ORDER NUMBER: ET90480

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CYLINDER NUMBER	COMPONENT	CONCENTRATION(v/v)	NIST TRACEABLE REFERENCE STANDARD
CC40174	Propane Ultrapure Air	4.79 ± 0.05 ppm Balance	VOLUMETRIC

ppm = umole/mole % = mole-%

The above analysis is traceable to the National Institute of Standards and Technology by intercomparison with the reference standard listed above.
Where indicated, volumetric and gravimetric reference standards are traceable thru use of our analytical balance. NIST Report No. NMAP 232.09/202491.

Analyst: M.S. Calhoun Approved: J.T. Marrin

The only liability of this company for use which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SO-CAL Airgas

BYRNE SPECIALTY GASES

pure and mixed gases - gas handling equipment - cryogenics

BYRNE
Byrne Specialty Gases, Inc.
118 S. Mead Street
Seattle, Washington 98108
(206) 764-4633

ANALYTICAL REPORT - PRODUCT CERTIFICATION

TO:
Byrne Specialty Gas Co.

Date: 28 April 1995

P.O.: SP-4147-51604

+/- 1 Percent Analytical,
EPA Traceability Protocol For Assay And Certification
of Gaseous Calibration Standards Procedure G-1.

CYLINDER NO.	CONSTITUENTS CONCENTRATION:	NOMINAL	ACTUAL
CC122183	Propane	8.5 PPM	9.67 PPM
	Air	Balance	Balance

Certification Period (months) : 36
Expiration Date : 28 April 1998
Cylinder Pressure: 2000 psia
DO NOT USE BELOW 150 PSIG

Claude J. Vahle ANALYST

VALID RESULTS: Meter Box and Critical Orifice Calibration Data Form

Calibration Date: 3/7/95 Meter Identification: 1694716

Calibrator: Tracy Prevo Barometric Pressure (Pb): 30.02 inches Hg

Orifice manometer setting (ΔH), in. H2O	Gas volume		Temperatures				Time (0), min	Yi	Differ from Average	ΔH@ in. H2O	Differ from Average	Flow Rate
	Wet test meter (Vw), ft3	Dry gas meter (Vd), ft3	Wet test meter (tw), °F	Dry gas meter								
				Inlet (tdi), °F	Outlet (tdo), °F	Average (td), °F						
0.81	2.072	2.000	67.0	74.0	60.0	67.0	4.33	1.0339	0.0005	1.9685	0.0153	0.48
0.81	2.063	2.000	67.4	75.5	65.5	70.5	4.29	1.0355	0.0021	1.9393	-0.0139	0.48
0.8	2.058	2.000	67.8	79.0	68.0	73.5	4.30	1.0381	0.0047	1.9257	-0.0275	0.48
1.04	5.072	5.000	68.5	82.4	72.4	77.4	9.42	1.0289	-0.0045	1.9689	0.0157	0.54
1.06	5.081	5.000	70.4	83.5	75.0	79.3	9.40	1.0306	-0.0028	1.9984	0.0452	0.54
1.04	5.110	5.000	74.8	81.7	77.9	79.8	9.46	1.0289	-0.0045	1.9942	0.0410	0.53
2.18	10.226	10.000	76.5	88.5	80.8	84.7	12.93	1.0327	-0.0007	1.9448	-0.0084	0.78
2.18	10.232	10.000	77.2	89.9	83.3	86.6	12.90	1.0356	0.0022	1.9318	-0.0214	0.78
3.56	12.217	12.000	78.8	98.2	86.1	92.2	12.08	1.0344	0.0010	1.9322	-0.0210	0.99
3.56	12.219	12.000	79.0	98.8	86.6	92.7	12.07	1.0351	0.0017	1.9281	-0.0251	0.99
							Average	1.0334		1.9532		
							Tolerance		< 0.02		< 0.2	

Vw = Gas volume passing through the wet test meter, ft3

Vd = Gas volume passing through the dry gas meter, ft3

tw = Temperature of the gas in the wet test meter, °F

tdi = Temperature of the gas at the inlet of the dry gas meter, °F

tdo = Temperature of the gas at the outlet of the dry gas meter, °F

td = Average temperature of the dry gas meter, obtained by averaging tdi and tdo, °F

ΔH = Pressure differential across the critical orifice, in. H20

Yi = Ratio of accuracy of wet test meter to dry gas meter for each calibration run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all ten calibration runs.

ΔH@i = Orifice pressure differential that gives 0.75 ft3/min of air at standard conditions for each calibration run.

Pb = Barometric pressure, in. Hg.

0 = Elapsed time for each calibration run.

VALID RESULTS: Thermocouple Calibration Form

Date: 1/19/96
Operator: T. Pino
Reference Thermometer: Mercury
Barometric Pressure: 30.68
Ambient Temperature: 44°F

TC #	ID	Reference Point	TC Reading	Ref Therm Reading	% Difference
1-C-24	Stack	Ice Water	32	32	0
		Boiling Water	211	212	-0.47
		Boiling Oil	340	342	-0.59

APPENDIX D:

Unit Operations

Unit Operations Conditions Graphs

APPENDIX E:

Quality Assurance

SI:414 Certificate of Completion
Manual Method 2,3,4 Calculation
Manual Method 25A RM Calculation

United States
Environmental Protection Agency

Air Pollution Training Institute

Tracy Allen Prevo

has successfully completed

COURSE # SI:414
QUALITY ASSURANCE FOR SOURCE EMISSION MEASUREMENTS

Chief, Air Pollution
Training Branch

Registrar
03-26-93 3.5 CEU

VALID RESULTS, EPA Method 2,3,4: Manual Stack Gas Volumetric Flow Rate Calculation Sheet

Client: Westinghouse Hanford Company
Test Date: 1/23/96
Operator: T. Prevo
Plant Location: Richland, WA
Source: Effluent Treatment Facility

Velocity and Moisture Test Runs Number 2 (@ 01:50 hours):

Dry Gas Molecular Weight (Md) *gram/gram-mole*

Md 28.90 **gm/gm-mole** = 0.44*(0.4 %CO2)+0.32*(20.9 %O2)+0.28(100-((0.4 %CO2)+(20.9 %O2)))

Corrected Water Collected Volume (Vwc(std)) *dry standard cubic feet:*

Vwc(std) 0.2824 **dscf** = 0.04707*((6.0 Vfinal)-(∅ Vinitial))

Corrected Silica Gel Collected Volume (Vwsg(std)) *dry standard cubic feet:*

Vwsg(std) 0.1650 **dscf** = 0.04715*((3.5 Wfinal)-(∅ Winitial))

Corrected Meter Volume (Vm(std)) *dry standard cubic feet:*

Vm(std) 21.260 **dscf** = (19.646 cubic feet)*(1.0334 Y)*((68 Tstd + 460)/(61.6 Tm + 460))*((30.90 Pbar + (0.7 dH/13.6)/(29.92 Pstd)

Stack Gas Moisture Content (Bws) *decimal*

Bws 0.0266 **decimal** = ((0.2824 Vwc(std))+(0.1650 Vwsg(std)))/((0.2824 Vwc(std))+(0.1650 Vwsg(std))+(21.260 Vm(std)))

Wet Gas Molecular Weight (Ms) *gram/gram-mole*

Ms 28.68 **gm/gm-mole** = (28.90 Md)*(1- 0.0266 Bws) + (18.0* 0.0266 Bws)

Stack Gas Velocity (Vs) *feet per second*

Vs 52.3 **feet/second** = 85.49*(0.99 Cp)*(0.7757 SQRT(DeltaP))*SQRT((100.1 Ts+460)/((30.90 Pbar+(-1.74 Pstatic/13.6))*(28.68 Ms)

Stack Gas Volumetric Flow Rate (Qs) *dry standard cubic feet per minute*

Qs 1,040 **dscfm** = 60*(1-0.0266 Bws)*(52.3 Vs)*(0.349 As)*((68 Tstd+460)/(100.1 Ts+460))*(((30.90 Pbar)+((-1.74 Pstatic)/13.6))/(29.92 Pstd))

Stack Area (As) *square feet*

As 0.349 **square feet** = (1/4)*(3.1416)*(8" Stack Diameter)*(8" Stack Diameter) /144 *square inches per square feet*

VALID RESULTS,INC. EPA Method 25A: Manual TOC Bias Calibration Correction Calculation

Client: Westinghouse Hanford Company
Test Date: 1/23/96
Operator: T. Prevo
Plant Location: Richland, WA
Source: Effluent Treatment Facility

Test Run Number 2:

Bias Calibration Corrected Effluent Gas Concentration (as Carbon)

C_{gas-C} 5.67 ppm = ((1.89 C_{gas-P})*3)

Bias Calibration Corrected Effluent Gas Concentration (as Propane)

C_{gas-P} 1.89 ppm = ((1.68 C_{avg-P} - -0.25 C_{o-P})*(9.67 C_{ma-P})/(9.6 C_{m-P} - -0.25 C_{o-P}))

Average Measured Gas Concentration

C_{avg-P} 1.68 ppm

Average of Initial and Final Zero Calibration Bias

C_{o-P} -0.25 ppm = ((0 Initial Zero Bias *ppm* + -0.5 Final Zero Bias *ppm*)/2)

Average of Initial and Final Upscale Calibration Bias

C_{m-P} 9.6 ppm = ((9.7 Initial Calibration Bias *ppm* + 9.5 Final Calibration Bias *ppm*)/2)

Actual Upscale Calibration Gas Concentration

C_{ma-P} 9.67 ppm

TOC Concentration (C_{TOC}) *milligrams per dry standard cubic meter*

C_{TOC} 0.010 grams/dscm = ((C_{gas-C} 5.67 ppm)*((44.0 g/g-mole)*(41,500)/((1,000,000 ng/mg)*(1,000 mg/gm))))

TOC Concentration (C_{TOC}) *pounds per dry standard cubic foot*

C_{TOC} 0.0044 grains/dscf = ((0.010 grams/dscm)*(15.43 grains/gm)/(35.32 cubic feet per cubic meter))

TOC Emission Rate (ER_{TOC}) *pounds per hour*

ER_{TOC} 0.039 lb/hr = ((0.0044 grains/dscf)*(1,040 dscf/m)*(60 min/hr)/(7,000 grains/lb))

TOC Emission Rate (ER_{TOC}) *grams per minute*

ER_{TOC} 0.30 gm/m = ((0.039 lb/hr)*(7,000 grains/lb)/((15.4 grains/gram)*(60 min/hr)))

TOC Emission Rate (ER_{TOC}) *tons per hour*

ER_{TOC} 0.17 tons/yr = ((0.039 lb/hr)*(24 hr/day)*(365 days/year)/(2,000 lbs/ton))

WHC-SD-LEF-TRP-001
Revision 0

242-A Evaporator/Plutonium Uranium Extraction (PUREX) Effluent Treatment Facility (ETF) Nonradioactive Air Emissions Test Report

Prepared for the U.S. Department of Energy
Office of Environmental Restoration and
Waste Management

Westinghouse Hanford Company Richland, Washington

Hanford Operations and Engineering Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

Approved for Public Release

DISTRIBUTION SHEET

To	From	Page 1 of 1
DISTRIBUTION	WHC Environmental Services JS Hill	Date 5-10-96
Project Title/Work Order		EDT No. 615722
242-A Evaporator/Plutonium Uranium Extraction (PUREX) Effluent Treatment Facility (ETF) Nonradioactive Air Emissions Test Report		ECN No.

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