Bruce B. Ferguson, CIH

Registration

Certified Industrial Hygienist, ABIH

Fields of Competence

Overall direction and management of projects; extensive experience in air quality testing and studies; industrial hygiene investigations and air quality studies; professional services associated with management of hazardous waste and asbestos; expert witness for environmental matters; research projects associated with chromatographic analysis and reduced sulfur analysis.

Experience Summary

Broadly based experience as a consultant and researcher. Extensive training in environmental regulations in all media; compliance management project experience in pulp and paper, chemicals and petrochemicals, oil and gas production, food and electronics manufacturing. Dr. Ferguson has directed more than 800 source emission tests for hydrocarbons and sulfur species from petroleum refineries, kraft pulp mills and steel mills. Directed over 250 routine emission tests at refineries, foundries, pharmaceutical plants, magnetic tape coating plants and high density urban areas. Directed over 400 tests utilizing EPA Reference Methods of Particulate, NO_x, SO_2, and other routine compounds.

Credentials

B. S., Chemistry/Mathematics – Athens College (1968)
M. S., Physical Chemistry – Vanderbilt University (1973)
Ph.D., Physical Chemistry – Vanderbilt University (1974)
American Chemical Society
Air Pollution Control Association

Employment History

1983-Present	WESTON
1977-1983	Harmon Engineering and Testing
1974-1977	PBR Electronics
1972-1973	College Grove Smelter

Key Projects

Project Manager for site assessments and surveys for the Navy Assessment and Control of Installation Pollutants (NACIP) program. Projects were conducted in South Carolina, Tennessee and Texas. The multi-faceted programs encompassed a variety of waste disposal practices and waste site locations at various Naval Installations.

Served as Project Manager for a $517,000 three year NASA contract at Marshall Space Flight Center in Alabama. He directed the efforts of seven full time people to monitor contamination of controlled environments, compressed gases, fuel, life support gases, source emissions, wastewater, plating solutions and rocket booster propellants. As Senior Scientist on the project, he developed a technique to trap and analyze hydrocarbons from contaminated areas in the sub ppb range.

Project Director for asbestos survey and abatement project for the development of methods/technology for containment and/or remedial action at Wright-Patterson Air Force Base. Such methods involve testing, identification and recording of potential hazards, documentation and program implementation.

Principal-in-Charge for a full-scale asbestos survey of 10 U. S. Army installations covering 2.2 million sq. ft. in the Republic of Korea. Major work tasks included the characterization of various hazards and prioritization of recommendations for the development of treatment methods.

Served as Principal Investigator for a U. S. Army Project to develop a transportable gas chromatograph-mass spectrometer. The instrument was used to monitor emissions from solid rocket firings.

Served as Principal Scientist for two EPA contracts in Research Triangle Park, North Carolina. He directed laboratory and field evaluations of EPA Reference Methods 15 and 16. Other tasks under these contracts involved long-term evaluation of process rate monitors; review and editing of QA procedures for EPA Reference Methods 13A and 13B; long-term laboratory and field evaluation of CO and H_2S CEM's and report review.

Principal Investigator for a multi-year EPA contract for development of source tests methodology for reduced sulfur compounds at kraft pulp mills and petroleum refineries. Tasks assigned involved evaluating methodology, developing new methodology and field validating the new procedures. As a result of the contract, new methodology was presented in the Federal Register.

Served as Project Director for a project requiring claims documentation testing on an indoor air quality cleaning device. Testing was performed on the device in a closed chamber to demonstrate the reduction and removal deficiency for such compounds as light weight hydrocarbons, formaldehyde, sulfur dioxide, hydrogen sulfide and other common pollutants. the project resulted in information submitted to the Federal Trade Commission to document the manufacturer's claim.

Served as Project Director for developing VOC emission inventories and for defining Reasonably Available Control Technology (RACT) for VOC emissions; developed permit documentation for VOC incinerators and conducted equipment evaluation and cost studies for projects. These projects have been performed for such clients as Upjohn Chemical, Republic Steel, Richmond Gravure, Southern Wood Piedmont and International Paper Company.

Prepared RCRA-required ground water sampling, monitoring and compliance plans for companies such as Prestolite, Wolverine, Courtaulds, Fruehauf and TR Miller Company in Alabama; Merck Pharmaceuticals, International Paper Company and Mount Pine Wood Treating in Texas, Missouri, Virginia, Georgia, Mississippi, Louisiana and Arkansas.

Directed efforts of a commercial laboratory to obtain accreditation for all parameters by the American Industrial Hygiene Association. Directed the firm's participation in the NIOSH proficiency analytical testing programs and the EPA Round Robin test programs, and subsequent accreditation under the National Institute of Standards and Technology's (NIST) National Voluntary Laboratory Accreditation Program (NVLAP).

Publications

Elam, D. E. and B. B. Ferguson. (1985) "Quality Assurance Aspects of Total Reduced Sulfur Continuous Emission Monitoring Systems." Continuous Emission Monitor Specialty Conference of the Air Pollution Control Association. Baltimore, MD.

Ferguson, B. B. (1985) "TRS Continuous Emission Monitoring in the Pulp and Paper Industry - One Year Later." Engineering Foundation Conference on Source Testing, Santa Barbara, CA.

Margeson, J. H., J. E. Knoll, M. R. Midgett, B. B. Ferguson and P. J. Schworer. (1985) "A Manual Method for Measurement of Reduced Sulfur Compounds." J. of the Air Pollution Control Association, 35(12), 1280.

Elam, D. E. and B. B. Ferguson. (1983) "Quality Assurance Requirements of Total Reduced Sulfur Emission Testing." Specialty Conference on Measurement and Monitoring of Non-Criteria (Toxic) Contaminants in Air. Air Pollution Control Association, Chicago, IL.

Ferguson, B. B. (1982) "Role of Analytical Laboratory in Hazardous Waste Management." The Second Ohio Environmental Engineering Conference.

Reece, J. W., A. R. Barbin, J. D. Sterrett and B. B. Ferguson. (1981) "Cyclonic Flow in a Ventrui." The 2nd Symposium on Flow: Its Measurement and Control in Science and Industry. St. Louis, MO. Sponsored by ASME and ISA.

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Lee A. Cecchi

Fields of Competence

Operations of Gas Chromatograph (GC) and associated equipment for source emission evaluation; performance specifications (PS) 1-5 on continuous emission monitoring systems (CEMS); coordination and performance of source sampling according to EPA and NIOSH methodology; data quality assurance; data reduction; report preparation; working knowledge of various IBM compatible software and of statistical analysis system (SAS) programming.

Experience Summary

Experienced in EPA Reference Methods 1-7, 10, 15, 16, 18, 25, 25A, and PS 1-5. Prepared quotations, coordinated and conducted projects associated with total reduced sulfur (TRS) emission testing. Coordinated and conducted projects involving on-site analysis of organic compounds by GC. Repair and modification of instruments in the field. Compiled emission, compliance, and PS test reports.

Credentials

B.S., Vocational Agriculture – Auburn University (1982)
M.S., Animal Science – Auburn University (1986)
Phi Kappa Phi
Kappa Delta Pi
Gamma Sigma Delta
Alpha Tau Alpha

Employment History

1987-Present	WESTON
1986-1987	Royal Sausage Company
1984-1986	Auburn University
1982-1983	Hinton Beef and Provision

Key Projects

Coordinated and conducted mill-wide inventory of TRS emissions in kraft pulping operations in Florida, Kentucky and South Carolina. Data utilized for odor reduction and modeling.

Coordinated and served as test team leader of an emission inventory study of units associated with carbon black manufacturing facilities in Arkansas, Louisiana, and West Virginia. Test parameters included: SO_2, NO_x, O_2, CO_2, CO, methane, acetylene and TRS.

Coordinated and served as test team leader for on-site isopropanol emission and scrubber efficiency testing using EPA Method 18 at a gunpowder manufacturing facility.

Served as test team leader in acetone and isopropanol condenser efficiency testing using EPA Method 18 at a copper rod facility.

Successfully solved another test team's technical problems involving EPA Methods 25 and 25A at a circuit board manufacturing facility.

Coordinated and served as test team leader for conducting fiber removal efficiency tests on digester blow gas cyclones.

Coordinated and solely conducted PS test in Idaho. Test parameters included EPA reference methodology to fulfill requirements of PS 1-5.

Served as test team leader in TRS testing in order to locate sulfidity loss problems at a facility in New Hampshire. Successfully located the primary source of sulfur loss.

Successfully modified existing equipment for EPA Method 25A analysis. Succesfully modified existing equipment for carbon disulfide in toluene analysis. Significantly reduced carbon disulfide analysis time.

Coordinated and served as test team leader for conducting TRS compliance and PS tests on recovery boilers, smelt dissolving tank vents, tall oil reactors, and lime kilns for numerous clients in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Maine, Mississippi, South Carolina and Texas.

Significantly decreased data reduction time by designing and implementing electronic spreadsheets for velocity, particulate, NO_x, SO_2 and TRS calculations.

Publications

Cecchi, L. A., D. L. Huffman, W. R. Egbert and W. R. Jones (1987). "Chemical and Physical Characteristics of Beef Chuck Muscles." (In Review).

Cecchi, L. A., D. L. Huffman, P. M. Brown, W. R. Egbert and W. R. Jones, (1986). "Chemical and Physical Analyses for Characterization of Beef Chuck Muscles." Proc Recip Meat Conference. (In Press).

Cecchi, L.A., D. L. Huffman and J. C. Cortray (1985). "Processing of Hams After Various Conditioning Times." J. of Animal Science. 61:19 (Abstric.)

Cecchi, L. A., D. L. Huffman and J. C. Cortray (1985). "Hot Processing of Hams Proves Successful." Highlights of Agricultural Research. 32(4):13.

Michael E. Steele

Fields of Competence

Project management; supervision and performance of air quality testing; preparation of emission inventories; financial analysis; engineering evaluation of emission control equipment.

Experience Summary

Mr. Steele has diverse experience in chemical engineering and process design in both the manufacturing sector and in environmental pollution control. He specializes in standard reference method testing, emission inventories, odor abatement studies, permit assistance, proposal preparation and engneering evaluations for a variety of industrial and government clients.

Credentials

B. S., Chemical Engineering – Pennsylvania State University (1981)
M. B. A., Operations Research and Production Management – University of Pittsburgh (1982)
Source Evaluation Society

Employment History

1986-Present	WESTON
1983-1986	Martin Marietta Energy Systems, Inc.
1982-1983	Union Carbide Corporation

Key Projects

Project Manager on an incinerator evaluation study for a circuit board manufacturer. Specific responsibilities included evaluation of the incinerator, recommendations for remedial action, supervision of the field testing effort and report preparation. Served as client's representative at meetings with the state regulatory agency.

Project Manager for a reasonably available control technology (RACT) evaluation for volatile organic compound (VOC) emissions from an offset printing facility. Specific responsibilities included determining the current status of production and emissions, determining VOC collection strategies and control options. Various methods of reducing the VOC from the air were considered in light of maintaining product quality and the economics of the control.

Project Manager for a mill-wide inventory at a large southern pulp and paper mill. Specific responsibilities included the coordination and supervision of the testing effort which encompassed 19 sources and 9 parameters. In addition, performance specification testing on four total reduced sulfur (TRS) and two sulfur dioxide (SO_2) continuous emission monitoring systems (CEMS) were also required. Preparation, field testing and report submittal were completed to the client's approval within the required 30 days.

Publications

Steele, M. E. and O. Fick, (1988) "Reasonably Available Control Technology for VOC Control from a Lithographic Printing Facility." Presented at the TAPPI Environmental Conference, Charleston, SC.

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APPENDIX B. NCG INCINERATOR - TRS FIELD DATA

INSTRUMENT DATA

CLIENT QT
PROJECT NO. 0414-09-01
SOURCE IDCIN
DATE 1/25

GAS PRESSURE/FLOW	TEMPERATURE	COLUMNS
H_2: 30 psi	TRAILER: 70°F	SAMPLE LOOP: 5" 40/100d
AIR: 19 psi	DETECTOR: 110°C	BHT: 100 1/4 × 6'
N_2-1: 30 psi	COLUMN: 65°C	~~BPE:~~ 13 HT 100 1/4 × 1'
N_2-2:		

TIMER PROGRAM

EVENT	1	2	3	4
PROGRAM	1	2	3	4
CIRCUIT	1	2	3	4
ON (min)	0	1	1	5
ON (sec)	03	48	51	30
VARY (min)	1000	600	600	600
OFF (min)	0	1	1	5
OFF (sec)	05	50	54	35
VARY (min)	600	600	600	600

REMARKS

INTEGRATOR PROGRAM

```
 IST: METH 0

:UN PRMTRS
:ERO   =  10
ITT 2↑ =  4
:HT SP =  0.5
?K WD  =  0.04
IHRSH  =  2
AR REJ =  5000

RPRT OPTNS
  2. RF UNC PKS=       0.0000
  3. MUL FACTOR=       1.0000
  4. PK HEIGHT MODE        NO
  5. EXTEND RT             NC
  6. RPRT UNC PKS          NC

TIME TBL :
   1.74 INTG # =  9
   2.00 PK WD  =  0.16
   2.10 INTG # = -9
   5.10 STOP
```

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CLIENT AT   PROJECT NO. 0414-09-01
SOURCE IDC, D   DATE 1/24

CMPD H2S CURVE NO. 1

TIME	CONC	RESPONSE	CALC CONC	% DIFF
0714	4.44	1.43×10^7	4.91	+1
0742	1.85	1.55×10^6	1.83	-1
1124	3.27	5.55×10^6	3.22	-1
1142	1.16	5.75×10^5	1.17	+1

SLOPE 2.25 Y int 4.01×10^5
CONC @ 5000 = 0.14

CMPD MeSH CURVE NO. 1

TIME	CONC	RESPONSE	CALC CONC	% DIFF
0718	2.02	1.53×10^6	2.08	+3
0742	0.77	2.34×10^5	0.77	0
1124	1.37	6.41×10^5	1.31	-4
1142	0.48	9.66×10^4	0.48	0

SLOPE 1.90 Y int 3.42×10^5
CONC @ 5000 → 0.10

CMPD DMS CURVE NO. 1

TIME	CONC	RESPONSE	CALC CONC	% DIFF
0714	2.63	2.63×10^6	2.77	+5
0742	1.00	4.24×10^5	1.02	+2
1124	1.78	1.01×10^6	1.64	-8
1142	0.63	1.79×10^5	0.64	+1

SLOPE 1.87 Y int 4.09×10^5
CONC @ 5000 → 0.09

CMPD DMDS CURVE NO. 1

TIME	CONC	RESPONSE	CALC CONC	
0714	1.44	1.22×10^6	1.53	+6
0742	0.55	2.43×10^5	0.57	+4
1124	0.97	4.92×10^5	0.88	-9

SLOPE 1.65 Y int 6.08×10^5
CONC @ 5000 → 0.05

RUN SUMMARY

RUN NO	1-A	1-B	1-C		
AVG MEAS TRS CONC, ppm	<0.43	<0.43	<0.43		
SYS CORR FACTOR	.972	.972	.972		
CORR TRS CONC, ppm	<0.44	<0.44	<0.44		
OXYGEN CONC, %	18.7	18.8	18.5		
OXYGEN CORR FACTOR	4.78	5.00	4.40		
OXYGEN CORRECTED TRS, ppm	<2.10	<2.20	<1.94		

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REDUCED SULFUR FIELD DATA

Client Georgia Pacific Source Excin Date 1/25

Cal Curve 1 Inst Data 1 Recovery Data 1 Analyst cc

	TIME	H_2S AREA	H_2S CONC (ppm)	CH_3SH AREA	CH_3SH CONC (ppm)	DMS AREA	DMS CONC (ppm)	DMDS AREA	DMDS CONC (ppm)	TRS
	0814	ND	<0.14	ND	<0.10	ND	<0.09	ND	<0.05	<0.43
	0824									
	0830									
	0836									
1A	0842									
	0848									
	0854									
	0900									
	0906									
	0912									
	0918	ND	<0.14	ND	<0.10	ND	<0.09	ND	<0.05	<0.43
	0924									
	0930									
	0936									
1B	0942									
	0948									
	0954									
	1000									
	1006									
	1012									
	1018	ND	<0.14	ND	<0.10	ND	<0.04	ND	<0.05	<0.43
	1024									
	1030									
	1036									
1C	1042									
	1048									
	1054									
	1100									
	1106									
	1112									

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WESTON

[illegible] #1 [illegible] 0414-09-01

SOURCE Incin DATE 1/24

CMPD H2S CURVE NO. 2

TIME	CONC	RESPONSE	CALC CONC	% DIFF
1124	3.27	5.55×10^6	3.14	-4
1142	1.16	5.75×10^5	1.12	-4
1512	4.92	1.51×10^7	4.45	+1
1530	1.84	2.03×10^6	1.98	+8

SLOPE 2.19 Y int 4.52×10^5

CONC @ 5000 = 0.13

CMPD MeSH CURVE NO. 2

TIME	CONC	RESPONSE	CALC CONC	% DIFF
1124	1.37	6.41×10^5	1.31	-4
1142	0.48	9.06×10^4	0.48	0
1512	2.06	1.56×10^6	2.11	+2
1530	0.77	2.43×10^5	0.78	+2

SLOPE 1.88 Y int 3.84×10^5

CONC @ 5000 = 0.10

CMPD DMS CURVE NO. 2

TIME	CONC	RESPONSE	CALC CONC	% DIFF
1124	1.78	1.01×10^6	1.69	-5
1145	0.63	1.79×10^5	0.62	-1
1512	2.08	2.36×10^6	2.75	+3
1530	1.00	4.30×10^5	1.03	+3

SLOPE 1.74 Y int 4.06×10^5

CONC @ 5000 = 0.08

CMPD DMDS CURVE NO. 2

TIME	CONC	RESPONSE	CALC CONC	% DIFF
1124	0.97	4.92×10^5	0.92	-5
1512	1.46	1.03×10^6	1.51	+3
1530	0.55	2.38×10^5	0.56	+2

SLOPE 1.49 Y int 6.59×10^5

CONC @ 5000 = 0.04

RUN SUMMARY

RUN NO	2-A	2-B	2-C		
AVG MEAS TRS CONC, ppm	<0.39	<0.39	<0.39		
SYS CORR FACTOR	.880	.880	.880		
CORR TRS CONC, ppm	<0.44	<0.44	<0.44		
OXYGEN CONC, %	18.2	18.1	18.9		
OXYGEN CORR FACTOR	3.93	3.79	5.24		
OXYGEN CORRECTED TRS, ppm	<1.73	<1.67	<2.31		

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REDUCED SULFUR FIELD DATA

Client #1 Source Inlet Date 1/25

Cal Curve 1 Inst Data 1 Recovery Data ~ Analyst cc

	TIME	H_2S AREA	H_2S CONC (ppm)	CH_3SH AREA	CH_3SH CONC (ppm)	DMS AREA	DMS CONC (ppm)	DMDS AREA	DMDS CONC (ppm)	TRS
	1206	ND	<0.13	ND	<0.10	ND	<0.04	ND	<0.04	<0.34
	1212									
	1218									
	1224									
2-A	1230									
	1236									
	1242									
	1248									
	1254	↓								
	1300	ND		↓		↓		↓		
	1306	ND	<0.13	ND	<0.10	ND	<0.04	ND	<0.04	<0.34
	1312									
	1318									
	1324									
2-B	1330									
	1336									
	1342									
	1348									
	1354	↓								
	1400	ND		↓		↓		↓		
	1406	ND	<0.13	ND	<0.10	ND	<0.04	ND	<0.04	<0.34
	1412									
	1418									
2-C	1424									
	1430									
	1436									
	1442									
	1448									
	1454									
	1500	↓		↓		↓		↓		

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WESTON

CLIENT QT
SOURCE Incid

0414-09-01
1/25

CMPD H2S CURVE NO. 3

TIME	CONC	RESPONSE	CALC CONC	% DIFF
1512	4.92	1.51x10^7	4.86	-1
1530	1.84	2.03x10^6	1.94	+5
1906	2.89	4.80x10^6	2.84	-1
1924	1.21	6.71x10^5	1.17	-3

SLOPE 2.18 Y int 4.78x10^5
CONC @ 5000 = 0.12

CMPD MeSH CURVE NO. 3

TIME	CONC	RESPONSE	CALC CONC	% DIFF
1512	2.06	1.56x10^6	2.11	+2
1530	0.77	2.43x10^5	0.77	0
1906	1.23	5.30x10^5	1.18	-4
1924	0.50	1.10x10^5	0.51	+1

SLOPE 1.85 Y int 3.90x10^5
CONC @ 5000 = 0.10

CMPD DMS CURVE NO. 3

TIME	CONC	RESPONSE	CALC CONC	% DIFF
1512	2.68	2.36x10^6	2.72	+1
1530	1.00	4.30x10^5	1.03	+3
1906	1.61	8.82x10^5	1.55	-4
1924	0.66	1.94x10^5	0.65	-1

SLOPE 1.76 Y int 4.08x10^5
CONC @ 5000 = 0.08

CMPD DMDS CURVE NO. 3

TIME	CONC	RESPONSE	CALC CONC	% DIFF
1512	1.46	1.03x10^6	1.50	+2
1530	0.55	2.38x10^5	0.56	+3
1906	~~[illegible]~~ 0.88	4.30x10^5	0.84	-5

SLOPE 1.50 Y int 5.62x10^5
CONC @ 5000 = 0.04

RUN SUMMARY

RUN NO	3-A	3-B	3-C		
AVG MEAS TRS CONC, ppm	<0.38	<0.38	<0.38		
SYS CORR FACTOR	.880	.880	.880		
CORR TRS CONC, ppm	<0.43	<0.43	<0.43		
OXYGEN CONC, %	14.8	14.8	14.8		
OXYGEN CORR FACTOR	5.00	5.00	5.00		
OXYGEN CORRECTED TRS, ppm	<2.15	<2.15	<2.15		

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WESTON

REDUCED SULFUR FIELD DATA

Client [illegible] Source [illegible] Date 1/25

Cal Curve 3 Inst Data 1 Recovery Data 3 Analyst [illegible]

	TIME	H_2S AREA	H_2S CONC (ppm)	CH_3SH AREA	CH_3SH CONC (ppm)	DMS AREA	DMS CONC (ppm)	DMDS AREA	DMDS CONC (ppm)	TRS
	1600	1.03×10⁴	0.17	ND	<0.10	ND	<0.08	ND	<0.04	
	1606	1.09×10⁴	0.18							
	1612	ND	<0.12							<0.38
	1618									
3A	1624									
	1630	↓								
	1636	2.12×10⁴	0.24							
	1642	ND								
	1648									
	1654	↓		↓		↓		↓		
	1700	ND	<0.12	ND	<0.10	ND	<0.08	ND	<0.04	<0.38
	1706									
	1712									
	1718									
3B	1724									
	1730									
	1736									
	1742									
	1748									
	1754	↓		↓		↓		↓		
	1800	ND	<0.12	ND	<0.10	ND	<0.08	ND	<0.04	<0.38
	1806									
	1812									
3C	1818									
	1824									
	1830									
	1836									
	1842									
	1848									
	1854	↓		↓		↓		↓		

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WESTON

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CLIENT Georgia Pacific [illegible] 0414-09-01
SOURCE Iowa DATE 1/25/90

COMPOUND	H2S	MeSH	DMS	DMDS	
PERMEATION RATE (nL/min)	886.3	370.3	481.7	263.6	75
TUBE NUMBER	89-38090	28-40474	82-40477	82-40478	
RETENTION TIME (min)	0.59	1.54	3.11	3.90	29.99

TIME	FLOW (mL/min)	CMPD	[illegible] CONC. (ppm)	AREA (mV-sec) 1	2	3	AVG.		[illegible]
0718	183	H2S	4.84	1.41	1.45	1.43	1.43	x10^7	
		MeSH	2.02	1.48	1.59	1.53	1.53	x10^6	
		DMS	2.63	2.89	2.55	2.44	2.63	x10^6	
		DMDS	1.44	1.38	1.18	1.09	1.22	x10^6	
0742	480	H2S	1.85	1.53	1.58	1.64	1.55	x10^6	
		MeSH	0.77	2.34	2.36	2.32	2.34	x10^5	
		DMS	1.00	4.09	4.38	4.24	4.24	x10^5	
		DMDS	0.55	-	2.36	2.49	2.43	x10^5	
1124	271	H2S	3.27	5.52	5.58	5.55	5.55	x10^6	
		MeSH	1.37	6.37	6.49	6.38	6.41	x10^5	
		DMS	1.78	1.01	1.02	1.01	1.01	x10^6	
		DMDS	0.97	4.97	4.82	4.98	4.92	x10^5	
1142	767	H2S	1.16	5.45	5.64	5.71	5.75	x10^5	
		MeSH	0.48	9.43	10.4	9.15	9.66	x10^4	
		DMS	0.63	1.42	1.46	1.59	1.79	x10^4	
		DMDS	0.34	—	-	—	—		
1512	180	H2S	4.92	1.45	1.51	1.56	1.51	x10^7	
		MeSH	2.06	1.51	1.58	1.58	1.56	x10^6	
		DMS	2.68	2.30	2.39	2.38	2.36	x10^6	
		DMDS	1.46	1.05	1.04	9.88	1.03	x10^6	

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[illegible]

[illegible]

[illegible] concentration in ppm

[illegible] (nL/min)

[illegible]

$$[illegible]\ 1240\,\frac{nL}{min} \times \frac{22.4\ L}{[illegible]\ g/mole} \times \frac{460 + 75}{492} \times \frac{29.92}{29.99} = 886.3\,\frac{nL}{min}$$

$$[illegible]\ 733\,\frac{nL}{min} \times \frac{22.4\ L}{[illegible]\ g/mole} \times \frac{460 + 75}{492} \times \frac{29.92}{29.99} = 370.3\,\frac{nL}{min}$$

$$[illegible]\ 1231\,\frac{nL}{min} \times \frac{22.4\ L}{[illegible]\ g/mole} \times \frac{460 + 75}{492} \times \frac{29.92}{29.99} = 481.7\,\frac{nL}{min}$$

$$[illegible]\ 1022\,\frac{nL}{min} \times \frac{22.4\ L}{94.2\ g/mole} \times \frac{460 + 75}{492} \times \frac{29.92}{29.99} = 263.6\,\frac{nL}{min}$$

$$[illegible]\ \frac{\_\_\_\_\ nL}{min} \times \frac{22.4\ L}{[illegible]\ g/mole} \times \frac{460 +}{492} \times \frac{29.92}{\_\_\_\_} = \_\_\_\_\,\frac{nL}{min}$$

$$CS_2\ \frac{\_\_\_\_\ nL}{min} \times \frac{22.4\ L}{76.1\ g/mole} \times \frac{460 +}{492} \times \frac{29.92}{\_\_\_\_} = \_\_\_\_\,\frac{nL}{min}$$

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CLIENT 47 JOB NO. 0414-09-01

SITE Fpcin DATE 1/25

COMPOUND	H_2S	MeSH	DMS	DMDS	
PERMEATION RATE (nL/min)	886.3	370.3	481.7	263.6	75
TUBE NUMBER	89-38090	28-40474	82-40477	82-40478	
RETENTION TIME (min)	0.59	1.54	3.11	3.90	29.99

TIME	FLOW (mL/min)	CMPD	INJECT CONC. (ppm)	AREA (uV-sec) 1	2	3	AVG.	
1530	482	H_2S	1.84	1.96	2.20	1.93	2.03	x10^6
		MeSH	0.77	2.57	2.22	2.50	2.43	x10^5
		DMS	1.00	4.25	4.35	4.30	4.30	x10^5
		DMDS	0.55	2.45	2.57	2.12	2.38	x10^5
1906	300	H_2S	2.84	4.74	4.74	4.91	4.80	x10^6
		MeSH	1.23	5.40	5.50	4.94	5.30	x10^5
		DMS	1.61	~~2.87~~	4.75	8.89	4.82	x10^5
		DMDS	0.88	—	4.30	4.29	4.30	x10^5
1924	735	H_2S	1.21	6.77	6.83	6.54	6.71	x10^5
		MeSH	0.50	1.04	1.15	1.12	1.10	x10^5
		DMS	0.06	—	1.90	1.98	1.94	x10^5
		DMDS	0.36	—	—	—	—	

Page ____ of ____

WESTON

CLIENT EP

SOURCE Inlet

TEST NO. 0414-09-01

DATE 1/25/90

	TRACE	DILUENT	TOTAL	INSTRUMENT DATA
F.M. READING	n/a	n/a	n/a	CALIBRATION NUMBER /
FLOW (L/min)	↓	↓	↓	TIME BEGAN/TIME END
CONC (ppm)				[✓ PRE]/POST RUN NO. 1

TIME	PEAK AREA	AVE AREA	MEAS CONC	REMARKS/NOTES
0410	7.27×10^6			
0411	7.44×10^6	7.24×10^6	3.64	TRACE ⇒ Cyl
0412	7.13×10^6			
0755	7.57×10^6			
0756	7.57×10^6	7.62×10^6	3.71	TRACE ⇒ GC
0757	7.73×10^6			
				Recovery = 98.1%

	TRACE	DILUENT	TOTAL	INSTRUMENT DATA
F.M. READING	n/a	n/a	n/a	CALIBRATION NUMBER /
FLOW (L/min)	↓	↓	↓	TIME BEGAN/TIME END
CONC (ppm)				PRE/[✓ POST] RUN NO. 1

TIME	PEAK AREA	AVE AREA	MEAS CONC	REMARKS/NOTES
1155	5.19×10^6			
1157	5.20×10^6	5.19×10^6	3.13	TRACE ⇒ Cyl
1158	5.17×10^6			
1201	5.53×10^6			
1202	5.54×10^6	5.53×10^6	3.22	TRACE ⇒ GC
1203	5.52×10^6			
				Recovery = 97.2%

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CLIENT φP

SOURCE Inlet

PROJECT NO. 0414-09-01

DATE 1/26

	TRACE	DILUENT	TOTAL	INSTRUMENT DATA	1
ROT. READING	N/A	N/A	N/A	CALIBRATION NUMBER	2
FLOW (L/min)	↓	↓	↓	TIME BEGAN/TIME END	
CONC (ppm)	↓	↓	↓	PRE/[✓ POST] RUN NO.	2

TIME	PEAK AREA	AVE AREA	MEAS CONC	REMARKS/NOTES
1544	3.36×10^6			
1545	3.52×10^6	3.59×10^6	2.57	TRACE ⇒ System
1547	3.90×10^6			
1549	4.81×10^6			
1550	4.62×10^6	4.76×10^6	2.92	TRACE ⇒ GC
1553	4.84×10^6			
				Recovery = 88.0%

	TRACE	DILUENT	TOTAL	INSTRUMENT DATA	1
ROT. READING	N/A	N/A	N/A	CALIBRATION NUMBER	3
FLOW (L/min)	↓	↓	↓	TIME BEGAN/TIME END	
CONC (ppm)	↓	↓	↓	PRE/[✓ POST] RUN NO.	3

TIME	PEAK AREA	AVE AREA	MEAS CONC	REMARKS/NOTES
1937	9.41×10^6			
1939	9.47×10^6	9.39×10^6	3.41	TRACE ⇒ System
1941	9.30×10^6			
1944	1.17×10^7			
1948	1.10×10^7	1.14×10^7	4.27	TRACE ⇒ GC
1949	1.15×10^7			
				Recovery = 91.6%

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WESTON

TAR-08-9/84

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ORSAT DATA

CLIENT Georgia Pacific PROJECT NO. 0414-09-01

SOURCE Inlet DATE 1/25

RUN NO. TIME		TRIAL 1	TRIAL 2	TRIAL 3	TRIAL 4	MEAN
Ambient Air	CO_2	0.0	0.0			
	TOTAL	20.4	20.4			
	O_2	20.4	20.4			
Run 1A 0814-0914	CO_2	1.0	1.0	1.0		
	TOTAL	19.7	19.6	19.7		
	O_2	18.7	18.6	18.7		18.7
Run 1B 0914-1016	CO_2	1.0	1.2	1.0		
	TOTAL	19.8	20.0	19.4		
	O_2	18.8	18.8	18.4		18.8
Run 1C 1016-1118	CO_2	1.2	1.2	1.2		
	TOTAL	19.7	19.7	19.7		
	O_2	18.5	18.5	18.5		18.5
Run 2A 1206-1306	CO_2	1.0	1.0	1.0		
	TOTAL	19.2	19.1	19.2		
	O_2	18.2	18.1	18.2		18.2
Run-2B 1306-1406	CO_2	1.0	1.0	1.0		
	TOTAL	19.1	19.2	19.1		
	O_2	18.1	18.2	18.1		18.1
Run 2C 1406 1506	CO_2	1.0	1.0	1.0		
	TOTAL	19.9	19.8	19.9		
	O_2	18.9	18.8	18.9		18.9

Page ____ of ____

WESTON

ORSAT DATA

CLIENT ØP PROJECT NO. 0414-09-01

SOURCE Irwin DATE 9/25

RUN NO. TIME		TRIAL 1	TRIAL 2	TRIAL 3	TRIAL 4	MEAN
Ambient Air	CO_2	0.0				
	TOTAL	20.4				
	O_2	20.4				
Run 3A 1600-1700	CO_2	1.0	1.0	1.0		
	TOTAL	19.4	19.4	19.4		
	O_2	18.4	18.4	18.8		18.8
Run 3B 1700-1800	CO_2	1.10	1.10	1.0		
	TOTAL	19.9	19.9	19.8		
	O_2	18.8	18.8	18.8		18.8
Run 3C 1800-1900	CO_2	1.0	1.0	1.0		
	TOTAL	19.7	19.8	19.8		
	O_2	18.7	18.8	18.8		18.8
	CO_2					
	TOTAL					
	O_2					
	CO_2					
	TOTAL					
	O_2					
	CO_2					
	TOTAL					
	O_2					

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TAR-04-9/84

WESTON

APPENDIX C. NCG INCINERATOR - PARTICULATE FIELD DATA AND LABORATORY DATA

7 10 11

PRELIMINARY VELOCITY DATA

CLIENT Georgia Pacific

ATC PROJECT NO. 0414-09

SOURCE Incinerator

DATE 1-23-90

DUCT DATA

Dist from far wall to outside of port 91 in.

Nipple length 53 in.

Depth of duct 38 in.

Width of duct (rec) — in.

Area of duct 7.88 ft^2

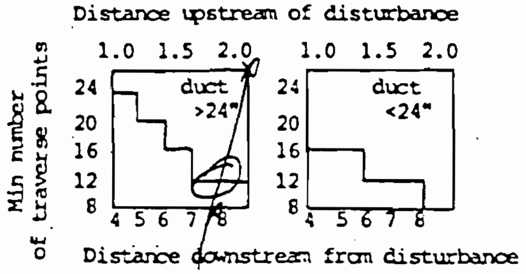
Equivalent diameter $\frac{2 \times \text{depth} \times \text{width}}{\text{depth} + \text{width}}$

$\frac{2(\quad)(\quad)}{(\quad)+(\quad)}$ = ____

Dist from ports to nearest disturbance

	up-stream	down-stream
ft	150	60
dia	19.9	7.6

LOCATION OF TRAVERSE POINTS



CIRCULAR DUCTS

Traverse point number on a diameter	2	4	6	8	10	12
	(Percent of stack diameter from inside wall to traverse point)					
1	14.6	6.7	4.4	3.2	2.6	2.1
2	85.4	25.0	14.6	10.5	8.2	6.7
3		75.0	29.6	19.4	14.6	11.8
4		93.3	70.4	32.3	22.6	17.7
5			85.4	67.7	34.2	25.0
6			95.6	80.6	65.8	35.6
7				89.5	77.4	64.4
8				96.8	85.4	75.0
9					91.8	82.3
10					97.4	88.2
11						93.3
12						97.9

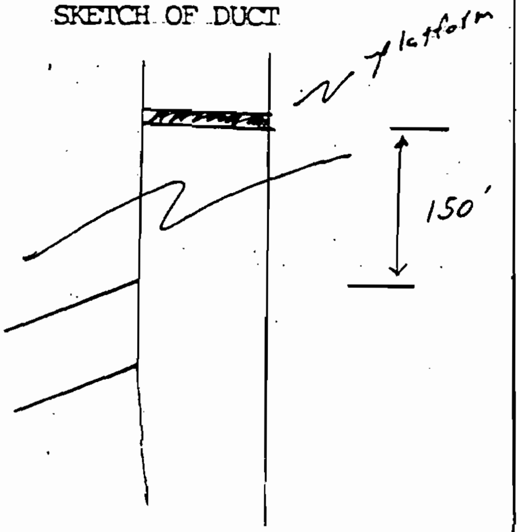
RECTANGULAR DUCTS

	2	3	4	5	6	7	8	9	10	11	12
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4			87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5				90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6					91.7	78.6	68.8	61.1	55.0	50.0	45.8
7						92.9	81.3	72.2	65.0	59.1	54.2
8							93.8	83.3	75.0	68.2	62.5
9								94.4	85.0	77.3	70.8
10									95.0	86.4	79.2
11										95.5	87.5
12											95.8

MEASUREMENTS

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	4.4	1.7	54.7
2	14.6	5.5	58.5
3	29.6	11.2	64.2
4	70.4	26.8	79.8
5	85.4	32.5	85.5
6	95.6	36.3	89.3
7			
8			
9			
10			
11			
12			

SKETCH OF DUCT



Page ____ of ____

PARTICULATE CALCULATIONS

Client: Georgia Pacific
Weston Project No: 0414-09-01
Source: NCG Incinerator

Date: 1/25/90

	INPUT DATA	Run 1	Run 2	Run 3	Mean
Sampling Time, min	(Theta)	60	60	60	60
Stack Area, ft2	(As)	7.88	7.88	7.88	7.88
Barometric Pressure, in Hg	(Pb)	29.77	29.77	29.77	29.77
Stack Pressure, in Hg	(Ps)	29.98	29.98	29.98	29.98
Pitot Tube Coefficient	(Cp)	.84	.84	.84	.84
Meter Correction Factor	(Y)	1.013	1.013	1.013	1.013
Nozzle Diameter, in	(Dn)	.247	.247	.247	.247
Meter Volume, ft^3	(Vm)	56.483	57.900	56.375	56.919
Meter Temperature, F	(Tm)	84	89	95	89
Meter Orifice Pressure, in H2O	(Delta H)	2.908	2.951	2.964	2.941
Volume H2O Collected, mL	(Vlc)	82.1	81.8	93.4	85.8
CO2 Concentration, %	(CO2)	1.0	1.0	1.0	1.0
O2 Concentration, %	(O2)	18.7	18.8	18.5	18.7
Average Sq Rt Velo Head, in H2O^1/2	(Delta P^1/2)ave	1.152	1.149	1.145	1.149
Stack Temperature, F	(Ts)	466	496	529	497
Particulate Collected, g	(Mn)	.0840	.1737	.0586	.1054

	CALCULATED DATA				
Standard Meter Volume, ft3	(Vmstd)	55.665	56.487	54.448	55.533
Standard Water Volume, ft3	(Vwstd)	3.864	3.850	4.396	4.037
Moisture Fraction	(BWS)	.065	.064	.075	.068
Mol Wt of Stack Gas	(Ms)	28.2	28.2	28.1	28.2
Average Stack Gas Velocity, ft/sec	(Vs)	86.6	87.7	89.1	87.8
Stack Gas Flow @ Stack Cond, ft^3/min	(Qa)	4.09E+4	4.15E+4	4.21E+4	4.15E+4
Stack Gas Flow @ Std Cond, ft^3/min	(Qs)	2.19E+4	2.15E+4	2.09E+4	2.14E+4
Isokinetic Sampling Rate, %	(%I)	101	104	103	103
Particulate Conc @ Std Cond, gr/ft^3	(Cs)	.023	.047	.017	.029
Particulate Emission Rate, lb/hr	(PMR)	4.353	8.715	2.963	5.343

PARTICULATE FIELD DATA

Client: Georgia Pacific
Weston Project No: 0414-09-01
Source: NCG Incinerator
Date: 1/25/90
Run#: 1

PORT POINT NO.	DGM READING Vm(ft^1/3)	DELTA P in. H20	DELTA P SQUARE ROOT	DELTA H IN. H20	PROBE TEMP (F)	AVG DGM TEMP (F)	STACK TEMP (F)	IMP OUT (F)	HOT BOX TEMP (F)	SAMPLE TRAIN VAC (in Hg)
1/1	513.990	1.50	1.22	3.22	239	75	450	63	249	5.0
2	519.500	1.40	1.18	3.00	250	79	456	54	255	5.0
3	524.500	1.50	1.22	3.30	241	81	478	61	252	5.0
4	530.200	1.20	1.10	2.64	246	83	465	64	252	5.0
5	533.600	1.30	1.14	2.86	247	84	468	64	252	5.0
6	538.600	.99	.99	2.18	244	84	464	68	253	5.0
2/1	541.800	1.20	1.10	2.64	235	82	456	66	243	5.0
2	547.800	1.50	1.22	3.30	234	86	485	56	251	5.0
3	551.810	1.50	1.22	3.30	234	87	470	58	252	5.0
4	556.600	1.50	1.22	3.30	241	88	477	61	246	5.0
5	562.400	1.30	1.14	2.86	240	88	455	60	248	5.0
6	566.100	1.10	1.05	2.30	234	87	470	61	247	5.0
	570.473									

DGM READING Vm:	56.483
AVG DELTA P:	1.33
AVG DELTA H:	2.91
AVG SQT DELTA P:	1.15
AVG DGM TEMP:	84
AVG STACK TEMP:	466

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PARTICULATE DATA

CLIENT Georgia Pacific WORK ORDER NO 0414-01-01

PLANT [illegible] DATE 1-24-90

RUN NO. One START TIME 0810 END TIME 0910

SAMPLING LOCATION Palatka CONTROL DEVICE none

SAMPLE TRAIN # 17-5,6 SAMPLE CONSOLE 4 SAMPLE CASE #

AMBIENT TEMP 60 WEATHER HAZE WIND SPEED/DIRECTION E 5-10

WESTON TEST PERSONNEL KJ, SS OBSERVERS

SKETCH OF STACK

Stack Dimensions 38" Orifice ΔH 1.843

Sample Time (min/pt) 5.0 Meter Corr. Factor 1.013

Net Sample Time (min) 60 Pitot Tube # 8' #4

Baro Press. (in Hg) 29.99 Pitot Factor 0.84

Stack Press. (in Hg) 29.98 Nozzle ID # .247

Stack Temp DB/WB (°F) 457 Noz Dia Pretest (in) 0.247

Assumed Mois (%) 7% Noz Dia Posttest (in) 0.247

Pretest Leak Check <.01 ft/min @15"Hg Avg Noz Dia (in) 0.247

Posttest Leak Check <.01 ft/min @15"Hg Filter Type/Number 900507

Final Gas Meter Reading 570.472 Silica gel # 1 / 17.1

Initial Gas Meter Reading 513.990 Δ Condensate (mL) 65+17.1

Δ Meter Reading 56.48

Orsat: Method of Collection TRS/integrated sample

	RUN 1	RUN 2	RUN 3	AVG
%CO₂	1.0	1.0	1.0	1.0
%O₂	18.7	18.7	18.7	18.7
% CO	—	—	—	—

Page ______ of ______

WESTON

FIELD DATA

7c0 509
.247

CLIENT Georgia Pacific WORK ORDER NO. 0414-09-01

SOURCE Incinerator DATE 1-24-99 RUN # ONE

PORT-POINT NO.	DIST FROM WALL (in)	CLOCK TIME	DGM READING Vm(ft³)	ΔP (in. H₂O)	ΔP (in H₂O)	DGM ~~TEMP~~ AVE IN (°F)	OUT (°F)	STACK TEMP (°F)	IMP TRAIN (°F)	HOT BOX TEMP (°F)	SAMPLE TRAIN VAC (in Hg)
1/1	0	0810	513.990	1.5	3.22	239	75	450	63	249	5.0
2	5		519.50	1.4	3.0	250	79	456	54	255	5.0
3	10		524.5	1.5	3.30	247	81	478	61	252	5.0
4	15		530.2	1.2	2.64	246	83	465	64	252	5.0
5	20		533.6	1.3	2.86	247	84	469	64	252	5.0
6	25		538.6	0.99	2.18	244	84	464	68	253	5.0
2/1	30		541.9	1.2	2.64	235	82	456	66	243	5.0
2	35		547.8	1.5	3.30	234	86	485	56	251	5.0
3	40		551.81	1.5	3.30	234	87	470	58	252	5.0
4	45		556.6	1.5	3.30	241	88	477	61	246	5.0
5	50		562.4	1.3	2.86	240	88	455	60	248	5.0
6	55		566.1	1.1	2.30	234	87	~~480~~ 470	61	247	5.0
		0920	570.473								
					≈2.80		85	468.6			
			-56.48	1.15(18)							

NOTES/REMARKS:

Difficult conditions
Dust + steam plume across site.

$$\Delta H = \Delta P\,[(893.94)\,(C_p)^2\,(FDA)^2\,(\Delta H@)\,(Dn)^4\,\left(\frac{T_m}{T_s}\right)]$$

K = 2.15 → 2.2

Page ______ of ______

WESTON

Client: Georgia Pacific
Weston Project No: 0414-09-01
Source: NCG Incinerator
Date: 1/25/90
Run#: 2

PORT POINT NO.	DGM READING Vm(ft^/3)	DELTA P in. H2O	DELTA P SQUARE ROOT	DELTA H IN. H2O	PROBE TEMP (F)	AVG DGM TEMP (F)	STACK TEMP (F)	IMP OUT (F)	HOT BOX TEMP (F)	SAMPLE TRAIN VAC (in Hg)
1/1	570.855	1.50	1.22	3.30	244	82	478	47	235	5.0
2	575.900	1.50	1.22	3.30	250	85	488	46	239	5.0
3	581.400	1.40	1.18	3.10	250	88	502	54	244	5.0
4	587.510	1.30	1.14	2.92	250	89	493	56	246	5.0
5	590.200	1.30	1.14	2.92	250	88	496	55	245	5.0
6	595.850	1.10	1.05	2.50	245	91	489	56	245	5.0
2/1	600.000	1.30	1.14	2.92	240	88	494	57	233	5.0
2	605.300	1.50	1.22	3.30	247	91	494	56	243	5.0
3	609.900	1.50	1.22	3.30	248	90	510	57	244	5.0
4	615.160	1.10	1.05	2.50	249	93	486	62	244	5.0
5	619.700	1.40	1.18	3.10	248	93	533	62	245	5.0
6	625.700	1.00	1.00	2.25	245	93	486	62	242	5.0
	628.755									

DGM READING Vm:	57.900
AVG DELTA P:	1.33
AVG DELTA H:	2.95
AVG SQT DELTA P:	1.15
AVG DGM TEMP:	89
AVG STACK TEMP:	496

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[illegible]

CLIENT Georgia Pacific W.O. NUMBER 0414-01-01
SOURCE Incinerator DATE 1-25-90

RUN Two START TIME 0750 END TIME 1100
SAMPLING SITE Inlet CONTROL DEVICE NONE
SAMPLING TYPE M-5-6 SAMPLE CONSOLE # 4 SAMPLE CART
AMBIENT TEMP 70 WEATHER HAZE/FOG WIND SPEED/DIRECTION E 5-10
WESTON TEST PERSONNEL RJ, SS OBSERVERS

SKETCH OF STACK

Stack Dimensions 38" Orifice ΔH 1.843
Sample Time (min/pt) 5.0 Meter Corr. Factor 1.013
Net Sample Time (min) 60 Pitot Tube # 8' #1
Baro Press. (in Hg) 29.99 Pitot Factor 0.84
Stack Press. (in Hg) 29.98 Nozzle ID # 0.247
Stack Temp DB/WB (°F) 268 Noz Dia Pretest (in) 0.247
Assumed Mois (%) 5% Noz Dia Posttest (in) 0.247
Pretest Leak Check <.01 @ 15" Hg Avg Noz Dia (in) 0.247
Posttest Leak Check <.01 @ 15" Hg Filter Type/Number 900513
Final Gas Meter Reading 628.755 Silica gel # 21
Initial Gas Meter Reading 570.855 Δ Condensate (mL) 81.8
Δ Meter Reading 57.900
Orsat: Method of Collection TAS / Integrated Sample

	RUN 1	RUN 2	RUN 3	AVG
%CO_2	1.0	1.0	1.0	1.0
%O_2	18.7	18.7	18.7	18.7
% CO	—	—	—	—

Page ______ of ______

WESTON

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FIELD DATA

CLIENT Georgia Pacific WORK ORDER NO. 0414-05-01

SOURCE Incinerator DATE 1-25-90 RUN # 2

TRAVERSE POINT NO.	~~SAMPLING TIME (min)~~	CLOCK TIME	DGM READING (Vm ft³)	ΔP (in H2O)	ΔH (in H2O)	~~DGM TEMP~~ Probe (°F)	Air (°F)	STACK TEMP (°F)	IMP TEMP (°F)	HOT BOX TEMP (°F)	PUMP VACUUM (in Hg)
1/1	0	0852	570.855	1.5	3.3	244	82	478	47	235	5.0
2	5		575.9	1.5	3.3	250	85	488	46	239	5.0
3	10		581.4	1.4	3.1	250	88	502	54	244	5.0
4	15		587.51	1.30	2.92	250	89	493	56	246	5.0
5	20		590.20	1.30	2.92	250	88	496	55	245	5.0
6	25		595.85	1.1	2.30	245	91	484	56	245	5.0
2/1	30		600.0	1.3	2.92	240	88	494	57	233	5.0
2	35		605.3	1.5	3.3	247	91	494	56	243	5.0
3	40		609.9	1.5	3.3	248	90	510	57	244	5.0
4	45		615.16	1.1	2.5	249	93	486	62	244	5.0
5	50		619.7	1.4	3.1	249	93	533	62	245	5.0
6	55		625.7	1.0	2.25	245	93	486	62	242	5.0
	60		628.755								
		1000									
			57.90	1.1486							

NOTES/REMARKS:

$\Delta H = \Delta P\,[(893.94)\,(C_p)^2\,(FDA)^2\,(\Delta H@)\,(Dn)^4\,\left(\frac{T_m}{T_s}\right)]$

K = 2.35

Page ______ of ______

WESTON

PARTICULATE FIELD DATA

Client: Georgia Pacific
Weston Project No: 0414-09-01
Source: NCG Incinerator
Date: 1/25/90
Run#: 3

PORT POINT NO.	DGM READING Vm(ft^1/3)	DELTA P in. H2O	DELTA P SQUARE ROOT	DELTA H IN. H2O	PROBE TEMP (F)	AVG DGM TEMP (F)	STACK TEMP (F)	IMP OUT (F)	HOT BOX TEMP (F)	SAMPLE TRAIN VAC (in Hg)
1/1	629.100	1.40	1.18	3.15	190	87	500	58	230	3.5
2	634.050	1.50	1.22	3.38	219	92	520	53	247	4.0
3	639.020	1.40	1.18	3.15	237	94	535	59	261	4.5
4	643.850	1.30	1.14	2.93	250	95	525	61	261	4.5
5	649.270	1.20	1.10	2.70	247	96	518	61	260	4.0
6	653.240	1.20	1.10	2.70	250	95	500	61	260	4.0
2/1	657.675	1.40	1.18	3.15	250	93	515	66	252	4.5
2	662.450	1.50	1.22	3.38	224	96	515	64	259	4.5
3	668.490	1.20	1.10	2.70	234	97	545	64	261	4.0
4	672.650	1.00	1.00	2.25	228	97	565	65	257	3.5
5	676.348	1.50	1.22	3.38	232	98	553	67	259	5.0
6	681.000	1.20	1.10	2.70	225	98	555	70	259	4.0
	685.475									

DGM READING Vm:	56.375
AVG DELTA P:	1.32
AVG DELTA H:	2.96
AVG SQT DELTA P:	1.15
AVG DGM TEMP:	95
AVG STACK TEMP:	529

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PARTICULATE [illegible]

CLIENT Georgia Pacific WORK ORDER NO. 0414-01-01
SOURCE Incinerator DATE 1-25-90

RUN # Three START TIME 11:30 END TIME 12:30
SAMPLING SITE Palatka CONTROL DEVICE None
SAMPLING TYPE M-5, C SAMPLE CONSOLE # 4 SAMPLE CASE # ____
AMBIENT TEMP 75 WEATHER Fog WIND SPEED/DIRECTION E-5G
WESTON TEST PERSONNEL KJ, SS OBSERVERS ____

SKETCH OF STACK

Stack Dimensions 38" Orifice ΔH 1.843
Sample Time (min/pt) 5.0 Meter Corr. Factor 1.013
Net Sample Time (min) 60 Pitot Tube # 8' #1
Baro Press. (in Hg) 29.99 Pitot Factor 0.84
Stack Press. (in Hg) 29.98 Nozzle ID # 0.247
Stack Temp DB/WB (°F) 500 Noz Dia Pretest (in) 0.247
Assumed Mois (%) 5% Noz Dia Posttest (in) 0.247
Pretest Leak Check <.01 ft³/m @ 15" Hg Avg Noz Dia (in) 0.247
Posttest Leak Check <.01 @ 12" Filter Type/Number 9005/
Final Gas Meter Reading 685.475 Silica gel # 3
Initial Gas Meter Reading 629.100 Δ Condensate (mL) 83.4
Δ Meter Reading 56.375
Orsat: Method of Collection Integrated Bag

	RUN 1	RUN 2	RUN 3	AVG
%CO_2	1.0	1.0	1.0	1.0
%O_2	18.5	18.5	18.5	18.5
% CO				

Page ____ of ____

WESTON

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FIELD DATA

CLIENT Georgia Pacific WORK ORDER NO. 0414-09-01

SOURCE NCG Incinerator DATE 1-25-90 RUN # three

PORT POINT NO.	DIST ~~TO~~ WALL (IN)	CLOCK TIME	DGM READING V_M(Ft³)	ΔP (in. H_2O)	ΔH ~~ΔP~~ (in H_2O)	DGM ~~TEMP~~ YRAC	AVE	STACK TEMP (F)	IMP TRAIN (F)	HOT BOX TEMP (F)	SAMPLE TRAIN VAC (in Hg)
1/1	0		629.100	1.40	3.15	190	87	500	58	230	3.5
2	5		634.050	1.50	3.38	219	92	520	53	247	4.0
3	10		639.020	1.40	3.15	237	94	535	59	261	4.5
4	15		643.850	1.30	2.93	250	95	525	61	261	4.5
5	20		649.270	1.20	2.70	247	96	518	61	260	4.0
6	25		653.240	1.20	2.70	250	95	500	61	260	4.0
2/1	30		657.675	1.40	3.15	250	93	515	66	252	4.5
2	35		662.450	1.50	3.38	224	96	515	64	259	4.5
3	40		668.490	1.20	2.70	234	97	545	64	261	4.0
4	45		672.650	1.00	2.25	228	97	565	65	257	3.5
5	50		676.486	1.50	3.38	232	98	553	67	259	5.0
6	55		681.000	1.20	2.70	225	98	555	70	259	4.0
	60										
x̄			685.475	1.145	2.964		95.0	529			

NOTES/REMARKS:

$$\Delta H = \Delta P\,[(893.94)\,(C_p)^2\,(FDA)^2\,(\Delta H@)\,(Dn)^4 \left(\frac{T_m}{T_s}\right)].$$

K = 2.25

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WESTON

SAMPLE RECOVERY AND INTEGRITY

CLIENT Georgia Pacific PROJECT NUMBER 0414-09

SOURCE Incinerator

SAMPLE DATE 1-25-90 SAMPLE PERSONNEL SS, AJ

RECOVERY DATE ______ RECOVERY PERSONNEL SS, AJ

MOISTURE DATA

	RUN # 1	RUN # 2	RUN # 3
Final Volume in Impingers (mL)	265	267	278
Initial Volume in Impingers (mL)	200	200	200
Net Volume Increase (mL)	65	67	78
Silica Gel Number	1	2	3
Final Silica Gel Wt (g)	236.6	249.3	238.7
Initial Silica Gel Wt (g)	219.5	234.5	223.3
Δ Wt (g)	17.1	14.8	15.4
Total Moisture (mL)	82.1	81.8	93.4

IMPINGER NUMBER

		1	2	3	4	5
Run # 1	Final Wt	135	125	5	Silica	
	Initial Wt	100	100	0		
	Δ Wt	35	25	5		
Run # 2	Final Wt	155	110	2		
	Initial Wt	100	100	0		
	Δ Wt	55	10	2		
Run # 3	Final Wt	140	115	3		
	Initial Wt	100	100	0		
	Δ Wt	60	15	3		

SAMPLE RECOVERY

	RUN # 1	RUN # 2	RUN # 3
Filter Number	900509	900513	900512
Filter Cont. No/Wash Cont. No.	1	2	3
Filter Container Sealed (Y/N)	Y	Y	Y
Probe Wash Level Mark? (Y/N)	Y	Y	Y
Solvent Blank Cont. No.	2		

NOTES:

TEST TEAM LEADER

Page ______ of ______

WESTON

Inter-Office Memorandum

WESTON
MANAGERS DESIGNERS/CONSULTANTS
Auburn Operations

TO: Mike Steele

FROM: Bruce Ferguson

DATE: 07 February 1990

PROJECT: G. P. Palatka

W.O. NO.: 0414-09-01
0033-70-03-0010

SUBJECT: Results for Samples Submitted to Lab on 26 January 1990

ACTION:

RESULTS AND DISCUSSION

Attached are the results for samples submitted to the laboratory on 26 January 1990 for particulate analysis. The following table summarizes the results.

Sample ID	Net Particulate Wt. (grams)
Run 1	0.0840
Run 2	0.1737
Run 3	0.0586
Blank Wash	0.0012
Blank Filter	0.0004

Final filter weight for the samples was obtained by taking the average of nine weights. This was due to the inconsistency of the weights possibly caused by salts on the filters.

ANALYTICAL METHODOLOGY

The analysis was performed following EPA Method 5. Acetone was used to rinse the sample bottles.

QUALITY ASSURANCE AND QUALITY CONTROL

All glassware was thoroughly cleaned before use. The blank wash and blank filter were analyzed at the same time and under the same conditions as the samples. The analytical balance used was calibrated prior to use and an NBS Class S 100 gram weight was weighed and recorded after every tenth weighing. Tongs were used while handling the beakers.

sr

METHOD 5
LABORATORY DATA

CLIENT G. P. Palatka

WESTON W.O. # 0414-09-01

Condition of Sample on Arrival?	GOOD	GOOD	GOOD	GOOD
Liquid Levels Marked? (Y/N)	Y	Y	Y	Y
Filter Container Sealed? (Y/N)	Y	Y	Y	Y
WESTON Laboratory Number	CD447	CD448	CD449	CD450
Laboratory Personnel Taking Custody	Belinda Castee + Ken Dixon			
Date Received in Laboratory	26 January 1990			

SAMPLE IDENTIFICATION	Initial Wt. #1 Initial Wt. #2 Initial Wt. #3 Initial Wt. #4 Avg. Initial Wt.	Final Wt. (L) #1 Final Wt. (L) #2 Final Wt. (L) #3 Final Wt. (L) #4 Avg. Final Wt. (L)	Final Wt. (F) #1 Final Wt. (F) #2 Final Wt. (F) #3 Final Wt. (F) #4 Avg. Final Wt. (F)	Δ Final (L) & Initial Wts. - Liquid Blank -Liquid Particulate Wt.	Δ Final (F) & Final (L) Wts. - Filter Weight - Filter Blank - Filter Particulate Wt. - Net Particulate Wt.
Laboratory # CD447	98.3878	98.4164		0.0290	0.4956
Beaker # 1'	98.3874	98.4168		0.0008	0.4394
Liquid Volume 97ml					0.0004
Field Run # 1				0.0282	0.0558
Filter # 900509	98.3876	98.4166	98.9122		0.0840
Laboratory # CD448	101.8173	101.8682		0.0509	0.5636
Beaker # 2'	101.8169	101.8677		0.0012	0.4392
Liquid Volume 155ml					0.0004
Field Run # 2				0.0497	0.1240
Filter # 900513	101.8171	101.8680	102.4316		0.1737
Laboratory # CD449	98.3337	98.3580		0.0242	0.4770
Beaker # 3'	98.3335	98.3575		0.0006	0.4416
Liquid Volume 81ml					0.0004
Field Run # 3				0.0236	0.0350
Filter # 900512	98.3336	98.3578	98.8348		0.0586
Laboratory # CD450	107.8823	107.8836	108.3215	0.0012	0.4380
Beaker # 79¹²	107.8828	107.8841	108.3220		0.4376
Liquid Volume 151ml					
Field Run # Blank (Acetone)				0.0012	0.0004
Filter # 900514	107.8826	107.8838	108.3218		

Note: (L) = Addition of Liquid to Avg. Initial Wt.
(F) = Addition of Filter to Avg. Final Wt. (L)
All Weights are Recorded in Grams

Analyst/Date Belinda Castee / 2·2·90 Laboratory Supervisor/Date

Page 1 of 1

CHAIN-OF-CUSTODY FORM

CLIENT Georgia Pacific

PROJECT NO. 0414-09-01

FACILITY Paper mill

DATE 1-25-90

DESCRIPTION OF SAMPLES Method 5

NAME OF INDIVIDUAL COLLECTING SAMPLES Scott Slocum

	RECEIVED BY	RECEIVED FROM	DATE	TIME	NO. SAMPLES
1.	Kendall Dixon	S. Slocum	1/26/90	5:00pm	~~8~~ 4
2.					
3.					
4.					

SAMPLES COLLECTED

SAMPLE ID	LAB NO	SAMPLE ID	LAB NO
PB 1 + F	CD447		
PB 2 + F	CD448		
PB 3 + F	CD449		
B1 + F	CD450		
F1	447		
F2	448		
F3	449		
F4	450		

Sample Description On Back? Yes

Scott S Slocum 1-25-90

Signed Date

CONDITION OF SAMPLES ON ARRIVAL

Shipping Box Damaged? None

Security Tape Intact? yes

Any Sample Containers Open? no

Any Sample Containers Damaged? no

Comments

HOLD FILTERS AFTER ANALYSIS.

Per Lee Cecchi

1/29

Samples Stored no

Form Complete yes

Belinda Castro 1/29/90

Signed Date

TAS-09-3/86

SAMPLE ID	DESCRIPTION
PB 1, 2, 3	Probe wash, Runs 1, 2 and 3
B1	Acetone Blank
F1, 2, 3	Filter, Runs 1, 2 and 3
F4	Blank filter

APPENDIX D. NCG INCINERATOR - SULFUR DIOXIDE AND VISIBLE EMISSION FIELD DATA

SULFUR DIOXIDE FIELD DATA

Client: Georgia Pacific
Weston Project No.: 0414-09-01
Source: NCG Incinerator
Date: 1/25/90

MCF: 1.052

	RUN 1	RUN 2	RUN 3
Sampling Time Start:	0830	0910	0945
Sampling Time End:	0900	0940	1015
Net Sample Time (Min):	30	30	30
Pre-Test Leak Check:	OK	OK	OK
Post-Test Leak Check:	OK	OK	OK
Final Gas Meter Reading (cf):	52.15	50.20	50.05
Init. Gas Meter Reading (cf):	.00	.00	.00
Delta Meter Reading (cf):	52.15	50.20	50.05
Dry Gas Meter Temp 1:	80	82	82
Dry Gas Meter Temp 2:	81	82	82
Dry Gas Meter Temp 3:	81	82	82
Dry Gas Meter Temp 4:	82	82	82
Average Dry Gas Meter Temp:	81	82	82
Barometric Pressure (in. Hg.):	29.99	29.99	29.99
Stack Pressure (in. Hg.):	—	—	—
Stack Temp (F):	500	500	500
Delta Condensate (g) Imp 1:	—	—	—
Imp 2:	—	—	—
Imp 3:	—	—	—
Imp 4:	—	—	—
Initial Silica Gel Weight:	—	—	—
Final Silica Gel Weight:	—	—	—
Silica Gel Delta Weight (g):	—	—	—
Total Moisture Volume (mL)	N/A	N/A	N/A
CO2 Concentration (%):			
O2 Concentration (%):			
CO Concentration (%):	N/A	N/A	N/A

SULFUR DIOXIDE LAB DATA

Client: Georgia Pacific
Weston Project No: 0414-09-01
Source: NCG Incinerator
Date: 1/25/90
Analyst: Cecchi/Slocum

	RUN 1A	RUN 1B	RUN 2A	RUN 2B	RUN 3A	RUN 3B	MEAN
Vm standard (DL)	53.6	53.6	51.5	51.5	51.4	51.4	52.2
V solution	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Va	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Vt	21.4	21.2	19.8	19.8	16.2	16.1	19.1
Vtb	.0	.0	.0	.0	.0	.0	.0
Normality of Titrant	.0101	.0101	.0101	.0101	.0101	.0101	.0101
Concentration SO2 ppm	2409	2387	2320	2320	1904	1892	2206
Concentration SO2 lb/DSCF	4.00E-4	3.96E-4	3.85E-4	3.85E-4	3.16E-4	3.14E-4	3.66E-4
Vol. Flow at Std. Cond. (ft3/min)							
Mass Emission SO2 lb/hr							

NORMALITY CALCULATION

	RUN 1	RUN 2	MEAN
Acid Volume (ml)	5.0	5.0	5.0
Acid Normality (N)	.020	.020	.020
BaCl2 Volume (ml)	9.9	10.0	10.0
BaCl2 Normality:	.0101		

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[illegible] G.P 0414-09-01

Inc [illegible] 1-25-90 [illegible] 3 1.052

	1	2	3
Sampling Time Start	8:30	9:10	9:45
Sampling Time End	9.00	9:40	10:15
Net Sample Time (Min)	30	30	30
Pre-test Leak Check	oK	oK	OK
Post-Test Leak Check	oK	oK	oK
Final Gas Meter Reading (L)	52.150	50.200	50.050
Initial Gas Meter Reading (L)	0.00	0.00	0.00
Δ Meter Reading (L)	52.150	50.200	50.150
Dry Gas Meter Temp 1	80	82	82
2	81	|	|
3	81	|	
4	82		
Avg	81	82	82
Barometric Pressure (in. Hg.)	29.99	29.99	29.99
Stack Pressure (in. Hg.)			
Stack Temp (°F)	500	500	500
Δ Condensate (g) Imp 1			
Imp 2			
Imp 3			
Imp 4			
Silica Gel Δ Weight (g)			
Total Moisture Volume (mL)			
CO_2 Concentration (%)			
O_2 Concentration (%)			
CO Concentration (%)			

NOTES:

Page ____ of ____

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WESTON

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CLIENT ~~ŁP~~ WORK ORDER No. 0414-09-01

PROJECT IDud [illegible] LC DATE 8/25

				MEAN		
V_m (std)	53.65	51.55	51.39			liters
V_{soln}	100	100	100			mL
V_{a1}/V_{a2}	2	2	2			mL
V_{t1}/V_{t2}	21.4/21.2	19.8/19.8	16.2/16.1			mL
V_{tb1}/V_{tb2}	0	0	[illegible]			mL
Normality of Titrant	.0101					normal
C_{SO_2}	2420/2400	2330/2330	1910/1900			ppm
C_{SO_2}						

$$C_{SO_2} = \frac{1.202 \times 10^4 (V_t - V_{tb}) N \left(\frac{V_{soln}}{V_a}\right)}{V_m\text{ (std)}}$$

C_{SO_2} = Concentration SO_2 (ppm)

V_t = Volume $BaCL_2$ used to titrate sample (mL)

V_{tb} = Volume $BaCL_2$ used to titrate blank (mL)

V_{soln} = Total Volume of solution (mL)

V_a = Volume of solution titrated (mL)

N = Normality of $BaCL_2$

V_m (std) = Standard dry gas volume used to collect sample

$$17.64 \times V_m \times mcf \times \frac{B_p}{T_m}$$

C_{SO_2} (lb/DSCF) = C_{SO_2} (ppm) x 1.66×10^{-7}

Calculate normality by the equation:

volume std acid x normality std acid = normality of $BaCL_2$ x volume $BaCL_2$

V_{acid_1} = ________ N_{acid_1} ________ mL $BaCL_{2_1}$ ________

V_{acid_2} = ________ N_{acid_2} ________ mL $BaCL_{2_2}$ ________

Page ______ of ______

WESTON

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CLIENT Georgia Pacific WORK ORDER NO. ______

UNIT Incinerator ANALYST T.G. DATE 1-24-90

	RUN 1	RUN 2	RUN 3	MEAN	QUALITY ASSURANCE SAMPLE	UNITS
V_m(std)					21×10^{-3} dscM	liters
V_{soln}					100	mL
V_{a1}/V_{a2}					10.0	mL
V_{t1}/V_{t2}					5.9/5.9	mL
V_{tb1}/V_{tb2}					0.0/0.0	mL
Normality of Titrant	.01,005	.01.005	.01.005	.01.005	.01.005	normal
C_{SO_2}					904.4/904	ppm
C_{SO_2}						

$$C_{SO_2} = \frac{1.202 \times 10^4 (V_t - V_{tb}) N \left(\frac{V_{soln}}{V_a}\right)}{V_m\,(std)}$$

$$\frac{904}{899.9} = 1.004$$

100.4 % Rec.

LOT 0584 7xxx

C_{SO_2} = Concentration SO_2 (ppm)

V_t = Volume $BaCL_2$ used to titrate sample (mL)

V_{tb} = Volume $BaCL_2$ used to titrate blank (mL)

V_{soln} = Total Volume of solution (mL)

V_a = Volume of solution titrated (mL)

N = Normality of $BaCL_2$

V_m (std) = Standard dry gas volume used to collect sample

$$17.64 \times V_m \times mcf \times \frac{B_p}{T_m}$$

C_{SO_2} (lb/DSCF) = C_{SO_2} (ppm) x 1.66×10^{-7}

Calculate normality by the equation:

volume std acid x normality std acid = normality of $BaCL_2$ x volume $BaCL_2$

V_{acid_1} = 5.0 N_{acid_1} 0.02 mL $BaCL_{2_1}$ 9.9

V_{acid_2} = 5.0 N_{acid_2} 0.02 mL $BaCL_{2_2}$ 10.0

Page ______ of ______

Performed simultaneously with EPA-Method 5 Particulate run

Visible Emission Observation

SOURCE NAME Georgia-Pacific Corp.

ADDRESS POB 919

SR 216

CITY Palatka STATE FL ZIP 32178

PHONE 904/325-2001 SOURCE ID NUMBER AC54 - 142 291

PROCESS EQUIPMENT Batch Digester, MEE, Condensate Stripper Systems OPERATING MODE Full

CONTROL EQUIPMENT NCG Incinerator OPERATING MODE Full

DESCRIBE EMISSION POINT round stack

START STOP same

HEIGHT ABOVE GROUND LEVEL START 250' STOP 250' HEIGHT RELATIVE TO OBSERVER START 250' STOP 250

DISTANCE FROM OBSERVER START 300 ft STOP 300 ft DIRECTION FROM OBSERVER START N STOP N

DESCRIBE EMISSIONS

START none STOP none

EMISSION COLOR START none STOP PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐

WATER DROPLETS PRESENT: NO ☒ YES ☐ IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐

POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED

START 1 stack diameter above stack outlet STOP same

DESCRIBE BACKGROUND

START cloudy STOP cloudy overcast

BACKGROUND COLOR START GREY STOP GREY SKY CONDITIONS START cloudy STOP cloudy

WIND SPEED START 2 MPH STOP 2 MPH WIND DIRECTION START SW STOP SW

AMBIENT TEMP. START 70°F STOP 70°F WET BULB TEMP. RH, percent

OBSERVATION DATE 1-25-90 START TIME 8:00 AM STOP TIME 9:20 AM

SEC / MIN	0	15	30	45	SEC / MIN	0	15	30	45
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0

AVERAGE OPACITY FOR HIGHEST PERIOD 0 % NUMBER OF READINGS ABOVE 5 % WERE 0

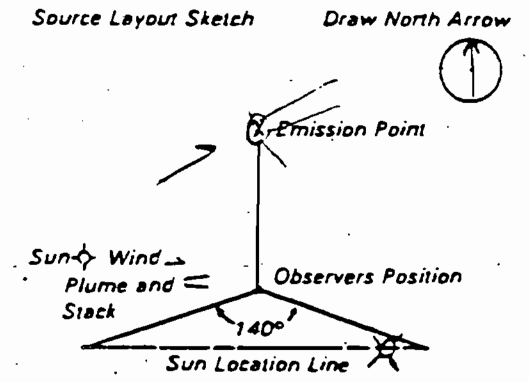
RANGE OF OPACITY READINGS 0 MINIMUM 0 MAXIMUM

OBSERVER'S NAME (PRINT) MARVIN SIMMONS

OBSERVER'S SIGNATURE M Simmons DATE 1/25/90

ORGANIZATION G-P

CERTIFIED BY ETA DATE 12/89



COMMENTS

Summary of Aver. Opacity

Set Number	Opacity Sum	Opacity Average
1	0	0 (0)
2	0	0 (0)
3	0	0 (0)
4	0	0 (0)
5	0	0 (0)
6	0	0 (0)
7	0	0 (0)
8	0	0 (0)
9	0	0 (0)
10	0	0 (0)
AVG.	0	0

APPENDIX E. NCG INCINERATOR - PROCESS DATA

DATE . JAN 23 1990

NATURAL GAS

TIME	CFM FLOW RATE			
0800	@ 2 cfm	MIN FLOW		
0900	"	"	Run 1	2 CFM x 60 =
1000	"	"		
1100	"	"		120 CFH
	INT			
1217	0.0			
1310	97		Run 2	$\frac{168\ \text{min}}{324\ \text{ft}^3} = \frac{60\ \text{min}}{X}$
1407	212			
1505	324			
				X = 115.7 CFH
1600	411			
1800	627		Run 3	$\frac{172\ \text{min}}{352\ \text{ft}^3} = \frac{60\ \text{min}}{X}$
1855	763			
				X = 122.8 CFH
			TOTAL	$\frac{395\ \text{min}}{763\ \text{ft}^3} = \frac{60\ \text{min}}{X}$
				X = 115.9 CFH

6 hr. 35 min or 395 min.

-3465 JAN 25 1990

No. 3

TIME	Liq. % Solids Cenco	Liq. to Noz. PSI	No. Liq. Noz. in Service	S.B. Oil PSI	No. of S.B. in Service	L.B. Oil PSI	No. of L.B. in Service	Feed-water PSI	Drum PSI	Green Liquor Titration	Green Liquor Sulfidity	No. 1 Spout Water GPM	No. 2 Spout Water GPM	No. 3 Spout Water GPM	No. 4 Spout Water GPM	No. 5 Spout Water GPM	No. 6 Spout Water GPM	Spout Cooling Water Temp.
7:00 A.M.		18	10	75	0	41	0	1630	1360	—		18	18	18	18	18	23	174
8:00 A.M.		17½	10	75	0	41	0	1660	1380	102								
9:00 A.M.		17½	10	75	0	41	0	1660	1360	102		18	18	18	18	18	23	172
10:00 A.M.		17½	10	75	0	41	0	1700	1360	101								
11:00 A.M.		17½	10	75	0	41	0	1710	1370	97		18	18	18	18	18	23	172
12:00 Noon		17½	10	75	0	41	0	1580	1360	99								
1:00 P.M.		17	10	75	0	41	0	1700	1350	101		18	18	18	18	18	23	168
2:00 P.M.		17	10	75	0	41	0	1700	1370	98								
3:00 P.M.		17	10	75	0	41	0	1700	1360	.98		18	18	18	18	18	23	168
4:00 P.M.		17	10	75	0	40	0	1700	1360	1.00								
5:00 P.M.		17	10	75	0	40	0	1700	1360	1.00		18	18	18	18	18	23	168
6:00 P.M.		17	10	75	0	40	0	1700	1360	.99								
7:00 P.M.		17	10	75	0	40	0	1700	1360	1.00		18	18	18	18	18	23	168
8:00 P.M.		17	10	75	0	40	0	1700	1360	1.00								
9:00 P.M.																		
10:00 P.M.																		
11:00 P.M.																		
12:00 Mid.																		
1:00 A.M.																		
2:00 A.M.																		
3:00 A.M.																		
4:00 A.M.																		
5:00 A.M.																		
6:00 A.M.																		

Operators: 7-3 Sig. Walton Sig. Sig.

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JAN 25 1990

NO. 2

TIME	S.C. Mix Tank Level	F.D. Fan Dischge Press.	Primary Duct Press.	Primary Belt Press.	Sec. Duct Press.	Sec. Belt Press.	Super heater Differential	Furnace Draft	Boiler Inlet Differential	Boiler Outlet Differential	Econ. Inlet Differential	Econ. Outlet Differential	Prec. Inlet Draft	Prec. Outlet Draft	Stack Press.	Prim. Air Flow	Sec. Air Flow	Total Air Flow	Flue Gas Combust. %	Flue Gas Oxygen %	T.R.S. PPM	SO2 PPM	I.D. Fan Speed
7:00 A.M.	15.5	12.5	4.0	3.0	8.5	8.5	.16	-.4	.50	.25	1.0	2.2	3.5	5.5	13.5	38	21	90	26	1.76	4.8	16.7	450
8:00 A.M.	15.5	13.0	4.5	3.5	8.5	8.5	.22	-.3	.40	.55	1.1	2.2	4.0	5.5	12.5	37	19	90	28	2.05	4.1	6.6	460
9:00 A.M.	15.5	13.0	4.0	3.0	8.5	8.5	.46	-.2	.40	.70	1.2	2.4	4.0	6.0	13.5	38	18	89	30	2.23	3.2	2.6	460
10:00 A.M.	15.5	13.0	3.5	2.5	8.5	8.5	.40	-.4	.40	.50	1.1	2.4	4.0	6.0	13.0	39	16	90	30	2.11	3.7	8.5	470
11:00 A.M.	15.5	13.0	4.5	3.5	8.5	8.5	.46	-.2	.20	.50	1.1	2.3	4.0	6.5	14.0	38	21	91	30	2.20	3.5	13.1	460
12:00 Noon	15.5	13.0	4.5	3.5	8.5	8.5	.22	-.3	.50	.40	1.0	2.2	3.5	6.0	14.0	37	21	91	30	1.90	3.0	3.9	460
1:00 P.M.	15.5	13.0	4.0	3.0	8.5	8.5	.32	-.1	.35	.45	1.1	2.3	4.0	6.5	14.5	37	21	92	30	1.55	5.8	-1.3	465
2:00 P.M.	15.5	13.0	4.0	3.0	8.5	8.5	.10	-.7	.50	.25	1.2	2.3	4.0	6.5	15.0	37	21	92	32	2.60	75.9	-23.9	475
3:00 P.M.	15.5	13.0	4.0	3.0	8.5	8.5	.2	.1	.25	.25	1.0	2.3	3.5	6.5	14	36	14	88	34.0	2.59	14.4	.2	460
4:00 P.M.	15.5	12.5	4.5	3.5	8.5	8.5	.1	.01	.50	.10	.9	2.1	4.0	6.0	14	36	16	88	32	2.57	FAIL	FAIL	450
5:00 P.M.	15.5	12.5	4.0	3.5	8.5	8.5	.2	-.02	.45	.10	1.0	2.2	4.0	6.0	15	36	16	88	32	1.52	4.4	27.8	460
6:00 P.M.	15.5	12.5	4.0	3.5	8.5	8.5	.11	-.02	.48	.50	1.2	2.3	4.0	6.0	15	36	16	88	32	1.58	5.4	32.2	460
7:00 P.M.	15.5	12.5	4.5	4.0	8.5	8.5	.11	-.02	.50	.50	1.1	2.3	4.0	6.0	15	36	16	86	30	1.86	2.4	9.2	450
8:00 P.M.	15.5	12.5	4.5	4.0	8.5	8.5	.11	.01	.48	.50	1.1	2.3	4.0	6.0	15	36	16	88	30	2.00	2.4	11.8	450
9:00 P.M.																							
10:00 P.M.																							
11:00 P.M.																							
12:00 M																							
1:00 A.M.																							
2:00 A.M.																							
3:00 A.M.																							
4:00 A.M.																							
5:00 A.M.																							
6:00 A.M.																							

Operators: 7-3 Jerry
Sig.

Remarks:

Operators: 3-11 Walton
Sig

Remarks:

Operators: 11-7
Sig.

Remarks:

503

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JAN 25 1990

101

NO. 1

TIME	Green Liquor Density	Diss. Tank Level	Drum Level	Feed-water Flow	Feed-water Temp.	Steam Flow M lb/hr	Primary Steam Temp.	Inter. Steam Temp.	Final Steam Temp.	Final Steam Press.	% Solids Liquid to Noz.	S.C. Mix Tk. Temp.	Final Liquid Temp.	Inlet Air Temp.	Heated Air Temp.	Boiler Outlet Temp.	Econ. Outlet Temp.	I.D. Inlet Temp.	I.D. Drive Oil Temp.	Liq. to Nozzles G.P.M.	S.C. Screw Feeder Speed	S.B. Oil Flow	L.B. Oil Flow
7:00 A.M.	1160	603	+3	712	275	610	725	605	860	1315		232	2542	103	349	–	404	374	135	384	0	0	0
8:00 A.M.	1169	592	+2	80	275	620	700	610	870	1340	660	232	254.6	103	349	–	410	374	135	384	0	0	0
9:00 A.M.	1165	55	0	87	275	600	720	610	840	1360		232	251.8	105	349	–	411	373	135	384	0	0	0
10:00 A.M.	1153	55	0	82	275	590	770	600	870	1340	65.7	232	251.5	106	350	–	419	377	135	383	0	0	0
11:00 A.M.	1160	55	0	80	275	585	740	600	880	1330		231	251.8	107	349	–	407	374	135	383	0	0	0
12:00 Noon	1163	56	−4	100	275	620	730	600	870	1315		231	251.8	108	350	–	411	376	134	382	0	0	0
1:00 P.M.	1163	55	+1	80	275	610	730	600	870	1310		231	250.5	112	350	–	409	372	135	384	0	0	0
2:00 P.M.	1162	56	0	80	276	580	780	610	860	1335		231	252.2	111	350	–	419	376	136	384	0	0	0
3:00 P.M.	1156	55	0	88	280	600	770	600	860	1300		231	251	113	351		405	371	135	385	0	0	0
4:00 P.M.	1156	55	0	88	280	620	700	600	850	1320	66.0	231	252	115	351		408	372	135	385	0	0	0
5:00 P.M.	1163	55	0	86	280	600	780	600	850	1320		231	252	116	351		415	[illegible]	[illegible]	385	0	0	0
6:00 P.M.	1161	55	0	80	280	600	760	600	860	1310	65.8	231	252	116	350		417	375	135	385	0	0	0
7:00 P.M.	1158	55	0	81	280	620	720	600	880	1300		231	252	112	352		[illegible]	[illegible]	135	385	0	0	0
8:00 P.M.	1160	55	0	88	280	620	700	600	870	1300		231	152	111	351		417	375	135	386	0	0	0
9:00 P.M.																							
10:00 P.M.																							
11:00 P.M.																							
12:00 M																							
1:00 A.M.																							
2:00 A.M.																							
3:00 A.M.																							
4:00 A.M.																							
5:00 A.M.																							
6:00 A.M.																							

Operators: 7-3 Sig.

Remarks:

Operators: 3-11 Walton Sig.

Remarks:

Operators: 11-7 Sig.

Remarks:

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JAN 26 1990

TIME	Evap. Steam Press.	Evap. Steam Flow lb/hr	Cond. Vacuum	Surface Cond. Temp.	Inter-Cond. Temp.	Feed From Boilout Tank GPM	Weak Liq. Stg. Tank Level	Weak Liq. Fed to Evap G.P.M.	Evap. Feed Liq. Solids	Soap Skimmer Level	Evap. Prdt. Flow GPM	Evap. Prdt. Solids	Evap. Prdt. °Be.	Temp. 5B Eff. Feed Liq.	Temp. 3A Eff. Liq to Storage	Conc. Steam Press.	Conc. Steam Flow lb/hr	Feed Liq to Conc. GPM	Feed Liq to Conc. Solids	Liq. Solids To #2 Conc.	Cond Prdt. Liq. Solids	50% Liq. Stg. Tk Level	Mix Tank Level	66% Stg. Tank Level
7:00 A.M.	44	30000	24	93	84	75	25.0	730	10.1	70%	210	50.0	28.5	150	220	53	54000	610	50.0	—	61.5	19.0	22.5	28.0
8:00 A.M.	44	28000	24	94	83	75	25.0	730	10.2	70%	200	49.5	28.6	153	220	53	57000	610	50.0	—	61.5	18.0	22.0	28.2
9:00 A.M.	44	28000	24	96	84	75	25.0	730	10.2	70%	205	50.0	29.3	150	220	53	54000	610	50.0	—	61.5	17.0	22.0	28.5
10:00 A.M.	44	28000	24	96	86	75	25'	730	10.3	70%	210	49.5	28.6	150	220	53	55000	610	50.0	—	61.0	16.0	22.0	28.8
11:00 A.M.	44	28000	24	92	84	75	25'	730	10.1	70%	205	50.0	28.6	150	220	53	54000	610	50.0	—	61.0	14.0	21.0	29.0
12:00 Noon	44	28000	24	96	88	75	25'	730	10.2	70%	200	50.0	28.7	150	220	53	57000	610	50.	—	61.0	14.0	21.0	29.2
1:00 P.M.	44	30000	24	97	90	75	25'	730	10.2	70%	210	50.0	28.6	150	220	53	54000	610	50.	—	61.0	14.0	21.0	29.7
2:00 P.M.	44	28000	24	96	90	75	25'	730	10.3	70%	190	51.5	28.8	150	220	53	54000	610	50.0	—	61.0	13.0	21.0	30.0
3:00 P.M.	44	28000	24	96	90	75	25	730	10.3	70	210	50	29.4	154	218	53	5400	610	50.0		61	13.0	20.0	30.0
4:00 P.M.	44	28000	24	96	90	75	25	730	10.3	70	190	50	29.0	154	218	53	55000	610	50		61	13	20	30.0
5:00 P.M.	44	28000	24	96	90	75	25	730	10.3	70	200	50	29.0	154	218	53	55000	610	50		61	[illegible]	[illegible]	[illegible]
6:00 P.M.	44	28000	24	96	90	75	25	730	10.0	70	200	51	29.2	154	218	53	55000	610	50		61	[illegible]	20	31.0
7:00 P.M.	44	28000	24	96	88	75	25	730	10.0	70	210	51	29.0	154	215	[illegible]	55000	610	50		61	[illegible]	20	31
8:00 P.M.	44	28000	24	94	88	75	25	730	10.0	70	210	51	29.0	154	218	[illegible]	55000	610	50		61	[illegible]	20	32
9:00 P.M.																								
10:00 P.M.																								
11:00 P.M.																								
12:00 Mid.																								
1:00 A.M.																								
2:00 A.M.																								
3:00 A.M.																								
4:00 A.M.																								
5:00 A.M.																								
6:00 A.M.																								

Operators: 7-3 Seurey Sign.

Remarks:

37.9·220
37.8-220
38.0-220
~~37.4~~ 37.9-220

37.8 220
38.0-220
37.8 @ 220°F
37.8 Baume

Operators: 3 - 11 Walton Sign.

Remarks

3 - 38.0
4 - 37.8
5 - 37.8
6 - 37.8

7 - 37.9
8 - 37.9
9 -
10 -

Operators: 11-7 Sign

Remarks:

37.8°Bé @ 220°F = 61% solids @ 11.1#/gal

$\frac{610 \text{ Gal}}{\text{Min}} \times \frac{60 \text{ min}}{\text{Hour}} \times .50\% \text{ solids} \times \frac{10.4\#}{\text{GAL}} =$ Actual 190,320# dry lbs/Hr

Max allowable
259,121

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digester room report - cost center no. 5

OPERATOR - SHIFT NO. 1	OPERATOR - SHIFT NO. 2	OPERATOR - SHIFT NO. 3	DATE - DAY OF WEEK - MONTH - DATE
RJ			1-25

COOK NO.	DIG. NO.	TESTS A	TESTS B	TESTS C	% SUL-PHI-DITY	POUNDS ACTIVE ALKALI	DIGESTER CHARGE - GALS. WHITE LIQUOR	BLACK LIQUOR	TOTAL LIQUOR	CHIP SILO NO.	TONS OF CHIPS	STATISTICS CHIPS IN	STEAM IN	FULL PRESS.	MAX. TEMP.	MIN. HELD	START BLOW	BLOW TANK #1	#2	#3	REMARKS:
2563	1		790				8770			11	—		535		[illegible]		700	1			
64	2		790				11380			11	51.7		545		364		735		2		
2545	12		790				9434			9	44.3		610		355		740			3	
2561	4		790	910	26.4		8770			10	48.3		610		355		736	1			
66	7		790				8770			10	42.7		625		356		810	1			
67	13		790				9844			8	[illegible]		640		[illegible]		810			3	
68	3		790				11380			11	[illegible]		630		348		820		2		
69	10		79				7434			9	48.0		710		[illegible]		840			3	
70	6		79				8970			10	[illegible]		715		[illegible]		845	1			
71	2		78				11380			11	—		735		356		905		2		
72	1		79				9740			10	—		800		352		932	1			
73	9		79				11959			8	—		805		355		940			3	
2562	9		79				11503			8	[illegible]		530		[illegible]		930			3	[illegible]
74	8		76	87	252		12260			11	—		820		[illegible]		920		[illegible]		
75	12		76				9833			9	—		820		[illegible]		1000			3	
76	2		76				9140			10	—		840		351		1028	1			
77	13		76				10061			8	—		830		[illegible]		[illegible]			3	
78	4		74				11860			11	55.1		905		[illegible]		1035		[illegible]		
79	10		76				9918			9	50.3		920		[illegible]		1110			3	
80	7		76				11700			10	—		925		[illegible]		[illegible]		2		
81	3		77	90	[illegible]		11700			11	51.9		950		[illegible]		[illegible]		2		
82	6		77				9220			10	—		1010		[illegible]		1130	1			
83	9		77				12088			9	—		1020		353		[illegible]			3	
84	5		77				9020			11	—		1045		[illegible]		1216	1			
2585	12		77				7918			9	—		1050		[illegible]		1220			3	

REMARKS - NO. 1 SHIFT	REMARKS - NO. 2 SHIFT	REMARKS - NO. 3 SHIFT

F-3735 (3-17-83)

1 2 3
2 8 5

digester room report - cost center no. 5

OPERATOR - SHIFT NO. 1	OPERATOR - SHIFT NO. 2	OPERATOR - SHIFT NO. 3	DATE - DAY OF WEEK - MONTH - DATE
	William W. Wall		Thursday JAN. 25 1990

COOK NO.	DIG. NO.	TESTS A	TESTS B	TESTS C	TESTS X SUL-PHI-DITY	POUNDS ACTIVE ALKALI	DIGESTER CHARGE - GALS. WHITE LIQUOR	DIGESTER CHARGE - GALS. BLACK LIQUOR	DIGESTER CHARGE - GALS. TOTAL LIQUOR	CHIP SILO NO.	TONS OF CHIPS	STATISTICS CHIPS IN	STATISTICS STEAM IN	STATISTICS FULL PRESS.	STATISTICS MAX. TEMP.	STATISTICS MIN. HELD	STATISTICS START BLOW	BLOW TANK #1	BLOW TANK #2	BLOW TANK #3	REMARKS:
2611	5		.77				9020			10	537		500		354		630	1			
2	11		.77				9700			9	669		525		349		645			3	3
3	2	774	.77	88	250		9020			11	550		525		350		655	1			
4	8		.77				9329			7	684	50	600		357		749	1			C # 1
5	1		.77				11700			10	559		600		354		700	1			Changed to GT & Blowing with HC
6	9		.77				11828			8	773		600		350		730			3	
7	4		.77				11710			11	—		605		356		740		2		Coast Max Busy on Trying to get Compt.
8	12		.77				9700			9	666		615		354		750			3	Top Pro.
9	7		.77				11710			10	—		645						2		
2620	13		.77				9700			8	—		645							3	
1	3		.77				9020			11	52.7		630					1			
2	10		.77				9595			7	—		915						2		
3	5	770	.77	88	250		9020			10	526		[illegible]					1			
4	11		.77				9700			9	624		720							3	
5	6		.77				9220			11	—		725					1			
6	2		.77				9020			10	52.8		755					1			
7	9		.77							8										3	
8	1		.77							11								1			
9																					
2630																					
1																					
2																					
3																					
4																					
5																					

REMARKS - NO. 1 SHIFT	REMARKS - NO. 2 SHIFT	REMARKS - NO. 3 SHIFT

P-3735 (3-17-83)

digester room report - cost center no. 5

OPERATOR - SHIFT NO. 1	OPERATOR - SHIFT NO. 2	OPERATOR - SHIFT NO. 3	DATE - DAY OF WEEK - MONTH - DATE
RJL	William W. Wall		Thursday 12

COOK NO.	DIG. NO.	TESTS A	TESTS B	TESTS C	% SULPHIDITY	POUNDS ACTIVE ALKALI	DIGESTER CHARGE - GALS. WHITE LIQUOR	DIGESTER CHARGE - GALS. BLACK LIQUOR	DIGESTER CHARGE - GALS. TOTAL LIQUOR	CHIP SILO NO.	TONS OF CHIPS	STATISTICS CHIPS IN	STEAM IN	FULL PRESS.	MAX. TEMP.	MIN. HELD	START BLOW	BLOW TANK #1	BLOW TANK #2	BLOW TANK #3	REMARKS:
2586	1		77				11700			10	54.1		1110		355		1240		2		
87	8		77	90	25.9		9329			7	—		1115		355		105	1			
88	2		77				11700			11	—		1135		354		115		2		
89	13		77				9700			8	—		1140		360		140			3	
90	4		77				9020			10	—		1150		356		150	1			
91	10		77				9700			9	494		1200		357		155			3	
92	7		77				11700			11	—		1230		351		200		2		
94	9		77				11828			8	—		1240		355		230			3	
95	12		77				9700			9	638		100		354		310			3	B
96	6		77	90	28.9		11960			11	—		110		358		235		2		Typewriter didnt Print Changing Rybin
90	5		77				11700			10	516		135		346		300		2		
93	3		77				9020			10	523		1260		?		?	1			Blowed sometime at 3-3 shift but didn't Print
98	13		77				9700			9	664		150		353		330			3	B
99	8		77				9330			11	533		225		351		350	1			
2600	10		77				9595			7	41.1		235		354		355		2		
01	2		77				11700			10	—		245		353		420		2		
02	1		.77				11700			7	59.2		305		356		440		2		c#2
03	9		.77				11824			8	76.9		310		352		510			3	on hold 3?? to ?? B
04	4	77.4	.77	89	27.0		9020			10	54.7		320		353		504	1			
5	12		.77				9700			9	64.7		405		351		545			3	
6	7		.77				11700			11	—		330		357		525		2		
7	3		.77				11700			10	558		410		353		545	1			
8	13		.77				9595			7	—		430		356		605		2		
9	6		.77				11960			11	580		440		354		640		2		B
2610	10		.77				9700			9	666		445		361		615			3	

REMARKS - NO. 1 SHIFT	REMARKS - NO. 2 SHIFT	REMARKS - NO. 3 SHIFT

F-3735 (3-17-83)

F-3593

DATE JAN 25 1990

NCG SYSTEM

	PRE-EVAPS							ACCUMULATOR		STRIPPER					INCINERATION									
															V= VENT C= COLLECT B= BURN									
HOURS	B.L. FLOW GPM	% SOL. IN	% SOL. OUT	IMM LIQ. TK LEVEL	VACCUM IN. Hg	HOG EJECT. ON/OFF	COOLING TOWER WATER TEMP.	AVG. TEMP.	FLASH TANK FLOW	FEED TANK LEVEL	COND. FLOW IN	STM. FLOW IN	PRESS	REFLUX TEMP OUT	#1 EVAP HW	#2 EVAP HW	#3 EVAP HW	#4 EVAP HW	PRE EVAP HW	BLOW HEAT COND.	STRIP. FEED TK.	TURP. COND.	SYS. NCG	STRIP. NCG
7	2900	16.1	18.7	44.0	23.5	OFF	94	207	4000	8.5	180	21000	9.0	190	C	C	C	C	C	C	C	C	B	B
8	3200	15.8	18.7	44.0	23.5	"	88	210	4500	9.0	180	21000	9.0	195	C	C	C	C	C	C	C	C	B	B
9	3200	16.3	18.5	45.0	24.0	"	88	185	4500	9.0	180	21000	9.0	195	C	C	C	C	C	C	C	C	B	B
10	3200	16.3	18.3	45.5	24.0	"	86	190	4000	9.0	180	21000	9.0	195	C	C	C	C	C	C	C	C	B	B
11	3200	16.1	18.6	46.0	23.5	"	86	198	4500	9.0	180	21000	9.0	195	C	C	C	C	C	C	C	C	B	B
12N	3000	16.2	18.6	46.5	24.0	"	88	185	4500	9.0	180	21000	9.0	195	C	C	C	C	C	C	C	C	B	B
1	3000	16.3	18.7	46.5	24.0	"	88	178	4500	9.0	180	21000	9.0	195	C	C	C	C	C	C	C	C	B	[illegible]
2	3000	16.0	18.4	46.5	24.5	"	86	180	3500	9.5	180	21000	9.0	195	C	C	C	C	C	C	C	C	B	B
3	3000	15.9	18.7	46.5	24	OFF	86	190	4000	9.1	180	21000	9.0	195	C	C	C	C	C	C	C	C	B	B
4	3000	16.2	18.3	46.0	24.5	"	85	180	3000	9.0	180	21000	9.0	190	C	C	C	C	C	C	C	C	B	B
5	3000	16.2	18.6	46.0	24.0	"	85	185	4000	8.6	180	21000	9.0	190	C	C	C	C	C	C	C	C	B	B
6	3000	16.2	18.7	46.0	24.0	"	85	200	4000	8.6	180	21000	9.0	190	C	C	C	C	C	C	C	C	B	B
7	3000	16.2	18.8	46	23.5	"	87	200	4500	8.8	180	21000	9.0	195	C	C	C	C	C	C	C	C	B	B
8	3000	16.2	18.5	46	23.5	"	88	205	5000	9.0	180	21000	9.0	195	C	C	C	C	C	C	C	C	B	B
9																								
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7 – 3 : OPERATOR

3 – 11 : OPERATOR

11 – 7 : OPERATOR

DATE: JAN 25 1990

HOURS	F-3782 FEED LIQUOR		NO. 3 EVAPORATORS							NO. 2 EVAPORATORS							NO. 1 EVAPORATORS											
			TOTAL FEED LIQ.	VAC.	STM. PRES	STEAM FLOW	COND H_2O	PRODUCT LIQUOR		TOTAL FEED LIQ.	VAC	STM. PRES	STEAM FLOW	COND H_2O	PRODUCT LIQUOR		TOTAL FEED LIQ.	VAC	STM. PRES	STEAM FLOW	COND H_2O	PRODUCT LIQUOR		UNFIL. TANK LEVEL	FILT. TANK LEVEL	NO. 1 HEAVY LIQ.	NO. 2 HEAVY LIQ.	
	Be'	°F	GPM	IN.	#/IN	#/HR	°F	Be'	°F	GPM	IN.	#/IN	#/HR	°F	Be'	°F	GPM	IN	#/IN	#/HR	°F	Be'	°F	FT.	FT.	FT.	FT.	
7	16.5	188	610	26.5	45	39000		29.0	212	620	24.0	45	40000		28.2	212	350	25.0	37	28000		29.1	212	9.0	16.0	19.0	12.0	
8	16.3	188	610	26.5	45	38000		29.0	212	620	24.5	45	38000		28.1	212	350	25.0	37	28000		29.2	212	12.5	17.0	19.0	10.0	
9	17.1	188	610	26.5	45	38000		28.9	212	620	24.5	45	39000		28.3	212	350	25.0	37	29000		29.0	212	14.0	16.5	19.0	10.0	
10	16.6	188	610	26.5	45	38000		28.7	212	620	24.5	45	39000		28.3	212	350	25.0	37	29000		28.9	212	15.5	16.0	19.0	10.5	
11	16.7	188	610	26.5	45	37000		28.7	212	620	24.5	45	39000		28.3	212	350	25.0	37	28000		29.1	212	15.0	17.5	19.0	11.5	
12	16.8	188	610	26.5	45	38000		28.8	212	620	24.5	45	38000		28.2	212	350	25.0	37	28000		29.5	212	15.5	17.5	19.0	12.0	
1	17.0	188	610	26.5	45	38000		28.8	212	620	24.5	45	39000		28.2	212	350	25.0	37	28000		29.4	212	12.5	17.5	19.0	12.0	
2	17.1	188	610	26.5	45	38000		29.0	212	620	25.0	45	38500		28.1	212	350	25.0	37	28000		29.6	212	12.0	18.0	19.0	12.0	
3	17.1	188	610	26.5	45	38000		29.3	212	620	25	45	37000		27.8	220	350	25	37	28000		29.2	220	10	17	19	12	
4	17.2	188	610	2	45	39000		28.8	212	620	25	45	40000		28.0	220	350	25	37	28000		29.2	220	11	16.5	19	11.5	
5	17.3	188	610	26.5	45	40000		29.0	212	620	24.5	45	39500		27.5	220	350	25	37	28500		29.0	220	10	16.5	16.5	13.5	
6	17.2	188	610	26.5	45	37000		29.0	212	620	24.5	45	39500		27.8	220	350	25	37	28000		29.1	220	10	14.5	16.5	14	
7	17.3	188	610	26.5	45	39000		29.1	212	620	24.5	45	39000		27.8	220	350	25	37	29000		29.2	220	10	15	16.5	15	
8	17.3	188	610	26.5	45	39500		29.2	212	620	25	45	39500		27.8	220	350	25	37	28500		29.2	220	13	15	16.5	15	
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7 - 3 : OPERATOR

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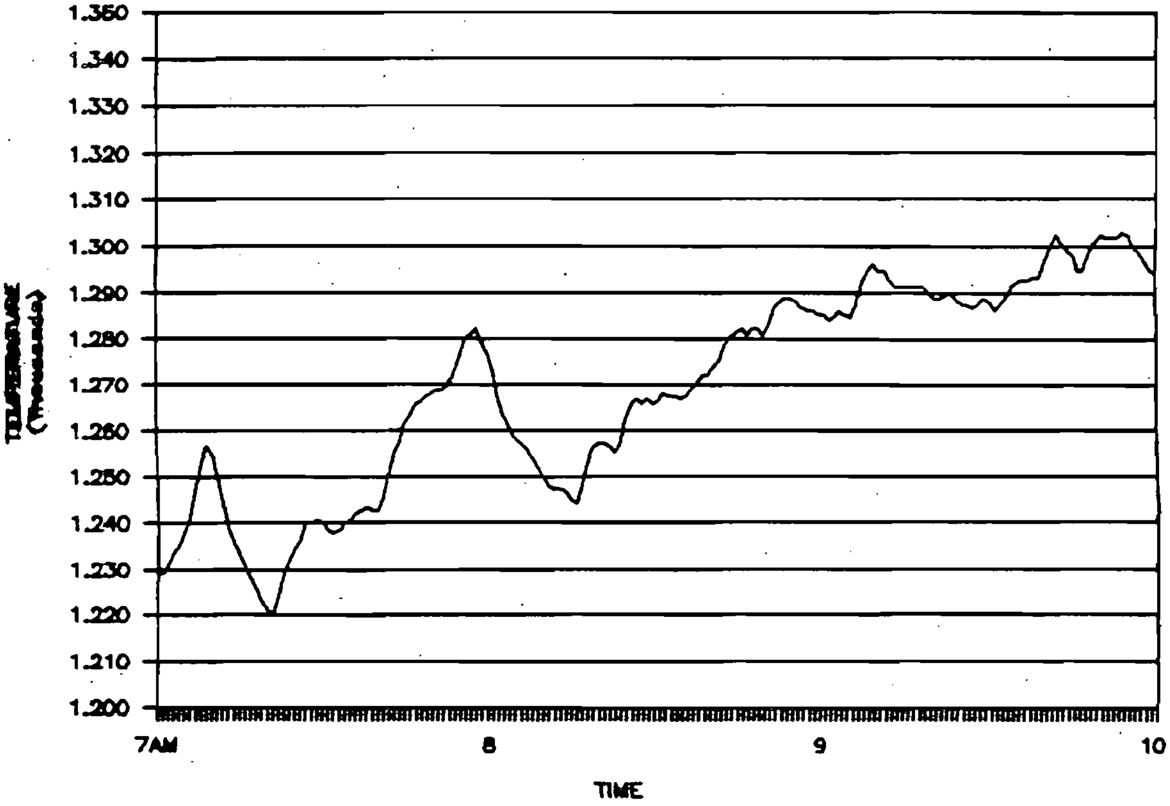
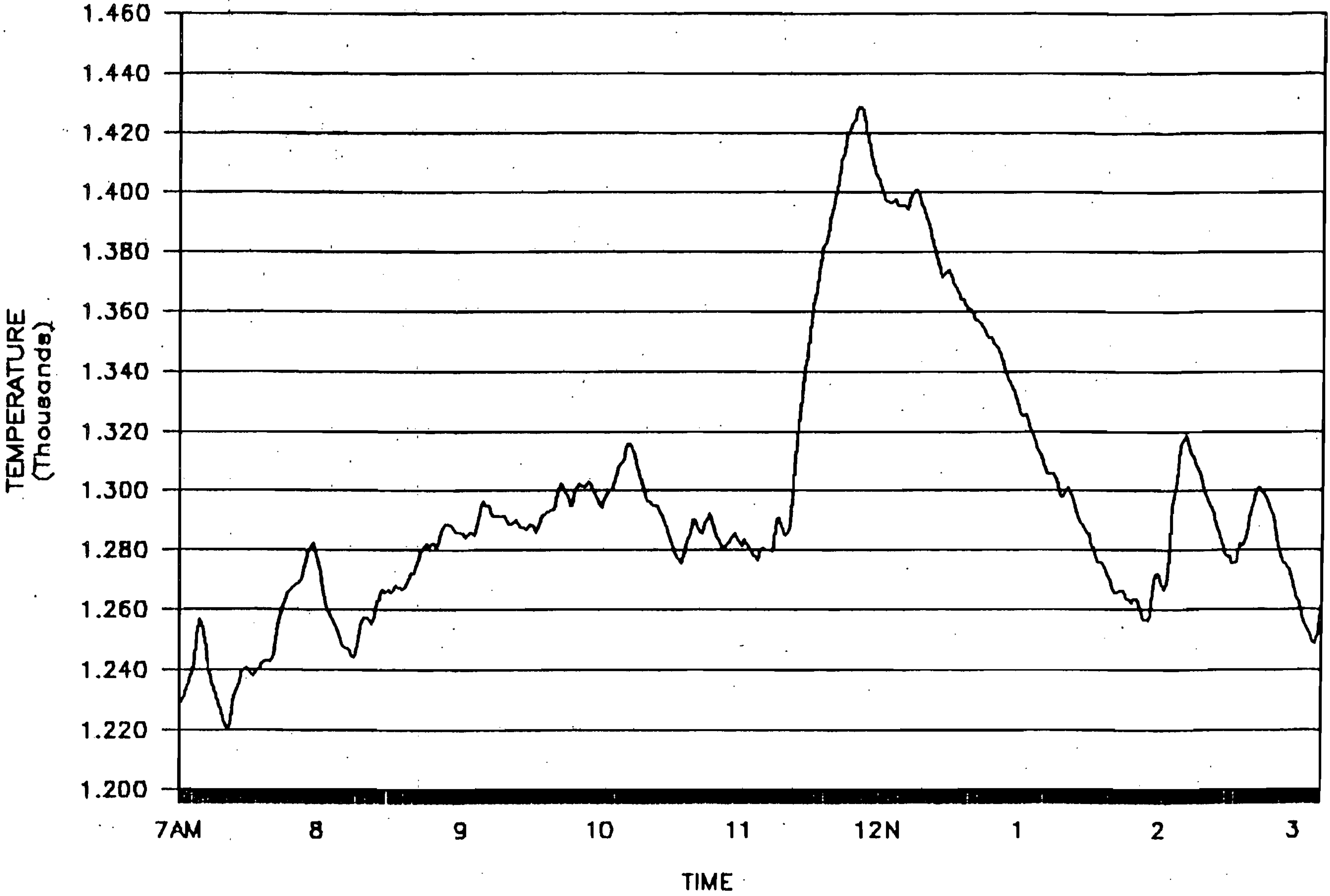


NCG INCINERATOR TEMPERATURE

25 JANUARY 1990

NCG COMPLIANCE TESTING TEMPERATURES

25 JANUARY 1990



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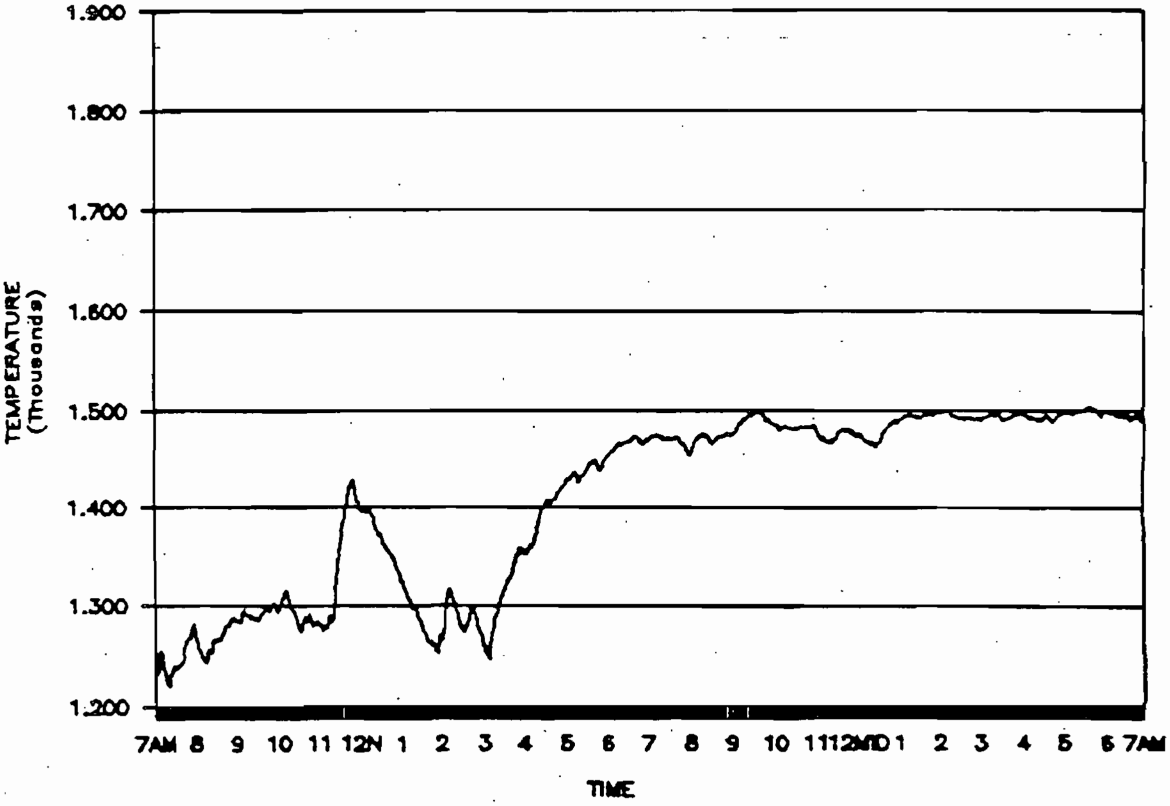
NCG INCINERATOR TEMPERATURE

25 JANUARY 1990



START	STOP	DURATION	TEMPERATURE BELOW 1200 DEGREES

TEMPERATURE ABOVE 1200 DEGREES ENTIRE 24 HOUR PERIOD

GEORGIA-PACIFIC CORPORATION
PALATKA OPERATIONS

25-Jan-90

NCG VALVE REPORT

START	STOP	DURATION	VALVE NAME	REASON FOR VENTING

NO VALVES VENTED ENTIRE 24 HOUR PERIOD

APPENDIX F. SPECIFIC CONDITIONS FOR THE INCINERATOR

Best Available Copy

Palatka, Florida

Specific Conditions for the Incinerator

1. The sources are permitted to operate continuously (i.e., 8760 hrs/year).

2. The emissions from the digester system (consisting of 13 digester systems); the multiple effect evaporation system (consisting of 4 multiple effect evaporator systems); and the NSPS condensate stripper system shall be collected and incinerated in the TRS incinerator. Note that each digester system includes the turpentine condenser system, blow heat accumulator, etc.; and that each multiple effect evaporator system includes the concentrator, the pre-evaporator, hotwells, etc. Actual mass emissions from each system shall be determined prior to and after any future changes, meaning those changes to the permitted systems not specifically authorized by these permits.

3. TRS emissions from the TRS incinerator shall not exceed 5 ppmv on dry basis at standard conditions corrected to 10% oxygen as a 12-hour average. Mass TRS emissions from the TRS incinerator shall exceed neither 0.12 lb/hr nor 0.53 ton/year. The mass TRS emissions are the maximum permitted aggregate total mass emissions allowed for the permitted sources. TRS emissions shall be determined by EPA Methods 1, 2, 3, and either 16 or 16A. No objectionable odor shall be emitted from the TRS incinerator.

4. Particulate emissions from the TRS incinerator (AC 54-142291) shall be limited as follows:

   a. Visible emissions from the TRS incinerator (AC54-142291) shall not exceed 5% opacity (no visible emissions) except that visible emissions of up to 20% opacity are allowed for not more than three minutes in any one hour. Visible emissions from the TRS incinerator shall be determined using DER Method 9.

   b. Mass particulate emissions from the TRS incinerator (AC 54-142291) shall neither exceed 5.5 lbs/hour nor 24.1 tons/year as measured by EPA Methods 1, 2, 3, and 5. Testing for compliance with the mass particulate emission limitation shall be exempt from the compliance testing schedule applicable to the other regulated pollutants emitted by the TRS incinerator. Instead, testing for compliance with the mass particulate emission limitation shall be completed not later than May 12, 1989, and subsequent testing shall be conducted at intervals of not longer than every 5 years thereafter, unless shorter testing intervals are ordered by the Department.

5. SO_2 emissions from the TRS incinerator shall exceed neither 1200 lbs/hr nor 3434 tons/year. SO_2 emissions shall be determined by EPA Methods 1, 2, 3, and 6.

APPENDIX G. EPA REFERENCE METHOD 16 ANALYTICAL METHODOLOGY

TEST PROCEDURES

REFERENCE METHOD 16
ANALYTICAL METHODOLOGY

Total reduced sulfur (TRS) testing is performed using the general techniques and procedures described in EPA Method 16. This section describes the instrumentation, equipment and procedures used by WESTON to conduct reduced sulfur emission testing in accordance with the guidelines given in the Method. Compounds of interest include hydrogen sulfide (H_2S), methyl mercaptan (MeSH), dimethyl sulfide (DMS), and dimethyl disulfide (DMDS) from kraft pulp mill sources. The equipment and techniques described herein have been evaluated by WESTON personnel and have been found acceptable to measure reduced sulfur emissions from regulated sources.

A continuous gas sample is extracted from the emission source; scrubbed through a cold, buffered citrate solution (to remove particulate, moisture and sulfur dioxide); transported to the mobile laboratory through an inert sample line; and analyzed by gas chromatographic separation with flame photometric detection.

EQUIPMENT AND INSTRUMENTATION

As shown in Figure 1, the system consists of a Teflon-lined probe, a cold, liquid scrubber, a nylon sample transfer line, a gas chromatograph, an integrator/chart recorder, a standard gas generator and the associated pumps, valves and gases. This configuration is used regardless of the source tested, but the GC conditions may be changed to achieve the desired separation of compounds.

The Teflon-lined, stainless steel probe (of sufficient length to monitor the gas stream without wall effects) is used to extract a gas sample from the emission source. The probe assembly is configured to allow the introduction of a trace gas at the tip of the probe to evaluate the performance of the entire analytical system, and the tip is directed away from stack gas flow to minimize particulate and moisture entrainment. The probe outlet is plumbed directly to the sample conditioning system.

The sample conditioning system consists of two 250-mL Teflon impingers containing a citrate buffer solution. The Teflon sample line drops directly into the first Teflon impinger which contains approximately a 2 molar solution of potassium citrate at a pH of 5.4 to 5.8. At this pH, SO_2 is selectively removed without affecting the reduced sulfur compounds. The impingers are emersed in an ice bath to reduce the gas temperature to 4 to 5°C thus condensing the moisture. Particulate matter is also removed by the impingers as the gas is washed with the citrate solution.

The sample conditioning system (cold, citrate buffer) is located as close to the sample port as practical to remove moisture and particulate from the sample before transport through sample lines to the mobile laboratory. This method of sample conditioning provides better recovery of reduced sulfur compounds than heating the sample and/or diluting with dry air. The citrate buffer solution removed moisture and particulate matter which may absorb H_2S during transport to the GC. By conditioning the sample at the source, loss of reduced sulfur compounds in the sample transport system is minimized.

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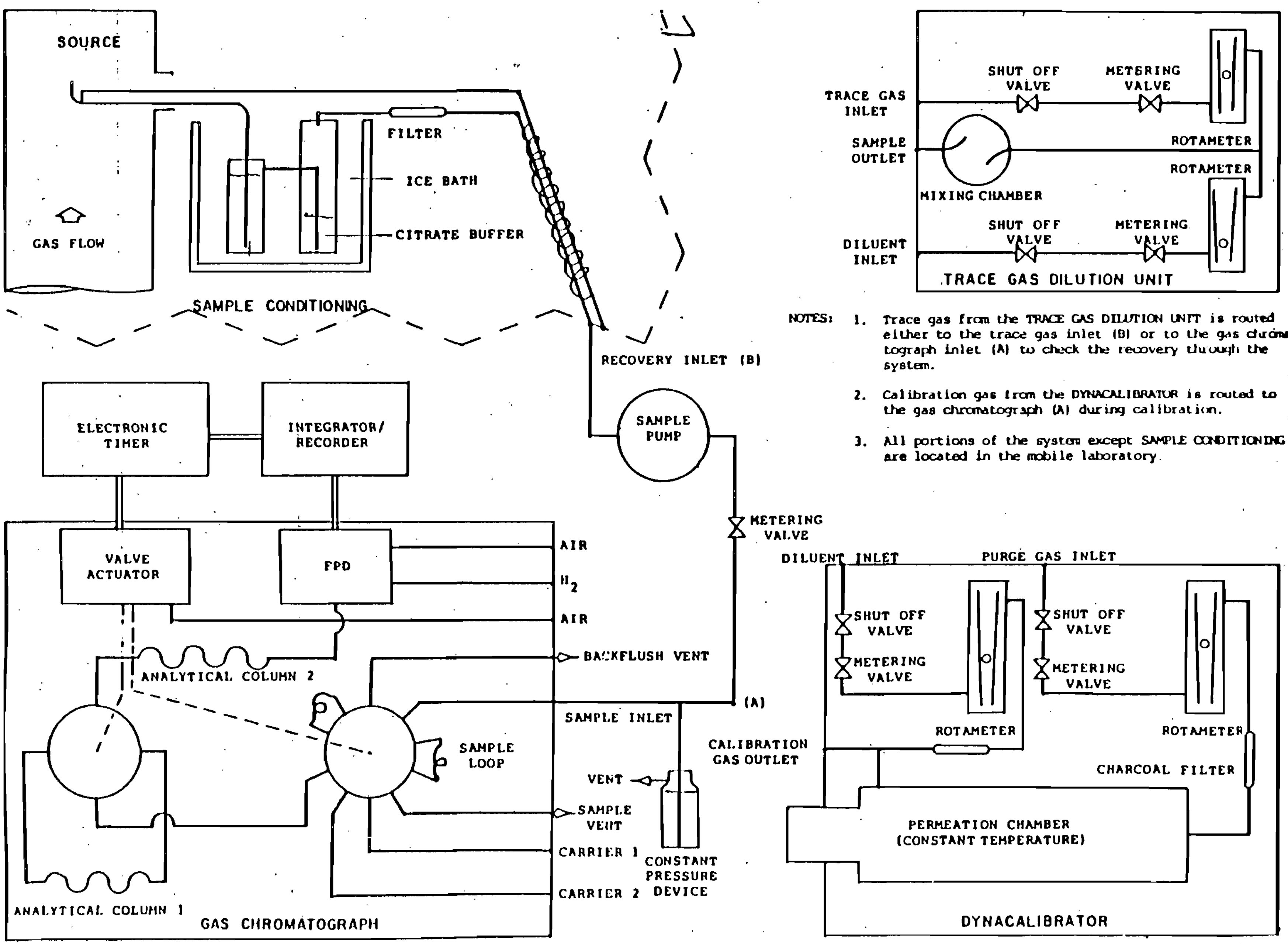


NOTES:

1. Trace gas from the TRACE GAS DILUTION UNIT is routed either to the trace gas inlet (B) or to the gas chromatograph inlet (A) to check the recovery through the system.
2. Calibration gas from the DYNACALIBRATOR is routed to the gas chromatograph (A) during calibration.
3. All portions of the system except SAMPLE CONDITIONING are located in the mobile laboratory.

FIGURE 1. SCHEMATIC DRAWING OF TRS ANALYTICAL SYSTEM

The conditioning system has been evaluated by **WESTON** personnel and has been found to quantitatively pass all reduced sulfur compounds of concern. Recovery of H_2S through the scrubber is demonstrated before and after each sample run.

The dry (approximately one percent moisture) gas is filtered through a microfibre filter before transport to the mobile laboratory through an unheated, nylon sample line. Nylon has been shown to be inert to the reduced sulfur compounds of concern and 200 meters of sample line may be used to transport the sample with greater than 95 percent efficiency.

The sample gas is transported to the mobile laboratory at 1.5 to 2.0 L/min by a diaphragm pump. With a sample line of 170 m x 4 mm ID tubing, the sample residence time is less than two minutes. Forty to sixty mL/min of sample gas are forced through the gas sampling valve and the excess gas is vented through the constant pressure device. The constant pressure device ensures that all samples and calibration gas are analyzed under the same conditions.

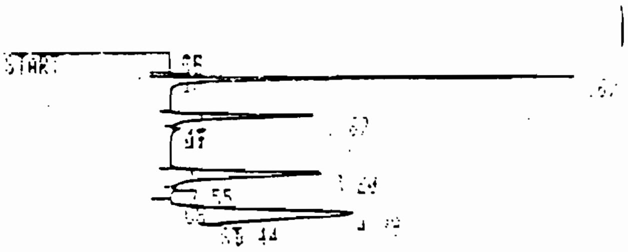
The gas chromatograph is equipped with a flame photometric detector. The carrier gas flow is reversed to achieve separation of all reduced sulfur compounds on the 2 m x 3 mm OD Carbosorb B HT 100 column. Column No. 2 is a 5 cm 3 mm OD Teflon tube packed with Carbosorb B HT 100. The ten-port valve is used to inject the sample from the sample loop. The valves are solenoid operated and the switching of each is controlled by digital valve interfaces triggered by the electronic timer. A precolumn is not normally required for the separation and a 1.6 mm OD Teflon line is used instead. The sample loop is the length of a 3 mm OD Teflon tube. Varying the length of this tube changes the amount of sample that is analyzed during any injection. Figure 2 shows a typical chromatogram generated by the gas chromatograph.

The peak areas are measured with an electronic integrator. The concentration of sulfur in the gas is proportional to the peak area as well as peak height. A strip chart recording of the peaks is obtained simultaneously on the same instrument. All charts are maintained as a permanent record of each project.

The gas chromatograph is field calibrated for each of the reduced sulfur compounds of concern. Calibration gas is generated using a VICI-Metronics Model 230 Dynacalibrator. As shown in the schematic drawing of Figure 1, the gas flow through the chamber and the diluent may be varied to produce a 100-fold change in the calibration gas concentrations. Permeation devices for each reduced sulfur compound, purchased from VICI-Metronics, are gravimetrically certified by the vendor to permeate at a known rate.

A known concentration of H_2S to evaluate system performance is generated by diluting 100 ppm H_2 with dry air using matched rotameters. A 5-10 ppm H_2S concentration is injected at the probe and then at the gas chromatograph to determine the loss of H_2S through the system. Because the trace gas goes through the citrate scrubber, the system recovery also includes moisture correction so that all results are reported on a dry basis.

Oxygen concentration is monitored on a continuous basis at the outlet of the GC vent with a Teledyne Model 320 oxygen analyzer. This measurement is an excellent indicator of leaks.



H_2 Flow = 50 mL/min

Air Flow = 110 mL/min

$N_2$1 Flow = 25 mL/min

$N_2$2 Flow = 45 mL/min

Attenuation = 2^5

Chart Speed = 1.0 cm/min
= 0.5 cm/min at 2.0 min

```
RUN #    30

AREA%
  RT           AREA TYPE    AR/HT        AREA%
 0.67       5709400 ↓ BB    0.059       43.153
 1.67       3928700 ↓ BV    0.121       29.694
 3.20       1502600 ↓ BV    0.182       11.357
 4.79       2089800 ↓ PV    0.282       15.795

TOTAL AREA= 1.3231E+07
MUL FACTOR= 1.0000E+00
```

Trailer Temp: 26°C

Detector Temp: 115°C

Column Temp: 50°C

Columns: 7' x 1/8" BHT 100
18" x 1/8" PPE

Event 1: 0.01 min, Start, Inject

Event 2: 2.00 min, Load

Event 3: 2.00 min Reverse Flow BHT 100 column

Event 4: 5.50 min Forward Flow BHT 100 column

RT 0.67 min = H_2S

RT 1.67 min = CH_3SH

RT 3.20 min = DMS

RT 4.79 min = DMDS

FIGURE 2. TYPICAL CHROMATOGRAM OF REDUCED SULFUR COMPOUNDS

All rotameters in the system are used to measure consistency of flow and not actually to measure the gas flow. All critical gas flows (Dynacalibrator, trace gas, etc.) are measured at each time of use with a soap bubble-flow tube and a stopwatch. The calibration curves for noncritical rotameters are verified periodically by the soap bubble-flow tube method.

METHODOLOGY

Before testing begins, the GC is checked thoroughly for proper operation. A standard gas (a mixture of all reduced sulfur compounds) is injected several times to verify compound retention times and to check the peak area with previously obtained calibration curves.

Before testing on a source actually begins, the sample line is placed in position from the sampling port to the GC set-up and rinsed thoroughly with acetic acid, water and acetone to clean the surface. The sampling system is leak checked by capping the probe and pulling a 10 in. Hg vacuum on the entire system. The sample flow rate at the pump outlet is measured with a soap bubble flow tube. A leak free system is defined as one having a leak rate of less than two percent of the sample flow rate. Because the sampling pump has a maximum vacuum capacity of 10 in. Hg and the normal vacuum in the system is less than 2 in. Hg, the leak check procedure subjects the system to significantly more rigorous conditions than during normal sampling. The entire system is operated under slight vacuum and any leaks during a run are indicated by an increase in oxygen content and/or a reduction in the recovery of H_2S through the system.

The train is then completely assembled and the probe is inserted into the source. The probe is allowed to reach thermal equilibrium while gas is being pulled through the system. An excess of a known concentration of H_2S is injected at the probe tip and pulled through the entire analytical system and then injected at the GC to check the recovery throughout the clean system. After the recovery has stabilized, the standard gas is disconnected from the probe and source gas is collected for a minimum of 15 minutes to ensure the sample line is properly conditioned before TRS concentrations are recorded.

Calibration curves are prepared for each compound before each test begins and verified after each run. Each gas concentration is injected at least three times to ensure instrument stability. The resulting calibration curves are made from the mean response of three injections at least three concentrations. All gas flow rates from the dynacalibrator are measured at the time of use using the soap bubble flow tube technique.

At the end of each sampling run, an H_2S standard is again injected at the probe to check sample loss in the system. Trace gas recovery is evaluated by injecting 5-10 ppm H_2S gas stream at the probe tip and recovering that sample through the sample conditioning and sample transport subsystems. The same gas stream was then introduced directly to the GC sample loop. The ratio of concentrations (based on calibration curves prepared from certified permeation devices) corrects for TRS loss, sample line leakage and moisture in the system. This factor is then used to adjust all measured reduced sulfur compound concentrations to provide results on a dry basis.

If moisture collection is excessive or if the scrubbing solution appears spent, the citrate buffer in the impingers may be changed. Under normal circumstances, one batch of scrubbing solution is sufficient for three 3-hour runs. Exceptions are noted on the field data sheets.

DATA MANIPULATION AND CALCULATION

Peak areas for the compounds of concern are transcribed from the integrator output to data sheets by the instrument operator. All integrator tapes are filed and the "Source Data" sheet is considered to be the record of the test. The instrument operating conditions, calibration data and recovery data are also transcribed from the integrator tape to the appropriate data sheets.

Data reduction is accomplished by referral to calibration curves generated from the analysis of known concentrations of each compound. Calibration curves fit the general equation of $Y = aX^b$. Coefficients of this equation are determined using a Hewlett Packard 15-C calculator programmed with a linear least squares program to give the best fit of the points. Correlation coefficients (R^2 values) are typically 0.98 or better. Copies of calibration curves used for data calculation are included in the appropriate appendix of the report.

The following information is provided as a guide to the reader to demonstrate the method of calculating TRS concentrations from raw data. The general procedure involves the preparation of a calibration curve for each compound of interest from gravimetrically certified permeation devices and then the calculation of source concentrations using the curve generated. Hypothetical data is included as an example.

The permeant concentration in a diluent gas stream is given by the equation:

$$C = \frac{24.04P}{MF}$$

Where:

C = concentration, ppm
P = device permeation rate, ng/min
F = diluent flow rate, mL/min
M = molecular weight of permeant
24.04 = molar volume at 20°C and 760 mm Hg

At least three permeant concentrations are used to construct a calibration curve. Each calibration point is considered valid when the mean peak area of three successive injections does not differ by more than five percent from the peak areas contributing to the mean. The slope of the calibration curve is given by the equation:

$Y = aX^b$ or $\log a = b \log X$

Where:

Y = response for concentration X
b = slope
a = constant

In theory, the slope of the calibration curve should be 2.00. Normally calibration curves have slopes between 1.6 and 2.2. Slopes of less than 1.6 may be acceptable if the measured concentrations are clearly within the linear region of the calibration curve. An example calculation is provided in Table 1.

Each calibration curve is checked after each run for drift. If the calculated concentration exceeds the known concentration by more than ten percent, a new calibration curve is constructed. Sample concentrations must be calculated from the curve which yield the greatest concentration values.

The "three successive injections" criterion outlined in the calibration section is also applicable to trace gas recovery. The equation defining trace gas recovery is:

$$\% \text{ Recovery} = \frac{\text{Conc of trace gas recovered through the system}}{\text{Conc of trace gas measured at GC}} \times 100\%$$

The system correction factor is calculated by the following equation:

$$\text{System Correction Factor} = \frac{100}{\% \text{ Recovery}}$$

The concentration of the trace gas recovered through the system should be within 20 percent of the known TRS concentrations. Recovery values of less than 80 percent are normally unacceptable.

All measured concentrations are multiplied by the system correction factor; thus all data are corrected for line losses and are expressed on a dry basis.

QUALITY ASSURANCE

All QC calibrations are performed using gases generated from certified permeation devices. The emission rate of ±2 percent. The emission rate is determined in a constant temperature chamber at a temperature which is traceable to NBS standard. The constant temperature chamber of the WESTON Dynacalibrator is certified by the vendor at the same temperature as the permeation device certification. All permeation devices are periodically replaced to ensure that they are used only during the recommended lifetime. The known emission rate coupled with the accurate measurement of the dilution gas flow ensures accurate generation of standard concentrations.

After preparation of a calibration curve from the linear least squares best fit the data, the mean response obtained for each gas concentration is used to calculate the concentration equivalent to the response. The calculated concentration should vary less than 10 percent from the known concentration except at the lower end of the curve. Near the detection limit for each compound, variation may be more due to variation in integration.

The sample system integrity is verified through routine leak checks and determination of the recovery of H_2S through the entire sampling and analysis system. Recovery studies are conducted before and after each 3-hour run to ensure that at least 80 percent of the H_2S injected at the probe tip is recovered at the GC. All source concentrations are corrected for the lower recovery value.

All rotameters are calibrated with an appropriate soap bubble flowmeter under actual operating conditions. Calibration graphs are prepared for field use. All flows are verified during the testing to ensure that all flows remain constant. The actual measured flows are used in the calculations.

TABLE 1. EXAMPLE CALCULATION

Calibration Point	1	2	3	4
Known Concentration[a]	10.5	6.41	2.92	1.39
Peak Areas[b]				
1	1.36×10^7	5.08×10^6	1.19×10^6	3.01×10^5
2	1.32×10^7	5.04×10^6	1.17×10^6	3.13×10^5
3	1.33×10^7	5.11×10^6	1.19×10^6	3.08×10^5
Mean Peak Area[b]	1.34×10^7	5.08×10^7	1.18×10^7	3.07×10^5
Difference of Individual Peak Areas From Mean Peak Area				
1	1.5%	0	<1%	2%
2	1.5%	<1%	<1%	2%
3	<1%	<1%	<1%	<1%
Calculated Concentration	10.6	6.33	2.89	1.40
Difference Between Known Concentration and Calculated Concentration	<1%	1.2%	1%	<1%

The slope of this H_2S calibration curve is 1.86.

[a] ppm, based on permeation rates and diluent flow.

[b] uv-sec.

Pressures and flows are observed continuously and recorded during all testing to ensure uniform operation. Periodic leak checks are performed to ensure system integrity. Any unreasonable results are immediately verified by checking the recovery of a standard gas.

All proceedings are recorded on preprinted data sheets. Daily summaries of the testing are prepared at the end of each day to consolidate the data. The data sheets and all integrator outputs remain on file at WESTON for a period of three years after the test.

The gas chromatographic columns and conditions are sufficient to obtain separation of all the reduced sulfur compounds. The method has been found to be free of interferences from carbon monoxide, carbon dioxide, and hydrocarbons. Sulfur dioxide interference is eliminated by the citrate scrubber at the source. The cold, citrate scrubber eliminates moisture interference by reducing the dew point of the gas to less than 4°C and the recovery studies correct the sample concentrations to dry conditions.

EVALUATION OF CARBON DIOXIDE INTERFERENCE

The response of a flame photometric detector (FPD) is known to be depressed by carbon monoxide (CO) and carbon dioxide (CO_2). Since CO is normally present in emission sources at concentrations of less than 200 ppm and since it responds on the analytical GC column in the same way as CO_2, it is not necessary to check for interference. It is, however, important to demonstrate that CO_2 does not depress the instrument response to the reduced sulfur compounds because CO_2 is present in many emission sources at high concentrations (up to approximately 20 percent).

On 23 August 1983, the WESTON TRS analytical system was evaluated to document the lack of interference by CO_2. The gas chromatograph, valving, and timing the operation of the system was identical to that described in this method. The instrument conditions shown on Figure 3 were used during the experiment.

Because CO_2 elutes from the column before H_2S, it is the only reduced sulfur compound that could be affected by CO_2 in the gas. To demonstrate a lack of interference, a gravimetrically certified H_2S in nitrogen and then the same concentration was generated in 16 percent CO_2 and 84 percent nitrogen. Both samples were analyzed repetitively to compare the response of H_2S in the presence of CO_2.

Five successive injections of 8.15 ppm H_2S in nitrogen gave the following peak areas (all multiplied by 10^3 uv-sec):

2.664
2.636 Mean = 2.631
2.611 Std Dev = 0.021
2.627
2.617

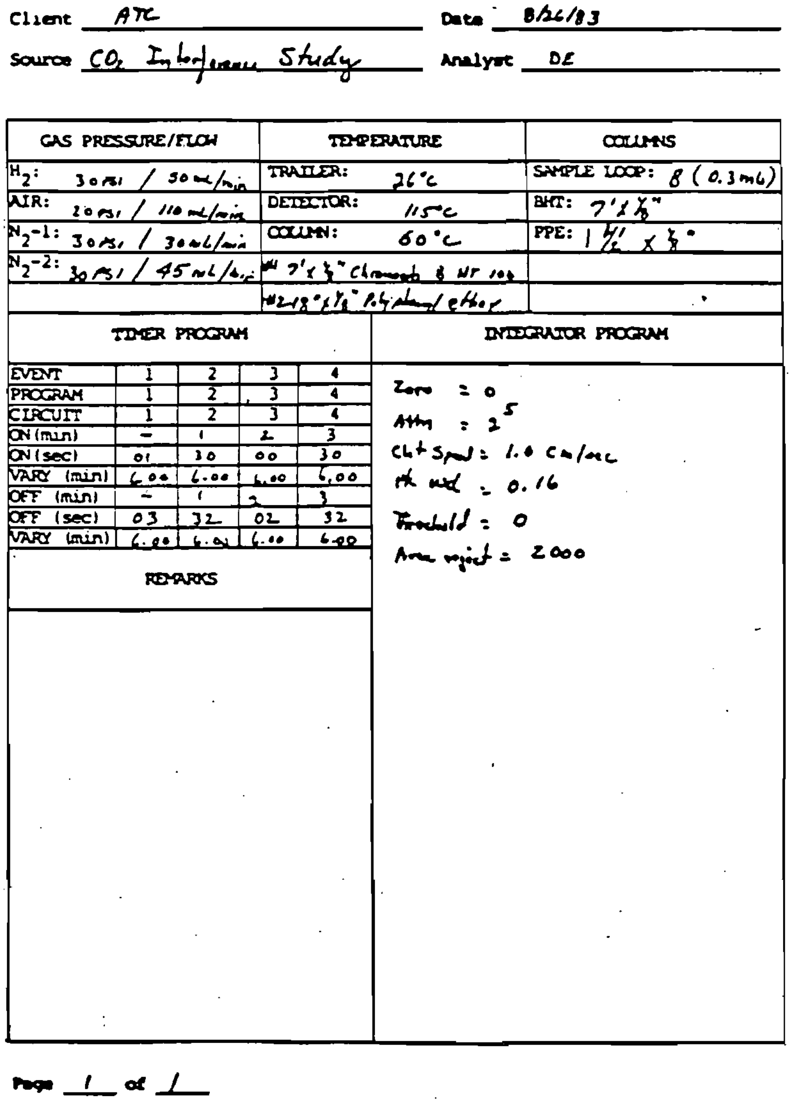
Five successive injections of 8.15 ppm H_2S in 16 percent CO_2, 84 percent nitrogen gave the following peak areas (all multiplied by 10 uv-sec):

2.608
2.633 Mean = 2.616
2.627 Std Dev = 0.013
2.611
2.601

The 0.57 percent decrease in response (equivalent to 0.3 percent concentration) between the two samples is not significant at the 95 percent confidence level. It is, therefore, concluded that the FPD response to H_2S is unaffected by CO_2 at the concentrations normally measured in emission sources.

EVALUATION OF TRS LOSS THROUGH NYLON SAMPLE LINES

On 26 June 1989, the WESTON TRS analytical system was evaluated to document the recovery of hydrogen sulfide (H_2S), methyl mercaptan (MeSH), dimethyl sulfide (DMS), and dimethyl disulfide (DMDS) through nylon sample lines. The gas chromatograph, valving, timing, and operation of the system was identical to that previously described.



Client ATC Date 8/26/83

Source CO_2 Interference Study Analyst DE

GAS PRESSURE/FLOW	TEMPERATURE	COLUMNS
H_2: 30 psi / 50 mL/min	TRAILER: 26°C	SAMPLE LOOP: 8 (0.3 mL)
AIR: 20 psi / 110 mL/min	DETECTOR: 115°C	BHT: 7' x 1/8"
N_2-1: 30 psi / 30 mL/min	COLUMN: 60°C	PPE: 1 1/2' x 1/8"
N_2-2: 30 psi / 45 mL/min	#1 7' x 1/8" Chromosorb & NT 108	
	#2 18" x 1/8" Polyphenyl ether	

TIMER PROGRAM

EVENT	1	2	3	4
PROGRAM	1	2	3	4
CIRCUIT	1	2	3	4
ON (min)	–	1	2	3
ON (sec)	01	30	00	30
VARY (min)	6.00	6.00	6.00	6.00
OFF (min)	–	1	2	3
OFF (sec)	03	32	02	32
VARY (min)	6.00	6.00	6.00	6.00

INTEGRATOR PROGRAM

Zero = 0
Attn = 2^5
Cht Speed = 1.0 cm/sec
Pk wd = 0.16
Threshold = 0
Area reject = 2000

REMARKS

Page 1 of 1

FIGURE 3. INSTRUMENT CONDITIONS USED DURING INTERFERENCE STUDIES

A sampling train was constructed by plumbing a Teflon-lined, stainless-steel probe to a pair of Teflon impingers, containing 2 M citrate buffer pH 5.4 to 5.8, maintained in an ice bath. The outlet of the second impinger was plumbed to a Balston AQ filter which was attached to 500 feet of 1/4 inch nylon sample line. The sample line was connected to the vacuum side of a KNF Kneuberger pump equipped with Viton valves and diaphragm. The KNF Kneuberger pump was operating at a flow rate of approximately 1 liter per minute. The outlet of the pump was discharged into a constant pressure bottle to maintain a sufficient flow to charge the sample loop of the gas chromatograph.

A gas cylinder containing H_2S, MeSH, DMS, and DMDS was used for the recovery evaluation. The gas was introduced at the probe tip and recovered through 500 feet of nylon sample line. The gas was then introduced directly to the gas chromatograph via the pump and constant pressure bottle. Three consecutive injections were obtained with a difference of less than ±5 percent and are summarized below:

	H_2S	MeSH	DMS	DMDS
Instrument Response, x 10^6 uv-sec				
Injection 1	7.29	3.49	3.12	3.56
Injection 2	7.28	3.41	3.17	3.54
Injection 3	7.32	3.41	3.22	3.60
Mean	7.30	3.44	3.17	3.57
Calculated Concentration, ppm	10.77	9.36	9.42	8.02

The cylinder gas was then plumbed directly to the constant pressure bottle and three consecutive injections were obtained with a difference of less than ±5 percent. Those results are summarized below:

	H_2S	MeSH	DMS	DMDS
Instrument Response, x 10^6 uv-sec				
Injection 1	7.87	3.90	3.64	3.94
Injection 2	7.90	3.92	3.63	4.02
Injection 3	7.94	3.94	3.64	4.13
Mean	7.90	3.92	3.64	4.03
Calculated Concentration, ppm	11.35	10.17	10.3	8.54

Recovery values based on the calculated concentrations measured directly to the gas chromatograph and after recovering the cylinder gas through the sample line are provided below:

	H_2S	MeSH	DMS	DMDS
Recovery through nylon sample line, percent	95	92	91	94

APPENDIX H. CERTIFICATION AND CALIBRATIONS

CERTIFICATE

The permeation rate of the DYNACAL® PERMEATION DEVICE listed below is certified traceable to N.B.S. standards.

CHEMICAL FILL : HYDROGEN SULFIDE
DEVICE TYPE : WAFER DEVICE
LENGTH/GEOMETRY : 30T3 WAFER
PART NUMBER : 147-533-0110
METHOD OF CERTIFICATION : GRAVIMETRIC
CERTIFICATION NUMBER : 89-38090

RATE: 1240 NG/MIN +/- 5% AT 50 DEG C
NOTE:
DATE: 29 SEPTEMBER 1989 BY:

VICI

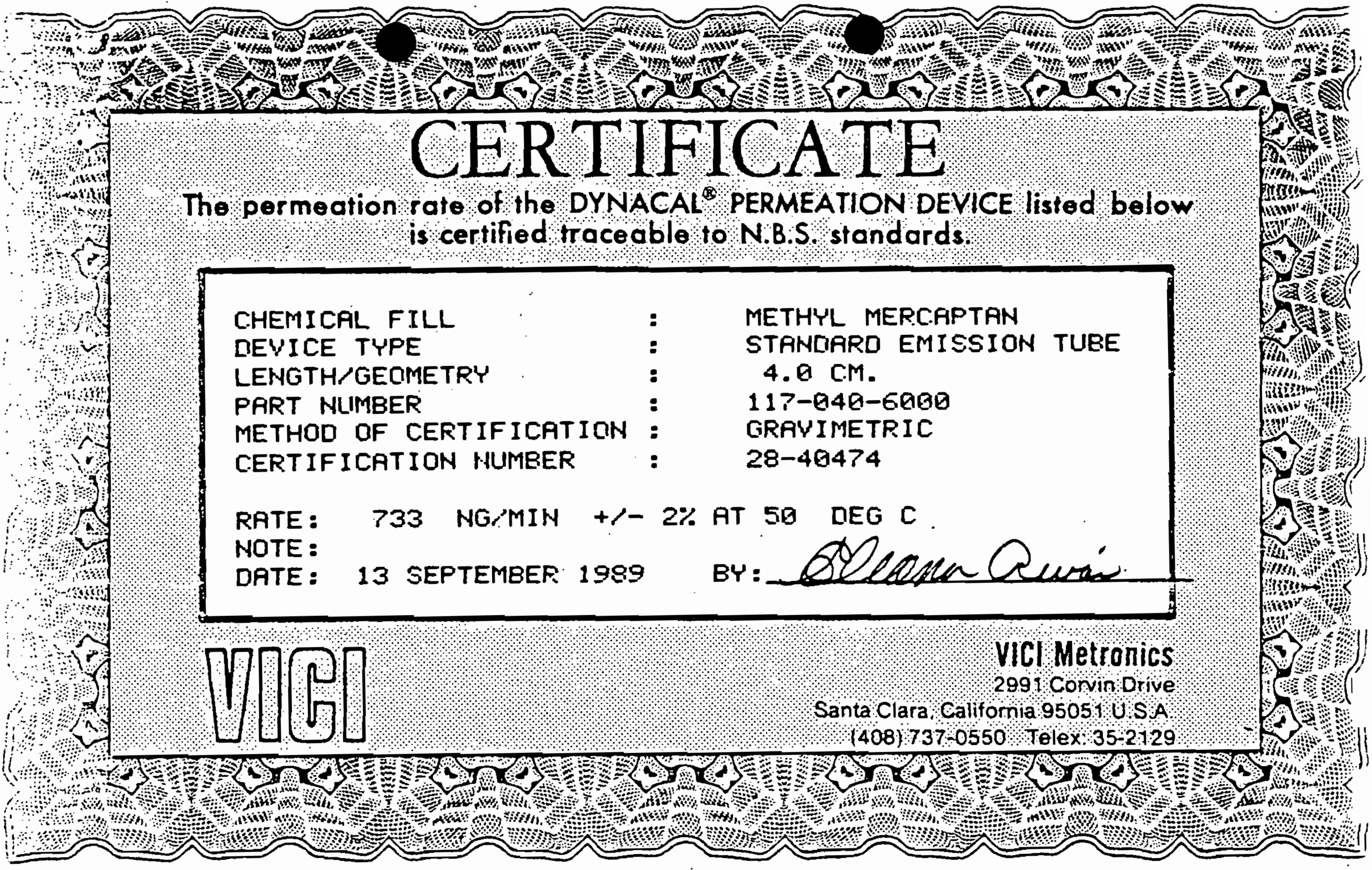
VICI Metronics
2991 Corvin Drive
Santa Clara, California 95051 U.S.A.
(408) 737-0550 Telex: 35-2129

INDIVIDUAL DEVICE CERTIFICATION

The gravimetric method measures the weight loss per unit of time at the certification temperature. Traceability is thus established by the use of temperature and weight standards traceable to N.B.S. standards.

Individual certification is accomplished by: (1) maintaining the device in a constant temperature chamber with a purge flow of dry nitrogen, and (2) weighing periodically on a semi-microanalytical balance, accurate to the nearest 0.01 mg, until a steady weight loss per unit time has been achieved. Temperature control and accuracy are better than ± 0.05°C, referenced against temperature standards traceable to the National Bureau of Standards. The semi-microanalytical balances are routinely serviced and calibrated by an independent service organization using N.B.S. traceable weight standards. Gravimetric permeation rate determinations are continued until the standard error of the permeation rate meets the required accuracy at the 95% confidence level.

Validation of the certification procedures and standards at VICI Metronics is accomplished by routine certification of Standard Reference Material (SRM) permeation devices obtained from the National Bureau of Standards.



CERTIFICATE

The permeation rate of the DYNACAL® PERMEATION DEVICE listed below is certified traceable to N.B.S. standards.

CHEMICAL FILL : METHYL MERCAPTAN
DEVICE TYPE : STANDARD EMISSION TUBE
LENGTH/GEOMETRY : 4.0 CM.
PART NUMBER : 117-040-6000
METHOD OF CERTIFICATION : GRAVIMETRIC
CERTIFICATION NUMBER : 28-40474

RATE: 733 NG/MIN +/- 2% AT 50 DEG C
NOTE:
DATE: 13 SEPTEMBER 1989 BY:

VICI

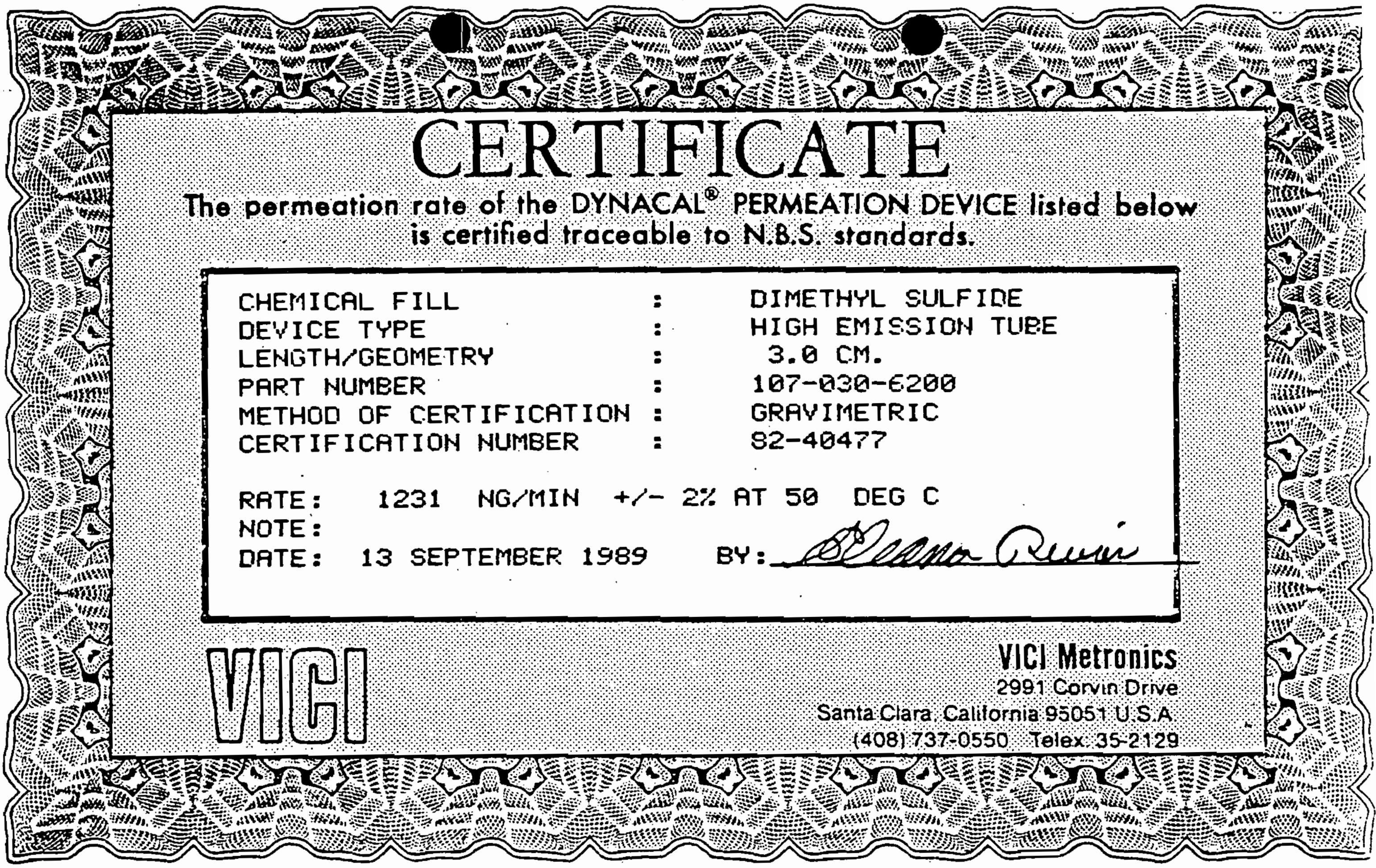
VICI Metronics
2991 Corvin Drive
Santa Clara, California 95051 U.S.A.
(408) 737-0550 Telex: 35-2129

INDIVIDUAL DEVICE CERTIFICATION

The gravimetric method measures the weight loss per unit of time at the certification temperature. Traceability is thus established by the use of temperature and weight standards traceable to N.B.S. standards.

Individual certification is accomplished by: (1) maintaining the device in a constant temperature chamber with a purge flow of dry nitrogen, and (2) weighing periodically on a semi-microanalytical balance, accurate to the nearest 0.01 mg, until a steady weight loss per unit time has been achieved. Temperature control and accuracy are better than ± 0.05°C, referenced against temperature standards traceable to the National Bureau of Standards. The semi-microanalytical balances are routinely serviced and calibrated by an independent service organization using N.B.S. traceable weight standards. Gravimetric permeation rate determinations are continued until the standard error of the permeation rate meets the required accuracy at the 95% confidence level.

Validation of the certification procedures and standards at VICI Metronics is accomplished by routine certification of Standard Reference Material (SRM) permeation devices obtained from the National Bureau of Standards.



CERTIFICATE

The permeation rate of the DYNACAL® PERMEATION DEVICE listed below is certified traceable to N.B.S. standards.

CHEMICAL FILL	:	DIMETHYL SULFIDE
DEVICE TYPE	:	HIGH EMISSION TUBE
LENGTH/GEOMETRY	:	3.0 CM.
PART NUMBER	:	107-030-6200
METHOD OF CERTIFICATION	:	GRAVIMETRIC
CERTIFICATION NUMBER	:	82-40477

RATE: 1231 NG/MIN +/- 2% AT 50 DEG C

NOTE:

DATE: 13 SEPTEMBER 1989 BY:

VICI

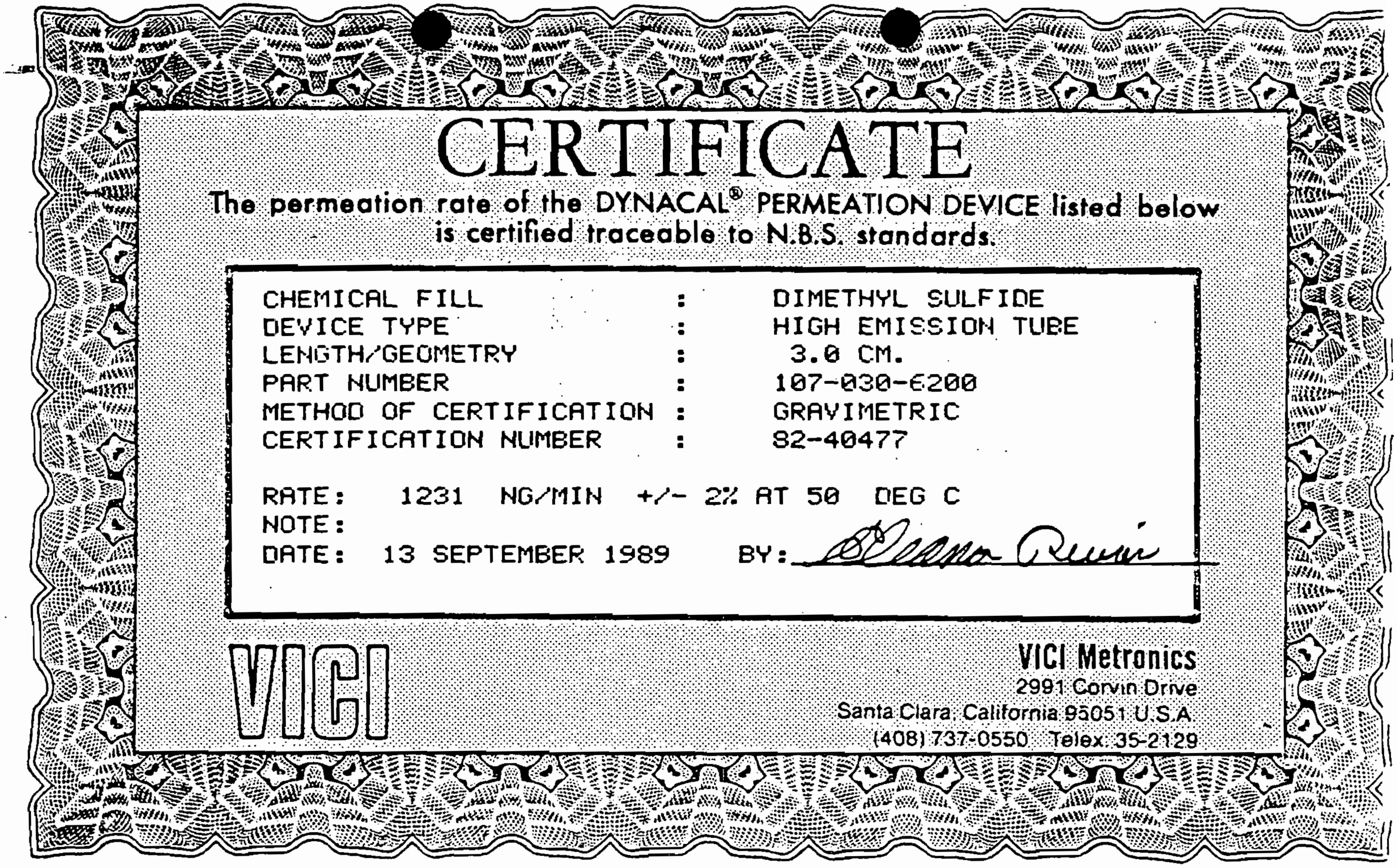
VICI Metronics
2991 Corvin Drive
Santa Clara, California 95051 U.S.A.
(408) 737-0550 Telex: 35-2129

INDIVIDUAL DEVICE CERTIFICATION

The gravimetric method measures the weight loss per unit of time at the certification temperature. Traceability is thus established by the use of temperature and weight standards traceable to N.B.S. standards.

Individual certification is accomplished by: (1) maintaining the device in a constant temperature chamber with a purge flow of dry nitrogen, and (2) weighing periodically on a semi-microanalytical balance, accurate to the nearest 0.01 mg, until a steady weight loss per unit time has been achieved. Temperature control and accuracy are better than ± 0.05°C, referenced against temperature standards traceable to the National Bureau of Standards. The semi-microanalytical balances are routinely serviced and calibrated by an independent service organization using N.B.S. traceable weight standards. Gravimetric permeation rate determinations are continued until the standard error of the permeation rate meets the required accuracy at the 95% confidence level.

Validation of the certification procedures and standards at VICI Metronics is accomplished by routine certification of Standard Reference Material (SRM) permeation devices obtained from the National Bureau of Standards.



CERTIFICATE

The permeation rate of the DYNACAL® PERMEATION DEVICE listed below is certified traceable to N.B.S. standards.

CHEMICAL FILL : DIMETHYL SULFIDE
DEVICE TYPE : HIGH EMISSION TUBE
LENGTH/GEOMETRY : 3.0 CM.
PART NUMBER : 107-030-6200
METHOD OF CERTIFICATION : GRAVIMETRIC
CERTIFICATION NUMBER : 82-40477

RATE: 1231 NG/MIN +/- 2% AT 50 DEG C
NOTE:
DATE: 13 SEPTEMBER 1989 BY:

VICI

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2991 Corvin Drive
Santa Clara, California 95051 U.S.A.
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INDIVIDUAL DEVICE CERTIFICATION

The gravimetric method measures the weight loss per unit of time at the certification temperature. Traceability is thus established by the use of temperature and weight standards traceable to N.B.S. standards.

Individual certification is accomplished by: (1) maintaining the device in a constant temperature chamber with a purge flow of dry nitrogen, and (2) weighing periodically on a semi-microanalytical balance, accurate to the nearest 0.01 mg, until a steady weight loss per unit time has been achieved. Temperature control and accuracy are better than ± 0.05°C, referenced against temperature standards traceable to the National Bureau of Standards. The semi-microanalytical balances are routinely serviced and calibrated by an independent service organization using N.B.S. traceable weight standards. Gravimetric permeation rate determinations are continued until the standard error of the permeation rate meets the required accuracy at the 95% confidence level.

Validation of the certification procedures and standards at VICI Metronics is accomplished by routine certification of Standard Reference Material (SRM) permeation devices obtained from the National Bureau of Standards.

CERTIFICATE

The permeation rate of the DYNACAL® PERMEATION DEVICE listed below is certified traceable to N.B.S. standards.

CHEMICAL FILL : DIMETHYL DISULFIDE
DEVICE TYPE : HIGH EMISSION TUBE
LENGTH/GEOMETRY : 20.0 CM.
PART NUMBER : 107-200-6301
METHOD OF CERTIFICATION : GRAVIMETRIC
CERTIFICATION NUMBER : 82-40478

RATE: 1022 NG/MIN +/- 2% AT 50 DEG C
NOTE:
DATE: 13 SEPTEMBER 1989 BY:

VICI

VICI Metronics
2991 Corvin Drive
Santa Clara, California 95051 U.S.A.
(408) 737-0550 Telex: 35-2129

INDIVIDUAL DEVICE CERTIFICATION

The gravimetric method measures the weight loss per unit of time at the certification temperature. Traceability is thus established by the use of temperature and weight standards traceable to N.B.S. standards.

Individual certification is accomplished by: (1) maintaining the device in a constant temperature chamber with a purge flow of dry nitrogen, and (2) weighing periodically on a semi-microanalytical balance, accurate to the nearest 0.01 mg, until a steady weight loss per unit time has been achieved. Temperature control and accuracy are better than ± 0.05°C, referenced against temperature standards traceable to the National Bureau of Standards. The semi-microanalytical balances are routinely serviced and calibrated by an independent service organization using N.B.S. traceable weight standards. Gravimetric permeation rate determinations are continued until the standard error of the permeation rate meets the required accuracy at the 95% confidence level.

Validation of the certification procedures and standards at VICI Metronics is accomplished by routine certification of Standard Reference Material (SRM) permeation devices obtained from the National Bureau of Standards.

nuTech

A0-4

CALIBRATION SHEET

Customer : Roy F. Weston   Serial : 81082
Date : 1/30/89

CALCULATION DATA FOR RUN :	1	2	3	
1. Barometric Pressure, P(B) :	30.03	30.03	30.03	
2. Orifice Setting, Delta H :	2.00	0.75	6.00	
3. Finial Reading (Test) :	86.673	97.619	108.797	
4. Initial Reading (Test) :	75.787	87.024	98.182	
5. Volume, V(T) Cubic Feet :	10.886	10.595	10.615	
6. Temp Initial T(T(I)) F :	70	72	73	
7. Temp Finial T(T(F)) F :	71	73	73	
8. Finial Reading (Box) :	14.746	25.657	36.687	
9. Initial Reading (Box) :	4.000	15.100	26.206	
10. Volume, V(B) Cubic Feet :	10.746	10.557	10.481	
11. Temp Initial T(B(I)) F :	72	76	79	
12. Temp Final T(B(F)) F :	76	79	84	
13. Elapsed Time, Minutes :	14.0	22.0	8.0	
Delta H(a) :	1.8403	1.8008	1.8873	1.843
Gamma :	1.0147	1.0112	1.0140	1.013

Calibration Performed By : William A. Ballard

POST METER CALIBRATION

CLIENT Georgia Pacific PROJECT NUMBER 0414-09-01 $\overline{\Delta H}$ 2.5 HIGHEST VACUUM 5.0

DATE 1-29/90 CONSOLE # 4NT METER # ____ P_B 29.90 γ_{STD} 0.985 CALIBRATED BY R.J.

			STANDARD METER						DRY TEST METER				
ΔH	Θ	VAC	V_{SF}	V_{SI}	V_S	T_{SI} / T_{SF}	T_S	P_S	V_{DF}	V_{DI}	V_D	T_{DI} / T_{DF}	T_D
2.5	15	6.0	618.730	605.380	13.350	70 72	71	.005	715.175	702.097	13.078	72 76	74
2.5	~~10~~	6.0	628.563	618.730	9.833	72 72	72	.005	724.812	715.175	9.637	76 78	77
2.5	12	6.0	639.300	628.563	10.737		72	.005	735.338	724.812	10.526	78 79	78.5

$$\gamma_i = \frac{V_S\,(P_B + P_S/13.6)(T_D + 460)\,\gamma_{STD}}{V_D\,(P_B + \Delta H/13.6)\,(T_S + 460)}$$

$$\Delta H@ = \frac{0.0319\,\Delta H}{P_B\,(T_D + 460)}\left[\frac{(T_S + 460)\Theta}{V_{S'}\,\gamma_{STD}}\right]^2$$

ΔH	γ_i CALCULATION	γ_i	ΔH@ CALCULATION	ΔH@
2.5	$\frac{(\quad + \quad /13.6)(\quad + 460)}{(\quad + \quad /13.6)(\quad + 460)}$	1.00501	$\frac{0.0319(\quad)}{(\quad + 460)}\left[\frac{(\quad + 460)}{(\quad)(\quad)}\right]$	1.8255
2.5		1.00830		1.8132
2.5		1.00801		1.8097
		1.00711		1.8168

$\bar{\gamma}$ FROM LAST FULL CALIBRATION: 1.013

IS THIS $\bar{\gamma}$ WITHIN 5%? Yes

ARE INDIVIDUAL VALUES FOR γ_i ± 2% FROM $\bar{\gamma}$? Yes

DATA CHECKED BY /DATE: K.W

QC REQUIREMENTS

1) LEAK CHECK STANDARD METER UP TO COARSE ADJUST VALVE UNDER POSITIVE PRESSURE ~ 0.5 INCHES H_2O.
2) ALLOW 15 MINUTE WARM-UP BEFORE BEGINNING CALIBRATION AND RE-VERIFY $\overline{\Delta H}$ AND VACUUM.
3) MAINTAIN CONSTANT ΔH.

WESTON

C:\MARKET\AIR\CALIBRAT

DATE: 1-10-90

DRY GAS METER IDENTIFICATION: #3

BAROMETRIC PRESSURE (P_b): 30.14/30.18 in. Hg

SINGER DRY GAS METER.

APPROXIMATE FLOW RATE ($\tilde{Q}$) cfm	SPIROMETER (WET METER) GAS VOLUME (V_s) ft³		DRY GAS METER VOLUME (V_{dg}) ft³		TEMPERATURES: SPIROMETER (WET METER) (t_s) °F Pre	Post	DRY GAS METER: Pre ~~INLET~~ (t_i) °F	Post ~~OUTLET~~ (t_o) °F	AVERAGE ($\bar{t}_d$) °F	DRY GAS METER PRESSURE (Δp) in. H_2O	TIME (Θ) min.	FLOW RATE (Q) ~~cfm~~ l	METER COEFFICIENT (Y_{ds})	AVERAGE METER COEFFICIENT ($\bar{Y}_{ds}$)
1,5 ~~0.40~~	1,500	4.04	0.00	69.99	78	78	77	78	78	.6	42.38	1.65	.994	
	2.00	4.70	0.00	74.10	78	78	78	78	78	.6	51	1.48	1.030	1.021
	2.00	5.02	0.00	82.10	78	78	78	78	78	.6	58	1.45.	1.0402	
1,000 ~~0.60~~	3.00	4.40	0.00	37.72	78	78	78	78	78	.4	32	1.22	1.048	
	4.40	4.98	0.00	15.30	78	78	78	78	78	.4	12.5	1.21	1.072	1.052
	4.98	5.36	0.00	10.350	78	78	78	78	78	.4	9	1.19	1.040	
a500 ~~0.80~~	2.00		0.00		78	78	78	78	78	.4				
1.00														
1.20														

$$Q = 17.65 \cdot \frac{V_s}{\Theta} \cdot \frac{P_b}{(t_s + 460)}$$

$$Y_{ds} = \frac{V_s}{V_{dg}} \cdot \frac{(\bar{t}_d + 460)}{(t_s + 460)} \cdot \frac{P_b}{\left(P_b + \frac{\Delta p}{13.6}\right)}$$

Figure 5.8. Example data sheet for calibration of a standard dry gas meter for method 5 sampling equipment (English units).

APPENDIX I. EXAMPLE CALCULATIONS

EXAMPLE CALCULATIONS FOR NCG INCINERATOR

(The data used for sample calculations are from Run 1)

I. Calculation for Meter Pressure (Pm), in. Hg

$$Pm = Pbar + (\text{avg. delta } H)/13.6$$

where,
Pbar = barometric pressure, in. Hg
Delta H = pressure differential of orifice, in. H2O

$$Pm = 29.77 \text{ in. Hg} + \frac{2.91 \text{ in.H2O}}{13.6 \text{ in.H2O/in.Hg}} = 29.98 \text{ in. Hg}$$

II. Calculation for Standard Meter Volume (Vmstd) , ft^3

$$Vmstd = \frac{17.64 \times Y \times Vm \times Pm}{Tm}$$

where,
Y = meter correction factor
Vm = meter volume, ft^3
Tm = meter temperature, deg R
Pm = meter pressure, in. Hg

$$Vmstd = \frac{17.64 \times 1.01 \times 56.48 \text{ ft}^3 \times 29.98 \text{ in. Hg}}{543.67 \text{ deg R}} = 55.665 \text{ ft}^3$$

III. Calculation for Standard Wet Volume (Vwstd), ft^3

$$Vwstd = .04707 \times Vlc$$

where, Vlc = volume of water collected, ml.

$$Vwstd = .04707 \times 82.10 = 3.864 \text{ ft}^3$$

IV. Calculation for Moisture Content (BWS)

$$BWS = \frac{Vwstd}{(Vwstd + Vmstd)} = .065$$

V. Calculation for Molecular Weight (Ms)

$$Ms = [0.44\ CO2 + 0.32\ O2 + 0.28\ (100 - CO2 - O2)]\ (1 - BWS) + 18\ BWS$$

$$Ms = [0.44 \times 1 + 0.32 \times 18.70 + 0.28\ (100 - 1 - 18.70)]$$

$$(1 - .06) + 18(.06) = 28.2$$

VI. Calculation of Average Velocity (Vs), ft/sec

$$Vs = 85.49 \times Cp \times \mathrm{Sqrt(delta\ P)avg} \times \mathrm{Sqrt}\left(\frac{Ts}{Ps \times Ms}\right)$$

where, Cp = pitot tube coefficient
delta P = velocity head of stack gas, in. H2O
Ts = absolute stack temperature, deg R
Ps = absolute stack gas pressure, in. Hg
Ms = molecular weight of stack gas

$$Vs = 85.49\ \frac{\mathrm{ft}}{\mathrm{sec}}\ \mathrm{sqrt}\left[\frac{\mathrm{(lb/lb\text{-}mole)(in.\ Hg)}}{\mathrm{(deg\ R)\ \ (in\ .H2O)}}\right] \times .84 \times 1.15\ \mathrm{sqrt(in.\ H2O)} \times$$

$$\mathrm{sqrt}\left(\frac{926.17\ \mathrm{deg\ R}}{29.98\ \mathrm{in.\ Hg} \times 28.20\ \mathrm{lb/lb\text{-}mole}}\right) = 86.6\ \mathrm{ft/sec}$$

VII. Calculation of Average Stack Gas Flow at Stack Conditions (Qa), ft^3/min

$$Qa = 60 \times Vs \times As$$

where, Vs = stack gas velocity, ft/sec
As = cross-sectional area of stack, ft^2

$$Qa = 60\ \frac{\mathrm{sec}}{\mathrm{min}} \times 86.57\ \mathrm{ft/sec} \times 7.88\ \mathrm{ft^2}$$

$$Qa = 4.09E{+}4\ \mathrm{ft^3/min}$$

VIII. Average Stack Gas Flow at standard conditions (Qs), Ft^3/min

$$Qs = 17.64\ \frac{\mathrm{deg\ R}}{\mathrm{in.Hg}} \times Qa \times (1 - BWS) \times \frac{Ps}{Ts}$$

where, Qa = average stack gas flow at stack conditions, ft^3/min
BWS = moisture content
Ps = absolute stack gas pressure, in. Hg
Ts = absolute stack temperature, deg R

$$Qs = 17.64\ \frac{\mathrm{deg\ R}}{\mathrm{in.Hg}} \times 40932.29\ \frac{\mathrm{ft^3}}{\mathrm{min}} \times (1 - .06) \times \frac{29.98\ \mathrm{in.Hg}}{926.17\ \mathrm{deg\ R}}$$

$$Qs = 2.19E{+}4\ \mathrm{ft^3/min}$$

IX. Percent Isokinetic Sampling (% I)

$$\% I = \frac{0.0945 \times Ts \times Vmstd}{Ps \times Vs \times An \times \theta \times (1 - BWS)}$$

where, Ts = average stack temperature, deg R

Vmstd = standard meter volume, ft^3

Ps = stack gas pressure, in.Hg

Vs = stack gas velocity, ft/sec

An = cross-sectional area of nozzle, ft^2

ϑ = total sampling time, min

BWS = moisture content

$$\% I = \frac{0.0945 \times 926.17 \text{ deg R} \times 55.66 \text{ ft}^3}{29.98 \times 86.57 \text{ ft/sec} \times .00 \text{ ft}^2 \times 60 \text{ min} \times (1- .06)}$$

$$\% I = 100.5$$

X. Particulate Concentration at standard conditions (Cs), grain/ft^3

$$Cs = 15.4 \frac{Mn}{Vmstd}$$

where, Mn = particulate matter collected, g

Vmstd = standard meter volume, ft^3

$$Cs = 15.4 \frac{.0840 \text{ g}}{55.66 \text{ ft}^3} = .023 \text{ grain/ft}^3$$

XI. Particulate Emission Rate (PMR), lb/hr

$$PMR = 0.00857 \times Cs \times Qs$$

where, Cs = particulate conc. at standard cond., grains/ft^3

Qs = average stack gas flow at standard conditions, ft^3/min

$$PMR = 0.00857 \times .02 \frac{\text{grains}}{\text{ft}^3} \times 21855.33 \frac{\text{ft}^3}{\text{min}}$$

$$PMR = 4.353$$

9 03

EXAMPLE SO_2 CALCULATIONS FOR NCG INCINERATOR
GP- PALATKA, FLORIDA
WESTON WORK ORDER NO. 0414-09-01

STANDARD METER VOLUME, U_{MSTD}

$$U_{MSTD} = K_1 Y \frac{V_M P_M}{T_M}$$

WHERE: K_1 = 17.64 °R / IN HG
Y = DGM CALIBRATION FACTOR
V_M = DRY GAS VOLUME AS MEASURED BY THE DRY GAS METER, DL
P_M = BAROMETRIC PRESSURE AT THE EXIT ORIFICE OF THE DGM, IN HG
T_M = AVERAGE DGM ABSOLUTE TEMP., °R

RUN 1, NCG INCINERATOR

$$V_{MSTD} = (17.64\ \cancel{°R}/\cancel{In\ Hg})(1.052)\left(\frac{52.15\ L \times 29.99\ \cancel{In\ Hg}}{541\ \cancel{°R}}\right)$$

$$V_{MSTD} = 53.6\ L$$

CONCENTRATION OF SULFUR DIOXIDE (SO_2), ppm

$$C_{SO_2} = \frac{K_2 (V_T - V_{TB})\, N\, V_{SOLN}}{V_{MSTD}\ V_A}$$

WHERE: K_2 = 1.202×10^4 µL/ml
V_T = VOLUME $BaCl_2$ USED TO TITRATE SAMPLE, mL
V_{TB} = VOLUME $BaCl_2$ USED TO TITRATE BLANK, mL
N = NORMALITY OF $BaCl_2$
V_{SOLN} = TOTAL VOLUME OF SOLUTION, mL
V_A = VOLUME OF SOLUTION TITRATED, mL
V_{MSTD} = STANDARD METER VOLUME, DL

FIRST TITRATION, RUN 1

$$C_{SO_2} = \frac{\left(1.202 \times 10^4 \frac{\mu L}{\cancel{mL}}\right)(21.4\ \cancel{mL} - 0.0\ \cancel{mL})(0.0101)(100\ \cancel{mL})}{(53.6\ L)\ (2\ \cancel{mL})}$$

$$C_{SO_2} = 2409\ \frac{\mu L}{L}\ (ppm)$$

$$\hookrightarrow 2409\ ppm \times 1.66 \times 10^{-7}\ \frac{lb/DSCF}{ppm} \times 2.19 \times 10^4\ \frac{DSCF}{Min} \times \frac{60\ Min}{Hr}$$

CONVERSION TO lb/Hr → 525 lb/hr

↑ FROM PARTICULATE SAMPLING.