

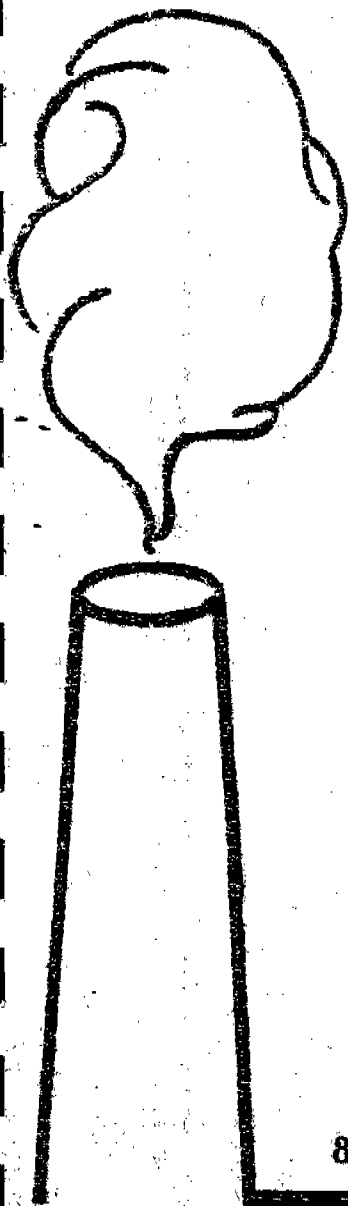
Note: This is a reference cited in AP 42, *Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources*. AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

AP-42 Section	<u>11.6</u>
Reference	<u>30</u>
Report Sect.	<u>4</u>
Reference	<u>30</u>

PRELIMINARY STACK TEST
LONESTAR FLORIDA/PENNSUCO, INC.
REPORT 391-P KILN No. 3
PRECIPITATOR INLET
STACK OUTLET

JULY 29 1981



South Florida Environmental Services, Inc.

8211-6 Bama Lane West Palm Beach, Florida 33406 305 / 793-4481

Source category: Portland Cement
Plant name : Lonestar Florida/Pennsuco, Inc.
Test date : 7/29/81
Process : wet

Date: 01/22/93
Location: Miami, FL
Ref. No.: 30

Basis for process rate : feed

Ratio:

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Process rate, ton/hr	Emission factor		Volumetric flow rate, DSCFM	Concen. ppm
						kg/Mg	lb/ton		
rotary kiln (No.3)	none	BASED ON PRODUCTION RATE							
		filt. PM	1	38,460	91.7	210	419		
		filt. PM	2	40,909	91.7	223	446		
		filt. PM	3	18,075	91.7	99	197		
		AVERAGE				177	354	RATING:	C
		SO2	1	385.14	91.7	2.10	4.20		
		SO2	2	705.46	91.7	3.85	7.69		
		SO2	3	551.73	91.7	3.01	6.02		
		AVERAGE				2.98	5.97	RATING:	C
		rotary kiln (No.3)	ESP	BASED ON PRODUCTION RATE					
filt. PM	1			10.86	91.7	0.0592	0.118		
filt. PM	2			17.80	91.7	0.0971	0.194		
filt. PM	3			23.40	91.7	0.1276	0.255		
AVERAGE				0.0946	0.189	RATING:	C		
SO2	1			347.83	91.7	1.90	3.79		
SO2	2			598.16	91.7	3.26	6.52		
SO2	3			539.14	91.7	2.94	5.88		
AVERAGE				2.70	5.40	RATING:	C		
NOx	1			698.74	91.7	3.81	7.62		
NOx	2			579.24	91.7	3.16	6.32		
NOx	3			852.82	91.7	4.65	9.30		
NOx	4			640.98	91.7	3.49	6.99		
NOx	5			704.65	91.7	3.84	7.68		
NOx	6			629.2	91.7	3.43	6.86		
NOx	7			520.92	91.7	2.84	5.68		
NOx	8			638.16	91.7	3.48	6.96		
NOx	9			532.84	91.7	2.91	5.81		
NOx	10			444.44	91.7	2.42	4.85		
NOx	11			594.63	91.7	3.24	6.48		
NOx	12			591.65	91.7	3.23	6.45		
AVERAGE				3.38	6.75	RATING:	C		
CO2	1			88,793	91.7	484	968	150,770	8.6
CO2	2			87,958	91.7	480	959	145,618	8.8
CO2	3			87,378	91.7	476	953	144,658	8.8
CO2	4			77,955	91.7	425	850	143398	7.92
CO2	5			74,595	91.7	407	813	133509	8.14
CO2	6			74,602	91.7	407	814	137230	7.92
AVERAGE				446	893	RATING:	C		

Notes: 1. C rating based on inadequate documentation
2. Sulfur content of coal: 1.33%

SUMMARY

PLANT: LONE STAR FLODRICA - PENNUSCO
LOCATION: OKEECHOWEE RD. MIAMI, FLORIDA
TEST/IDENTIFICATION 391-P / 276-S DATE: JUNLY 29 1991
TESTING BY: SOUTH FLORIDA ENVIRONMENTAL SERVICES
KILN/COOLER NO. 3

PERFORMANCE

Kiln Production	Ton/Hr.	<u>92</u>	@ <u>1.750</u>	K.F. Factor
Kiln Feed Rate	Ton/Hr.	<u>16.1</u>		
Fuel Rate (Coal)	Ton/Hr.	<u>18.0</u>	@ <u>12 456</u>	BTU/lb.
" " (Oil)	Gal/Hr.	<u>—</u>		
Fuel Ash	%	<u>11.0</u>		
Fuel Sulphur	%	<u>1.63</u>	@ <u>0.10</u>	Kiln Feed S.

KILN (Stack)

ALLOWABLE

Exhaust Gas Flow	DSCFM	<u>137.045</u>		
Part. Concen.	lb/SCF	<u>0.00784</u>		
Emission Rate	lb/Ton	<u>.109 / 17.456</u>	<u>0.3 / 48.3 #/H</u>	<u>0.3 (161)</u>
SOX (Kiln)				
(Concentration)	PPM			
Emission Rate	lb/Ton		<u>0.3 / 48.3 #/H</u>	<u>0.3 (161)</u>
Emission Rate	lb/MMBTU			

SOX (Kiln)

(Concentration)

Emission Rate	lb/Ton			
Emission Rate	lb/MMBTU			

NOX (Kiln)

(Concentration)

Emission Rate	lb/Ton			
---------------	--------------	--	--	--

COOLER (Stack)

Exhaust Gas Flow	DSCFM			
Part. Concen.	lb/SCF ...			
Emission Rate	lb/Ton ...			

REMARKS:

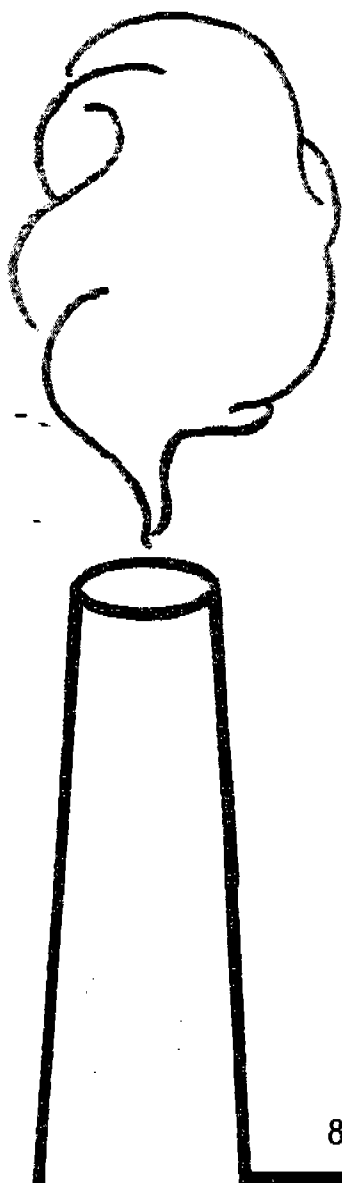
→ WET

Reference 38:

Type of process
not identified!

PRELIMINARY STACK TEST
LONESTAR FLORIDA/PENNSUCO, INC.
REPORT 391-P KILN No. 3
PRECIPITATOR INLET
STACK OUTLET

JULY 29 1981



South Florida Environmental Services, Inc.

8211-6 Bama Lane West Palm Beach, Florida 33406 305 / 793-4481

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NOMENCLATURE

INTRODUCTION

INTRODUCTION

Lonestar Florida/Pennsuco, Inc. operates a portland cement plant located on Okeechobee Road in Miami, Florida. In order to control particulate emissions, the gases from the kilns pass through electrostatic precipitators.

On July 29, 1981, the following tests were performed on Kiln No. 3:

Precipitator Inlet

Particulates
Sulfur Dioxide

Stack Outlet

Particulates
Sulfur Dioxide
Oxides of Nitrogen

Precipitator Inlet and Stack Outlet tests were performed simultaneously by representatives of South Florida Environmental Services, Inc.

Testing was performed in accordance with the applicable U.S. Environmental Protection Agency Methods 1 - 4, 6, 7 and 17, and the State of Florida, Department of Environmental Regulation, Florida Administrative Code, adopted April 1981.

The results of these tests are reported in the following table.

PRECIPITATOR INLET

PARTICULATE EMISSION TEST

Average Emissions	32481.57 lbs./hr.
-------------------	-------------------

SULFUR DIOXIDE

Average Emissions	547.44 lbs./hr.
-------------------	-----------------

STACK OUTLET

PARTICULATE EMISSION TEST

Average Emissions	17.35 lbs./hr.
-------------------	----------------

Average Allowable Emissions	48.27 lbs./hr.
-----------------------------	----------------

OXIDES OF NITROGEN

Average Emissions	619.02 lbs./hr.
-------------------	-----------------

Average Allowable Emissions	620.80 lbs./hr.
-----------------------------	-----------------

SULFUR DIOXIDE

Average Emissions	495.04 lbs./hr.
-------------------	-----------------

Average Allowable Emissions	27.51 lbs./hr.
-----------------------------	----------------

ALLOWABLE EMISSIONS

The allowable emissions were determined by applying the allowable rate as stated in Environmental Protection Agency Permit Number PSD-FL-050, to the process rate provided by Lonestar Florida/Pennsuco, Inc.

	<u>ALLOWABLE RATE</u>	<u>PROCESS RATE</u>	<u>ALLOWABLE EMISSIONS</u>
* Particulate Emissions	.3 lb/tn kiln feed	160.90 tn/hr feed	48.27 lb/hr
** Oxides of Nitrogen	6.77 lb/tn clinker	91.7 tn/hr clinker	620.80 lb/hr
** Sulfur Dioxide	.3 lb/tn clinker	91.7 tn/hr clinker	27.51 lb/hr

* Insulflated dust included as determined by precipitator inlet test.

** Clinker rate determined from previous test data.

PARTICULATE EMISSION TESTS

PRECIPITATOR INLET

SUMMARY OF RESULTS

	<u>RUN 1</u>	<u>RUN 2</u>	<u>RUN 3</u>	<u>AVERAGE</u>
DATE OF TEST	7-29-81	7-29-81	7-29-81	
EMISSION RATE (lbs./hr.)	38460.45	40908.80	18075.48	32481.57
PERCENT ISOKINETIC	92.85	97.34	96.64	95.61

PRECIPITATOR INLET

PARTICULATE TEST DATA

	RUN 1	RUN 2	RUN 3
AREA=	144.5	144.5	144.5
SAMPLE VOLUME(CU.FT.)=	19.57	19.82	19.55
WATER VAPOR(CU.FT.)=	7.95	9.46	9.27
SAMPLE MOISTURE=	28.9	32.31	32.18
SATURATION MOISTURE=	100	100	100
MOLECULAR WEIGHT=	27.49	27.04	27.09
VELOCITY(FPM)=	2473	2479	2460
VOL.FLOW RATE(ACFM)=	357397	358172	355462
VOL.FLOW RATE(SCFM-DRY)=	150770 ^{1.08}	145618	144658
CONCENTRATION(GR/DSCF)=	29.7609 ^{1.10}	32.7755	14.5778 ^{34.875}
EMISSION RATE(#/HR.)=	38460.45 ^{1.06}	40908.8	18075.48 ✓ ^{42.875}
% ISOKINETIC=	92.85	97.34	96.64

$$\frac{144.5 \times 19.57 \times 18075.48}{1000}$$

STACK OUTLET

SUMMARY OF RESULTS

	<u>RUN 1</u>	<u>RUN 2</u>	<u>RUN 3</u>	<u>AVERAGE</u>
DATE OF TEST	7-29-81	7-29-81	7-29-81	
EMISSION RATE (lbs./hr.)	10.86	17.8	23.4	17.35
ALLOWABLE EMISSION RATE (lbs./hr.)	48.27	48.27	48.27	48.27
PERCENT ISOKINETIC	90.38	92.87	92.85	92.03

STACK OUTLET

PARTICULATE TEST DATA

	RUN 1	RUN 2	RUN 3
AREA=	158.74	158.74	158.74
SAMPLE VOLUME(CU.FT.)=	35.98	34.42	35.37
WATER VAPOR(CU.FT.)=	14.59	15.34	15.82
SAMPLE MOISTURE=	28.85	30.83	30.9
SATURATION MOISTURE=	100	100	100
MOLECULAR WEIGHT=	27.47	27.2	27.15
VELOCITY(FPM)=	1994	1896	1954
VOL.FLOW RATE(ACFM)=	316514.8	300959.2	310201.0
VOL.FLOW RATE(SCFM-DRY)=	143398	133509	137230
CONCENTRATION(GR/DSCF)=	8.8E-03	.0155	.0198
EMISSION RATE(#/HR.)=	10.86	17.8	23.4
% ISOKINETIC=	90.38	92.87	92.85

$$\frac{143398 \times 0.0088 \times 60}{7000} = 10.82$$

SOUTH FLORIDA ENVIRONMENTAL SERVICES, INC.
TEST FOR PARTICULATE EMISSIONS

LONESTAR FLORIDA/PENNSUCO, INC.
POST OFFICE BOX 122035
HIALEAH, FLORIDA 33012

TYPE PROCESS - MANUFACTURE PORTLAND CEMENT

KILN NO. 3

PRELIMINARY STACK TEST

REPORT NUMBER - 391-P

JULY 29, 1981

RUN NUMBER(S) 1, 2 AND 3 - PRECIPITATOR INLET 1, 2 AND 3 - STACK OUTLET

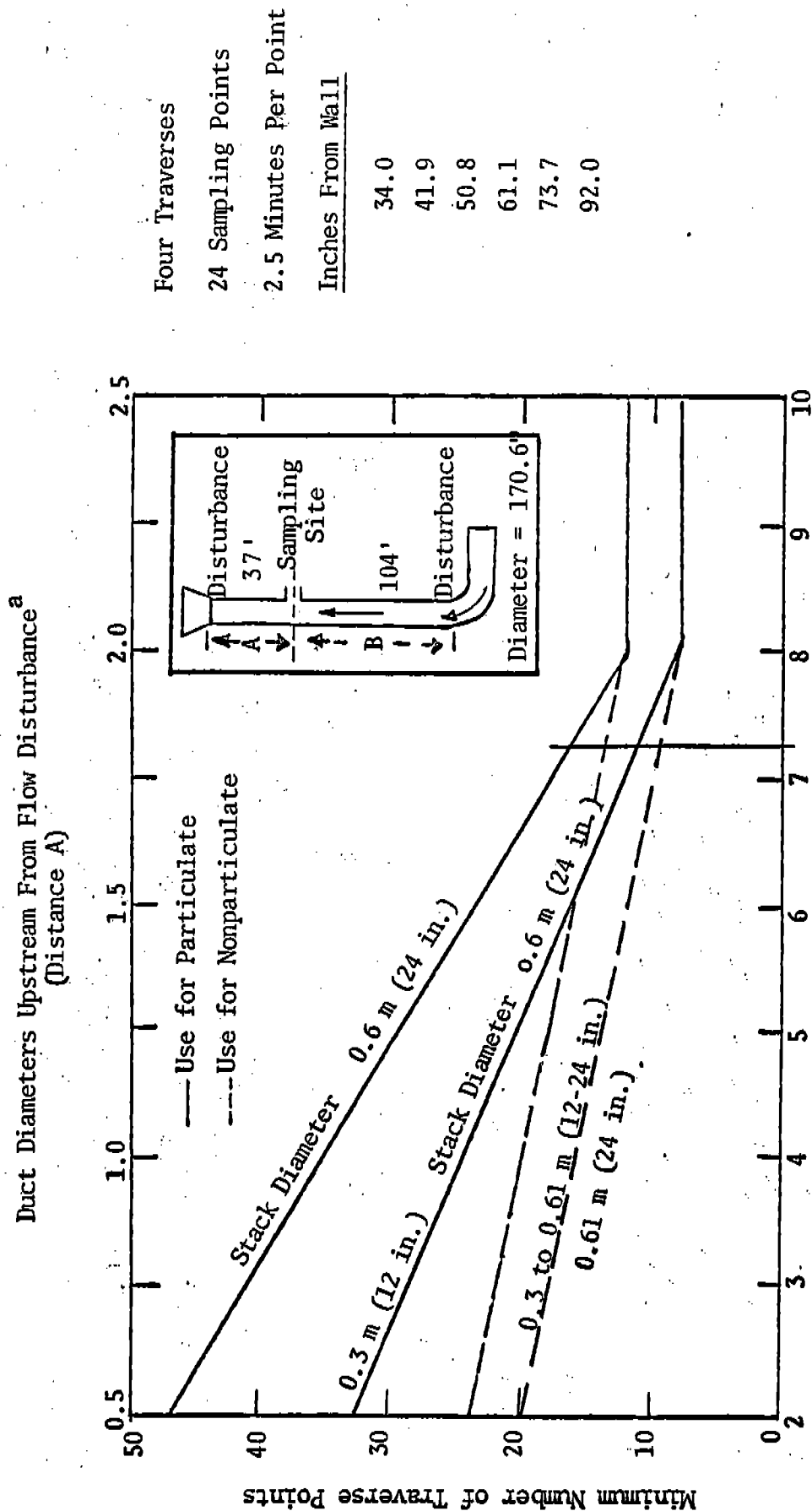
SIMULTANEOUS TEST ON KILN NO. 3 PRECIPITATOR INLET AND STACK OUTLET

TEST CONDUCTED BY

N. D. McIntyre

DIAGRAM OF STACK CONFIGURATION

KILN No. 3



^aFrom point of any type of disturbance (bend, expansion, contraction, etc.).

TEMPERATURE
SENSOR

IN-STACK
FILTER HOLDER

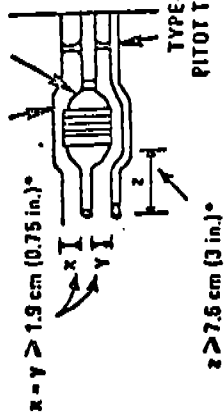
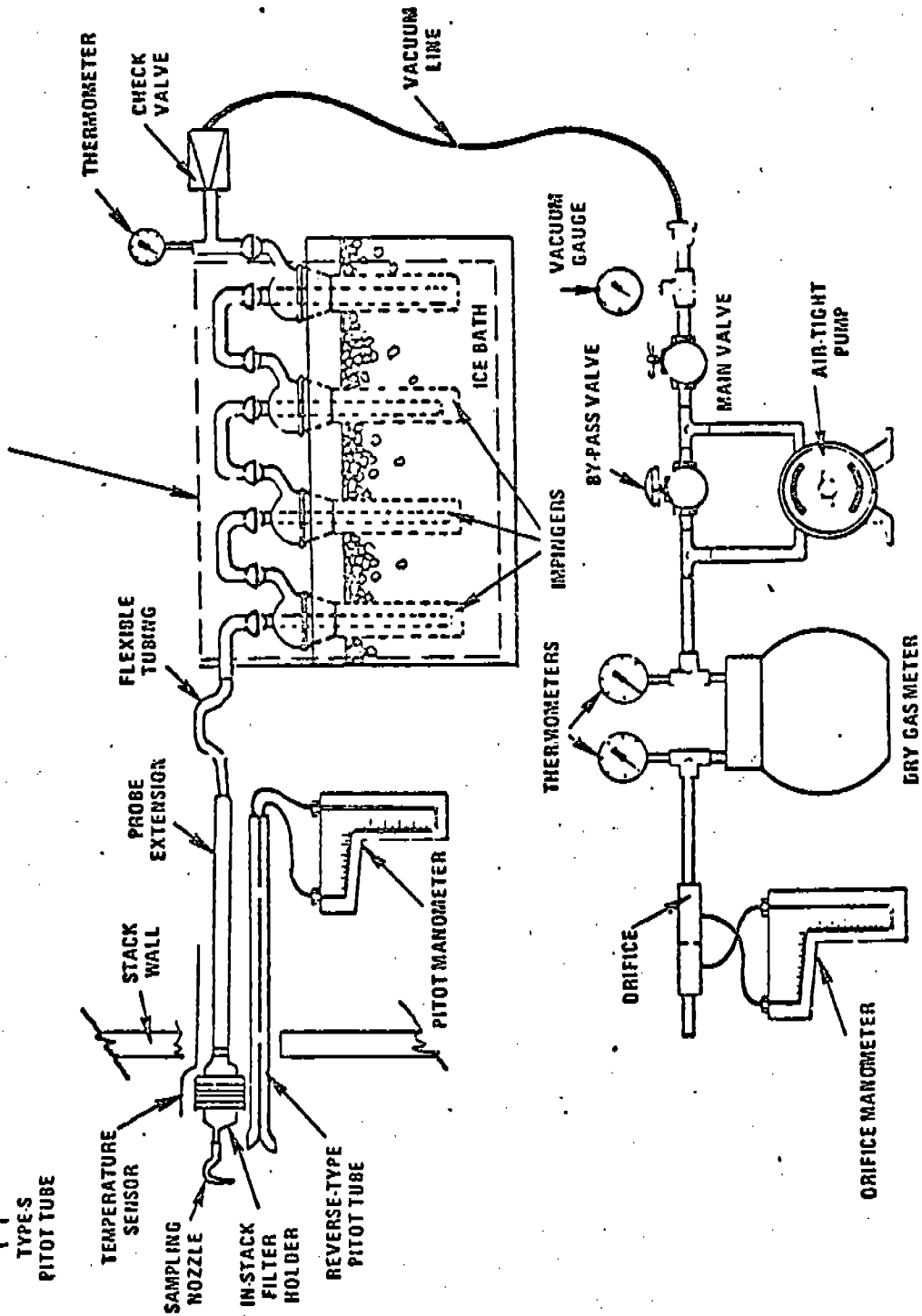


DIAGRAM OF METHOD 17 SAMPLING EQUIPMENT

IMPINGER TRAIN OPTIONAL, MAY BE REPLACED
BY AN EQUIVALENT CONDENSER



* SUGGESTED (INTERFERENCE-FREE) SPACINGS

Figure 17-1. Particulate-Sampling Train, Equipped with In-Stack Filter.

OXIDES OF NITROGEN

OXIDES OF NITROGEN

VSC = SAMPLE VOLUME AT STANCARD CONDITIONS, DRY BASIS, ML.
M = MASS OF NOX AS NO2 IN GAS SAMPLE, MG.
C = CONCENTRATION OF NOX AS NO2, DRY BASIS, CORRECTED TO STANDARD CONDITIONS LB./DSCF.
E = EMISSION RATE, LBS./HR.

RUN NO.	VSC	M	C	E
1	1748.4	2362.6	8.44E-05	698.74
2	1751.5	1962	6.99E-05	579.24
3	1731.5	2855.6	1.03E-04	852.82
4	1736.1	2152	7.74E-05	640.98
5	1726.2	2352.3	8.51E-05	704.65
6	1663	2023.6	7.6E-05	629.2
7	1733.4	1746.2	6.29E-05	520.92
8	1739.6	2146.8	7.7E-05	638.16
9	1744.5	1797.6	6.43E-05	532.84
10	1721	1479.2	5.37E-05	444.44
11	1692.7	1946.5	7.18E-05	594.63
12	1786.5	2044.1	7.14E-05	591.65

AVERAGE EMISSIONS

619.02

SULFUR DIOXIDE

PRECIPITATOR INLET

SULFUR DIOXIDE

SUMMARY OF RESULTS

	<u>RUN NO. 1</u>	<u>RUN NO. 2</u>	<u>RUN NO. 3</u>
LB COLLECTED IN SAMPLE	8.33×10^{-4}	1.60×10^{-3}	1.24×10^{-3}
SAMPLE CONCENTRATION (lb./cu.ft. DSCF)	4.26×10^{-5}	8.05×10^{-5}	6.36×10^{-5}
EMISSIONS (lbs./hr.)	385.14	705.46	551.73
AVERAGE EMISSIONS (lbs./hr.)	547.44		

PRECIPITATOR INLET

SULFUR DIOXIDE

CONCENTRATION IN IMPINGERS

$$W_{so_2} = K_2(V_t - V_{tb}) N \frac{V_{sol}}{V_a}$$

W_{so_2} = Sulfur Dioxide captured in sample, pounds

K_2 = 7.061×10^{-5} lbs/meg

V_t = Volume of Titrant (ml) Sample

V_{tb} = Volume of Titrant (ml) Blank

N = Normality of Titrant

V_{soln} = Sample Volume

V_a = Volume of Aliquot Titrated (ml)

Run No.	V_t	V_{tb}	N	V_{soln}	V_a	W_{so_2}
1	6.1	0.2	.0100	1000	5	8.33×10^{-4}
2	11.5	0.2	.0100	1000	5	1.60×10^{-3}
3	9.0	0.2	.0100	1000	5	1.24×10^{-3}

STACK OUTLET

SULFUR DIOXIDE

SUMMARY OF RESULTS

	<u>RUN NO. 1</u>	<u>RUN NO. 2</u>	<u>RUN NO. 3</u>
LB. COLLECTED IN SAMPLE	1.45×10^{-3}	2.57×10^{-3}	2.32×10^{-3}
SAMPLE CONCENTRATION (lb./cu.ft. DSCF)	4.04×10^{-5}	7.47×10^{-5}	6.55×10^{-5}
EMISSIONS (lb./hr.)	347.83	598.16	539.14
AVERAGE EMISSIONS (lbs./hr.)	495.04		

STACK OUTLETSULFUR DIOXIDECONCENTRATION IN IMPINGERS

$$W_{so_2} = K_2(V_t - V_{tb}) N \frac{V_{sol}}{V_a}$$

W_{so_2} = Sulfur Dioxide captured in sample, pounds

K_2 = 7.061×10^{-5} lbs/meg

V_t = Volume of Titrant (ml) Sample

V_{tb} = Volume of Titrant (ml) Blank

N = Normality of Titrant

V_{soln} = Sample Volume

V_a = Volume of Aliquot Titrated (ml)

Run No.	V_t	V_{tb}	N	V_{soln}	V_a	W_{so_2}
1	10.5	0.2	.0100	1000	5	1.45×10^{-3}
2	18.4	0.2	.0100	1000	5	2.57×10^{-3}
3	16.6	0.2	.0100	1000	5	2.32×10^{-3}

APPENDIX A

PARTICULATE FIELD AND LABORATORY DATA
PRECIPITATOR INLET

PRECIPITATOR INLET

FIELD DATA

	RUN 1	RUN 2	RUN 3
DATE	7-29-81	7-29-81	7-29-81
START TIME	10:00	4:28	7:20
STOP TIME	13:29	6:50	8:51
CP FACTOR	.84	.84	.84
Y	1.0002	1.0002	1.0002
THA	1.69	1.69	1.69
DIAMETER OF NOZZLE-DN(IN)	.2485	.2485	.2485
AREA OF NOZZLE-AN(SQ.FT.)	3.368E-04	3.368E-04	3.368E-04
DIAMETER OF STACK-DS(IN)	115.0947	115.0947	115.0947
NO. STACKS	2	2	2
STATIC PRES.-SP(IN H2O)	-3.6	-3.6	-3.6
BAROMETRIC PRES.-PB(IN HG)	29.99	29.99	29.99
TEST TIME-O(MIN.)	60	60	60
METER VOLUME-VM(CU.FT.)	20.3	20.64	20.54
SQR.1P	.552	.552	.548
ORFICE PRES.-1H(IN.H2O)	.41	.415	.35
AVG.METER TEMP.-TM(DEG.F)	89.3	91.6	96.5
AVG.STACK TEMP.-TS(DEG.F)	423.8	413	413.9
TOTAL PARTICULATE WT.-TPW(GM)	37.7542	42.0991	18.4671
WATER COLLECTED-WC(ML)	169	201	197
MOLECULAR WT.-MD(DRY)	31.352	31.356	31.396
SATURATION MOISTURE-SM(%)	100	100	100

SOUTH FLORIDA ENVIRONMENTAL SERVICES, INC.

PARTICULATE FIELD DATA

ORT 391-P-1I ASSUMED MOISTURE % 33 DIAMETER 102 x 102 METERED VOL. 20.30
 DATE 7-29-81 DRY GAS METER NO. 1 NO. DUCT 2 AVG. ΔP .552
 OPERATOR uf PROBE TIP DIA., IN. 1/4 (P17.5) STATIC PRES. -3.6 AVG. ΔH .410
 TIME 10:00 - 13:29 WET BULB TEMP. BAR. PRES. "Hg" 29.99 AVG. METER TEMP. 89.3
 FACTOR K=1.33 LEAK CHECK LO2 CFM @ 25" TEST TIME 60 AVG. STACK TEMP. 423.8

ST. 102

IN FROM WALL

POINT

SAMPLING TIME

DRY GAS METER CU. FT. START

PITOT MANOMETER (in. H₂O) ΔP ΔP

ORIFICE MANOMETER (in. Hg)

DRY GAS TEMP. °F

PUMP VACUUM PSIG

IMPINGER

FILTER TEMP. °F

ST. 102

421

430

433

444

445

444

430

433

430

430

430

SOUTH FLORIDA ENVIRONMENTAL SERVICES, INC.

PARTICULATE FIELD DATA

METERED VOL. _____
 DIAMETER _____
 ASSUMED MOISTURE % _____
 NO. DUCT _____
 DRY GAS METER NO. _____
 STATIC PRES. _____
 PROBE TIP DIA., IN. _____
 BAR. PRES. "Hg" _____
 WET BULB TEMP. _____
 TEST TIME _____
 AVG. $\sqrt{\Delta P}$ _____
 AVG. METER TEMP. _____
 AVG. STACK TEMP. _____

LEAK CHECK K=1.33

TIME 12:20

FACTOR

POINT	IN FROM WALL	SAMPLING TIME	DRY GAS METER CU. FT. START	PITOT MANOMETER (AP) in. H ₂ O $\sqrt{\Delta P}$	ORIFICE MANOMETER (AH)	DRY GAS TEMP. °F	PUMP VACUUM PSIG	IMPINGER	FILTER TEMP. °F	ST. TEMP. °F
1	S	2.5	200.46	1.25	1.29	89	5	62		41
2		"	201.24	1.25	1.33	90	5	60		44
3		"	202.03	1.24	1.32	90	5	58		43
1	A	"	202.23	1.21	1.28	90	5	63		41
2		"	203.64	1.34	1.43	91	6	59		41
3		"	204.58	1.35	1.47	91	7	59		40
1		"	205.46	1.31	1.41	91	7	62		41
2		"	206.44	1.39	1.52	92	8	59		42
3	WA	"	207.43	1.38	1.51	92	8	59		41
1		"	208.28	1.30	1.40	92	11	60		42
2		"	209.22	1.35	1.47	92	10	60		42
3	e	"	210.17	1.36	1.48	92	10	60		42

SOUTH FLORIDA ENVIRONMENTAL SERVICES, INC.

PARTICULATE FIELD DATA

METERED VOL. 20.64

DIAMETER 102 X 102

NO. DUCT 2

AVG. $\sqrt{\Delta P}$.55

AVG. ΔH .415

AVG. METER TEMP. 91.6

AVG. STACK TEMP. 413.0

TEST TIME 60

LEAK CHECK 0.15 CFM @ 25"

WET BULB TEMP. ---

PROBE TIP DIA., IN. 1/4

BAR. PRES. "Hg" 29.99

STATIC PRES. -3.6

DRY GAS METER NO. 1

ASSUMED MOISTURE % 33

DRY GAS METER 391-P-2I

PORT 7-29-81

DATE WA

RATOR 1628-1850

FACTOR K=1.33

POINT	IN FROM WALL	SAMPLING TIME	DRY GAS METER CU. FT. START	PITOT MANOMETER ΔP in. H ₂ O $\sqrt{\Delta P}$	ORIFICE MANOMETER (AH)	DRY GAS TEMP. °F	PUMP VACUUM PSIG	IMPINGER	FILTER TEMP. °F	STD. TEMP. °F
1	S	2.5	212.61	.51	.168	87	5.5	62	40	40
2	"	"	213.60	.47	.163	88	5.4	57	40	40
3	"	"	214.64	.40	.153	89	6.7	56	43	43
1	A	"	215.62	.27	.36	89	7	61	43	43
2	"	"	216.39	.32	.43	90	5	58	44	44
3	"	"	217.34	.34	.45	90	5	58	42	42
1	M	"	218.33	.23	.31	91	5	62	42	42
2	"	"	219.03	.33	.44	90	5	61	399	399
3	"	"	219.93	.41	.55	92	5	59	403	403
1	e	"	220.09	.21	.28	92	5	60	397	397
2	"	"	221.03	.23	.31	92	5	59		
3	"	"	221.77	.23	.36	92	5	59		
1		"	222.57	.27						
2		"	223.44							
3		"								

SOUTH FLORIDA ENVIRONMENTAL SERVICES, INC.

PARTICULATE FIELD DATA

PORT 391-R-2I METED VOL. _____
 E 7-29-81 AVG $\sqrt{\Delta P}$ _____
 RATOR WA AVG. ΔH _____
 E 1759 AVG. METER TEMP. _____
 K=1.33 TEST TIME _____
 LEAK CHECK _____

POINT	IN FROM WALL	SAMPLING TIME	DRY GAS METER CU. FT. START	PILOT MANOMETER (ΔP) in. H ₂ O $\sqrt{\Delta P}$	ORIFICE MANOMETER (ΔH)	DRY GAS TEMP. °F	PUMP VACUUM PSIG	IMPINGER	FILTER TEMP. °F	STACK TEMP. °F
1	S	2.5	224.03	.20	.27	92	7	65		391
2		"	224.76	.21	.28	93	7	63		389
3		"	225.53	.19	.25	93	7	62		393
1	A	"	226.21	.22	.29	93	8	62		386
2		"	227.16	.33	.44	93	9	59		401
3		"	228.11	.36	.48	93	10	58		393
1	M	"	229.00	.30	.40	93	8	62		415
2		"	229.97	.37	.50	93	9	59		406
3		"	230.94	.32	.43	94	11	59		393
1	E	"	231.84	.32	.43	94	11	62		412
2		"	232.79	.35	.47	95	10	60		412
3		"	233.69	.29	.39	95	9	60		415

PRINCIPLE INLET

1

SOUTH FLORIDA ENVIRONMENTAL SERVICES, INC.

LABORATORY DATA

REPORT NUMBER 391-3-P-I

DATE 8-05-81

FILTER NUMBER 3

FINAL WEIGHT
INITIAL WEIGHT
DIFFERENCE

64.3232 GRAMS
46.2179 GRAMS
18.10535 GRAMS

PROBE AND NOZZLE WASH
EVAPORATING DISH NUMBER 3B

FINAL WEIGHT
INITIAL WEIGHT
DIFFERENCE

104.027 GRAMS
103.6638 GRAMS
.3632 GRAMS

BLANK CORRECTION

ACETONE IN DISH
BLANK

140 ML.
1E-05 GRAMS
1.4E-03 GRAMS

TOTAL PARTICULATE WEIGHT = 18.4671 GRAMS

IMPINGERS

TOTAL WATER
INITIAL WATER
TOTAL SILICA
INITIAL SILICA

390 MLS.
200 MLS.
207 GRAMS
200 GRAMS

TOTAL WATER COLLECTED = 197 ML.

ORSAT ANALYSIS

CO2	20	X	.44 =	8.8
O2	4.9	X	.32 =	1.568
N2	75.1	X	.28 =	21.028

MOLECULAR WEIGHT OF DRY GAS MD = 31.396

ANALYST

GB

APPENDIX B

PARTICULATE FIELD AND LABORATORY DATA
STACK OUTLET

STACK OUTLET

FIELD DATA

	RUN 1	RUN 2	RUN 3
DATE	7-29-81	7-29-81	7-29-81
START TIME	10:00	1630	19:20
STOP TIME	1329	18:50	20:51
CP FACTOR	.815	.815	.815
Y	1.0049	1.0049	1.0049
↑HA	1.78	1.78	1.78
DIAMETER OF NOZZLE-DN(IN)	.367	.367	.367
AREA OF NOZZLE-AN(SQ.FT.)	7.346E-04	7.346E-04	7.346E-04
DIAMETER OF STACK-DS(IN)	170.6	170.6	170.6
NO. STACKS	1	1	1
STATIC PRES.-SP(IN H2O)	-.27	-.27	-.27
BAROMETRIC PRES.-PB(IN HG)	29.99	29.99	29.99
TEST TIME-O(MIN.)	60	60	60
METER VOLUME-VM(CU.FT.)	37.05	35.55	36.69
SQR.↑P	.475	.451	.464
ORFICE PRES.-↑H(IN.H2O)	1.373	1.25	1.31
AVG.METER TEMP.-TM(DEG.F)	89.3	90.7	93.2
AVG.STACK TEMP.-TS(DEG.F)	370.2	364.3	365.8
TOTAL PARTICULATE WT.-TPW(GM)	.0206	.0347	.0456
WATER COLLECTED-WC(ML)	310	326	336
MOLECULAR WT.-MD(DRY)	31.316	31.3	31.24
SATURATION MOISTURE-SM(%)	100	100	100

SOUTH FLORIDA ENVIRONMENTAL SERVICES, INC.

PARTICULATE FIELD DATA

REPORT 391-P-1 ASSUMED MOISTURE % 34 DIAMETER 170.6" METERED VOL. 3705
 DATE 7-29-81 DRY GAS METER NO. 2 NO. DUCT 1 AVG. $\sqrt{\Delta P}$ 175
 OPERATOR EB PROBE TIP DIA., IN. 3/8 STATIC PRES. -27 AVG. ΔH 1373
 TIME 10:00am WET BULB TEMP. — BAR. PRES. "Hg" 29.99 AVG. METER TEMP. 89.3
 FACTOR 52 LEAK CHECK 0.15 @ 23" TEST TIME 100 AVG. STACK TEMP. 354.10

POINT	IN FROM WALL	SAMPLING TIME	DRY GAS METER CU. FT. START	PITOT MANOMETER ΔP in. H ₂ O $\sqrt{\Delta P}$	ORIFICE MANOMETER ΔH	DRY GAS TEMP. °F	PUMP VACUUM PSIG	IMPINGER	FILTER TEMP. °F	STACK TEMP. °F
1	340	25 min	655.18	27.0	5.15	87	2			375
2	419	"	659.09	27	1.64	87		57		376
3	508	"	660.77	27	1.64	87	2			376
4	611	"	662.51	25	1.52	88				374
5	737	"	664.09	25	1.52	88	2	58		371
6	920	"	665.71	24	1.46	88				371
1	340	"	667.05	18	1.09	88	1	60		370
2	419	"	668.53	21	1.27	88				371
3	508	"	670.01	22	1.34	89	1	59		371
4	611	"	671.54	22	1.34	89				371
5	737	"	673.01	22	1.34	89	2	62		371
6	920	"	674.60	22	1.34	89				370
1	340	"	676.04	19	1.15	89	1	62		363
2	419	"	677.38	16	0.97	89				363
3	508	"	678.83	19	1.15	90	1	62		364
4	611	"	680.20	18	1.09	90				367
5	737	"	681.66	20	1.21	90	1	63		366
6	920	"	683.14	21	1.27	90				367
1	340	"	684.60	24	1.46	90	2	62		361
2	419	"	686.28	26	1.58	91				373
3	508	"	687.95	26	1.58	91	2	61		371
4	611	"	689.51	24	1.46	92				371
5	737	"	691.11	26	1.58	92	2	63		373
6	920	"	692.73	23	1.40	92				372

SOUTH FLORIDA ENVIRONMENTAL SERVICES, INC.

PARTICULATE FIELD DATA

REPORT 391-P-3 ASSUMED MOISTURE % 34 DIAMETER 170.12 METERED VOL. 36.69
 DATE 7-29-81 DRY GAS METER NO. 2 NO. DUCT 1 AVG $\sqrt{\Delta P}$ 1164
 OPERATOR EB PROBE TIP DIA., IN. 3/8 STATIC PRES. -22 AVG. ΔH 1.31
 TIME 7:20 - 2051 WET BULB TEMP. — BAR. PRES. "Hg" 29.92 - AVG. METER TEMP. 93.2
 FACTOR K=1007 LEAK CHECK .014 x m e 33" TEST TIME 160 AVG. STACK TEMP. 365.8

POINT	IN FROM WALL	SAMPLING TIME	DRY GAS METER CU. FT. START	PITOT MANOMETER ΔP in. H ₂ O $\sqrt{\Delta P}$	ORIFICE MANOMETER (AH)	DRY GAS TEMP. °F	PUMP VACUUM PSIG	IMPINGER	FILTER TEMP. °F	STA. TEMP. °F
1		25 min	731.07	.18	1.09	93				370
2		"	732.63	.25	1.52	93	2	58		372
3		"	734.10	.22	1.34	93				370
4		"	735.66	.22	1.34	93	2	60		370
5		"	737.23	.25	1.52	93				368
6		"	738.89	.23	1.40	93	1	59		364
1		"	740.27	.17	1.03	93	2	63		370
2		"	741.72	.22	1.34	93				365
3		"	743.34	.22	1.34	93	3	61		364
4		"	744.88	.23	1.40	93				365
5		"	746.41	.22	1.34	93	2	60		367
6		"	747.99	.21	1.27	93				365
1		"	749.34	.16	.97	93	2	64		365
2		"	750.65	.15	.91	93				358
3		"	751.86	.17	1.03	93	2	64		359
4		"	753.41	.19	1.15	93				358
5		"	754.85	.19	1.15	93	2	64		361
6		"	756.36	.20	1.21	93				362
1		"	757.94	.24	1.46	93	3	66		366
2		"	759.59	.26	1.58	93				364
3		"	761.37	.26	1.58	94	4	65		367
4		"	762.98	.26	1.58	94				365
5		"	764.61	.26	1.58	94	5	65		367
6		"	766.27	.23	1.40	94				

STACK OUTLET

SOUTH FLORIDA ENVIRONMENTAL SERVICES, INC.

LABORATORY DATA

REPORT NUMBER 391-P-1

DATE 7-29-81

FILTER NUMBER 1

FINAL WEIGHT	.2232 GRAMS
INITIAL WEIGHT	.2072 GRAMS
DIFFERENCE	.0160500001 GRAMS

PROBE AND NOZZLE WASH

EVAPORATING DISH NUMBER 1D

FINAL WEIGHT	98.3997 GRAMS
INITIAL WEIGHT	98.3938 GRAMS
DIFFERENCE	5.9E-03 GRAMS

BLANK CORRECTION

ACETONE IN DISH	125 ML.
BLANK	1E-05 GRAMS
	1.3E-03 GRAMS

TOTAL PARTICULATE WEIGHT = .0206 GRAMS

IMPINGERS

TOTAL WATER	500 MLS.
INITIAL WATER	200 MLS.
TOTAL SILICA	210 GRAMS
INITIAL SILICA	200 GRAMS

TOTAL WATER COLLECTED = 310 ML.

ORSAT ANALYSIS

CO2	18	X	.44 =	7.92
O2	10.9	X	.32 =	3.488
N2	71.1	X	.28 =	19.908

MOLECULAR WEIGHT OF DRY GAS MD = 31.316

ANALYST

SB

STACK OUTLET

3

SOUTH FLORIDA ENVIRONMENTAL SERVICES, INC.

LABORATORY DATA

REPORT NUMBER 391-P-3

DATE 7-29-81

FILTER NUMBER 2

FINAL WEIGHT	.2536 GRAMS
INITIAL WEIGHT	.209 GRAMS
DIFFERENCE	.0446500001 GRAMS

PROBE AND NOZZLE WASH

EVAPORATING DISH NUMBER 3D

FINAL WEIGHT	97.9537 GRAMS
INITIAL WEIGHT	97.9514 GRAMS
DIFFERENCE	2.3E-03 GRAMS

BLANK CORRECTION

ACETONE IN DISH	125 ML.
BLANK	1E-05 GRAMS
	1.3E-03 GRAMS

TOTAL PARTICULATE WEIGHT = .0456 GRAMS

IMPINGERS

TOTAL WATER	524 MLS.
INITIAL WATER	200 MLS.
TOTAL SILICA	212 GRAMS
INITIAL SILICA	200 GRAMS

TOTAL WATER COLLECTED = 336 ML.

ORSAT ANALYSIS

CO2	18	X	.44 =	7.92
O2	9	X	.32 =	2.88
N2	73	X	.28 =	20.44

MOLECULAR WEIGHT OF DRY GAS MD = 31.24

ANALYST

QB

APPENDIX C

OXIDES OF NITROGEN
FIELD AND LABORATORY DATA

OXIDES OF NITROGENFIELD DATAREPORT 391-POPERATOR MMSAMPLE LOCATION DUST (F₂ to ST₂)DATE 7-29-81INSTALLATION Kilo #3BAROMETRIC PRESSURE 29.99

SAMPLE NUMBER	FLASK & VALVE NUMBER	SAMPLE TIME	PROBE TEMPERATURE	LEG A ₁	LEG B ₁	INITIAL PRESSURE	INITIAL TEMPERATURE
1	1	952	373	30.9	3.0	20.9	87
2	2	1111	374	31.0	3.0	1.99	85
3	3	1241	357	31.0	3.0	1.99	86
4	4	1332	372	30.9	3.0	2.09	87
5	5	1630	373	31.0	3.0	1.99	87
6	6	1755	364	30.7	3.4	2.69	87
7	7	1821	362	31.0	3.0	1.99	87
8	8	1843	359	30.9	3.1	2.19	87
9	9	1932	367	30.9	3.1	2.19	87
10	10	1950	357	30.7	3.3	2.59	87
11	11	2014	366	30.7	3.2	2.49	87
12	12	2030	367	31.0	2.9	1.89	87

OXIDES OF NITROGENLABORATORY DATAREPORT 391-P ANALYST WA kc 642DATE 8-3-81 BAROMETRIC PRESSURE 30.06 Ph ADJUSTMENT MADE 1-12

SAMPLE NUMBER	FLASK & VALVE NUMBER	TIME	LEG A _f	LEG B _f	FINAL PRESSURE P _f	FINAL TEMPERATURE T _f	FLASK VOLUME V _f	ABSORBANCE A	DILUTION FACTOR f
1	1	832	17.7	16.2	28.56	82	2053	.460	4
2	2	837	17.7	16.2	28.56	82	2049	.382	4
3	3	844	17.9	16.1	28.26	82	2049	.556	4
4	4	850	17.8	16.1	28.36	81	2050	.419	4
5	5	853	18.0	16.0	28.06	81	2054	.458	4
6	6	857	18.1	15.9	27.86	81	2046	.394	4
7	7	859	17.9	16.1	28.26	81	2047	.340	4
8	8	903	17.8	16.2	28.46	81	2054	.418	4
9	9	906	17.7	16.2	28.56	81	2052	.350	4
10	10	911	17.7	16.2	28.56	80	2051	.288	4
11	11	914	18.0	16.0	28.06	80	2045	.379	4
12	12	917	17.6	16.4	28.86	80	2051	.398	4

APPENDIX D
CALIBRATION DATA

DRY GAS METER CALIBRATION

Meter Number 1

Barometric Pressure 30.16

February 1, 1981

ΔH (in. H_2O)	0.1	0.3	0.5	1.0	2.0	4.0	8.0
CF_w	2.02	2.48	2.44	4.85	4.82	9.57	9.61
CF_d	2.00	2.50	2.50	5.00	5.00	10.00	10.00
T_w °F	66	67	67	68	68	70	70
IT_d °F	71	79	87	94	99	112	119
OT_d °F	70	74	79	83	87	97	101
Time (t) (min.)	11.50	7.97	6.13	8.67	6.18	8.47	5.78
Y	1.1074	1.0044	.9970	.9951	.9938	.9960	.9977
ΔH_a	1.78	1.69	1.71	1.72	1.76	1.66	1.52

Average ΔH_a 1.69

Average Y 1.0002

$$Y = \frac{CF_w P_b (T_d + 460)}{CF_d (P_b + \frac{\Delta H}{13.6}) (T_w + 460)}$$

$$H_a = \frac{0.317 \Delta H}{P_b (OT + 460)} \cdot \left[\frac{(T_w + 460)}{CF_w} \right]^2$$

DRY GAS METER CALIBRATION

Meter Number 2

Barometric Pressure 30.21

January 6, 1981

ΔH (in. H_2O)	0.3	0.5	1.0	2.0	4.0
CF_w	2.48	2.49	4.96	4.95	9.93
CF_d	2.50	2.50	5.00	5.00	10.00
T_w °F	70	71	70	68	67
IT_d °F	75	76	77	80	81
OT_d °F	75	76	77	80	81
Time (t) (min.)	8.02	6.20	8.98	6.37	9.20
Y	1.0006	1.0042	1.0027	1.0076	1.0096
ΔH_a	1.73	1.71	1.80	1.79	1.85

Average ΔH_a 1.78

Average Y 1.0049

$$Y = \frac{CF_w P_b (T_d + 460)}{CF_d (P_b + \frac{\Delta H}{13.6} (T_w + 460))}$$

$$H_a = \frac{0.317 \Delta H}{P_b (OT + 460)} \cdot \left[\frac{(T_w + 460) t}{CF_w} \right]^2$$

THERMOMETER CALIBRATION

CALIBRATED TO 32°F AND 212°F

November 1, 1980

	<u>NUMBER</u>	<u>ICE BATH</u>	<u>BOILING WATER</u>
THERMOCOUPLE	TC	32°F	213°F
FILTER HOLDER	T2	33°F	212°F
METER	T3	27°F	207°F
IMPINGER	T4	29°F	211°F

PITOT CALIBRATION

Pitot Tube No. 17

November 13, 1980

$$Cp (S) = .99 \sqrt{\frac{\Delta P (STD)}{\Delta P (S)}}$$

	<u>RUN 1</u>	<u>RUN 2</u>	<u>RUN 3</u>
ΔP STD (in. H ₂ O)	.39	.40	.41
ΔP s (in. H ₂ O)			
Side A	.58	.59	.60
Side B	.58	.59	.60
CpS	.811	.815	.818
Deviation	0	0	0
Average CpS	.815		

TYPE S PITOT TUBE INSPECTION DATA FORM

Pitot tube assembly level? X yes _____ no

Pitot tube openings damaged? _____ yes (explain below) X no

$$\alpha_1 = \underline{3}^\circ (<10^\circ), \quad \alpha_2 = \underline{2}^\circ (<10^\circ), \quad \beta_1 = \underline{1}^\circ (<5^\circ),$$
$$\beta_2 = \underline{\quad 2 \quad}^\circ \quad (<5^\circ)$$
$$\gamma = 2^\circ, \quad \theta = 2^\circ, \quad A = \frac{3}{8} \text{ cm (in.)}$$
$$z = A \sin \gamma = \underline{1/32} \text{ cm (in.)}; < 0.32 \text{ cm } (< 1/8 \text{ in.}),$$
$$w = A \sin \theta = \frac{1}{64} \text{ cm (in.)}; <.08 \text{ cm (<1/32 in.)}$$

P_A .45" cm (in.) P_b .47" cm (in.)

$D_{+} = \underline{3/4} \text{ cm (in.)}$

Comments: _____

Calibration required? yes X no

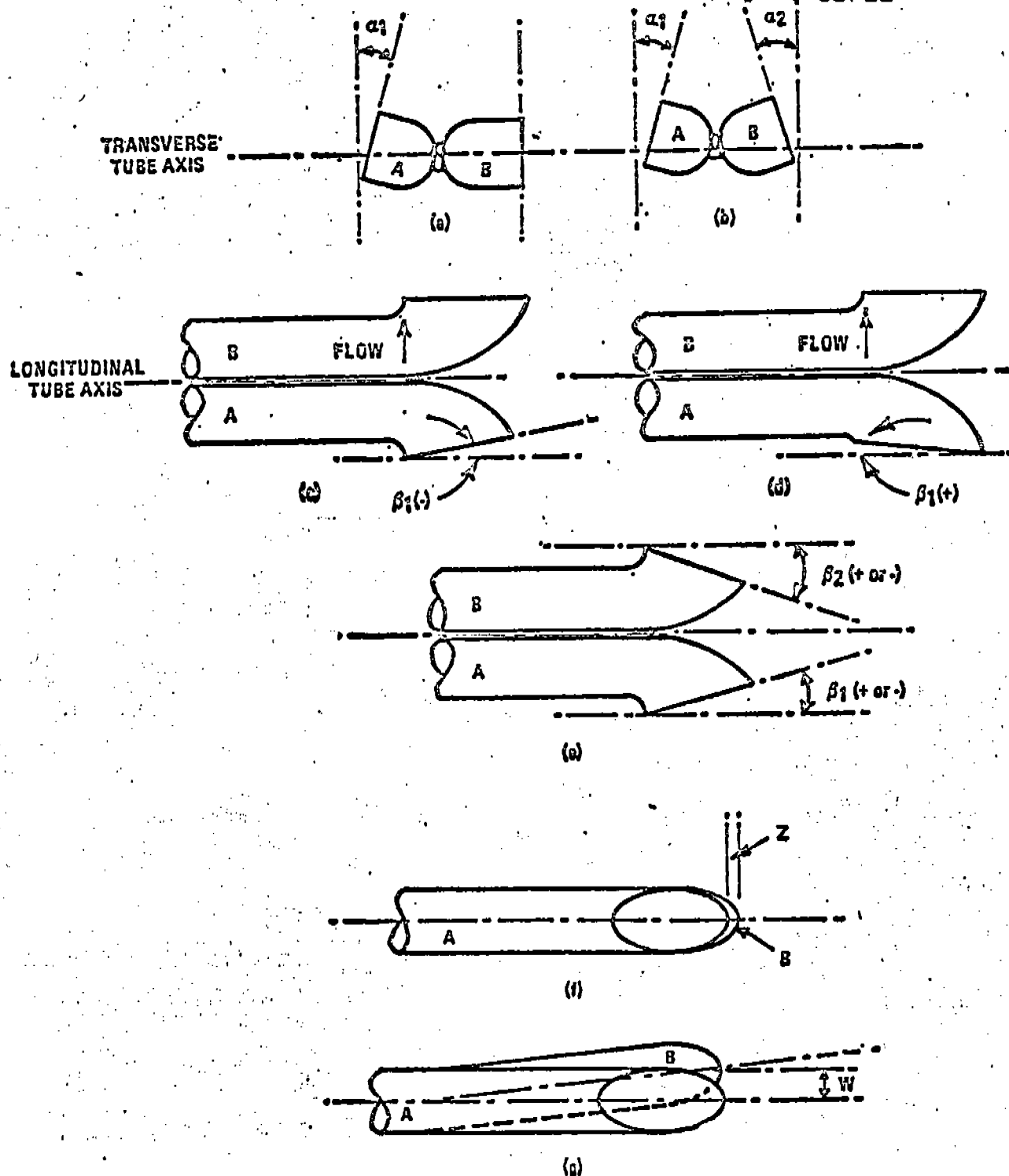


Figure 2.3. Types of face-opening misalignment that can result from field use or improper construction of Type S pitot tubes. These will not affect the baseline value of $\bar{C}_p(s)$ so long as α_1 and $\alpha_2 < 10^\circ$, β_1 and $\beta_2 < 5^\circ$, $z < 0.32$ cm (1/8 in.) and $w < 0.08$ cm (1/32 in.) (citation 11 in Section 6).

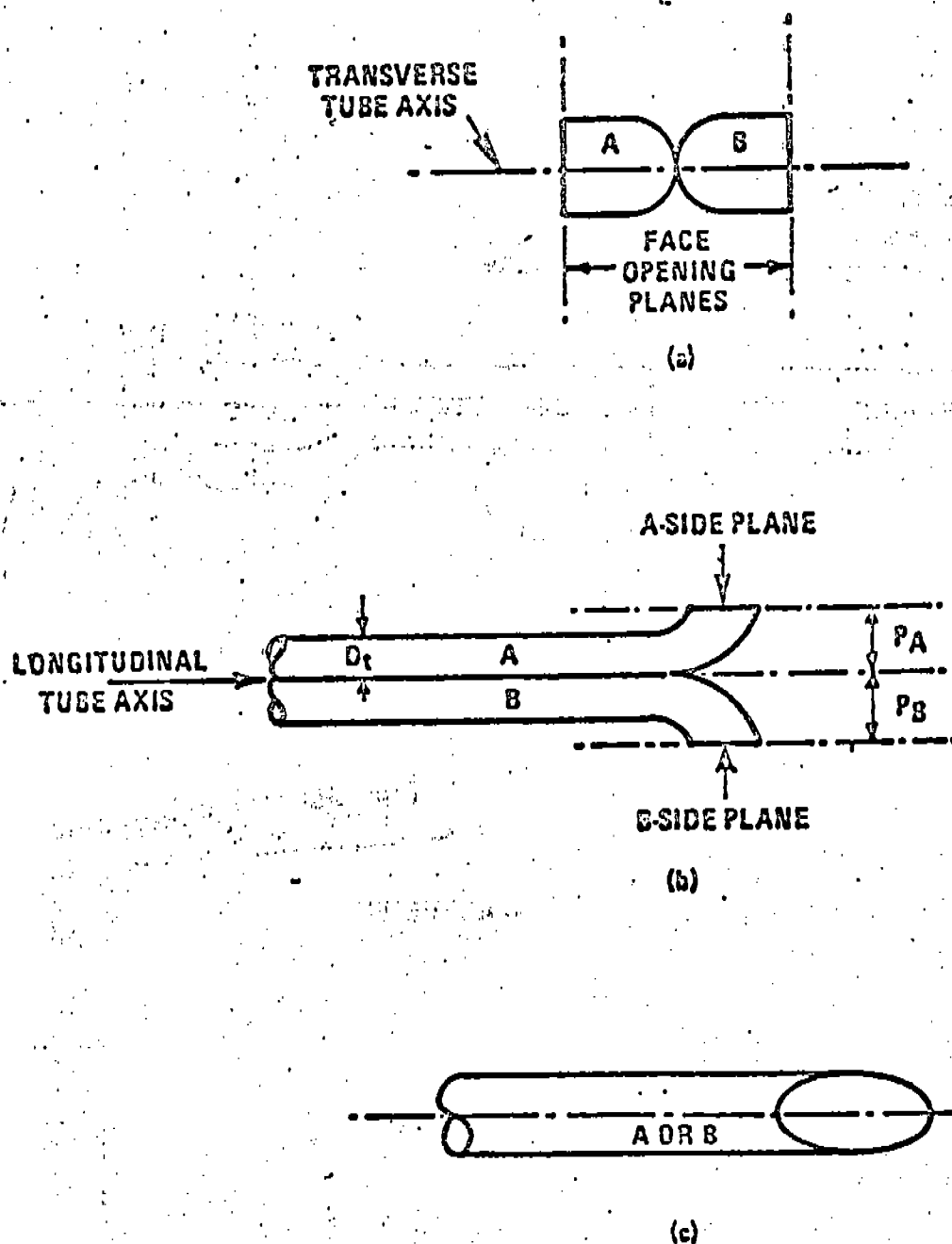


Figure 2-2. Properly constructed Type S pitot tube, shown in: (a) end view; face opening planes perpendicular to transverse axis; (b) top view; face opening planes parallel to longitudinal axis; (c) side view; both legs of equal length and centerlines coincident, when viewed from both sides. Baseline coefficient values of 0.84 may be assigned to pitot tubes constructed this way.

STANDARD SOLUTION AND CONTROL SAMPLE
ANALYTICAL DATA FORM

Plant LANCASTER Date 8-3-81
Analyst CA Optimum wavelength 407 nm
Blank used as reference? ☒

Sample number	Sample, μ g	Working solution	Control sample	Measured, absorbance, OD	Calculated absorbance, ^a OD	Absorbance comparison error, ^b %
A1	100	x		.138	-	-
A2	200	x		.302	-	-
A3	300	x		.457	-	-
A4	400	x		.639	-	-
S1	100		x	.303	.312	-2.9
S2	200		x	.459	.467	-1.7
S3	400		x	.641	.623	+2.9
						Avg ^c 2.5

$$K_c = 100 \cdot \left[\frac{A_1 + 2A_2 + 3A_3 + 4A_4}{A_1^2 + A_2^2 + A_3^2 + A_4^2} \right] = \underline{642.}$$

^a Calculated absorbance: OD = (μ g)/ K_c i.e., S1 calculated absorbance = 100/ K_c .

^b Absorbance comparison errors:

$$\% = 100 \times \left(\frac{\text{measured absorbance, OD} - \text{calculated absorbance, OD}}{\text{calculated absorbance, OD}} \right)$$

^c Average of absolute values.

OPTIMUM WAVELENGTH DETERMINATION DATA FORM

Spectrophotometer number 7122

Date 7-16-81

Calibrated by W. Arlington

Reviewed by _____

Spectrophotometer setting, nm	Absorbance of standard OD ^a	Absorbance of blank OD ^b	Actual absorbance of OD ^c
399	.310	.010	.300
400	.300	.010	.290
401	.305	.005	.300
402	.310	.010	.300
403	.310	.010	.300
404	.315	.010	.305
405	.316	.010	.306
406	.318	.010	.308
407	.319	.010	.309
408	.323	.010	.313
409	.312	.010	.302
410	.311	.010	.301
411	.310	.010	.300
412	.310	.010	.300
413	.309	.010	.299
414	.308	.010	.298
415	.306	.010	.296
416	.303	.009	.294

a Absorbance of the 200 µg NO₂ standard in a single beam spectrophotometer.

b Absorbance of the blank in a single-beam spectrophotometer.

c For a single-beam spectrophotometer -- absorbance of the standard minus absorbance of the blank. For a double beam spectrophotometer -- absorbance of the 200 µg NO₂ standard with the blank in the reference cell.

Spectrophotometer setting for maximum actual absorbance of standard 704 nm.

If the maximum actual absorbance occurs at a spectrophotometer setting of <399 or >416 nm, the spectrophotometer must be repaired or recalibrated.

NOMENCLATURE

CP	PITOT TUBE COEFFICIENT
Y	METER CORRECTION FACTOR
$\uparrow$ HA	ORIFICE COEFFICIENT
DN	DIAMETER OF THE NOZZLE (IN.)
AN	AREA OF NOZZLE (SQ. FT.)
DS	DIAMETER OF STACK (IN.)
SP	STATIC PRESSURE (IN. H ₂ O)
PB	BAROMETRIC PRESSURE
O	TIME IN MINUTES
VM	METER VOLUME (CU. FT.)
$\uparrow$ P	PITOT PRESSURE HEAD (IN. H ₂ O)
$\uparrow$ H	ORIFICE PRESSURE DROP (IN. H ₂ O)
TH	METER TEMPERATURE (DEGREES F.)
TS	STACK TEMPERATURE (DEGREES F.)
TPW	TOTAL PARTICULATE WEIGHT (GRAMS)
WC	WATER COLLECTED, ML.
MD	MOLECULAR WIEGHT OF DRY GAS
SM	SATURATION MOISTURE (%)
C	CORRECTION FACTOR
STD	STANDARD CONDITIONS (68 DEGREES F., 29.92 HG)
SCFM	STANDARD CUBIC FEET PER MINUTE

OXIDES OF NITROGEN

NOMENCLATURE

- A = ABSORBANCE OF SAMPLE.
- C = CONCENTRATION OF NOX AS NO₂, DRY BASIS, CORRECTED TO STANDARD CONDITIONS. LB./DSCF.
- F = DILUTION FACTOR (I.E., 25/5, 25/10, ETC.) REQUIRED ONLY IF SAMPLE DILUTION WAS NEEDED TO REDUCE THE ABSORBANCE TO THE RANGE OF CALIBRATION
- KC = SPECTROPHOTOMETER CALIBRATION FACTOR.
- M = MASS OF NOX AS NO₂ IN GAS SAMPLE, MG.
- PF = VOLUMETRIC FLOW RATE, DSCF.
- PI = INITIAL ABSOLUTE PRESSURE OF FLASK, K (°R).
- PSTD = STANDARD ABSOLUTE PRESSURE, 760 MM (29.92 IN.) HG.
- TF = FINAL ABSOLUTE TEMPERATURE OF FLASK K (°R).
- TI = INITIAL ABSOLUTE TEMPERATURE OF FLASK, K (°R).
- TSTD = STANDARD ABSOLUTE TEMPERATURE, 293K (528°R).
- VSC = SAMPLE VOLUME AT STANDARD CONDITIONS, DRY BASIS, ML.
- VF = VOLUME OF FLASK AND VALVE, ML.
- VA = VOLUME OF ABSORBING SOLUTION, 25 ML.
- E = EMISSION RATE, LB./HR.
- Q = VOLUMETRIC FLOW RATE, DSCF.