AP-42 Section Number: 1.8

Reference Number: 65

Title: Stack Test for Total Gaseous Non-Methane Organic Compounds Report 1371-S Boler No.5 - Bryant, United States Sugar Corporation

February 1990

Rule 56

USSC11

UNITED STATES SUGAR CORPORATION

STACK TEST FOR TOTAL GASEOUS NON-METHANE ORGANIC COMPOUNDS

REPORT 1371-S

BOILER NO. 5 - BRYANT

FEBRUARY 15, 1990

TABLE OF CONTENTS

INTRODUCTION

United States Sugar Corporation operates a raw sugar mill located in Pahokee, Florida. On December 21, 1989, tests for Total Gaseous Non-Methane Organic Compounds were performed on the exhaust stack servicing Boiler No. 5.

The testing was performed in order to comply with the operating permit conditions set forth by the Florida Department of Environmental Regulation, and to determine compliance with Chapter 17-2 of the Florida Administrative Code.

During the testing period, records of the boiler data were maintained by plant personnel and are presented in the Appendix.

The average emission emission rate during the test period was .88 lbs./ton. The allowable emissions are 1.4 lbs./ton of wet bagasse.

The results of this test verify compliance with the Florida Department of Environmental Regulation, and Chapter 17-2 of the Florida Administrative Code.

SOUTH FLORIDA ENVIRONMENTAL SERVICES, INC.

STACK TEST FOR TOTAL GASEOUS NON-METHANE ORGANIC COMPOUNDS

United States Sugar Corporation
Post Office Drawer 1207
Clewiston, Florida 33440

Bryant Sugar Factory

Type Process - Raw Sugar Manufacturing

Boiler No. 5

Abatement Device - Wet Scrubber

Compliance Stack Test

Report 1371-S

February 15, 1990

Run Numbers 1, 2 and 3

Allowable Emissions - 1.4 lbs./ton of wet bagasse
Actual Emissions - .88 lbs./ton

All testing and analysis was performed in accordance with the Florida Department of Environmental Regulation, and Chapter 17-2 of the Florida Administrative Code.

I hereby certify that to my knowledge, all data submitted in this report is true and correct.

W. Arlington

William D. Arlington
Project Director

ALLOWABLE EMISSION DETERMINATION

The allowable emissions were determined in accordance with the Florida Department of Environmental Regulation Permit.

Substantiating data and calculations are presented in the Appendix.

CYCLONIC FLOW DETERMINATION

Due to the configuration of the system, cyclonic flow was considered to be non-existent at the sampling site.

UNITED STATES SUGAR CORPORATION
BOILER NO. 5 - BRYANT
1371-S

SUMMARY OF GASEOUS EMISSION RATES
FEBRUARY 15, 1990

RUN	TIME	C3H8	VOLUMETRIC FLOW RATE (SCFM)	HEAT INPUT (MBTU)	VOC (LBS/TON)
1	840-1003	49	147473	477.0	.59
2	1106-1206	60	160980	481.6	.79
3	1435-1535	94	161496	474.1	1.26
AVG			156,650	477.6	.88

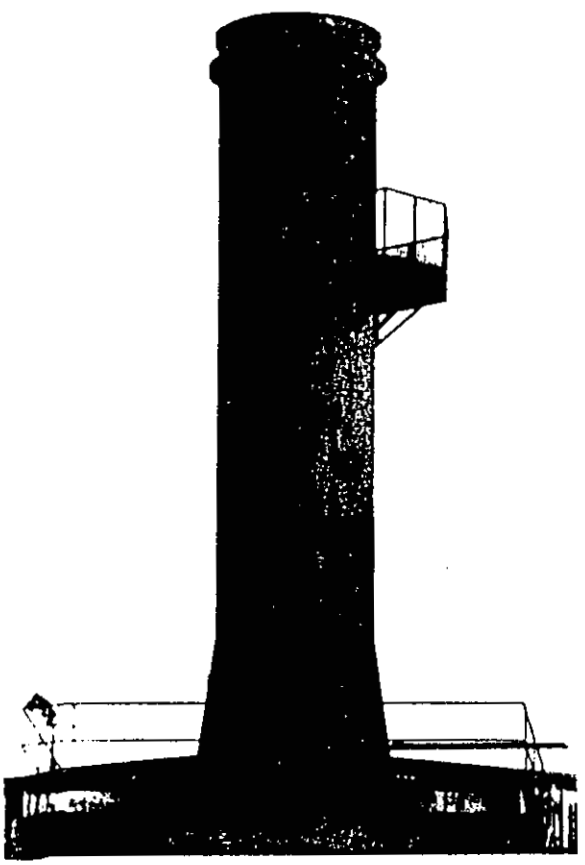
TEST RESULTS
U.S.S.C. - BRYANT MILL
BOILER #5
REPORT NUMBER 1371-S

	RUN 1	RUN 2	RUN 3
AREA (SQ.FT.)	41.28	41.28	41.28
SATURATION MOISTURE (%)	26.77	24.19	22.16
MOLECULAR WEIGHT	26.79	27.10	27.34
VELOCITY (FPM)	5631	5898	5729
VOL.FLOW RATE (ACFM)	232469	243483	236516
VOL.FLOW RATE (SCFM-DRY)	147473	160980	161496

SAMPLING POINT DETERMINATION
UNITED STATES SUGAR CORPORATION
BRYANT - BOILER NO. 5

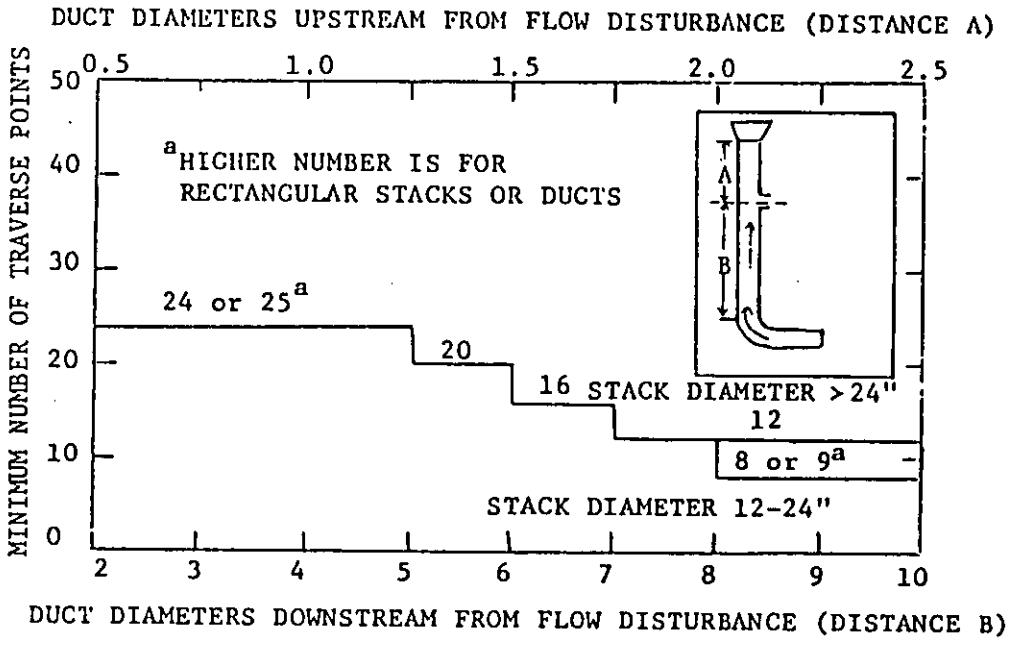
STACK CONFIGURATION:	CIRCULAR
DIAMETER (INCHES):	87
DISTANCE A - PORT TO DOWNSTREAM DISTURBANCE (INCHES):	87
DISTANCE B - PORT TO UPSTREAM DISTURBANCE (INCHES):	349
NUMBER OF SAMPLING POINTS:	24
NUMBER OF TEST PORTS:	2
NUMBER OF POINTS ON A TRAVERSE:	12

POINT LOCATION ON A TRAVERSE:



TRAVERSE POINT NUMBER	INCHES TO STACK WALL
1	1.9
2	5.8
3	10.3
4	15.4
5	21.8
6	30.9
7	56.1
8	65.3
9	71.6
10	76.7
11	81.2
12	85.1

SAMPLING POINT DETERMINATION



CIRCULAR STACKS

Number of points equal next higher multiple of four.

RECTANGULAR STACKS

Number Traverse Points	Subarea Layout Matrix
9	3 x 3
12	4 x 3
16	4 x 4
20	5 x 4
25	5 x 5
30	6 x 5
36	6 x 6
42	7 x 6
49	7 x 7

Field Data - Stack Flow

PARTICULATE FIELD DATA

PLANT USSC - Bryant
REPORT 1371-S-1
DATE 02-15-90
OPERATOR GPH
TIME 0836 - 1005
K FACTOR .73
ASSUMED MOISTURE % 29
DRY GAS METER NO. 4
NOZZLE ID NO. 3/16 A
WET BULB TEMP. —
POST LEAK CHECK
Cp .815 (p-8)
Y .9937

Y/Y$_i$ —
Δ Ha 1.783
Dn .1880
DIAMETER (In) 87
NO. DUCT 1
STATIC PRES. -.67
BAR. PRES. (In. Hg) 30.13
TEST TIME (min) 60
METERED VOL. —
AVE. $\sqrt{\Delta p}$ 1.545
AVG. Δ H 1.898
AVG. METER TEMP. 80.0
AVG. STACK TEMP. 152.5

Boiler #5

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	DRY GAS METER CU. FT.	VELOCITY HEAD (Δ p) in. H_2O	PRESSURE ORIFICE METER Δ H) in H_2O	DRY GAS TEMP. (°F)	PUMP VACUUM (In. Hg.)	IMPINGER (°F)	FILTER TEMP. (°F)	STACK TEMP. (°F)
1	2.5		1.50						148
2			1.60						147
3			2.00						148
4			2.00						148
5			2.40						147
6			2.30						147
7			2.30						147 *
8			2.00						154
9			2.20						154
10			2.10						155
11			2.00						154
12			2.00						154
1			1.10						156
2			1.10						156
3			1.00						155
4			1.20						156
5			1.30						156
6			1.70						156
7			2.20						156
8			4.30						156
9			6.00						156
10			6.30						156
11			6.30						155
12			5.50						155

PARTICULATE FIELD DATA

PLANT USSC - Bryant
REPORT 1371-S-2
DATE 02-15-90
OPERATOR JPH
TIME 1106 — 1208
K FACTOR .78
ASSUMED MOISTURE % 28
DRY GAS METER NO. 4
NOZZLE ID NO. 3/16 A
WET BULB TEMP. ———
POST LEAK CHECK
Cp .81S(p-8)
Y .9937

Y/Y$_i$ ———
Δ Ha 1.483
Dn .1880
DIAMETER (in) 84
NO. DUCT 1
STATIC PRES. -.64
BAR. PRES. (in. Hg) 30.13
TEST TIME (min) 60
METERED VOL. ———
AVE. $\sqrt{\Delta p}$ 1.633
AVG. ΔH 2.111
AVG. METER TEMP. 80.0
AVG. STACK TEMP. 148.4

Boiler #5

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	DRY GAS METER CU. FT.	VELOCITY HEAD (Δ p) in. H_2O	PRESSURE ORIFICE METER Δ H) in H_2O	DRY GAS TEMP. (°F)	PUMP VACUUM (In. Hg.)	IMPINGER (°F)	FILTER TEMP. (°F)	STACK TEMP. (°F)
1	2.5		2.00						147
2			2.10						148
3			2.30						148
4			2.60						149
5			3.20						150
6			3.00						150
7			2.80						150
8			2.70						149
9			2.50						149
10			2.30						149
11			2.20						148
12			1.60						148
1			.90						148
2			1.00						148
3			1.10						148
4			1.10						148
5			1.30						149
6			1.60						150
7			4.20						150
8			5.50						147
9			6.10						144
10			6.20						144
11			5.70						147
12			3.50						146

PARTICULATE FIELD DATA

PLANT USSC – Bryant
REPORT 1371-S-3
DATE 02-15-90
OPERATOR GPG
TIME 1436 – 1536
K FACTOR .73
ASSUMED MOISTURE % 28
DRY GAS METER NO. 4
NOZZLE ID NO. 3/16 a
WET BULB TEMP. —
POST LEAK CHECK
Cp .815 (p-8)
Y .9937

Y/Y$_i$ —
Δ Ha 1.783
Dn .1880
DIAMETER (in) 87
NO. DUCT 1
STATIC PRES. -.67
BAR. PRES. (in. Hg) 30.13
TEST TIME (min) 60
METERED VOL. —
AVE. $\sqrt{\Delta p}$ 1.598
AVG. Δ H 2.017
AVG. METER TEMP. 80.0
AVG. STACK TEMP. 144.9

Boiler #5

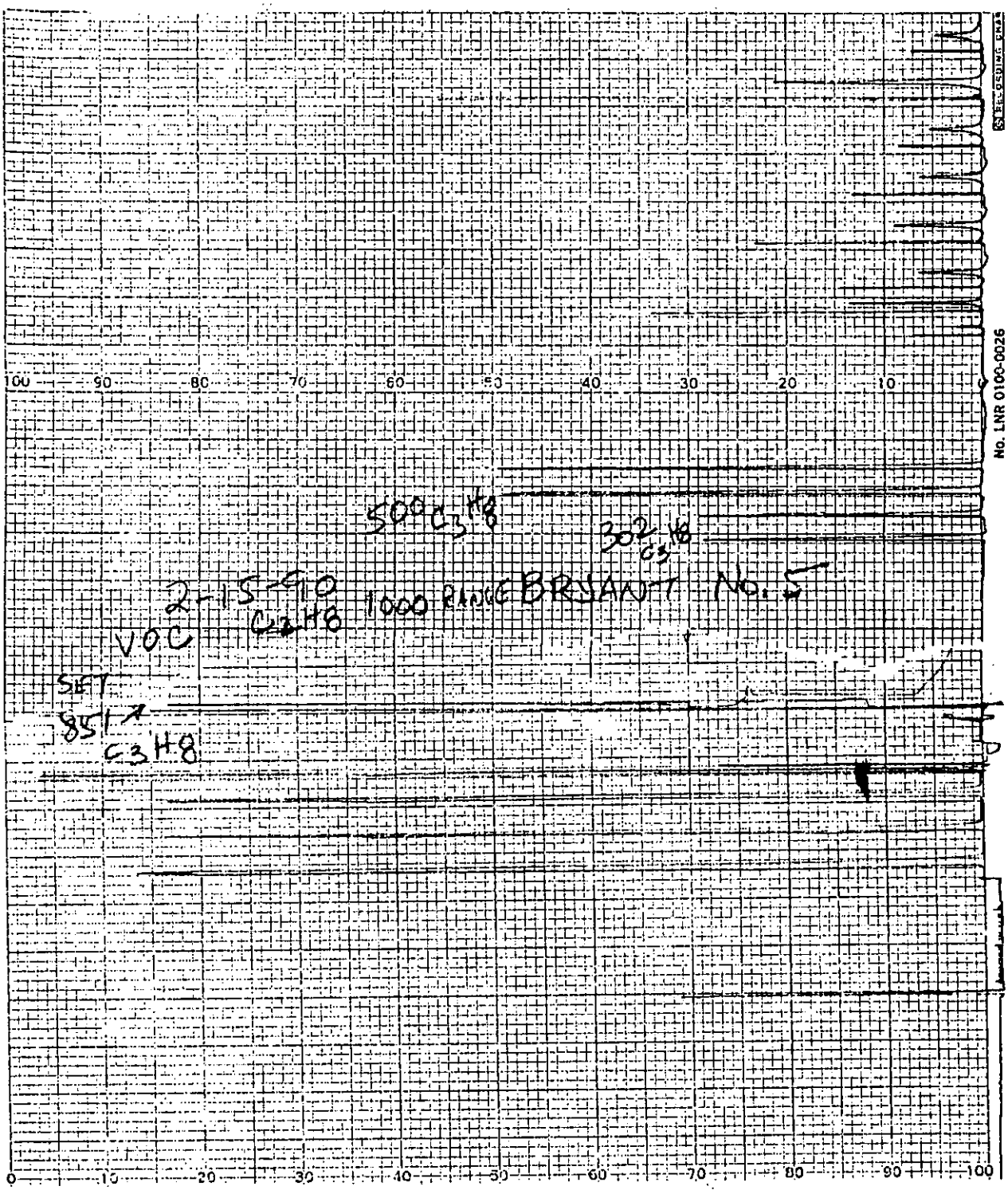
Avg Temp = 150

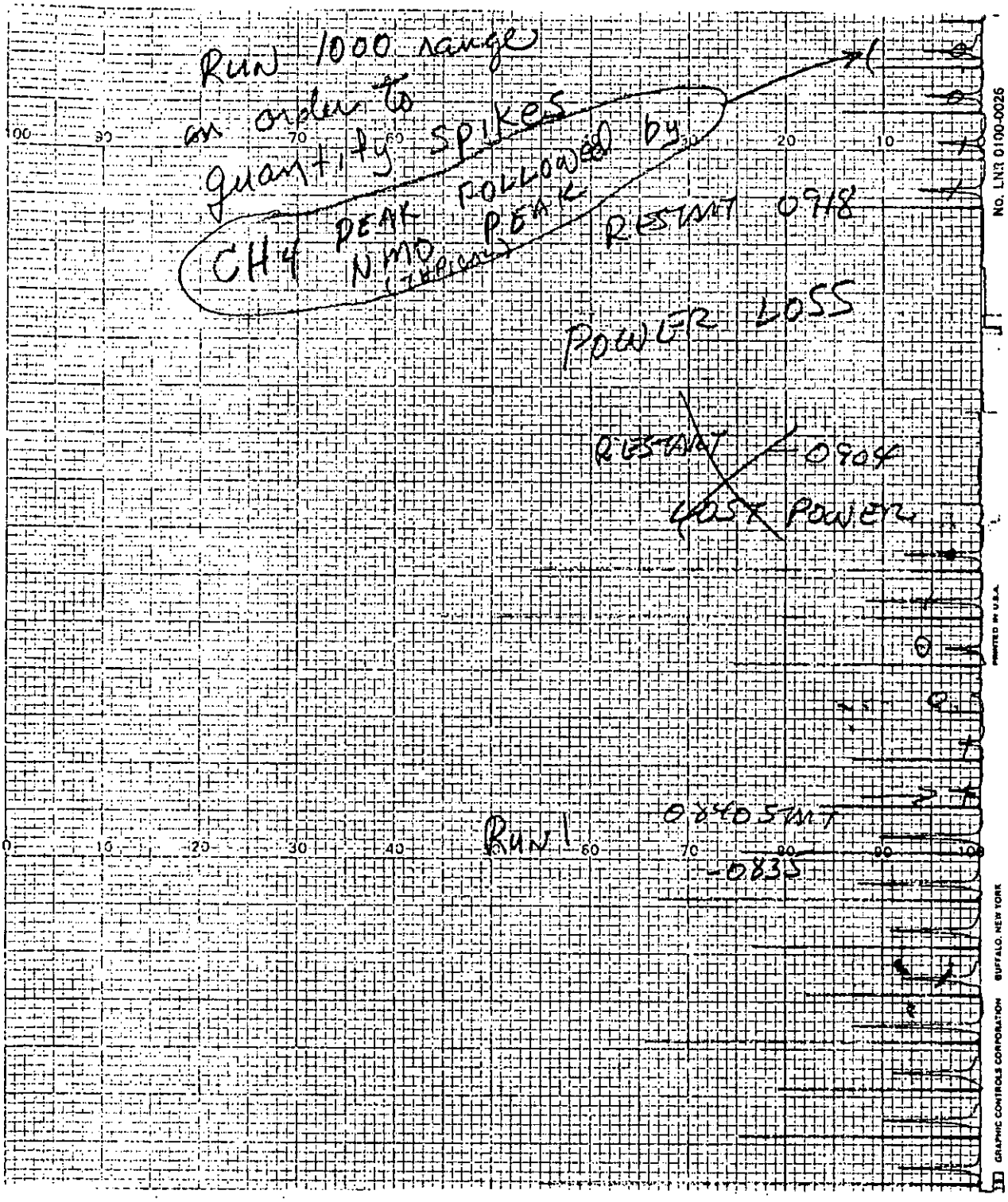
TRAVERSE POINT NUMBER	SAMPLING TIME (min)	DRY GAS METER CU. FT.	VELOCITY HEAD (Δ p) in. H_2O	PRESSURE ORIFICE METER Δ H) in H_2O	DRY GAS TEMP. (°F)	PUMP VACUUM (in. Hg.)	IMPINGER (°F)	FILTER TEMP. (°F)	STACK TEMP. (°F)
1	2.5		1.10						146
2			1.90						146
3			2.20						146
4			2.30						146
5			2.50						146
6			3.00						146
7			2.50						146
8			2.70						146
9			2.60						146
10			2.50						146
11			2.10						144
12			2.10						144
1			1.10						144
2			1.10						144
3			1.00						145
4			1.10						145
5			1.30						144
6			1.70						145
7			3.60						145
8			4.60						144
9			5.40						143
10			6.00						143
11			5.80						143
12			5.80						143

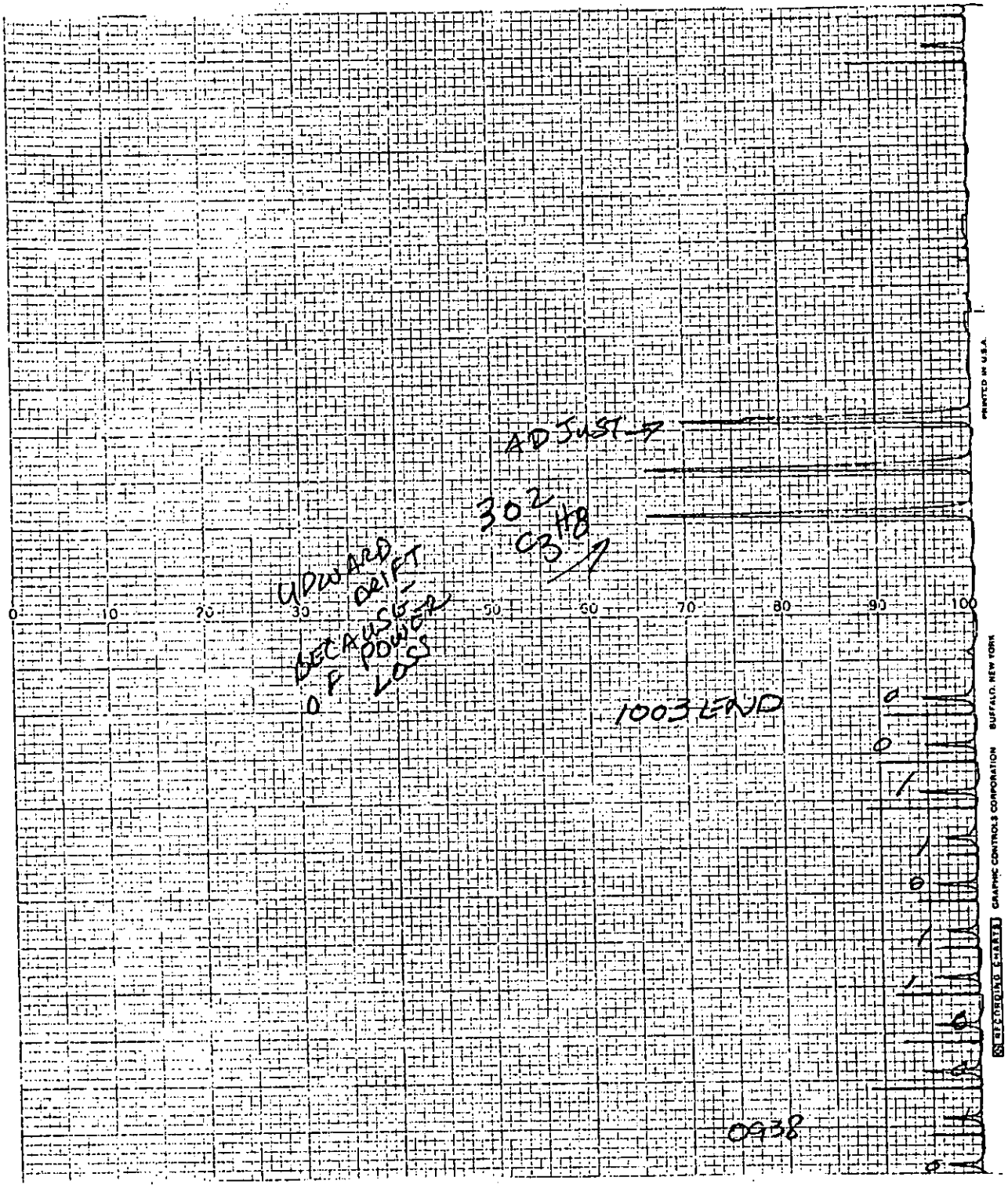
Field Data - Strip Chart

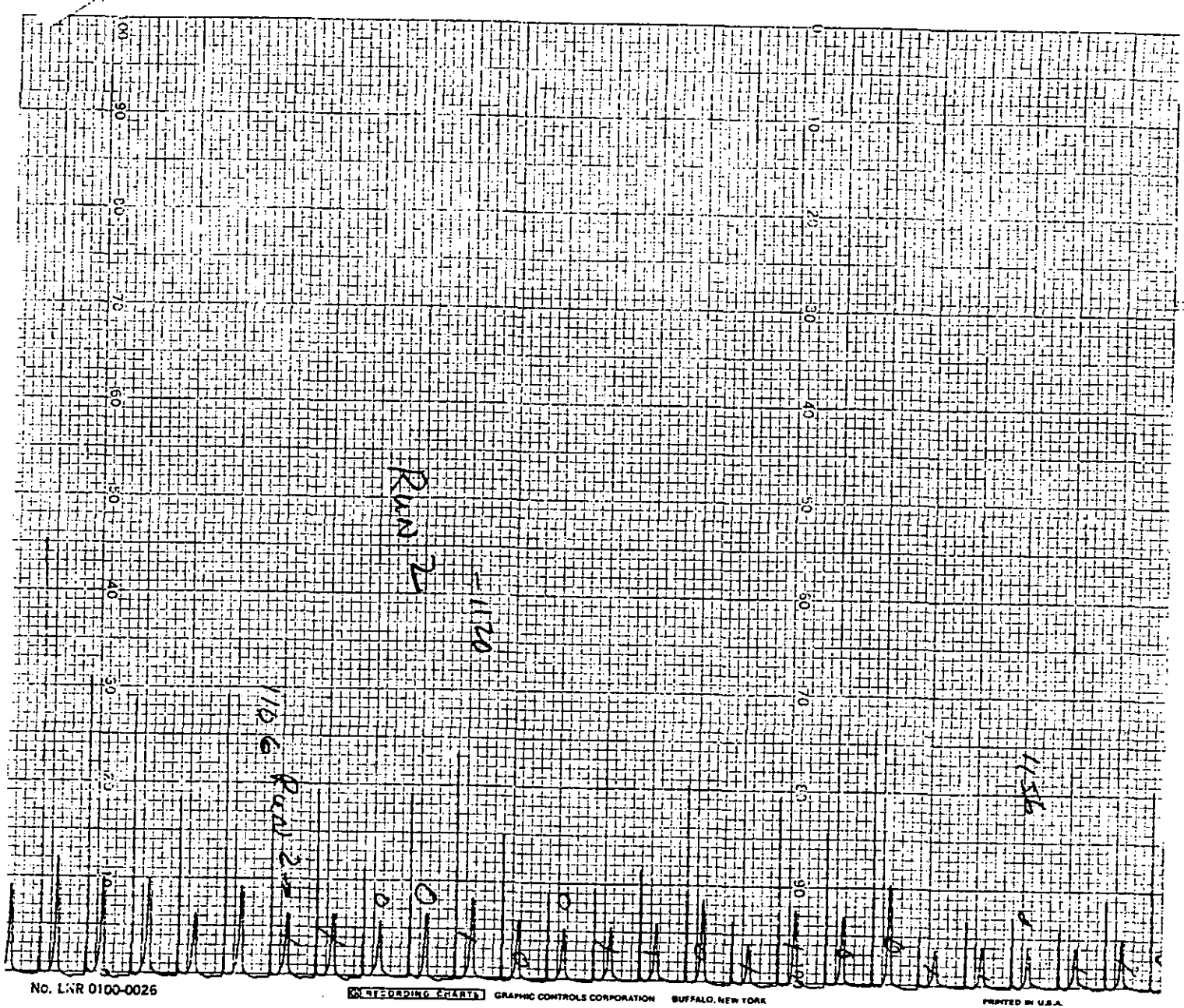
U.S.SUGAR CORPORATION
NO.5 BOILER
BRYANT, FLORIDA
FEBRUARY 15,1990

LOAD	TIME	ppm
220000	0840-0845	25
	0845-0850	22
	0850-0855	118
	0918-0923	52
	0923-0928	57
RUN 1	0928-0933	45
	0933-0938	39
	0938-0943	54
	0943-0948	38
	0948-0953	41
	0953-0958	44
	0958-1003	51
	AVERAGES	49
	1106-1111	62
	1111-1116	61
	1116-1121	81
	1121-1126	56
	1126-1131	58
	1131-1136	83
RUN 2	1136-1141	53
	1141-1146	85
	1146-1151	39
	1151-1156	41
	1156-1201	45
	1201-1206	55
	AVERAGES	60
	1435-1440	118
	1440-1445	80
	1445-1450	57
	1450-1455	115
	1455-1500	155
RUN 3	1500-1505	60
	1505-1510	95
	1510-1515	99
	1515-1520	63
	1520-1525	72
	1525-1530	105
	1530-1535	105
	AVERAGES	94


RECORDING CHART
No. LNR 0100-0026
100
90
80
70
60
50
40
30
20
10
0
10
20
30
40
50
60
70
80
90
100
500 C3H8
302 C3H8
2-15-90
VOC
C3H8
1000 RANGE BRYANT No. 5
SET
851
C3H8


Run 1000 range
in order to
quantify spikes
CH4 peak followed by
N2O peak
Restart 0948
Power loss
Restart 0904
Lost power
Run 1
0840 start
-0835
No. LN3 0100-0026
Printed in U.S.A.
Graphic Controls Corporation Buffalo, New York


ADJUST
302
CB HB
UPWARD DRIFT
BECAUSE
OF POWER
LOSS
1003 END
0938
0
10
20
30
40
50
60
70
80
90
100
RECORDING CHART
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
PRINTED IN U.S.A.



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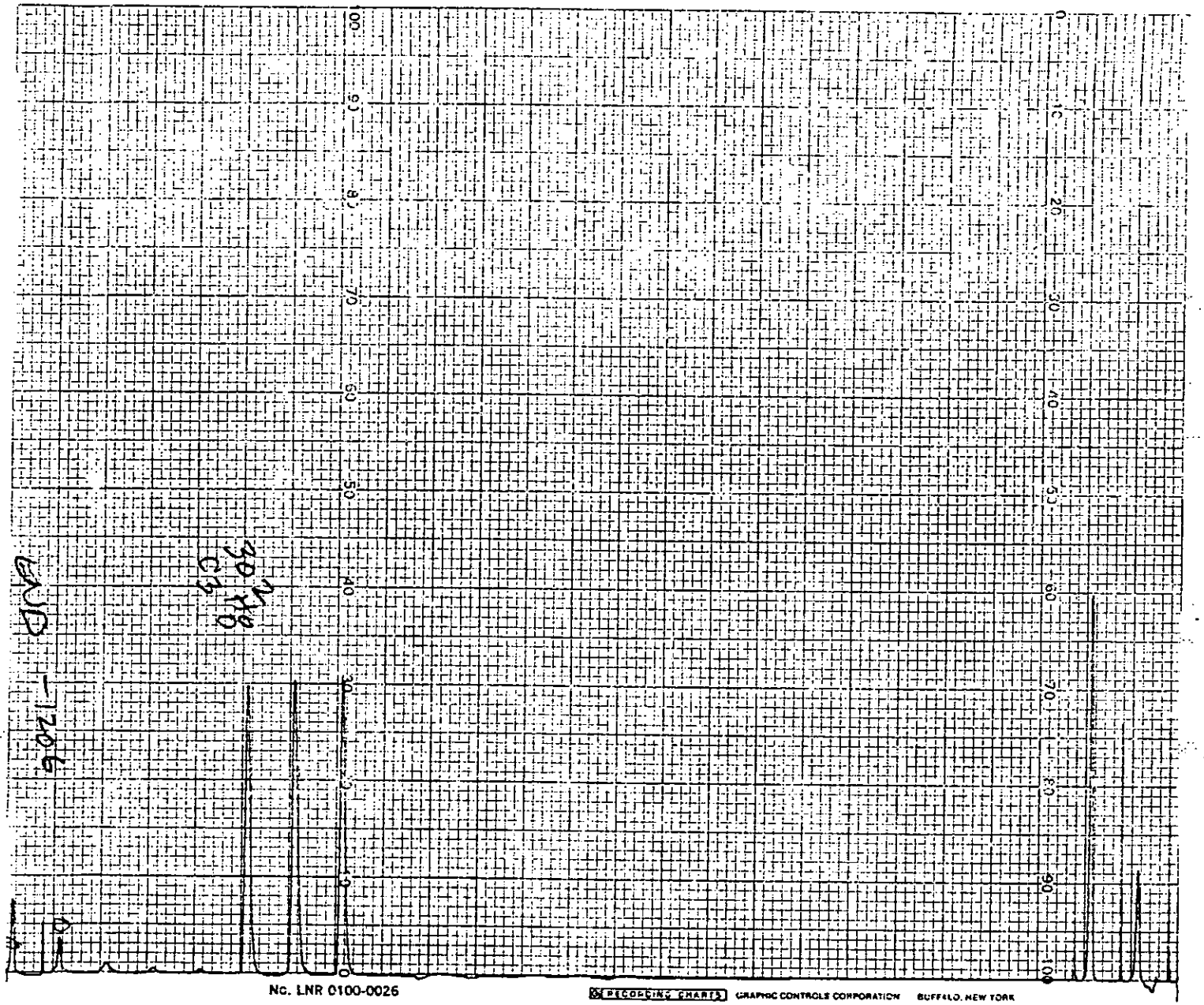
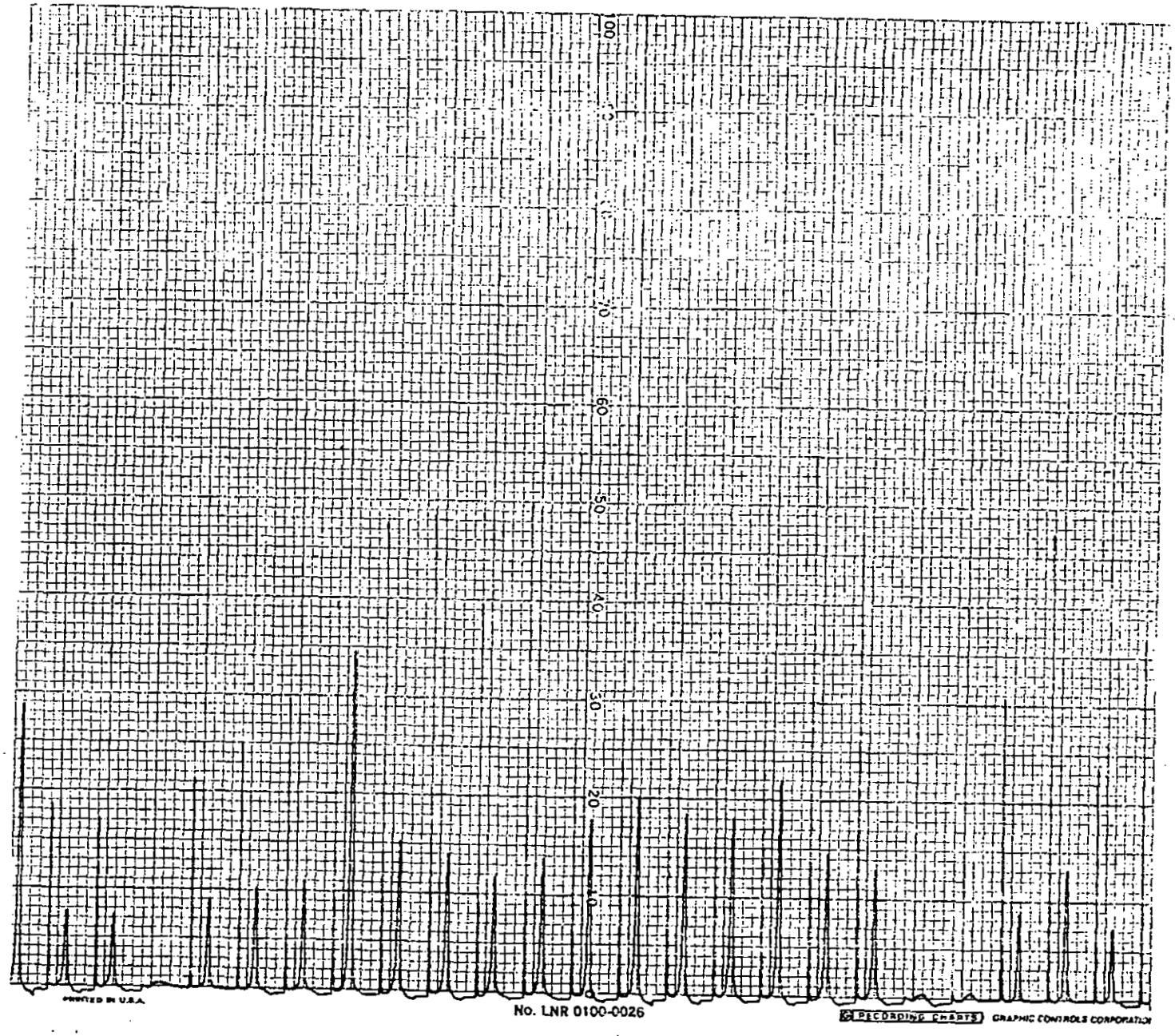
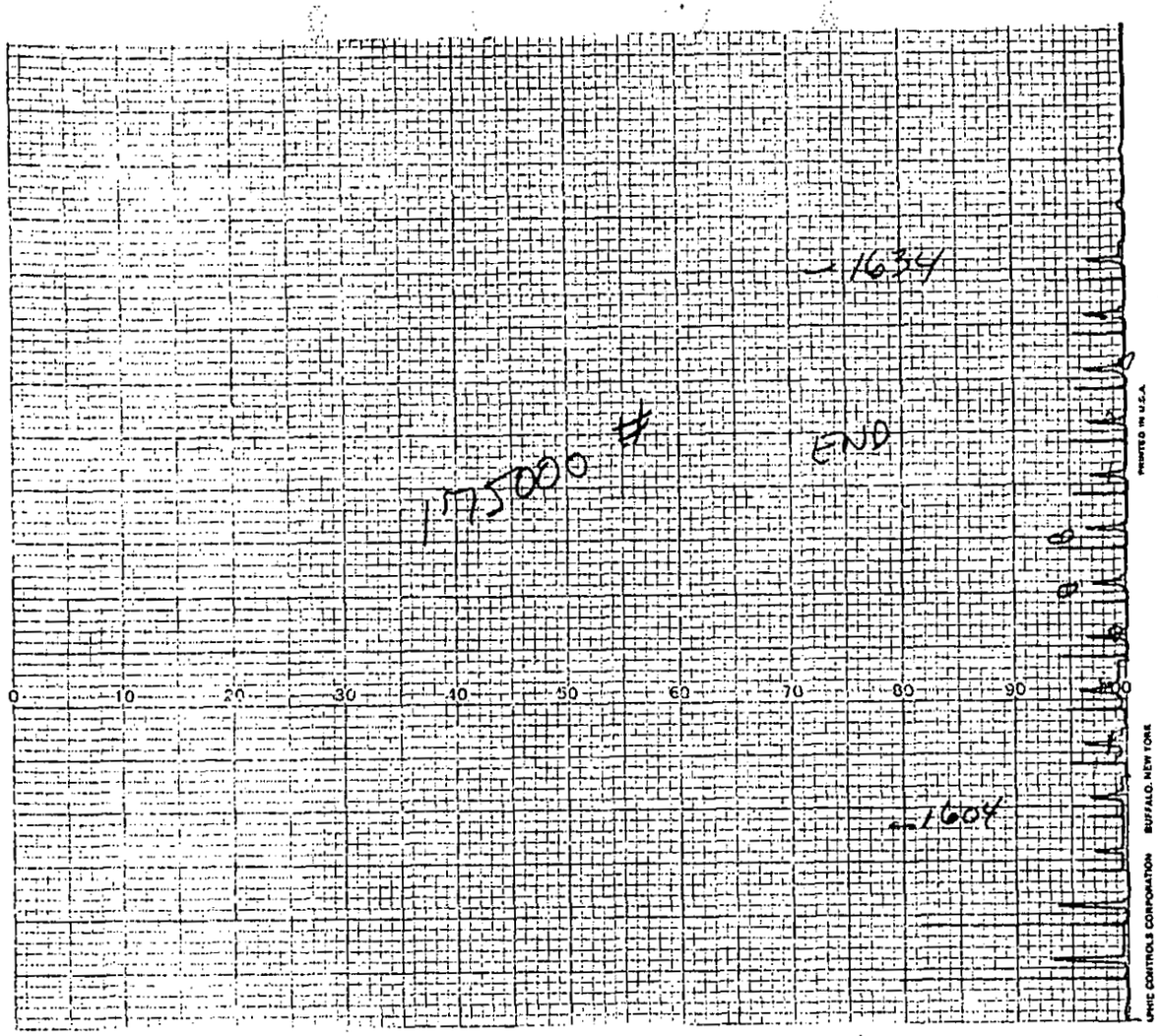


No. LNR 0100-0026

RECORDING CHARTS GRAPHIC CONTROLS CORPORATION BUFFALO, NEW YORK


100
90
80
70
60
50
40
30
20
10
PRINTED IN U.S.A.
No. LNR 0100-0026
RECORDING CHARTS
GRAPHIC CONTROLS CORPORATION

302 CS HD
1535 END
100 90 80 70 60 50 40 30 20 10
0 10 20 30 40 50 60 70 80 90 100
Run 3
1435
PRINTED IN U.S.A.
BUFFALO, NEW YORK
No. LNR 0100-0025


~1634
END
175000 #
0
10
20
30
40
50
60
70
80
90
100
~1604
PRINTED IN U.S.A.
GRAPHIC CONTROLS CORPORATION BUFFALO, NEW YORK

Allowable Emission Data Sheets

ALLOWABLE EMISSIONS

U.S.S.C. - BRYANT MILL
BOILER #5
RUN NUMBER 1371-S-1

BTU OF STEAM @ 900 F & 860 PSIA		1453.2 BTU/LB
BTU OF FEED WATER @ 260 F & 1285 PSIA		230.7 BTU/LB
NET BTU VALUE OF STEAM		1222.5 BTU/LB
INITIAL INTEGATOR READING	3406	
FINAL INTEGATOR READING	3499	
INTEGATOR FACTOR	3500	
TOTAL TIME(MIN.)	91	
STEAM PRODUCTION RATE		214615.4 LB/HR
FURNACE EFFICENCY		55%
TOTAL HEAT INPUT		477 MBTU/HR
HEAT INPUT - OIL		0 MBTU/HR
HEAT INPUT - BAGASSE		477 MBTU/HR

ALLOWABLE EMISSIONS

U.S.S.C. - BRYANT MILL
BOILER #5
RUN NUMBER 1371-S-2

BTU OF STEAM @ 900 F & 860 PSIA		1453.2 BTU/LB
BTU OF FEED WATER @ 260 F & 1285 PSIA		230.7 BTU/LB
NET BTU VALUE OF STEAM		1222.5 BTU/LB
INITIAL INTEGATOR READING	3560	
FINAL INTEGATOR READING	3625	
INTEGATOR FACTOR	3500	
TOTAL TIME(MIN.)	63	
STEAM PRODUCTION RATE		216666.7 LB/HR
FURNACE EFFICENCY		55%
TOTAL HEAT INPUT		481.6 MBTU/HR
HEAT INPUT - OIL		0 MBTU/HR
HEAT INPUT - BAGASSE		481.6 MBTU/HR

ALLOWABLE EMISSIONS

U.S.S.C. - BRYANT MILL
BOILER #5
RUN NUMBER 1371-S-3

BTU OF STEAM @ 900 F & 860 PSIA		1453.2 BTU/LB
BTU OF FEED WATER @ 260 F & 1285 PSIA		230.7 BTU/LB
NET BTU VALUE OF STEAM		1222.5 BTU/LB
INITIAL INTEGATOR READING	3775	
FINAL INTEGATOR READING	3840	
INTEGATOR FACTOR	3500	
TOTAL TIME(MIN.)	64	
STEAM PRODUCTION RATE		213281.3 LB/HR
FURNACE EFFICENCY		55%
TOTAL HEAT INPUT		474.1 MBTU/HR
HEAT INPUT - OIL		0 MBTU/HR
HEAT INPUT - BAGASSE		474.1 MBTU/HR

Boiler Data

BOILER DATA SHEET

COMPANY USSC - Bryant

BOILER NUMBER 5

DATE 02-15-90

REPORT NO. 1371-S

INTEGRATOR FACTOR 3500

OIL METER FACTOR —

			STEAM			FEED WATER	
TIME	INTEGRATOR	OIL METER	FLOW	TEMP.	PRESSURE	TEMP.	PRESSURE
08:35	343406	02942	215	900	850	260	1270
08:50			215	905	850	260	1270
09:05			215	900	850	260	1270
91 09:20			215	900	850	260	1270
09:35			215	900	845	260	1270
09:50			215	900	845	260	1270
10:06	343409	029425	215	900	840	260	1270
				900	860 psig 1453.2	260	1285 psig 1285 psig 230.7
11:06	343560	029425	215	905	860	260	1270
11:21			215	900	850	260	1270
63 11:36			215	900	840	260	1270
11:51			215	895	850	260	1270
12:06	343720	029425	215	895	840	260	1270
				900	860 psig 1453.2	260	1285 psig 230.7
1435	343775	029426	212	900	830	260	1270
14:50			212	895	835	260	1270
64 1505			215	880	845	260	1270
15:20			215	895	860	260	1270
15:35			215	900	845	260	1270
15:39	343840	029427	215	905	850	260	1270
				900	860 psig 1453.2	260	1285 psig 230.7

SIGNED

PROCESS DATA

COMPANY U.S.S.C.-Bogart INSTALLATION Boiler #5

DATE 2-15-90 REPORT NO. 1371-5

TYPE OF INSTALLATION Boiler

TYPE OF MATERIAL PROCESSED Steam

TYPE(S) OF FUEL USED Bagasse

TYPE OF POLLUTION CONTROL SYSTEM Impingement Scrubber

GENERAL CONDITION OF CONTROL EQUIPMENT Normal

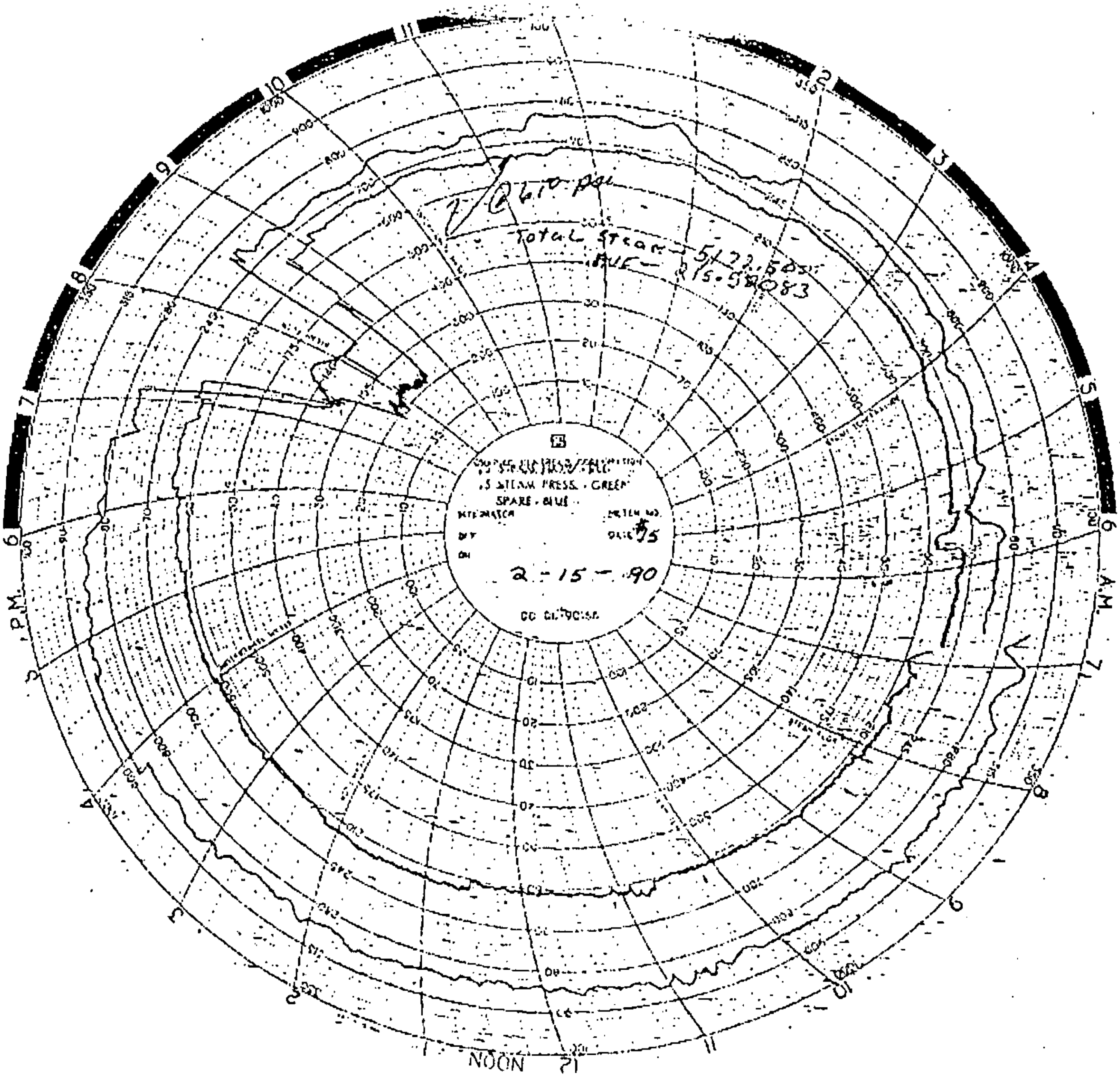
	NORMAL	RUN 1	RUN 2	RUN 3
FUEL USED	—	Bagasse	—	—
SCRUBBER WATER FLOW RATE (GPM)	620-640	630	622	636
PRESSURE DROP (INCHES)	8-8½	8-8½	8-8½	8-8½
TOTAL OPERATING CURRENT	NA	NA	NA	NA
MATERIALS PROCESSED	—	Steam	—	—

COMPANY REPRESENTATIVE [signature]

TITLE Adm. Assist to Senior V.P. Sugar Houses

DATE 2-15-90

TIME	ΔP (IN)	W. PRESS. (PSI)	FLOW (GPM)	pH
5:36	8 / 8 1/2	22	620	7.3
8:51	8 / 8 1/2	22	620	7.2
9:06	8 / 8 1/4	23	640	7.3
9:21	8 1/4 / 8 3/4	23	660	7.3
9:36	8 / 8 1/2	25	620	7.2
9:51	8 1/2 / 8 3/4	24	625	7.1
10:06	8 / 8 1/4	22	625	7.2
11:06	8 / 8 1/4	22	625	7.3
11:21	8 / 8	22	620	7.4
11:36	8 1/4 / 8 1/2	22	620	7.4
11:51	8 / 8 1/4	23	625	7.1
12:08	8 / 8 1/4	24	620	7.3
2:36	8 / 8 1/2	22	640	7.5
2:51	8 1/2 / 8 3/4	23	640	7.2
3:06	8 1/2 / 8 1/4	23	640	7.1
3:21	8 1/4 / 8 1/4	23	630	7.4
3:36	8 / 8 1/2	22	630	7.3


@610 psi
Total Steam
SPARE - BLUE
DATE
ON
2-15-90
NOON
P.M.
A.M.

Stack Flow Calculations - Run 1

CALCULATIONS FOR RUN 1

STACK AREA

(DIAMETER / 24)SQ. X 3.1416 X NO. OF STACKS

(87 / 24)SQ. X 3.1416 X 1

41.283

STACK PRESSURE

BAROMETRIC PRESSURE + (STATIC PRESSURE / 13.6)

30.13 + (-.67 / 13.6)

30.081

SAMPLE VOLUME

17.64 X (Y) X METER VOLUME X STACK PRESURE / (METER TEMP. + 460)

17.64 X 1 X 30 X 30.081 / (80 + 460)

29.664

PERCENT MOISTURE

100 X WATER VAPOR VOLUME / (WATER VAPOR VAPOR VOLUME + SAMPLE VOLUME)

100 X 23.535 / (23.535 + 29.664)

44.239

CALCULATIONS FOR RUN 1

SATURATION MOISTURE

100 X (VAPOR PRESSURE @ STACK TEMP. / STACK PRESSURE)

100 X (8.054 / 30.081)

26.774

STACK MOISTURE FRACTION

THE LESSOR OF SAMPLE MOISTURE OR SATURATION MOISTURE / 100

26.774 / 100

.26774

MOLECULAR WEIGHT OF STACK GAS

29.00 (DRYERS) OR 30.00 (BOILERS) X (1 - MOISTURE) + (18 X MOISTURE)

30 X (1 - .26774) + (18 X .26774)

26.787

STACK VELOCITY

85.49 X CP X 60 X ^P X SQR(STACK TEMP. + 460) /SQR(STACK PRESSURE X MOLECULAR WT.)

$$\frac{85.49 \times .815 \times 60 \times 1.545 \times \mathrm{SQR}(152.5 + 460)}{\mathrm{SQR}(30.081 \times 26.787)}$$

5631.2

VOLUMETRIC FLOW RATE (ACFM)

STACK AREA X STACK VELOCITY

41.283 X 5631.2

232468.9

CALCULATIONS FOR RUN 1

VOLUMETRIC FLOW RATE (SCFM DRY)

17.64 X (ACFM) X STACK PRESSURE X (1-MOISTURE) / (STACK TEMP. + 460)

17.64 X 232468.9 X 30.081 X (1-.26774) / (152.5 + 460)

147473.5

Calibration Data

CALIBRATION DATA

August 24, 1989

Meter No. 4
Barometric Pressure 29.88

^ H	0.1	0.3	0.5	1.0	2.0	4.0	8.0
CFw	2.50	2.50	5.00	5.00	10.00	10.00	10.00
CFd	2.46	2.50	5.08	5.09	10.18	10.06	9.85
Tw	90	88	87	87	87	89	89
Td	91	89	90	88	89	90	91
Time	13.66	7.85	12.25	8.80	12.64	8.84	6.29
Y	1.0179	1.0011	.9884	.9817	.9811	.9861	.9993
^ Ha	1.7389	1.7165	1.7322	1.7943	1.8476	1.8173	1.8368

Average ^Ha = 1.7834 Average Y = .9937

Thermocouple Calibrations

	TC-4	TC-5	ASTM
Ice	32	32	32
Boiling Water	212	212	212
Oil	399	399	399

Barometer Calibration

Aneroid - 29.88 Hg - 29.88

Pitot No. 8

	1	2	3
Std.	.29	.30	.31
Side A	.42	.44	.46
Side B	.42	.44	.48
CPs	.823	.817	.805
Deviation	.008	.002	.010

Average CPs = .815

Nozzle Calibration

Date 2/15/90 3/16A = .188, .188, .188, .188 = .1880

Scott Specialty Gases
PLUMSTEADVILLE, PA. 18949 PHONE: 215-766-8861 TWX: 510-665-9344

ER NUMBER ALM-005089 PROJECT NO. 15192

RD

SRM,CRM,GMIS) GMIS

ER NUMBER AAL- 18422

TRATION 973.2 PPM PROPANE/NITROGEN

ANALYZER

MAKE HP GC (FID)

MODEL 5700A

SERIAL NO. 2303A00973

DATE OF CALIBRATION 11/20/89

TA (FOR CONCENTRATION LISTED UNDER "REPLICATE ANALYSIS" ON THE OTHER SIDE)

GAS

ENT PROPANE

ANALYSIS 11/20/89 UNITS AREA

R 208500 T 183177

333 Z 0 T 183564

0 T 183963 R 208741

ANALYSIS N.R. UNITS

R T

Z T

T R

CYLINDER WAS BLENDED, ANALYZED AND SHIPPED FROM SCOTT SPECIALTY GASES
ROUTE 611
PLUMSTEADVILLE PA 18949

Date Shipped 12/1/89

Our Project No: 15192

Scott Specialty Gases

PLUMSTEADVILLE, PA. 18949 PHONE: 215-766-8861 TWX: 510-665-9344

Date Shipped 12/1/89

Our Project No: 15192

Your P.O. No: F0122

AIR CONSULTING & MGMT

CERTIFICATE OF ANALYSIS – EPA PROTOCOL GASES*

(Concentrations are in mole % or ppm)

Cylinder Number ALM-005076 Certified Accuracy +/-1 % NBS Traceable Analysis Dates: First 11/20/89 Last N.R.

CP= 2000 PSIG

COMPONENTS	CERTIFIED CONC	EXPIRATION DATE	ANALYTICAL PRINCIPLE	PRIMARY STANDARD NBS/SRM's	REPLICATE CONCENTRATIONS FIRST	REPLICATE CONCENTRATIONS SECOND
PROPANE	500 PPM	5/20/91	FID	1669B	499.2 PPM	
					500.5 PPM	
AIR	BALANCE				501.4 PPM	

Cylinder Number _____ Certified Accuracy _____ % NBS Traceable Analysis Dates: First _____ Last _____

COMPONENTS	CERTIFIED CONC	EXPIRATION DATE	ANALYTICAL PRINCIPLE	PRIMARY STANDARD NBS/SRM's	REPLICATE CONCENTRATIONS FIRST	REPLICATE CONCENTRATIONS SECOND

*We hereby certify the cylinder gas has been analyzed according to EPA Protocol No: 1 PROCEDURE G1

Analyst Tom Sassaman TOM SASSAMAN Approved By Mark Sirinides MARK SIRINIDES

The only liability of this Company for gas which fails to comply with this analysis shall be replacement thereof by the Company without extra cost.

Scott Specialty Gases

PLUMSTEADVILLE, PA. 18949 PHONE: 215-766-8861 TWX: 510-665-9344

Date Shipped 12/1/89
Our Project No: 15192
Your P.O. No: F0122
Page 10 of 15

AIR CONSULTING & MGMT

CERTIFICATE OF ANALYSIS – EPA PROTOCOL GASES*

(Concentrations are in mole % or ppm)

Cylinder Number ALM-005089 Certified Accuracy +/-1 % NBS Traceable Analysis Dates: First 11/20/89 Last N.R.
CP= 2000 PSIG

COMPONENTS	CERTIFIED CONC	EXPIRATION DATE	ANALYTICAL PRINCIPLE	PRIMARY STANDARD NBS/SRM's	REPLICATE CONCENTRATIONS FIRST	SECOND
PROPANE	857 PPM	5/20/91	FID	1669B	855.0PPM	
					857.5 PPM	
					857.7 PPM	
AIR	BALANCE					

Cylinder Number _____ Certified Accuracy _____ % NBS Traceable Analysis Dates: First _____ Last _____

COMPONENTS	CERTIFIED CONC	EXPIRATION DATE	ANALYTICAL PRINCIPLE	PRIMARY STANDARD NBS/SRM's	REPLICATE CONCENTRATIONS FIRST	SECOND

*We hereby certify the cylinder gas has been analyzed according to EPA Protocol No: 1 PROCEDURE G1

Analyst Tom Sassaman TOM SASSAMAN Approved By Mark S. Sirinides MARK SIRINIDES

The only liability of this Company for gas which fails to comply with this analysis shall be replacement thereof by the Company without extra cost.

Scott Specialty Gases

PLUMSTEADVILLE, PA. 18949 PHONE: 215-766-8861 TWX: 510-665-9344

Date Shipped 12/1/89
Our Project No: 15192
Your P.O. No: F0122
Page 12 of 15

AIR CONSULTING & MGMT

CERTIFICATE OF ANALYSIS – EPA PROTOCOL GASES*

(Concentrations are in mole % or ppm)

Cylinder Number IL-3605 Certified Accuracy +/-1 % NBS Traceable Analysis Dates: First 11/20/89 Last N.R.

CP= 2000 PSIG

COMPONENTS	CERTIFIED CONC	EXPIRATION DATE	ANALYTICAL PRINCIPLE	PRIMARY STANDARD NBS/SRM's	REPLICATE CONCENTRATIONS FIRST	REPLICATE CONCENTRATIONS SECOND
PROPANE	302 PPM	5/21/91	FID	1669B	301.9 PPM	
					302.7 PPM	
					302.6 PPM	
AIR	BALANCE					

Cylinder Number _____ Certified Accuracy _____ % NBS Traceable Analysis Dates: First _____ Last _____

COMPONENTS	CERTIFIED CONC	EXPIRATION DATE	ANALYTICAL PRINCIPLE	PRIMARY STANDARD NBS/SRM's	REPLICATE CONCENTRATIONS FIRST	REPLICATE CONCENTRATIONS SECOND

*We hereby certify the cylinder gas has been analyzed according to EPA Protocol No: 1 PROCEDURE G1

Analyst Tom Sassaman TOM SASSAMAN Approved By Mark S. Sirinides MARK SIRINIDES

CYLINDER NUMBER ALM-CC5089 PROJECT NO. 15192

STANDARD

TYPE (SRM,CRM,GMIS) GMIS

CYLINDER NUMBER AAL- 18422

CONCENTRATION 973.2 PPM PROPANE/NITROGEN

ANALYZER

MAKE HP GC (FID)

MODEL 5700A

SERIAL NO. 2303A00973

DATE OF CALIBRATION 11/20/89

RAW DATA (FOR CONCENTRATION LISTED UNDER "REPLICATE ANALYSIS" ON THE OTHER SIDE)

Z=ZERO GAS

COMPONENT PROPANE

FIRST ANALYSIS 11/20/89 UNITS AREA

Z 0 R 208500 T 183177

R 208333 Z 0 T 183564

Z 0 T 183963 R 208741

SECOND ANALYSIS N.R. UNITS _____

Z _____ R _____ T _____

R _____ Z _____ T _____

Z _____ T _____ R _____

THIS CYLINDER WAS BLENDED, ANALYZED AND SHIPPED FROM SCOTT SPECIALTY GASES
ROUTE 611
PLUMSTEADVILLE PA 18949

CYLINDER NUMBER IL-3605 PROJECT NO. 15192

STANDARD

TYPE (SRM,CRM,GMIS) SRM 1669B

CYLINDER NUMBER FF-19478

CONCENTRATION 476 PPM PROPANE/NITROGEN

ANALYZER

MAKE HP GC (FID)

MODEL 5700A

SERIAL NO. 2303A00973

DATE OF CALIBRATION 11/20/89

RAW DATA (FOR CONCENTRATION LISTED UNDER "REPLICATE ANALYSIS" ON THE OTHER SIDE)

Z=ZERO GAS

COMPONENT PROPANE

FIRST ANALYSIS 11/20/89 UNITS AREA

Z 0 R 103133 T 65422

R 103213 Z 0 T 65645

Z 0 T 65579 R 103161

SECOND ANALYSIS N.R. UNITS

Z R T

R Z T

Z T R

THIS CYLINDER WAS BLENDED, ANALYZED AND SHIPPED FROM SCOTT SPECIALTY GASES
ROUTE 611
PLUMSTEADVILLE PA 18949

CYLINDER NUMBER ALM-005076 PROJECT NO. 15192

STANDARD

TYPE (SRM,CRM,GMIS) SRM 1669B

CYLINDER NUMBER FF-19478

CONCENTRATION 476 PPM PROPANE/NITROGEN

ANALYZER

MAKE HP GC (FID)

MODEL 5700A

SERIAL NO. 2303A00973

DATE OF CALIBRATION 11/20/89

RAW DATA (FOR CONCENTRATION LISTED UNDER "REPLICATE ANALYSIS" ON THE OTHER SIDE)

Z=ZERO GAS

COMPONENT PROPANE

FIRST ANALYSIS 11/20/89 UNITS AREA

Z 0 R 103242 T 108281

R 103403 Z 0 T 108718

Z 0 T 108734 R 103222

SECOND ANALYSIS N.R. UNITS

Z R T

R Z T

Z T R

THIS CYLINDER WAS BLENDED, ANALYZED AND SHIPPED FROM SCOTT SPECIALTY GASES
ROUTE 611
PLUMSTEADVILLE PA 18949

EPA Method 25A

METHOD 25A—DETERMINATION OF TOTAL GASEOUS ORGANIC CONCENTRATION USING A FLAME IONIZATION ANALYZER

1. *Applicability and Principle*

1.1 Applicability. This method applies to the measurement of total gaseous organic concentration of vapors consisting primarily of alkanes, alkenes, and/or arenes (aromatic hydrocarbons). The concentration is expressed in terms of propane (or other appropriate organic calibration gas) or in terms of carbon.

1.2 Principle. A gas sample is extracted from the source through a heated sample line, if necessary, and glass fiber filter to a flame ionization analyzer (FIA). Results are reported as volume concentration equivalents of the calibration gas or as carbon equivalents.

2. *Definitions*

2.1 Measurement System. The total equipment required for the determination of the gas concentration. The system consists of the following major subsystems:

2.1.1 Sample Interface. That portion of the system that is used for one or more of the following: sample acquisition, sample transportation, sample conditioning, or protection of the analyzer from the effects of the stack effluent.

2.1.2 Organic Analyzer. That portion of the system that senses organic concentration and generates an output proportional to the gas concentration.

2.2 Span Value. The upper limit of a gas concentration measurement range that is specified for affected source categories in the applicable part of the regulations. The span value is established in the applicable regulation and is usually 1.5 to 2.5 times the applicable emission limit. If no span value is provided, use a span value equivalent to 1.5 to 2.5 times the expected concentration. For convenience, the span value should correspond to 100 percent of the recorder scale.

2.3 Calibration Gas. A known concentration of a gas in an appropriate diluent gas.

2.4 Zero Drift. The difference in the measurement system response to a zero level calibration gas before and after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

2.5 Calibration Drift. The difference in the measurement system response to a mid-level calibration gas before and after a stated period of operation during which no unscheduled maintenance, repair or adjustment took place.

2.6 Response Time. The time interval from a step change in pollutant concentration at the inlet to the emission measurement system to the time at which 95 percent of the corresponding final value is reached as displayed on the recorder.

2.7 Calibration Error. The difference between the gas concentration indicated by the measurement system and the known concentration of the calibration gas.

3. *Apparatus*

A schematic of an acceptable measurement system is shown in Figure 25A-1. The essential components of the measurement system are described below:

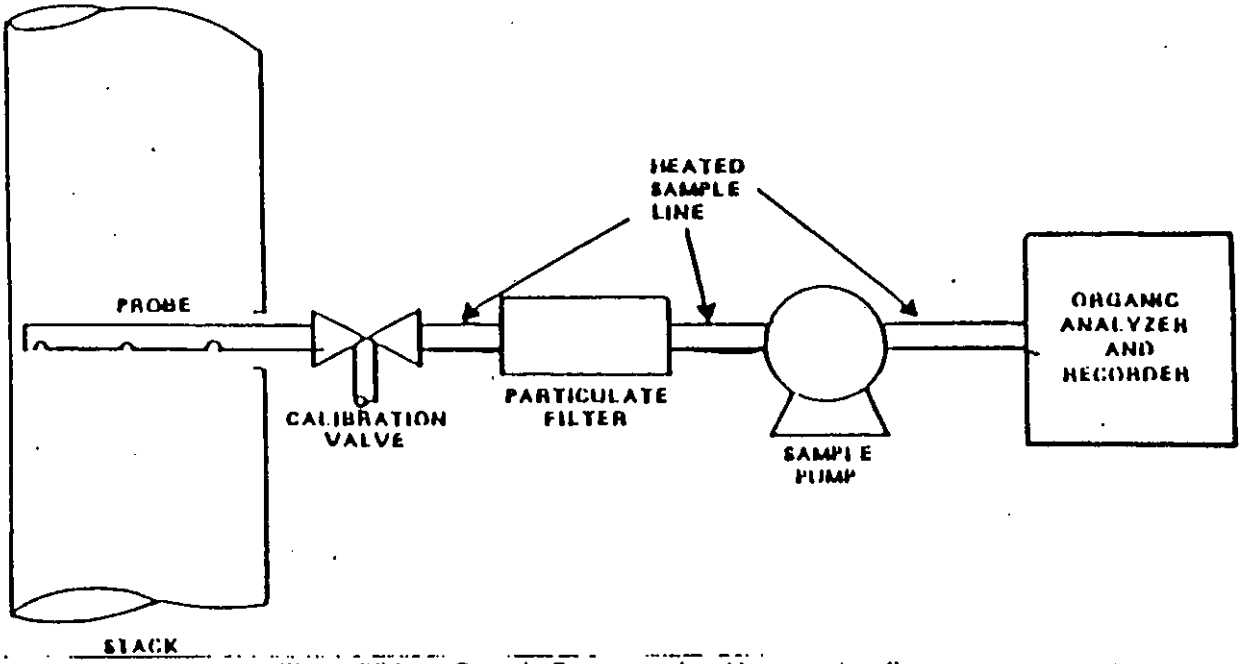


Figure 25A-1. Organic Concentration Measurement System.

3.1 Organic Concentration Analyzer. A flame ionization analyzer (FIA) capable of meeting or exceeding the specifications in this method.

3.2 Sample Probe. Stainless steel, or equivalent, three-hole rake type. Sample holes shall be 4 mm in diameter or smaller and located at 16.7, 50, and 83.3 percent of the equivalent stack diameter. Alternatively, a single opening probe may be used so that a gas sample is collected from the centrally located 10 percent area of the stack cross-section.

3.3 Sample Line. Stainless steel or Teflon* tubing to transport the sample gas to the analyzer. The sample line should be heated, if necessary, to prevent condensation in the line.

3.4 Calibration Valve Assembly. A three-way valve assembly to direct the zero and calibration gases to the analyzers is recommended. Other methods, such as quick-connect lines, to route calibration gas to the analyzers are applicable.

3.5 Particulate Filter. An in-stack or an out-of-stack glass fiber filter is recommended if exhaust gas particulate loading is significant. An out-of-stack filter should be heated to prevent any condensation.

3.6 Recorder. A strip-chart recorder, analog computer, or digital recorder for recording measurement data. The minimum data recording requirement is one measurement value per minute. Note: This method is often applied in highly explosive areas. Caution and care should be exercised in choice of equipment and installation.

4. *Calibration and Other Gases*

Gases used for calibrations, fuel, and combustion air (if required) are contained in compressed gas cylinders. Preparation of calibration gases shall be done according to the procedure in Protocol No. 1, listed in Reference 9.2. Additionally, the manufacturer of the cylinder should provide a recommended shelf life for each calibration gas cylinder over which the concentration does not change more than ±2 percent from the certified value. For calibration gas values not generally available (i.e., organics between 1 and 10 percent by volume), alternative methods for preparing calibration gas mixtures, such as dilution systems, may be used with prior approval of the Administrator.

Calibration gases usually consist of propane in air or nitrogen and are determined in terms of the span value. Organic compounds other than propane can be used following the above guidelines and making the appropriate corrections for response factor.

* Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

4.1 Fuel. A 40 percent H_2/60 percent He or 40 percent H_2/60 percent N_2 gas mixture is recommended to avoid an oxygen synergism effect that reportedly occurs when oxygen concentration varies significantly from a mean value.

4.2 Zero Gas. High purity air with less than 0.1 parts per million by volume (ppmv) of organic material (propane or carbon equivalent) or less than 0.1 percent of the span value, whichever is greater.

4.3 Low-level Calibration Gas. An organic calibration gas with a concentration equivalent to 25 to 35 percent of the applicable span value.

4.4 Mid-level Calibration Gas. An organic calibration gas with a concentration equivalent to 45 to 55 percent of the applicable span value.

4.5 High-level Calibration Gas. An organic calibration gas with a concentration equivalent to 80 to 90 percent of the applicable span value.

5. *Measurement System Performance Specifications*

5.1 Zero Drift. Less than ±3 percent of the span value.

5.2 Calibration Drift. Less than ±3 percent of span value.

5.3 Calibration Error. Less than ±5 percent of the calibration gas value.

6. *Pretest Preparations*

6.1 Selection of Sampling Site. The location of the sampling site is generally specified by the applicable regulation or purpose of the test; i.e., exhaust stack, inlet line, etc. The sample port shall be located at least 1.5 meters or 2 equivalent diameters upstream of the gas discharge to the atmosphere.

6.2 Location of Sample Probe. Install the sample probe so that the probe is centrally located in the stack, pipe, or duct and is sealed tightly at the stack port connection.

6.3 Measurement System Preparation. Prior to the emission test, assemble the measurement system following the manufacturer's written instructions in preparing the sample interface and the organic analyzer. Make the system operable.

FIA equipment can be calibrated for almost any range of total organics concentrations. For high concentrations of organics (>1.0 percent by volume as propane) modifications to most commonly available analyzers are necessary. One accepted method of equipment modification is to decrease the size of the sample to the analyzer through the use of a smaller diameter sample capillary. Direct and continuous measurement of organic concentration is a necessary consideration when determining any modification design.

6.4 Calibration Error Test. Immediately prior to the test series, (within 2 hours of the start of the test) introduce zero gas and

high-level calibration gas at the calibration valve assembly. Adjust the analyzer output to the appropriate levels, if necessary. Calculate the predicted response for the low-level and mid-level gases based on a linear response line between the zero and high-level responses. Then introduce low-level and mid-level calibration gases successively to the measurement system. Record the analyzer responses for low-level and mid-level calibration gases and determine the differences between the measurement system responses and the predicted responses. These differences must be less than 5 percent of the respective calibration gas value. If not, the measurement system is not acceptable and must be replaced or repaired prior to testing. No adjustments to the measurement system shall be conducted after the calibration and before the drift check (Section 7.3). If adjustments are necessary before the completion of the test series, perform the drift checks prior to the required adjustments and repeat the calibration following the adjustments. If multiple electronic ranges are to be used, each additional range must be checked with a mid-level calibration gas to verify the multiplication factor.

6.5 Response Time Test. Introduce zero gas into the measurement system at the calibration valve assembly. When the system output has stabilized, switch quickly to the high-level calibration gas. Record the time from the concentration change to the measurement system response equivalent to 95 percent of the step change. Repeat the test three times and average the results.

7. *Emission Measurement Test Procedure*

7.1 Organic Measurement. Begin sampling at the start of the test period, recording time and any required process information as appropriate. In particular, note on the recording chart periods of process interruption or cyclic operation.

7.2 Drift Determination. Immediately following the completion of the test period and hourly during the test period, reintroduce the zero and mid-level calibration gases, one at a time, to the measurement system at the calibration valve assembly. (Make no adjustments to the measurement system until after both the zero and calibration drift checks are made.) Record the analyzer response. If the drift values exceed the specified limits, invalidate the test results preceding the check and repeat the test following corrections to the measurement system. Alternatively, recalibrate the test measurement system as in Section 6.4 and report the results using both sets of calibration data (i.e., data determined prior to the test period and data determined following the test period).

8. *Organic Concentration Calculations*

Determine the average organic concentration in terms of ppmv as propane or other calibration gas. The average shall be determined by the integration of the output recording over the period specified in the applicable regulation.

If results are required in terms of ppmv as carbon, adjust measured concentrations using Equation 25A-1.

$$C_c = K\,C_{meas} \qquad \text{Eq. 25A-1}$$

Where:

C_c = Organic concentration as carbon, ppmv.

C_{meas} = Organic concentration as measured, ppmv.

K = Carbon equivalent correction factor,

K = 2 for ethane.

K = 3 for propane.

K = 4 for butane.

K = Appropriate response factor for other organic calibration gases.

9. *Bibliography*

9.1 Measurement of Volatile Organic Compounds—Guideline Series. U.S. Environmental Protection Agency. Research Triangle Park, NC. Publication No. EPA-450/2-78-041. June 1978. p. 46-54.

9.2 Traceability Protocol for Establishing True Concentrations of Gases Used for Calibration and Audits of Continuous Source Emission Monitors (Protocol No. 1). U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory. Research Triangle Park, NC. June 1978.

9.3 Gasoline Vapor Emission Laboratory Evaluation—Part 2. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, NC. EMB Report No. 75-GAS-6. August 1975.

Method 25B—Determination of Total Gaseous Organic Concentration Using a Nondispersive Infrared Analyzer

1. *Applicability and Principle*

1.1 Applicability. This method applies to the measurement of total gaseous organic concentration of vapors consisting primarily of alkanes. (Other organic materials may be measured using the general procedure in this method, the appropriate calibration gas, and an analyzer set to the appropriate absorption band.) The concentration is expressed in terms of propane (or other appropriate organic calibration gas) or in terms of carbon.

1.2 Principle. A gas sample is extracted from the source through a heated sample line, if necessary, and glass fiber filter to a nondispersive infrared analyzer (NDIR). Results are reported as volume concentration equivalents of the calibration gas or as carbon equivalents.

2. *Definitions*

FIELD AND ANALYTICAL PROCEDURES

A Byron Model 301 Flame Ionization Analyzer (FIA) was used to quantify non-methane organnics (NMO). The 301 employs a gas chromatographic (GC) column for separation of methane from the remainder of the organic compounds. A sample is continously passed through the FIA sample loop. Every three minutes the contents of the sample loop are injected into the GC Column. After a few seconds the methane portion is passed to the flame ionization detector (FID) for analysis. Following return of the FID response to baseload, the column is backflushed with carrier air. The NMO portion of the sample is then injected into the FID. The NMO response is compared to that of NDS traceable protocol, propane in air standards. Concentration is then reported in terms of ppm as carbon. All calibration standards are introduced at the sampling "interface" so that they see the same sampling system as the source gases. It was necessary to perform the testing on a 1000 ppm propane range due to the potential for VOC spiking that can occur with a bagasse fuel. Following each test run a mid-range standard is injected to the sampling system to document instrument drift. An upscale drift was documented after each test run.

This was caused by a power outage during the run. No corrections were made to the data since the drift was upward (conservative).

PROJECT PARTICIPANTS

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Bill Arlington	Project Director
Gerard P. Gauthreaux	Field Technician

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Murray Brinson	Mill Manager
Peter Barquin	Ass't. to Senior Vice President

Florida Department of Environmental Regulation

Ken Tucker	Observer

Palm Beach County Health Department

A. J. Saytal	Observer