AP-42 Section Number: 9.9.1

Reference Number: 24

Title: Cyclone Emissions and Efficiency Evaluation

Pollution Curbs, Inc.

March 1972

Contract #202082

Purchase Order #2116-4

March 10, 1972

CYCLONE EMISSIONS AND EFFICIENCY EVALUATION

Submitted To:

TIERNEY-GERBER ROTO VENT, INC.
416 35TH AVENUE NORTHEAST
MINNEAPOLIS, MINNESOTA 55418

Prepared By:

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502 NORTH PRIOR AVENUE
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Frank J Belgea

Frank J. Belgea,
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1. SUMMARY

The particulate emission rate from the dust collection system at the Edinburg Farmers Elevator complied with North Dakota Regulation R23-25-05. Air flow and pressure measurements indicated that some adjustments will be necessary in order to obtain the performance characteristics designed for.

The particulate emission rate from the dust collection system at the Thompson Farmers Co-op Elevator complied with Regulation R23-25-05.

1. SUMMARY

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The particulate emission rate from the dust collection system at the Thompson Farmers Co-op Elevator complied with Regulation R23-25-05.

2. INTRODUCTION

2.1 Purpose

Tierney-Gerber Roto Vent, Inc. had installed dust control systems, employing cyclone separators, at the Edinburg, North Dakota Farmers Elevator and at the Thompson, North Dakota Farmers Co-op Elevator. Pollution Curbs, Inc. (PCI) was retained by Tierney-Gerber to determine the particulate emission rates and the collector efficiencies of these systems.

2.2 Background

PCI engineers, together with Mr. Chuck Ramberg and Mr. Darrel Peterson representing Tierney-Gerber, made measurements and collected samples and other pertinent data at the Edinburg site on March 1 and at the Thompson site March 2, 1972.

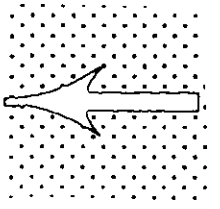
The Edinburg installation controlled dust generated by a Carter Model 2564 cleaner, a Crippen Model M.D. 5472 cleaner, and the truck dump. The Thompson installation controlled dust generated by the distributor head, three floor sweeps, three vacuum fittings, the boot cleaner, an automatic scale, the front pit, the back pit, and the legs.

No. 1 heavy dark northern spring wheat was being processed at Edinburg and at Thompson during sampling. All system dampers and blast gates were adjusted by Mr. Ramburg prior testing.

3. RESULTS

3.1 Edinburg Farmers Elevator Company

Item	Inlet	Exhaust
Grain cleaning rate (bu/hr)[1]	500	500
Process weight rate (lb/hr)[2]	30,000	30,000
Source gas volume (scfm)	3,330	3,330
Duct static pressure (In. WC)		
At Cyclone	+1.0	-16.0
At Fan	-16.0	+0.2
Fan Speed (rpm)	1,200	1,200
Dust Concentration (gr/scf)	0.098	0.051
Dust Emission Rate (lb/hr)	2.78	1.46
Collector Efficiency (%)		47.70



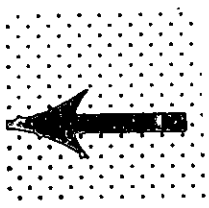
NOTES:
1. Carter cleaner handling 500 bushels per hour; Crippen cleaner not operating; truck dump isolated from system. Data supplied by Mr. Roy Lavang, elevator manager.

2. Computed as the product of the cleaning rate and the average bulk density of No. 1 heavy dark northern spring wheat (60 lb/bu).

.18 Clifton

3.2 Thompson Farmers Co-op Elevator Company

Item	Inlet	Exhaust
Grain handling rate (bu/hr)[1]	9,000	9,000
Process weight rate (lb/hr)[2]	540,000 270 ton	540,000
Source gas volume (scfm)	10,000	10,000
Duct static pressure (In. WC)		
At Fan	-3.9	+5.2
At Cyclone	+5.1	+0.1
Dust Concentration (gr/scf)	0.428	0.029
Dust Emission Rate (lb/hr)	36.68	2.48
Collector Efficiency (%)		93.22



NOTES: 1. Distributor head handling 4500 bushels per hour; front pit, back pit and legs handling 4500 bushels per hour; automatic scale not operating; floor sweeps, vacuum fittings and boot cleaner isolated from system. Data supplied by Mr. Larry Kvasager, elevator operator.

2. Computed as the product of the cleaning rate and the average bulk density of No. 1 heavy dark northern spring wheat (60 lb/bu).

lb/ton .14

4. CONCLUSIONS

4.1 Edinburg Installation

The results reported indicated that the dust control system exhausted only 3,330 cfm; 39% of its designed capacity of 8,550 cfm. This lower air flow had two major effects: 1) A lower, though not necessarily insufficient weight of particulate matter was captured by the dust control system; and, 2) Inadequate gas velocity in the cyclone contributing to low (47.7%) collection efficiency. An unusually high pressure drop across the cyclone (17.0 In. WC) was noted indicating a restriction or improperly set damper between the pressure taps.

Dust emissions were in compliance with North Dakota State Health Department Air Pollution Control Regulation R23-25-05, Table 3.

The degree reliability of the dust sampling data was indicated by the good agreement between the results of the individual runs[1] comprising the tests.

4.2 Thompson Installation

The maximum emission rate of particulate matter allowed by regulation R23-25-05, Table 3 for a process weight rate of 270 tons/hr is 61.8 lb/hr. The results reported indicated that the dust emissions from the system installed at the Thompson, North Dakota Farmers Co-op Elevator were in compliance with this regulation. The system appeared to be operating as designed although some visible dust was observed escaping from the dust bin into which the cyclone catch was being deposited.

Relatively close agreement between results of individual runs and the constant collector efficiency noted indicate that the test data was reliable.

NOTE 1: See Section 6.2 for individual test run data.

5. PROCEDURES

5.1 Particulate Emissions

Samples were extracted from the inlet and exhaust ducts serving the cyclone separators following the standards of the American Society of Mechanical Engineers Power Test Code PTC-27, dated 1957 and entitled "Determining Dust Concentration in a Gas Stream". A temporary exhaust stack was fabricated and installed on the cyclone at the Thompson, North Dakota elevator for purposes of the test.

Two sample runs were made at each test site and the results reported as the average value. Individual field data sheets were reproduced for presentation in the Appendix of this report.

Isokinetic conditions were maintained during each test run through use of a null balance probe of the Muhlrad design. The Muhlrad null-probe gives true isokinetic flow over all ranges of Reynolds numbers usually encountered. Samples were collected in Whatman filter paper thimbles which had been preweighed. The probe was carefully brushed out at the end of each run and the brushings added to the thimble catch.

5.2 Source Gas Volumes

Gas velocities were determined by multipoint pitot tube traverse. For this purpose, a standard pitot tube in conjunction with an inclined manometer was employed. Two traverses were made at each sampling site through ports located 90° apart

circumferentially. The results were averaged, corrected for density and combined with respective dust cross-sectional areas to yield standard volumetric gas flow rates.

Two separate determinations were made at the Edinburg elevator; one in the cyclone inlet duct and one in the cyclone discharge duct. The average of the two determinations was used to compute the particulate emission rates.

Gas density was determined psychrometrically. The wet bulb wick froze at 32° F while the dry bulb indicated 0°F. Under these conditions, the moisture content of the gas was considered negligible.

Field data sheets showing calculations were reproduced for presentation in the Appendix of this report.

6. APPENDIX

6.1 Abbreviations and Symbols

Avg	Average
°	Degrees
°F	Degrees Fahrenheit
bu/hr	Bushels per hour
lb/hr	Pounds per hour
cfm	Cubic feet per minute
scfm	Standard cubic feet per minute
gr/scf	Grains per standard cubic foot
VP	Velocity pressure
V_s	Stack gas velocity
In.WC	Inches of water column
%	Percent
rpm	Revolutions per minute
acfm	Actual cubic feet per minute
HTC	Humidity and temperature correction
PC	Pressure correction
DF	Density factor
DB	Dry bulb temperature
WB	Wet bulb temperature

APPENDIX 6.2

POLLUTION CURBS, INC.

PITOT TRAVERSE

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CUSTOMER TIERNEY-GERBER ROTO-VENT, INC. JOB NO. 202082

SYSTEM EDINBURG EL. GRAIN CLEANERS DATE 3/1/72

LOCATION CYCLONE INLET

TYPE OF PITOT STANDARD

Orientation		
Dist.	VP	Vs
1/2	0.08	1133
1 5/8	0.13	1444
2 7/8	0.19	1746
4 1/2	0.20	1791
6 7/8	0.20	1791
13 1/8	0.10	1266
15 1/2	0.10	1266
17 1/8	0.08	1133
18 3/8	0.08	1133
19 1/2	0.08	1133
Total		13,836

Orientation	
VP	Vs
0.10	1266
0.12	1387
0.14	1498
0.14	1498
0.12	1387
0.13	1444
0.14	1498
0.18	1699
0.20	1791
0.19	1746
Total	15,214

Avg. Vs = 1452

V = Avg. Vs x DF = 1452 x 0.95 = 1381

Duct Diam. or Dim. 21"

Duct Area A = 2.405

ACFM = V x A = 3322

SCFM = 3676

GAS ANALYSIS CORR: Fyrite ____ Orsat ____

	Meas	Act			
CO_2	____	____	x	44 =	____
O_2	____	____	x	32 =	____
CO	____	____	x	28 =	____
H_2O	____	____	x	18 =	____
N_2	____	____	x	28 =	____
				Total =	____

Composition Ratio (CR) = $\frac{\text{Total}}{28.9}$ = ____

Temp. Corr. (TC) = $\frac{530}{\text{Duct temp} + 460}$ = ____

HTC = CR x TC = ____

HUMIDITY & TEMP. CORR:

At test station:

DB 0 WB - H - lb/lb

Duct temp 0 Hum Vol. 11.5

HTC = $\frac{1 + H}{\text{Hum Vol} \times .075}$

= $\frac{1 + -}{11.5 \times .075}$ = 1.13

PRESSURE CORR: PC

Barometric Press. ABS (BPA) 29.2 "Hg

BPA x 13.6 = 397.1

Duct SP ± + 1.0

Duct SP ABS 398.1

PC = $\frac{\text{Duct SP ABS}}{407}$ = 0.98

DENSITY

Density = HTC x PC x 0.075 =

1.13 x 0.98 x 0.075

= 0.083 lb/cu ft

Density Correction Factor (DF)

DF = $\sqrt{.075/D}$

= 0.095

BY FJB

POLLUTION CURBS, INC.

PITOT TRAVERSE

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CUSTOMER TIERNEY-GERBER ROTO-VENT, INC. JOB NO. 202082

SYSTEM EDINBURG GRAIN CLEANERS DATE 3/1/72

LOCATION CYCLONE DISCHARGE

TYPE OF PITOT STANDARD

Orientation		
Dist.	VP	Vs
1/2	0.12	1387
1 5/8	0.14	1498
2 3/8	0.13	1444
4 1/2	0.12	1387
6 7/8	0.14	1498
13 1/8	0.08	1133
15 1/2	0.08	1133
17 1/8	0.07	1066
18 3/8	0.07	1066
19 1/2	0.05	896
Total		12,508

Orientation	
VP	Vs
0.13	1444
0.14	1498
0.15	1551
0.15	1551
0.13	1444
0.13	1444
0.11	1328
0.10	1266
0.08	1133
0.05	896
Total	13,555

Avg. Vs = 1303

V = Avg. Vs x DF = 1303 x 0.95 = 1238

Duct Diam. or Dim. 20"

Duct Area A = 2.182

ACFM = V x A = 2701

SCFM = 2989

GAS ANALYSIS CORR: Fyrite ____ Orsat ____

	Meas	Act			
CO_2	____	____	x 44 =	____	
O_2	____	____	x 32 =	____	
CO	____	____	x 28 =	____	
H_2O	____	____	x 18 =	____	
N_2	____	____	x 28 =	____	
			Total =	____	

Composition Ratio (CR) = $\frac{\text{Total}}{28.9}$ = ____

Temp. Corr. (TC) = $\frac{530}{\text{Duct temp} + 460}$ = ____

HTC = CR x TC = ____

HUMIDITY & TEMP. CORR:

At test station:

DB 0 WB - H - lb/lb

Duct temp 0 Hum Vol. 11.5

HTC = $\frac{1 + H}{\text{Hum Vol} \times .075}$

= $\frac{1 + -}{11.5 \times .075}$ = 1.13

PRESSURE CORR: PC

Barometric Press. ABS (BPA) 29.2 "Hg

BPA x 13.6 = 397.1

Duct SP ± + 0.2

Duct SP ABS 397.3

PC = $\frac{\text{Duct SP ABS}}{407}$ = 0.98

DENSITY

Density = HTC x PC x 0.075 =

1.13 x 0.98 x 0.075

= 0.083 lb/cu ft

Density Correction Factor (DF)

DF = $\sqrt{.075/D}$

= 0.95

BY EJB

POLLUTION CURBS, INC.

Contract #202082

FIELD SAMPLE DATA - NULL PROBE

CUSTOMER TIERNEY-GERBER ROTO-VENT, INC. JOB NO. 202082

SYSTEM EDINBURG CLEANER SYSTEM DATE 2/29/72

LOCATION CYCLONE INLET

SAMPLE NO. 1 SAMPLE TRAIN NO. 76

TRAVERSE POSITION 20 pt

NOZZLE SIZE 8 mm METER NO. S 1748146

Clock

Gas meter reading end 42.2 at time 1527 Outage: 7 min.

start Zero at time 1420 Moisture: None

RDG 42.2 at time 67 min.

Meter corr. factor (MCF) = 1.04

Actual cubic feet (ACF) = MCF x RDG = 43.9

Barometric pressure abs. = Meter pressure abs. MPABS = 29.2

Meter temperature Start 16 End 30 Avg 23

Meter temperature abs MTABS 460

+ 23 (Avg. meter temperature)

MTABS = 483

Standard cubic feet (SCF) = corrected meter reading

$$SCF = ACF \times \frac{MPABS}{29.92} \times \frac{520}{MTABS}$$

$$= 43.9 \times \frac{29.2}{29.92} \times \frac{520}{483} = 46.1 \text{ cubic feet}$$

Total Wt. 6.7055 grams

- 6.4184 tare

Sample Wt. = 0.2871 net

$$\frac{\text{Sample Wt.} \times 15.43}{SCF} = \frac{0.2871 \times 15.43}{46.1} =$$

0.0961 Loading: grains per std cu ft

1.9 x Loading: gr/scf = _____ Loading: lb/1000 lb gas

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POLLUTION CURBS, INC.

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FIELD SAMPLE DATA - NULL PROBE

CUSTOMER TIERNEY-GERBER ROTO-VENT, INC. JOB NO. 202082

SYSTEM EDINBURG CLEANER SYSTEM DATE 3/1/72

LOCATION CYCLONE INLET

SAMPLE NO. 2 SAMPLE TRAIN NO. 179

TRAVERSE POSITION 20 pt

NOZZLE SIZE 8 mm METER NO. S 1748146

Clock

Gas meter reading end 40.8 at time 1644 Outage: 4 min.

start Zero at time 1540 Moisture: None

RDG 40.8 at time 64 min.

Meter corr. factor (MCF) = 1.04

Actual cubic feet (ACF) = MCF x RDG = 42.4

Barometric pressure abs. = Meter pressure abs. MPABS = 29.2

Meter temperature Start 20 End 20 Avg 20

Meter temperature abs MTABS 460

\+ 20 (Avg. meter temperature)

MTABS = 480

Standard cubic feet (SCF) = corrected meter reading

$$SCF = ACF \times \frac{MPABS}{29.92} \times \frac{520}{MTABS}$$

$$= 42.4 \times \frac{29.2}{29.92} \times \frac{520}{480} = 44.8 \text{ cubic feet}$$

Total Wt. 7.0712 grams

\- 6.7846 tare

Sample Wt. = 0.2866 net

$$\frac{\text{Sample Wt.} \times 15.43}{SCF} = \frac{0.2866 \times 15.43}{44.8} = 0.0987$$

Loading: grains per std cu ft

1.9 x Loading: gr/scf = _____ Loading: lb/1000 lb gas

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FIELD SAMPLE DATA - NULL PROBE

CUSTOMER TIERNEY-GERBER ROTO-VENT, INC. JOB NO. 202082

SYSTEM EDINBURG CLEANER SYSTEM DATE 3/1/72

LOCATION CYCLONE EXHAUST

SAMPLE NO. 1 SAMPLE TRAIN NO. 182

TRAVERSE POSITION 20 pt

NOZZLE SIZE 8 mm METER NO. S 1729440

Clock

Gas meter reading end 41.1 at time 1528 Outage: 6 min.

start Zero at time 1422 Moisture: None

RDG 41.1 at time 66 min.

Meter corr. factor (MCF) = 1.05

Actual cubic feet (ACF) = MCF x RDG = 43.2

Barometric pressure abs. = Meter pressure abs. MPABS = 29.2

Meter temperature Start 30 End 46 Avg 38

Meter temperature abs MTABS 460

+ 38 (Avg. meter temperature)

MTABS = 498

Standard cubic feet (SCF) = corrected meter reading

$$SCF = ACF \times \frac{MPABS}{29.92} \times \frac{520}{MTABS}$$

$$= 43.2 \times \frac{29.2}{29.92} \times \frac{520}{498} = 44.0 \text{ cubic feet}$$

Total Wt. 6.2275 grams

- 6.0919 tare

Sample Wt. = 0.1356 net

$$\frac{\text{Sample Wt.} \times 15.43}{SCF} = \frac{0.1356 \times 15.43}{44.0} =$$

0.0476 Loading: grains per std cu ft

1.9 x Loading: gr/scf = _____ Loading: lb/1000 lb gas

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FIELD SAMPLE DATA - NULL PROBE

CUSTOMER TIERNEY-GERBER ROTO-VENT, INC. JOB NO. 202082

SYSTEM EDINBURG CLEANERS DATE 3/1/72

LOCATION CYCLONE DISCHARGE

SAMPLE NO. 2 SAMPLE TRAIN NO. 181

TRAVERSE POSITION 20 pt

NOZZLE SIZE 8 mm METER NO. S 1729440

			Clock	
Gas meter reading end	44.3	at time	1640	Outage: 2 min.
start	Zero	at time	1542	Moisture: None
RDG	44.3	at time	62 min.	

Meter corr. factor (MCF) = 1.05

Actual cubic feet (ACF) = MCF x RDG = 46.5

Barometric pressure abs. = Meter pressure abs. MPABS = 29.2

Meter temperature Start 32 End 56 Avg 44

Meter temperature abs MTABS 460

\+ 44 (Avg. meter temperature)

MTABS = 504

Standard cubic feet (SCF) = corrected meter reading

$$SCF = ACF \times \frac{MPABS}{29.92} \times \frac{520}{MTABS}$$

$$= 46.5 \times \frac{29.2}{29.92} \times \frac{520}{504} = 46.8 \text{ cubic feet}$$

Total Wt. 6.7797 grams

\- 6.6151 tare

Sample Wt. = 0.1646 net

$$\frac{\text{Sample Wt.} \times 15.43}{\text{SCF}} = \frac{0.1646 \times 15.43}{46.8} =$$

0.0543 Loading: grains per std cu ft

1.9 x Loading: gr/scf = _____ Loading: lb/1000 lb gas

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POLLUTION CURBS, INC.
EMISSION AND EFFICIENCY CALC - PARTICULATE MATTER

Date 3/6/72
By FJB

Customer TIERNEY-GERBER ROTO-VENT, INC. Job No. 202032

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
	Thimble No.	Inlet or Outlet	Paired with No.	Sample Volume SCF	Sample Weight grams	Conc. gr/SCF $\frac{V \times 15.3}{IV}$	System Volume ACFM	Gas Dens. lb/cu. ft.	System Volume SCFM $\frac{VII \times VIII}{0.075}$	Contaminant Weight lbs/hr $\frac{VI \times IX}{116.7}$	% Penetration $\frac{X \text{ outlet}}{X \text{ inlet}} \times 100$	%Eff. 100-XI
						EDINBURG FARMERS ELEVATOR COMPANY						
#1	076	In	182	46.1	0.2871	0.096	3010*	0.083	3330	2.74		
#2	179	In	181	44.8	0.2866	0.099	3010*	0.083	3330	2.82		
Avg.		In				0.098	3010*	0.083	3330	2.78		
#1	182	Out	076	44.0	0.1356	0.048	3010*	0.083	3330	1.37	50.00	50.00
#2	181	Out	179	46.8	0.1646	0.054	3010*	0.083	3330	1.54	54.61	45.39
Avg.		Out				0.051	3010*	0.083	3330	1.46	52.34	47.70

*Average of two measurements.

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POLLUTION CURBS, INC.

PITOT TRAVERSE

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CUSTOMER TIERNEY-GERBER ROTO-VENT, INC. JOB NO. 202082

SYSTEM THOMPSON CO-OP, HOUSE DUST CONTROL DATE 3/2/72

LOCATION CYCLONE INLET

TYPE OF PITOT STANDARD

Orientation		
Dist.	VP	Vs
5/8	0.79	3560
1 3/4	0.79	3560
3 1/4	0.80	3582
5	0.80	3582
7 1/2	0.90	3800
14 1/2	0.91	3821
17	0.91	3821
18 3/4	0.90	3800
20 1/4	0.89	3779
21 3/8	0.89	3779
Total		37,084

Orientation	
VP	Vs
0.92	3842
0.93	3863
0.90	3800
0.84	3669
0.82	3625
0.78	3537
0.68	3303
0.70	3351
0.70	3351
0.44	2656
Total	34,997

Avg. Vs = 3604

V = Avg. Vs x DF = 3604 x 0.94 = 3388

Duct Diam. or Dim. 22"

Duct Area A = 2.640

ACFM = V x A = 8944

SCFM = 10,017

GAS ANALYSIS CORR: Fyrite ____ Orsat ____

	Meas	Act			
CO_2	____	____	x 44 =	____	
O_2	____	____	x 32 =	____	
CO	____	____	x 28 =	____	
H_2O	____	____	x 18 =	____	
N_2	____	____	x 28 =	____	
			Total =	____	

Composition Ratio (CR) = $\frac{\text{Total}}{28.9}$ = ____

Temp. Corr. (TC) = $\frac{530}{\text{Duct temp} + 460}$ = ____

HTC = CR x TC = ____

HUMIDITY & TEMP. CORR:

At test station:

DB 0 WB - H - lb/lb

Duct temp 0 Hum Vol. 11.8

HTC = $\frac{1 + H}{\text{Hum Vol} \times .075}$

= $\frac{1 + -}{11.8 \times .075}$ = 1.13

PRESSURE CORR: PC

Barometric Press. ABS (BPA) 29.3 "Hg

BPA x 13.6 = 398.5

Duct SP ± + 5.1

Duct SP ABS 403.6

PC = $\frac{\text{Duct SP ABS}}{407}$ = 0.99.

DENSITY

Density = HTC x PC x 0.075 =

1.13 x 0.99 x 0.075

= 0.084 lb/cu ft

Density Correction Factor (DF)

DF = $\sqrt{.075/D}$

= 0.94

BY FJB

POLLUTION CURBS, INC. Contract #202082

FIELD SAMPLE DATA - NULL PROBE

CUSTOMER TIERNEY-GERBER ROTO-VENT, INC. JOB NO. 202082

SYSTEM THOMPSON CO-OP, HOUSE DUST CONTROL DATE 3/2/72

LOCATION CYCLONE INLET

SAMPLE NO. 1 SAMPLE TRAIN NO. 186

TRAVERSE POSITION 20 pt

NOZZLE SIZE 8 mm METER NO. S 1729440

Clock

Gas meter reading end 89.8 at time 1548 Outage: 10 min.

start Zero at time 1438 Moisture: None

RDG 89.8 at time 70 min.

Meter corr. factor (MCF) = 1.05

Actual cubic feet (ACF) = MCF x RDG = 94.3

Barometric pressure abs. = Meter pressure abs. MPABS = 29.3

Meter temperature Start 32 End 20 Avg 26

Meter temperature abs MTABS 460

+ 26 (Avg. meter temperature)

MTABS = 486

Standard cubic feet (SCF) = corrected meter reading

$$SCF = ACF \times \frac{MPABS}{29.92} \times \frac{520}{MTABS}$$

$$= \frac{94.3}{} \times \frac{29.3}{29.92} \times \frac{520}{486} = 98.8 \text{ cubic feet}$$

Total Wt. 8.3759 grams

- 5.8329 tare

Sample Wt. = 2.5430 net

$$\frac{\text{Sample Wt.} \times 15.43}{\text{SCF}} = \frac{2.543 \times 15.43}{98.8} =$$

0.3972 Loading: grains per std cu ft

1.9 x Loading: gr/scf = _____ Loading: lb/1000 lb gas

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POLLUTION CURBS, INC.

Contract #202082

FIELD SAMPLE DATA - NULL PROBE

CUSTOMER TIERNEY-GERBER ROTO-VENT, INC. JOB NO. 202082

SYSTEM THOMPSON CO-OP, HOUSE DUST CONTROL DATE 3/2/72

LOCATION CYCLONE INLET

SAMPLE NO. 2 SAMPLE TRAIN NO. 195

TRAVERSE POSITION 20 pt

NOZZLE SIZE 8 mm METER NO. S 1729440

Clock

Gas meter reading end 152.3 at time 1800 Outage: 15 min.

start 49.8 at time 1645 Moisture: None

RDG 102.5 at time 75 min.

Meter corr. factor (MCF) = 1.05

Actual cubic feet (ACF) = MCF x RDG = 107.6

Barometric pressure abs. = Meter pressure abs. MPABS = 29.3

Meter temperature Start 26 End 60 Avg 43

Meter temperature abs MTABS 460

+ 43 (Avg. meter temperature)

MTABS = 503

Standard cubic feet (SCF) = corrected meter reading

$$SCF = ACF \times \frac{MPABS}{29.92} \times \frac{520}{MTABS}$$

$$= 107.6 \times \frac{29.3}{29.92} \times \frac{520}{503} = 108.9 \text{ cubic feet}$$

Total Wt. 9.2838 grams

- 6.0478 tare

Sample Wt. = 3.2360 net

$$\frac{\text{Sample Wt.} \times 15.43}{SCF} = \frac{3.2360 \times 15.43}{108.9} =$$

0.4585 Loading: grains per std cu ft

1.9 x Loading: gr/scf = _____ Loading: lb/1000 lb gas

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POLLUTION CURBS, INC. Contract #202082

FIELD SAMPLE DATA - NULL PROBE

CUSTOMER TIERNEY-GERBER ROTO-VENT, INC. JOB NO. 202082

SYSTEM THOMPSON CO-OP HOUSE DUST CONTROL DATE 3/2/72

LOCATION CYCLONE DISCHARGE

SAMPLE NO. 1 SAMPLE TRAIN NO. 188

TRAVERSE POSITION 10 pt

NOZZLE SIZE 8 mm METER NO. S1748146

Clock

Gas meter reading end 84.5 at time 1537 Outage: None

start Zero at time 1437 Moisture: None

RDG 84.5 at time 60 min.

Meter corr. factor (MCF) = 1.04

Actual cubic feet (ACF) = MCF x RDG = 87.9

Barometric pressure abs. = Meter pressure abs. MPABS = 29.3

Meter temperature Start 30 End 30 Avg 30

Meter temperature abs MTABS 460

\+ 30 (Avg. meter temperature)

MTABS = 490

Standard cubic feet (SCF) = corrected meter reading

$$SCF = ACF \times \frac{MPABS}{29.92} \times \frac{520}{MTABS}$$

$$= \frac{87.9}{} \times \frac{29.3}{29.92} \times \frac{520}{490} = 91.3 \text{ cubic feet}$$

Total Wt. 5.4715 grams

\- 5.2909 tare

Sample Wt. = 0.1806 net

$$\frac{\text{Sample Wt.} \times 15.43}{SCF} = \frac{0.1806 \times 15.43}{91.3} =$$

0.0305 Loading: grains per std cu ft

1.9 x Loading: gr/scf = _____ Loading: lb/1000 lb gas

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FIELD SAMPLE DATA - NULL PROBE

CUSTOMER TIERNEY-GERBER ROTO-VENT, INC. JOB NO. 202082

SYSTEM THOMPSON CO-OP, HOUSE DUST CONTROL DATE 3/2/72

LOCATION CYCLONE DISCHARGE

SAMPLE NO. 2 SAMPLE TRAIN NO. 180

TRAVERSE POSITION 10 pt

NOZZLE SIZE 8 mm METER NO. S 1748146

			Clock	
Gas meter reading end	185.5	at time	1754	Outage: None
start	88.5	at time	1654	Moisture: None
RDG	97.0	at time	60 min.	

Meter corr. factor (MCF) = 1.04

Actual cubic feet (ACF) = MCF x RDG = 101.6

Barometric pressure abs. = Meter pressure abs. MPABS = 29.3

Meter temperature Start 20 End 20 Avg 20

Meter temperature abs MTABS 460

\+ 20 (Avg. meter temperature)

MTABS = 480

Standard cubic feet (SCF) = corrected meter reading

$$SCF = ACF \times \frac{MPABS}{29.92} \times \frac{520}{MTABS}$$

$$= \frac{101.6}{} \times \frac{29.3}{29.92} \times \frac{520}{480} = 107.8 \text{ cubic feet}$$

Total Wt. 5.7083 grams

\- 5.5204 tare

Sample Wt. = 0.1879 net

$$\frac{\text{Sample Wt.} \times 15.43}{\text{SCF}} = \frac{0.1879 \times 15.43}{107.8} =$$

0.0269 Loading: grains per std cu ft

1.9 x Loading: gr/scf = _____ Loading: lb/1000 lb gas

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POLLUTION CURBS, INC.
EMISSION AND EFFICIENCY CALC - PARTICULATE MATTER

Date 3/6/72
By FJB

Customer TIERNEY-GERBER ROTO-VENT, INC. Job No. 202082

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
	Thimble No.	Inlet or Outlet	Paired with No.	Sample Volume SCF	Sample Weight grams	Conc. gr/SCF $\frac{V \times 15.3}{IV}$	System Volume ACFM	Gas Dens. lb/cu. ft.	System Volume SCFM $\frac{VII \times VIII}{0.075}$	Contaminant Weight lbs/hr $\frac{VI \times IX}{116.7}$	% Penetration $\frac{X \text{ outlet}}{X \text{ inlet}} \times 100$	%Eff. 100-XI
						THOMPSON FARMERS CO-OP ELEVATOR COMPANY						
#1	186	In	188	108.9	3.2360	0.459	8940	0.084	10,000	39.33		
#2	195	In	180	98.8	2.5430	0.397	8940	0.084	10,000	34.02		
Avg.		In					8940	0.084	10,000	36.68		
#1	188	Out	186	91.3	0.1806	0.031	8940	0.084	10,000	2.66	6.76	93.24
#2	180	Out	195	107.8	0.1879	0.027	8940	0.084	10,000	2.31	6.79	93.21
Avg.		Out					8940	0.084	10,000	2.48	6.78	93.22

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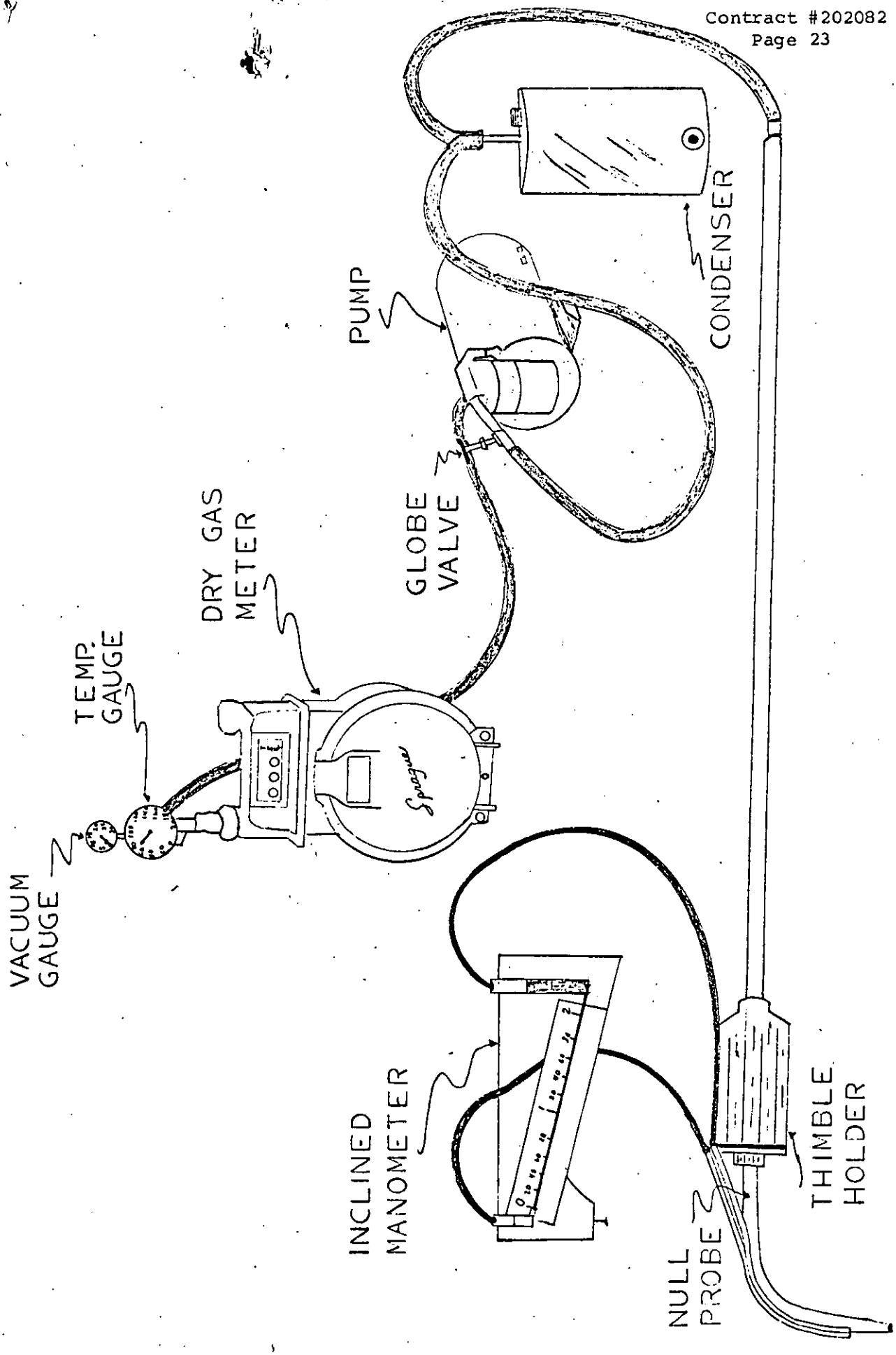
APPENDIX 6.3



THIMBLE TRAIN ASSEMBLY