Background Report Reference

AP-42 Section Number: 9.9.1

Background Report Section: 4

Reference Number: 34

Title: Dust Collector Emission and Efficiency Evaluation at the Marquette Elevator

Pollution Curbs Inc.

January 1974

AP-42 Section Reference 9.9.1
Report Sect. Reference 4 34

Contract #401236

Purchase Order Number 362-4

January 29, 1974

DUST COLLECTOR EMISSIONS AND EFFICIENCY EVALUATION AT THE MARQUETTE ELEVATOR

Prepared For:

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1. INTRODUCTION

A mechanical dust collector, with optional filtration capabilities, had been developed by Gerber Industries, Inc. Minneapolis, Minnesota, with specific intended application to the grain industry. A prototype unit was installed at the Louis Dreyfus Company, Marquette Elevator, 2300 Marshall Avenue SE, Minneapolis, for purposes of performance testing. The grain handling systems served by the test dust control system and collector were as tabulated below:

SYSTEM	CAPACITY	NUMBER OF DUST PICK-UPS
Rail ,Receiving belt		3
Receiving leg	12,000 bu/hr	1
Dribble hood		1
Shipping leg	12,000 bu/hr	1
Cleaner leg	8,000 bu/hr	1
Cleaner leg	7,000 bu/hr	1

PCI was retained by Gerber Industries to evaluate the emissions from the prototype collector and determine its operating efficiency without filter media. On January 15 and 16, 1974, PCI test engineers made measurements and collected samples and other pertinent data relative to the above alluded to evaluation and determinations. During the tests of January 15, all of the systems tabulated were handling grain except one cleaner leg (cap'y 7000 bu/hr). During the tests of January 16, only the receiving belt, receiving leg and dribble hood were handling grain.

2. PROCEDURES

2.1 Volumetric Flow Rates

Exhaust gas velocities were determined at inlet and outlet of the collector, by multipoint pitot tube traverse. The resultant velocity data was corrected for density and combined with appropriate duct cross-sectional areas to yield volumetric flow rate. A standard pitot tube in conjunction with an incline gage manometer was employed for this purpose.

2.2 Dust Samples

Two (2) sample runs each were made at the inlet to and the outlet from the collector on January 15, 1974, and again on January 16, 1974. The samples were obtained isokinetically utilizing three-eigths inch standard sampling nozzles. The samples were collected in tared Whatman paper thimbles. All procedures were according to ASME Power Test Code PTC-27, dated 1957, and entitled, "DETERMINING DUST CONCENTRATION IN A GAS STREAM".

Respective collector inlet and outlet sample runs were made somewhat simultaneously. These runs commenced at the same time, however, the inlet sample runs terminated earlier than outlet runs due to higher dust loading.

The results reported in Section 3 were the average of two runs in each case. Individual field sample data sheets were reproduced for presentation in the Appendix.

2.3 Particle Size Distribution

A particle size distribution analysis was performed on a composite of the two samples collected for each dust concentration test. Standard sieve techniques were employed utilizing a 125 μ and a 63 μ sieve. The fraction passing the 63 μ sieve, in each case, was further analyzed employing a Model B Coulter Counter.

Particle size distribution curves were reproduced for inclusion in the Appendix.

3. RESULTS

3.1 Test of January 15 - All systems operating except one cleaner leg.

Parameter		Collector Inlet	Collector Outlet
Gas flow rate (scfm)		9050	8900
Gas temperature (°F)		38	38
Dust Concentration (gr/scf)		9.700	0.140
Allowable dust Conc. (gr/scf)			0.092
Dust Emission Rate (lb/hr)		752	10.8
Particle Size Distribution (% > stated size)			
	5 μ	99.9	95.0
	10 μ	99.9	67.0
	20 μ	97.5	17.2
	40 μ	92.2	6.0
	60 μ	86.8	1.2
	80 μ	80.0	0.2
	100 μ	74.0	< 0.1
	125 μ	65.0	< 0.1
Collector Efficiency (%)			98.6

$\frac{752\ lb/hr}{960\ T/hr} = .77\ lb/ton$

3.2 Test of January 16 - Receiving leg, belt and dribble hood operating.

Parameter	Collector Inlet	Collector Outlet
Gas Flow Rate (scfm)	7900	7500
Gas Temperature (°F)	38	38
Dust Concentration (gr/scf)	3.760	0.100
Allowable Dust Conc. (gr/scf)		0.098
Dust Emission Rate (lb/hr)	255	6.43
Particle Size Distribution (% > stated size)		
5 μ	99.9	96.0
10 μ	99.0	78.2
20 μ	97.0	20.5
40 μ	92.5	2.8
60 μ	85.8	0.5
80 μ	78.9	< 0.1
100 μ	72.0	< 0.1
125 μ	63.1	< 0.1
Collector Efficiency (%)		97.5

$$\frac{255\ \#/hr}{360\ T/hr} =$$

4. CONCLUSION

Emissions of particulate matter are restricted in the State of Minnesota by MPCA Regulation APC-5. Table 2 of APC-5 limits particulate emissions as follows:

Source Gas Volume (scfm)	Maximum Allowable Concentration (gr/scf)
7500	0.098
8900	0.092

Under the operating conditions of both January 15, and January 16, the dust concentration exhausting from the collector exceeded the allowable. The emissions of Janaury 16, however, exceeded the limitations by two percent. This small difference was considered to be within normally accepted field test tolerances and may be discounted by MPCA.

PCI is of the opinion that the prototype unit acting as a mechanical collector only, may be adequate to control particulate air pollution from many typical grain handling operations. The addition of filter media to the air cleaning mechanism of the prototype collector should enhance its capabilities, perhaps to an operating efficiency of 99+ percent.

The reliability of the results reported herein is supported by the close agreement between pairs of sample runs and by the smoothness of the characteristic particle size distribution curves.

APPENDIX

STANDARD ABBREVIATIONS AND SYMOBLS USED IN REPORTS

°A	Degrees absolute
ABS	Absolute
Avg.	Average
acf,	Actual cubic feet per minute
BPA	Barometric pressure, absolute, inches of mercury
cfh	Cubic feet per hour
cfm	Cubic feet per minute
CO	Carbon monoxide
CO_2	Carbon dioxide
CPS	Cycles per second
DB	Dry bulb temperature
dB	Decibel
dBA	Decibel as measured on the "A" scale of a sound level meter
DF	Density factor
ft	Feet
gpd	Gallons per day
gpm	Gallons per minute
g	Grams
gr	Grains
h.p.	Horse power
H	Pounds of water per pound of dry air
h	Head, inches of water
H_2O	Water or moisture
HTC	Humidity temperature correction
"Hg	Inches of mercury
Hz	Hertz
KHz	Kilo Hertz
l	Liter
lb	Pound
lpm	Liters per minute
mg	Milligram
mg/l	Milligrams per liter
mg/m^3	Milligrams per cubic meter
ml	Milliliter
M^2	Square meter
M^3	Cubic meter
µ	Micron - Micro
µg	Micro gram
o.u.	Odor unit
o.u./min.	Odor unit per minute
N	Nitrogen
O_2	Oxygen
PC	Pressure correction
scf	Standard cubic feet; a cubic foot of air or gas having a weight of 0.075 lb
scfh	Standard cubic feet per hour
scfm	Standard cubic feet per minute
sdcfm	Standard dry cubic feet per minute
SP	Static pressure, inches of water
TWA	Time weighted average

MCF	Meter correction factor
MPABS	Meter pressure absolute
MTABS	Meter temperature absolute
MBtu	Million British thermal units
min	Minute
rpm	Revolutions per minute
VP	Vapor pressure, inches of mercury
Vol.%	Volume percent
WB	Wet bulb temperature
WBGT	Wet bulb globe temperature
Wt.%	Weight percent

POLLUTION CURBS, INC.

PITOT TRAVERSE

CUSTOMER GERBER INDUSTRIES JOB NO. 401236

SYSTEM MARQUETTE ELEVATOR DATE 1-15-74

LOCATION COLLECTOR INLET

TYPE OF PITOT STANDARDX

Orientation		
Dist.	VP	Vs
1	.38	2469
2	.40	2533
3	.35	2369
4	.35	2369
5	.30	2193
1	.60	3102
2	.56	2997
3	.55	2970
4	.55	2970
5	.56	2997
1	1.0	4005
2	1.0	4005
3	.95	3904
4	1.0	4005
5	1.03	4064
1	1.20	4386
2	1.15	4295
3	1.15	4295
4	1.15	4295
5	1.03	4064
	Total	68277

Orientation	
VP	Vs
.40	2533
.40	2533
.35	2369
.35	2369
.30	2193
.57	3024
.57	3024
.55	2970
.54	2943
.56	2997
1.03	4064
.97	3945
.95	3904
1.0	4005
1.03	4064
1.25	4478
1.20	4386
1.15	4295
1.10	4200
1.03	4064
Total	68380

Avg. Vs = 3380

V = Avg. Vs x DF = 3380 x .99 = 3346

Duct Diam. or Dim. 32" X 12"

Duct Area A = 2.67 ft²

ACFM = V x A = 8934

SCFM = 9051

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) = $\frac{520}{\text{Duct temp} + 460}$ = 1.07

HTC = CR x TC = ____

HUMIDITY & TEMP. CORR:

At test station:

DB 28 WB ____ H ____ lb/lb

Duct temp 28°F Hum Vol. 12.3

HTC = $\frac{1 + H}{\text{Hum Vol} \times 0.076}$

= $\frac{1 +}{12.3 \times 0.076}$ = 1.07

PRESSURE CORR: PC

Barometric Press. ABS (BPA) 28.58"Hg

BPA x 13.6 = 389.7

Duct SP ± -3.6

Duct SP ABS 385.1

PC = $\frac{\text{Duct SP ABS}}{407}$ = .95

DENSITY

Density = HTC x PC x 0.076 =

$\frac{1.07 \times .95 \times 0.076}{.077}$ = lb/cu ft

Density Correction Factor (DF)

DF = $\sqrt{0.076/D}$

= 0.99

BY FJB

POLLUTION CURBS, INC.

FIELD SAMPLE DATA

CLIENT GERBER INDUSTRIES JOB NO. 401236

SYSTEM MARQUETTE ELEVATOR DATE 1-15-74

LOCATION COLLECTOR INLET

SAMPLE NO. ONE (1) SAMPLE TRAIN NO. ONE (1)

TRAVERSE POSITION 20 points CONTAMINANT PARTICULATE MATTER

NOZZLE SIZE 3/8" METER NO. S-146

		Clock	
Gas meter reading end	63.9	at time 30 MIN	Outage Time - min
start	0	at time 30 MIN	Condensate - ml
RDG	63.9	at time 30 MIN	Condenser Temp. - °F

Meter corr. factor (MCF) = 1.07

Actual cubic feet (ACF) = MCF x RDG = 68.4

Barometric pressure abs. = Meter pressure abs. MPABS = 28.6 in. Hg

Meter temperature Start 42 End 98 Avg 70 °F

Meter temperature abs MTABS 460

+ 70 (Avg. meter temperature)

MTABS = 530 °A

Vapor pressure of water (VP)

VP at __°F = ___ in. Hg

Standard dry cubic feet (SDCF) = corrected meter reading

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

$$= 68.4 \times \frac{28.58}{29.92} \times \frac{520}{530} = 64.10 \text{ dry cubic feet}$$

Total Wt. 46.6946 grams

- 06.0926 tare

Sample Wt. = 40.6020 net

$$\frac{\text{Sample Wt.} \times 15.43}{SCF} = \frac{40.6020 \times 15.43}{64.10} =$$

9.774 Loading: grains per std. dry cu ft

Form #3702 Rev. 1-74

POLLUTION CURBS, INC.

FIELD SAMPLE DATA

CLIENT GERBER INDUSTRIES JOB NO. 401236

SYSTEM MARQUETTE ELEVATOR DATE 1-15-74

LOCATION COLLECTOR INLET

SAMPLE NO. TWO (2) SAMPLE TRAIN NO. FOUR (4)

TRAVERSE POSITION 20 points CONTAMINANT PARTICULATE MATTER

NOZZLE SIZE 3/8" METER NO. S-146

Clock

Gas meter reading end 44.6 at time _____ Outage Time — min

start 0 at time _____ Condensate — ml

RDG 44.6 at time _____ Condenser Temp. — °F

Meter corr. factor (MCF) = 1.07

Actual cubic feet (ACF) = MCF x RDG = 47.7

Barometric pressure abs. = Meter pressure abs. MPABS = 28.0 in. Hg

Meter temperature Start 50 End 80 Avg 68 F

Meter temperature abs MTABS 460

+ 68 (Avg. meter temperature)

MTABS = 528 °A

Vapor pressure of water (VP)

VP at __°F = ____ in. Hg

Standard dry cubic feet (SDCF) = corrected meter reading

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

$$= 47.7 \times \frac{28.58}{29.92} \times \frac{520}{528} = 44.87 \text{ dry cubic feet}$$

Total Wt. 34.7007 grams

- 6.7103 tare

Sample Wt. = 27.9904 net

$$\frac{\text{Sample Wt.} \times 15.43}{SCF} = \frac{27.9904 \times 15.43}{44.87} =$$

9.625 Loading: grains per std. dry cu ft

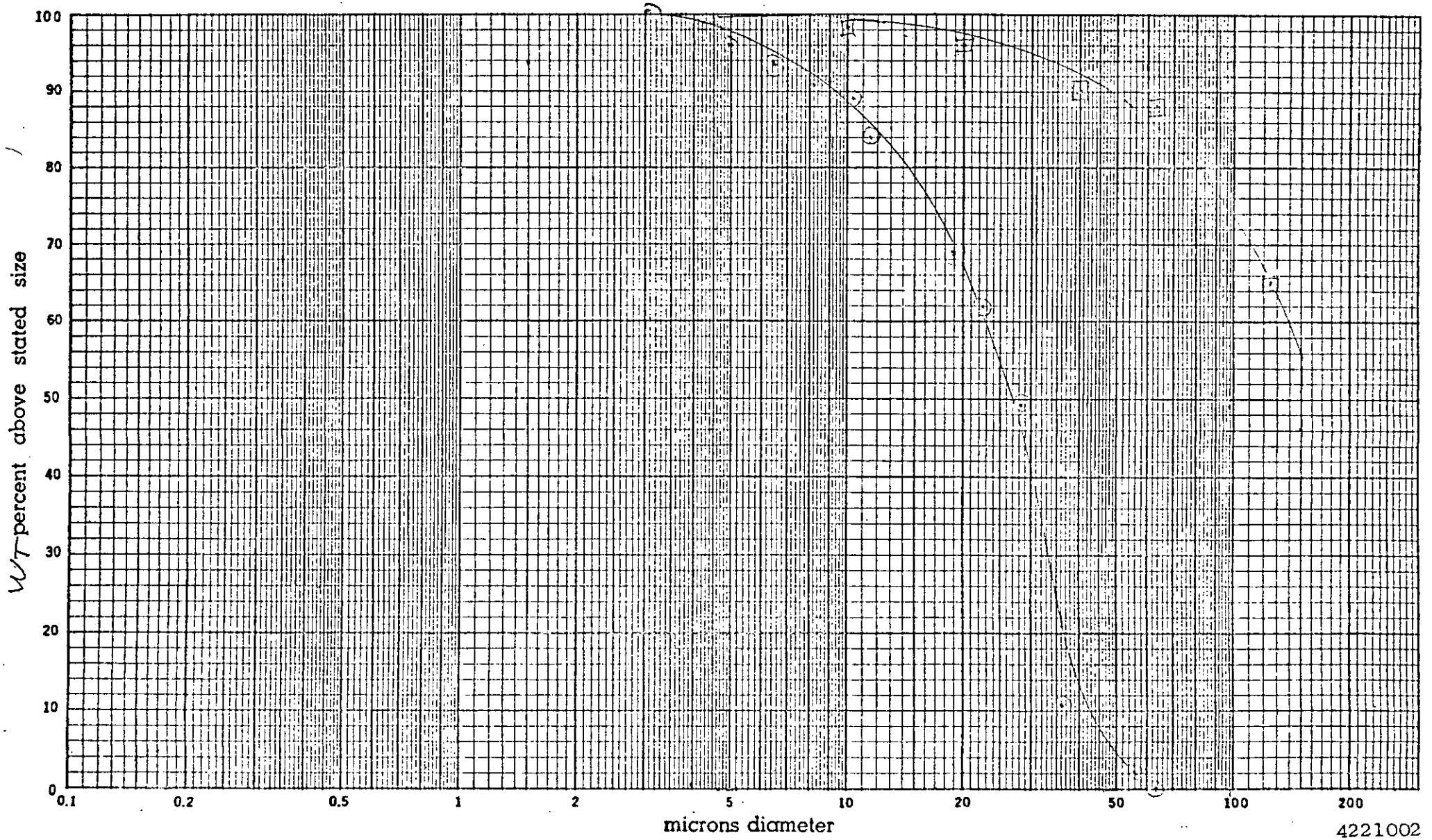
Form #3702 Rev. 1-74

GERBER INDUSTRIES, MARQUETTE ELEVATOR

PARTICLE SIZE ANALYSIS

Source INLET CYCLONE — Coulter Counter® — Operator CSH — Date 1-23-74

	material and sample number	electrolyte and dispersant	aperture	
⊙	Dust 1-15-74 63μ	isoton/	280μ	
⊡	Overall Dist.	isoton/	280μ	
△				
◇				



4221002

POLLUTION CURBS, INC.

PITOT TRAVERSE

CUSTOMER GERBER INDUSTRIES JOB NO. 401236

SYSTEM MARQUETTE ELEVATOR DATE 1-15-74

LOCATION COLLECTOR OUTLET

TYPE OF PITOT STANDARD

Orientation		
Dist.	VP	Vs
1	.62	3153
2	.60	3102
3	.65	3229
1	.65	3229
2	.70	3351
3	.80	3582
1	.50	2832
2	.60	3102
3	.70	3351
1	.75	3468
2	.80	3582
3	.85	3690
Total		39671

Orientation	
VP	Vs
.62	3153
.60	3102
.65	3229
.70	3351
.78	3537
.80	3582
.55	2970
.57	3024
.70	3351
.75	3468
.80	3582
.85	3690
Total	40039

Avg. Vs = 3324

V = Avg. Vs x DF = 3324 x .99 = 3290

Duct Diam. or Dim. 32"x 12"

Duct Area A = 2.67 Ft²

ACFM = V x A = 8786

SCFM = 8900

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) = $\frac{520}{\text{Duct temp} + 460}$ = 1.07

HTC = CR x TC = _____

HUMIDITY & TEMP. CORR:

At test station:

DB 28 WB _____ H _____ lb/lb

Duct temp 28°F Hum Vol. 12.3

HTC = $\frac{1 + H}{\text{Hum Vol} \times 0.076}$

= $\frac{1 + -}{12.3 \times 0.076}$ = 1.07

PRESSURE CORR: PC

Barometric Press. ABS (BPA) 28.58 "Hg

BPA x 13.6 = 388.7

Duct SP ± -3.6

Duct SP ABS 385.1

PC = $\frac{\text{Duct SP ABS}}{407}$ = .95

DENSITY

Density = HTC x PC x 0.076 =

1.07 x .95 x 0.076 = .077 lb/cu ft

Density Correction Factor (DF)

DF = $\sqrt{0.076/D}$

= .99

BY EJB

Form D101 Rev 3/71

POLLUTION CURBS, INC.

FIELD SAMPLE DATA

CLIENT GERBER INDUSTRIES JOB NO. 401236

SYSTEM MARQUETTE ELEVATOR DATE 1-15-74

LOCATION COLLECTOR OUTLET

SAMPLE NO. ONE (1) SAMPLE TRAIN NO. THREE (3)

TRAVERSE POSITION 12 points CONTAMINANT PARTICULATE MATTER

NOZZLE SIZE 3/8" METER NO. #68

		Clock		
Gas meter reading end	122.88	at time 60 Min	Outage Time	- min
start	0	at time 60 Min	Condensate	- ml
RDG	122.88	at time 1 hour	Condenser Temp.	- °F

Meter corr. factor (MCF) = 1.63

Actual cubic feet (ACF) = MCF x RDG = 126.57

Barometric pressure abs. = Meter pressure abs. MPABS = 28.0 in. Hg

Meter temperature Start 40 End 92 Avg 70 F

Meter temperature abs MTABS 460

+ 70 (Avg. meter temperature)

MTABS = 530 °A

Vapor pressure of water (VP)

VP at __°F = ____ in. Hg

Standard dry cubic feet (SDCF) = corrected meter reading

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

$$= 126.6 \times \frac{28.58}{29.92} \times \frac{520}{530} = 117.9 \text{ dry cubic feet}$$

Total Wt. 8.1897 grams

- 7.0406 tare

Sample Wt. = 1.1491 net

$$\frac{\text{Sample Wt.} \times 15.43}{SCF} = \frac{1.1491 \times 15.43}{117.9} =$$

0.150 Loading: grains per std. dry cu ft

Form #3702 Rev. 1-74

POLLUTION CURBS, INC.

FIELD SAMPLE DATA

CLIENT GERBER INDUSTRIES JOB NO. 401236

SYSTEM MARQUETTE ELEVATOR DATE 1-15-74

LOCATION COLLECTOR OUTLET

SAMPLE NO. TWO (2) SAMPLE TRAIN NO. FIVE (5)

TRAVERSE POSITION 12 points CONTAMINANT PARTICULATE MATTER

NOZZLE SIZE 3/8" METER NO. #68

		Clock	
Gas meter reading end	124.18	at time 3:01	Outage Time – min
start	0	at time 2:01	Condensate – ml
RDG		at time 1 hour	Condenser Temp. – °F

Meter corr. factor (MCF) = 1.03

Actual cubic feet (ACF) = MCF x RDG = 128

Barometric pressure abs. = Meter pressure abs. MPABS = 28.6 in. Hg

Meter temperature Start 50 End 80 Avg 71 °F

Meter temperature abs MTABS 460

+ 71 (Avg. meter temperature)

MTABS = 531 °A

Vapor pressure of water (VP)

VP at __°F = ____ in. Hg

Standard dry cubic feet (SDCF) = corrected meter reading

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

$$= 128 \times \frac{28.58}{29.92} \times \frac{520}{531} = 119.7 \text{ dry cubic feet}$$

Total Wt. 8.3339 grams

- 7.2887 tare

Sample Wt. = 1.0452 net

$$\frac{\text{Sample Wt.} \times 15.43}{SCF} = \frac{1.0452 \times 15.43}{119.7} =$$

0.135 Loading: grains per std. dry cu ft

Form #3702 Rev. 1-74

PC 012

GERBER INDUSTRIES, MARQUETTE ELEVATOR

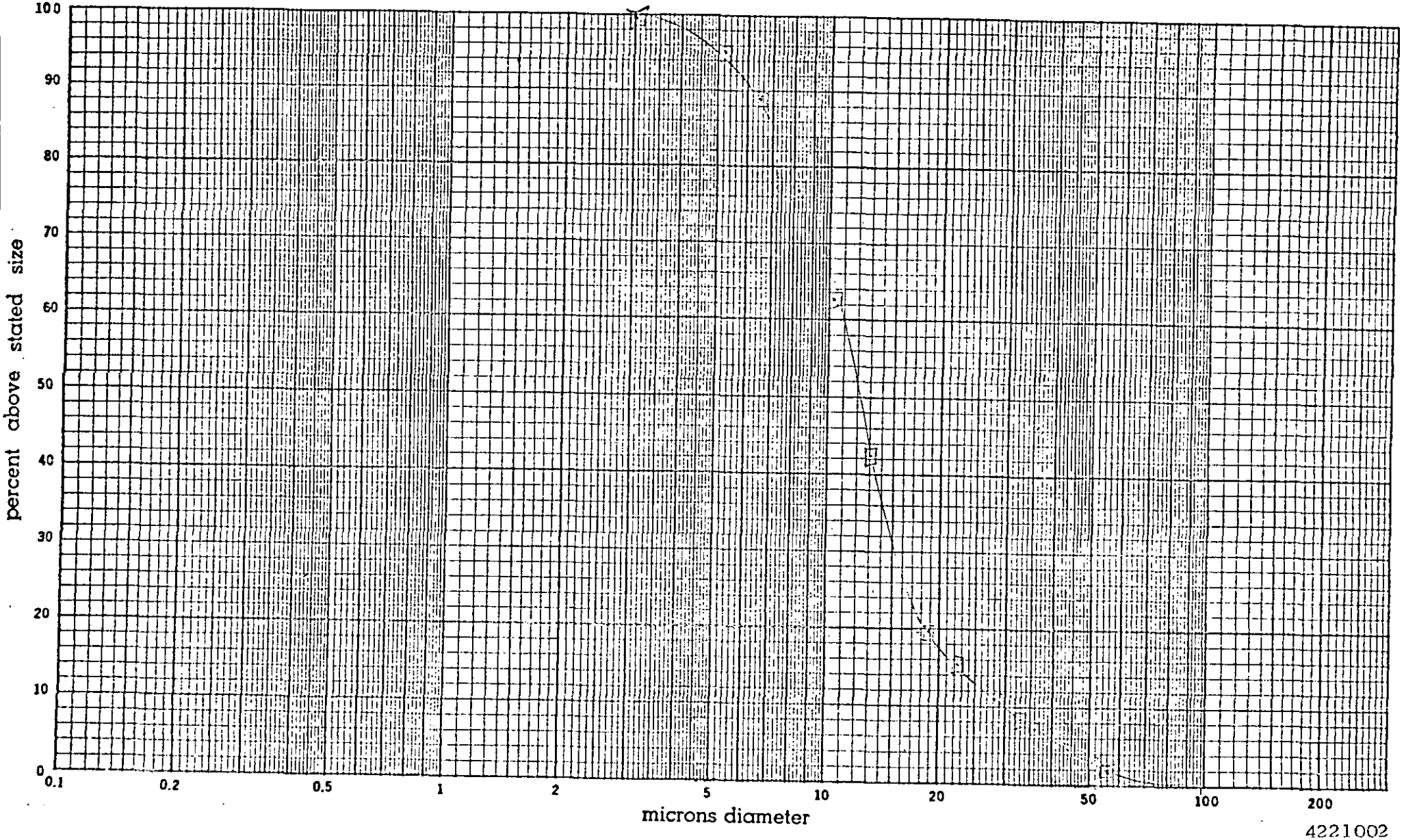
PARTICLE SIZE ANALYSIS

Source OUTLETT CYCLONE

Coulter Counter®

Operator CSH **Date** 1-24-74

	material and sample number	electrolyte and dispersant	aperture	
⊙	Outlet 1-15-74	isoton/	280μ	
⊡				
△				
◇				



4221002

POLLUTION CURBS, INC.

PITOT TRAVERSE

CUSTOMER GERBER INDUSTRIES JOB NO. 401236

SYSTEM MARQUETTE ELEVATOR DATE 1-16-74

LOCATION COLLECTOR INLET

TYPE OF PITOT STANDARD

Orientation		
Dist.	VP	Vs
1	.25	2003
2	.30	2193
3	.29	2157
4	.29	2157
5	.28	2119
1	.37	2436
2	.40	2533
3	.42	2595
4	.50	2832
5	.49	2804
1	.65	3229
2	.70	3351
3	.69	3327
4	.73	3422
5	.77	3514
1	.90	3800
2	.91	3821
3	.90	3800
4	.86	3709
5	.75	3468
	Total	59170

Orientation	
VP	Vs
.29	2157
.30	2193
.30	2193
.29	2157
.28	2119
.39	2501
.42	2595
.46	2716
.45	2687
.49	2804
.65	3229
.70	3351
.70	3351
.73	3422
.77	3514
.91	3821
.85	3690
.80	3582
.80	3582
.75	3468
Total	59132

Avg. Vs = 2950

V = Avg. Vs x DF = 2950 x 1.0 = 2950

Duct Diam. or Dim. 32" x 12"

Duct Area A = 2.67 Ft²

ACFM = V x A = 7876

SCFM = 7876

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) = $\frac{520}{\text{Duct temp} + 460}$ = 1.04

HTC = CR x TC = _____

HUMIDITY & TEMP. CORR:

At test station:

DB 38° WB _____ H — lb/lb

Duct temp _____ Hum Vol. 12.5

HTC = $\frac{1 + H}{\text{Hum Vol} \times 0.076}$

= $\frac{1 +}{\times 0.076}$ = 1.05

PRESSURE CORR: PC

Barometric Press. ABS (BPA) 28.58 "Hg

BPA x 13.6 = _____

Duct SP ± - 2.6

Duct SP ABS 385.4

PC = $\frac{\text{Duct SP ABS}}{407}$ = .95

DENSITY

Density = HTC x PC x 0.076 =

$\frac{1.05}{.076} \times .95 \times 0.076$ = lb/cu ft

Density Correction Factor (DF)

DF = $\sqrt{0.076/D}$

= 1.0

BY EJB

POLLUTION CURBS, INC.

FIELD SAMPLE DATA

CLIENT GERBER INDUSTRIES JOB NO. 401236

SYSTEM MARQUETTE ELEVATOR DATE 1-16-74

LOCATION COLLECTOR INLET

SAMPLE NO. ONE (1) SAMPLE TRAIN NO. SEVEN (7)

TRAVERSE POSITION 20 points CONTAMINANT PARTICULATE MATTER

NOZZLE SIZE 3/8" METER NO. 146

		Clock			
Gas meter reading end	42.10	at time		Outage Time	— min
start	0	at time	20 Min.	Condensate	— ml
RDG	42.10	at time		Condenser Temp.	— °F

Meter corr. factor (MCF) = 1.07

Actual cubic feet (ACF) = MCF x RDG = 44.9

Barometric pressure abs. = Meter pressure abs. MPABS = 28.58 in. Hg

Meter temperature Start 50 End 80 Avg 63 °F

Meter temperature abs MTABS 460

+ 63 (Avg. meter temperature)

MTABS = 523 °A

Vapor pressure of water (VP)

VP at __°F = ____ in. Hg

Standard dry cubic feet (SDCF) = corrected meter reading

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

$$= 44.9 \times \frac{28.58}{29.92} \times \frac{520}{523} = 42.6 \text{ dry cubic feet}$$

Total Wt. 17.7504 grams

- 5.9070 tare

Sample Wt. = 11.8434 net

$$\frac{\text{Sample Wt.} \times 15.43}{SCF} = \frac{11.8434 \times 15.43}{42.6} =$$

4.29 Loading: grains per std. dry cu ft

Form #3702 Rev. 1-74

POLLUTION CURBS, INC.

FIELD SAMPLE DATA

CLIENT GERBER INDUSTRIES JOB NO. 401236

SYSTEM MARQUETTE ELEVATOR DATE 1-16-74

LOCATION COLLECTOR INLET

SAMPLE NO. TWO (2) SAMPLE TRAIN NO. NINE (9)

TRAVERSE POSITION 20 points CONTAMINANT PARTICULATE MATTER

NOZZLE SIZE 3/8" METER NO. S-146

		Clock	
Gas meter reading end	38.7	at time	Outage Time – min
start	0	at time	Condensate – ml
RDG	38.7	at time	Condenser Temp. – °F

Meter corr. factor (MCF) = 1.07

Actual cubic feet (ACF) = MCF x RDG = 41.4

Barometric pressure abs. = Meter pressure abs. MPABS = 28.0 in. Hg

Meter temperature Start 50 End 70 Avg 61.7 °F

Meter temperature abs MTABS 460

+ 62 (Avg. meter temperature)

MTABS = 522 °A

Vapor pressure of water (VP)

VP at __°F = ____ in. Hg

Standard dry cubic feet (SDCF) = corrected meter reading

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

$$= 41.4 \times \frac{28.58}{29.92} \times \frac{520}{522} = 39.4 \text{ dry cubic feet}$$

Total Wt. 14.8697 grams

- 6.6095 tare

Sample Wt. = 8.2602 net

$$\frac{\text{Sample Wt.} \times 15.43}{SCF} = \frac{8.2602 \times 15.43}{39.4} =$$

3.23 Loading: grains per std. dry cu ft

Form #3702 Rev. 1-74

GERBER INDUSTRIES, MARQUETTE ELEVATOR

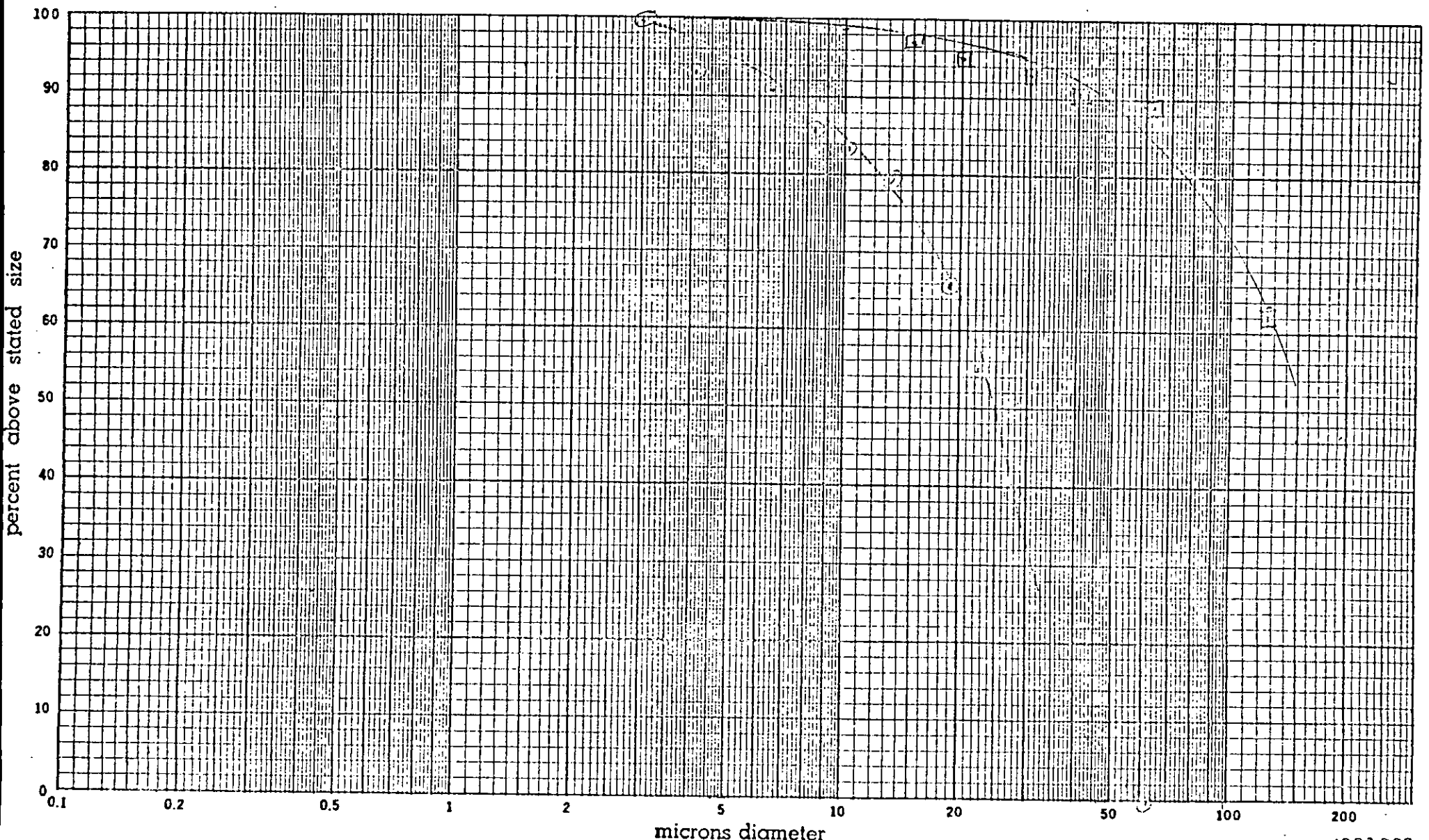
PARTICLE SIZE ANALYSIS

Source INLET CYCLONE

Coulter Counter®

Operator CSH Date 1-24-74

	material and sample number	electrolyte and dispersant	aperture	
⊙	Inlet 1-16-74 63μ	isoton/	280μ	
⊡	Total Dust	isoton/	280μ	
△				
◇				



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POLLUTION CURBS, INC.

PITOT TRAVERSE

CUSTOMER GERBER INDUSTRIES JOB NO. 401236

SYSTEM MARQUETTE ELEVATOR DATE 1-16-74

LOCATION COLLECTOR OUTLET

TYPE OF PITOT STANDARD

Orientation		
Dist.	VP	Vs
1	.50	2832
2	.55	2970
3	.60	3102
1	.40	2533
2	.42	2595
3	.57	3024
1	.50	2832
2	.57	3024
3	.59	3076
1	.44	2656
2	.43	2626
3	.45	2687
	Total	33941

Orientation	
VP	Vs
.50	2832
.51	2860
.60	3102
.40	2533
.42	2595
.57	3024
.52	2888
.57	3024
.59	3076
.44	2656
.43	2626
.45	2687
Total	33903

Avg. Vs = 2823

V = Avg. Vs x DF = 2823 x 1.0 = 2823

Duct Diam. or Dim. 30" x 12"

Duct Area A = 2.67 Ft²

ACFM = V x A = 7537

SCFM = 7537

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) = $\frac{520}{\text{Duct temp} + 460}$ = 1.04

HTC = CR x TC = ____

HUMIDITY & TEMP. CORR:

At test station:

DB 38° WB ____ H — lb/lb

Duct temp ____ Hum Vol. 12.5

HTC = $\frac{1 + H}{\text{Hum Vol} \times 0.076}$

= $\frac{1 + \quad}{12.5 \times 0.076}$ = 1.05

PRESSURE CORR: PC

Barometric Press. ABS (BPA) 28.58 "Hg

BPA x 13.6 = 388.7

Duct SP ± - 2.6

Duct SP ABS ____

PC = $\frac{\text{Duct SP ABS}}{407}$ = .95

DENSITY

Density = HTC x PC x 0.076 =

$\frac{1.05 \times .95}{.076} \times 0.076$ = ____ lb/cu ft

Density Correction Factor (DF)

DF = $\sqrt{0.076/D}$

= 1.0

BY FJB

POLLUTION CURBS, INC.

FIELD SAMPLE DATA

CLIENT GERBER INDUSTRIES JOB NO. 401236

SYSTEM MARQUETTE ELEVATOR DATE 1-16-74

LOCATION COLLECTOR OUTLET

SAMPLE NO. ONE (1) SAMPLE TRAIN NO. SIX (6)

TRAVERSE POSITION 12 points CONTAMINANT PARTICULATE MATTER

NOZZLE SIZE 3/8" METER NO. #369

		Clock	
Gas meter reading end	102.56	at time	Outage Time — min
start	0	at time 10:45	Condensate — ml
RDG	102.56	at time	Condenser Temp. — °F

Meter corr. factor (MCF) = 1.11

Actual cubic feet (ACF) = MCF x RDG = 113.8

Barometric pressure abs. = Meter pressure abs. MPABS = 28.58 in. Hg

Meter temperature Start 50 End 70 Avg 62.5 °F

Meter temperature abs MTABS 460

+ 62.5 (Avg. meter temperature)

MTABS = 523 °A

Vapor pressure of water (VP)

VP at __°F = ____ in. Hg

Standard dry cubic feet (SDCF) = corrected meter reading

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

$$= 113.8 \times \frac{28.58}{29.92} \times \frac{520}{523} = 108.1 \text{ dry cubic feet}$$

Total Wt. 7.0176 grams

- 6.2531 tare

Sample Wt. = 0.7645 net

$$\frac{\text{Sample Wt.} \times 15.43}{SCF} = \frac{0.7645 \times 15.43}{108.1} =$$

0.11 Loading: grains per std. dry cu ft

Form #3702 Rev. 1-74

POLLUTION CURBS, INC.

FIELD SAMPLE DATA

CLIENT GERBER INDUSTRIES JOB NO. 401236

SYSTEM MARQUETTE ELEVATOR DATE 1-16-74

LOCATION COLLECTOR OUTLET

SAMPLE NO. TWO (2) SAMPLE TRAIN NO. TEN (10)

TRAVERSE POSITION 12 points CONTAMINANT PARTICULATE MATTER

NOZZLE SIZE 3/8" METER NO. #68

		Clock	
Gas meter reading end	110.14	at time	Outage Time — min
start	0	at time 12:00	Condensate — ml
RDG	110.14	at time	Condenser Temp. — °F

Meter corr. factor (MCF) = 1.03

Actual cubic feet (ACF) = MCF x RDG = 113.4

Barometric pressure abs. = Meter pressure abs. MPABS = 28.0 in. Hg

Meter temperature Start 50 End 70 Avg 64.2 °F

Meter temperature abs MTABS 460

+ 64 (Avg. meter temperature)

MTABS = 524 °A

Vapor pressure of water (VP)

VP at __°F = ____ in. Hg

Standard dry cubic feet (SDCF) = corrected meter reading

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

$$= 113.4 \times \frac{28.58}{29.92} \times \frac{520}{524} = 107.5 \text{ dry cubic feet}$$

Total Wt. 7.0541 grams

- 6.4399 tare

Sample Wt. = 0.6142 net

$$\frac{\text{Sample Wt.} \times 15.43}{SCF} = \frac{0.6142 \times 15.43}{107.5} =$$

0.09 Loading: grains per std. dry cu ft

Form #3702 Rev. 1-74

GERBER INDUSTRIES, MARQUETTE ELEVATOR

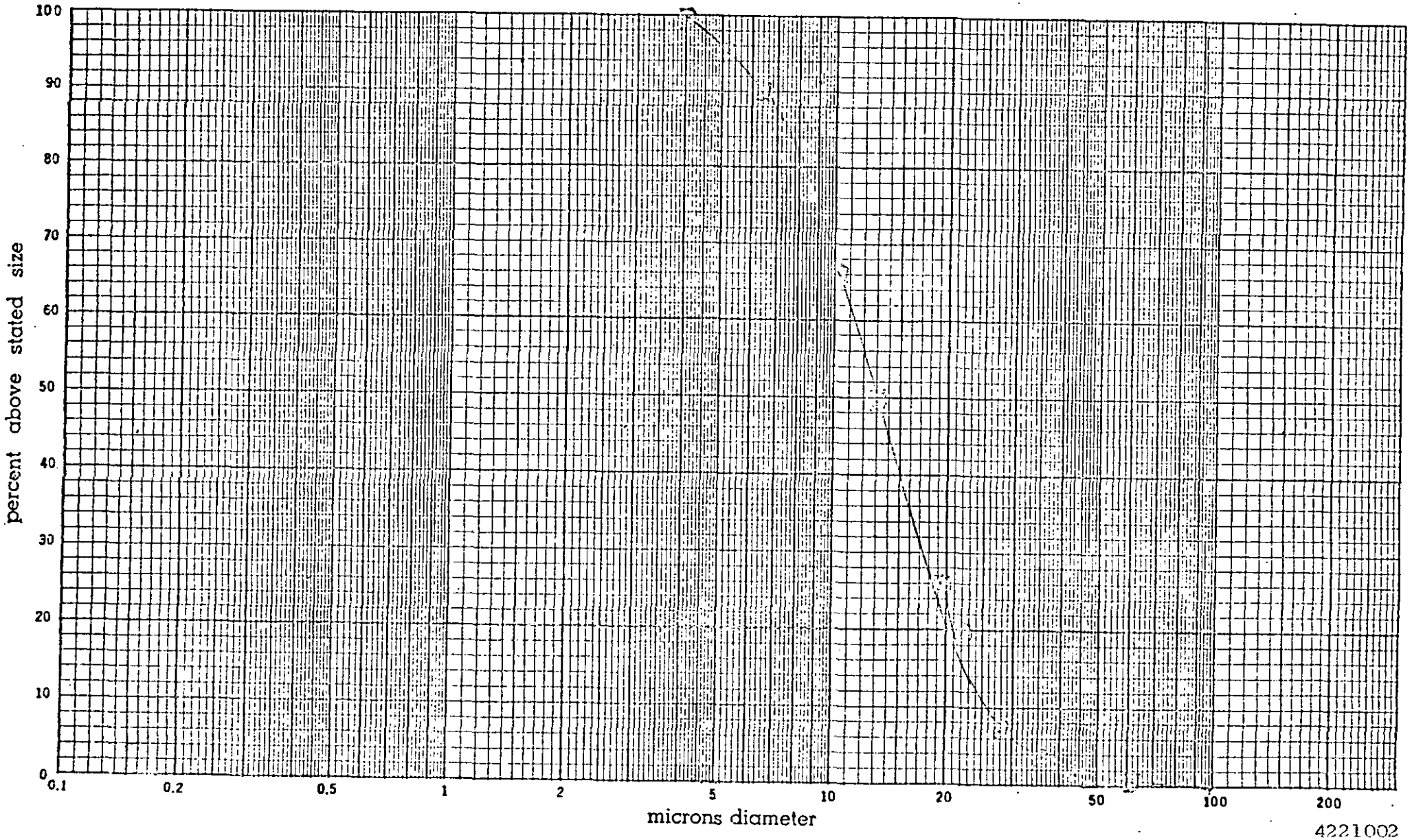
PARTICLE SIZE ANALYSIS

Source OUTLET CYCLONE

Coulter Counter®

Operator CSH **Date** 1-23-74

	material and sample number	electrolyte and dispersant	aperture	
⊙	Outlet 1-16-74	isoton/	280μ	
⊡				
△				
◇				



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