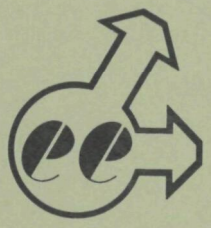
72-CI-33 (GRN)
SOURCE TEST REPORT
ON MEASUREMENT OF EMISSIONS FROM
CARGILL, INC.
FAYETTEVILLE, NORTH CAROLINA
FOR
ENVIRONMENTAL PROTECTION AGENCY
UNITED STATES GOVERNMENT
THOMAS E. WARD
PROJECT TEST OFFICER



environmental engineering, inc.

2324 S. W. 34th STREET / GAINESVILLE, FLORIDA 32601 / PHONE 904 / 372-3318

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SOURCE TEST REPORT

PLANT TESTED: Cargill, Inc.
Fayetteville, North Carolina

TESTOR: Environmental Engineering, Inc.
2324 Southwest 34 Street
Gainesville, Florida 32601

CONTRACT NO: 68-02-0232-Task Order 14

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INTRODUCTION

Particulate emission tests were performed on the outlet stack from a fabric collector located on the truck-dump system at Cargill, Inc., Fayetteville, North Carolina. The tests were performed between August 8 and 10, 1972.

Soybeans, which are hauled in by truck, are dumped from the truck into a conveyor system for conveyance into the plant. The dumping area emissions are controlled by a fabric baghouse collector.

Three separate particulate tests were performed, each approximately two hours in length.

SUMMARY OF RESULTS

Summarized results of the particulate emission stack tests performed at Cargill, Inc. are included in Table 1.

The Environmental Protection Agency (EPA) performed the analysis.

Complete particulate emission calculation data are included in Appendix A.

Complete plant operating data collected by the EPA are included in Appendix B.

TABLE 1

SOURCE TEST DATA

TEST NO -72-CI-33 (GRN) *NO OF RUNS* - 3
PLANT - Cargill, Inc. Fayetteville, N.C.
SOURCE - Truck Dump Bag House
TYPE OF PLANT - Feed and Grain Mill
CONTROL EQUIPMENT - Dry Fabric Collector
POLLUTANTS SAMPLED - Particulate

	1	2	3
1) *RUN NUMBER*	1	2	3
2) *DATE*	8/8-9/72	8/9/72	8/10/72
3) *TIME BEGAN*	1405.830	11:06	8:25
4) *TIME END*	1410.1035	15:25	10:20
5) *BAROMETRIC PRESSURE, IN HG*	29.73	29.73	29.73
6) *METER ORIFICE PRESSURE DROP, IN HG*	1.7	1.41	1.28
7) *VOL DRY GAS METER COND, CUBIC FEET*	90.084	85.767	77.787
8) *AVERAGE GAS METER TEMPERATURE, DEG F*	83.1	95.6	71.8
9) *VOL DRY GAS, S.T.P. , CUBIC FEET*	87.712	81.572	77.282
10) *TOTAL H2O COLLECTED, ML*	38.6	30.1	35.1
11) *VOL H2O VAPOR COLLECTED, S.T.P. , CU FT*	1.83	1.43	1.66
12) *STACK GAS MOISTURE, PERCENT VOLUME*	2	1.7	2.1
13) *ASSUMED STACK GAS MOISTURE, PCT VOL*	200	200	200
14) *PERCENT CO2*	-	-	-
15) *PERCENT O2*	-	-	-
16) *PERCENT CO*	-	-	-
17) *PERCENT N2*	-	-	-
18) *PERCENT EXCESS AIR*, STACK GAS WAS AIR	N/A	N/A	N/A
19) *MOLECULAR WEIGHT OF STACK GAS, DRY*	28.85	28.85	28.85
20) *MOLECULAR WEIGHT OF STACK GAS, STK COND*	28.63	28.66	28.62
21) *STACK GAS SPECIFIC GRAVITY*	0.99	0.99	0.99
22) *AVG SQUARE ROOT (VEL HEAD), IN H2O*	1.16	1.063	1.007
23) *AVERAGE STACK GAS TEMPERATURE, DEG F*	81.2	90.2	72.6
24) *AVG SQUARE ROOT (STK TEMP×VEL HEAD)*	26.991	24.928	23.237
25) *PITOT CORRECTION FACTOR*	0.83	0.83	0.83
26) *STACK PRESSURE, IN HG, ABSOLUTE*	29.02	29.02	29.02
27) *STACK GAS VEL, STACK COND, F.P.M.*	3983	3676.3	3429.4
28) *STACK AREA, SQ FEET*	2.95	2.95	2.95
29) *EFFECTIVE STACK AREA, SQUARE FEET*	2.95	2.95	2.95
30) *STACK GAS FLOW RATE, S.T.P. , SCFMD*	10926	9959	9559
31) *NET TIME OF TEST, MINUTES*	114	116	112
32) *SAMPLING NOZZLE DIAMETER, INCHES*	0.1875	0.1875	0.1875
33) *PERCENT ISOKINETIC*	108.3	108.6	111.1
34) PARTICULATE EMISSIONS @ S.T.P., LBS/HR			
Total, front half	0.62	0.83	0.17
Total, back half	0.24	1.30	0.14
TOTAL	0.86	2.13	0.31

****S.T.P.↔ DRY, 70 DEGREES F, 29.92 INCHES MERCURY****

LOCATION OF SAMPLING POINTS

Sampling ports and points were selected by using the guidelines stated in Method 1 of the Federal Register (36 F.R. 24882, 24883, December 23, 1971).

Figure 1 is a schematic diagram of the truck-dump baghouse outlet that was sampled.

TRUCK DUMP BAGHOUSE

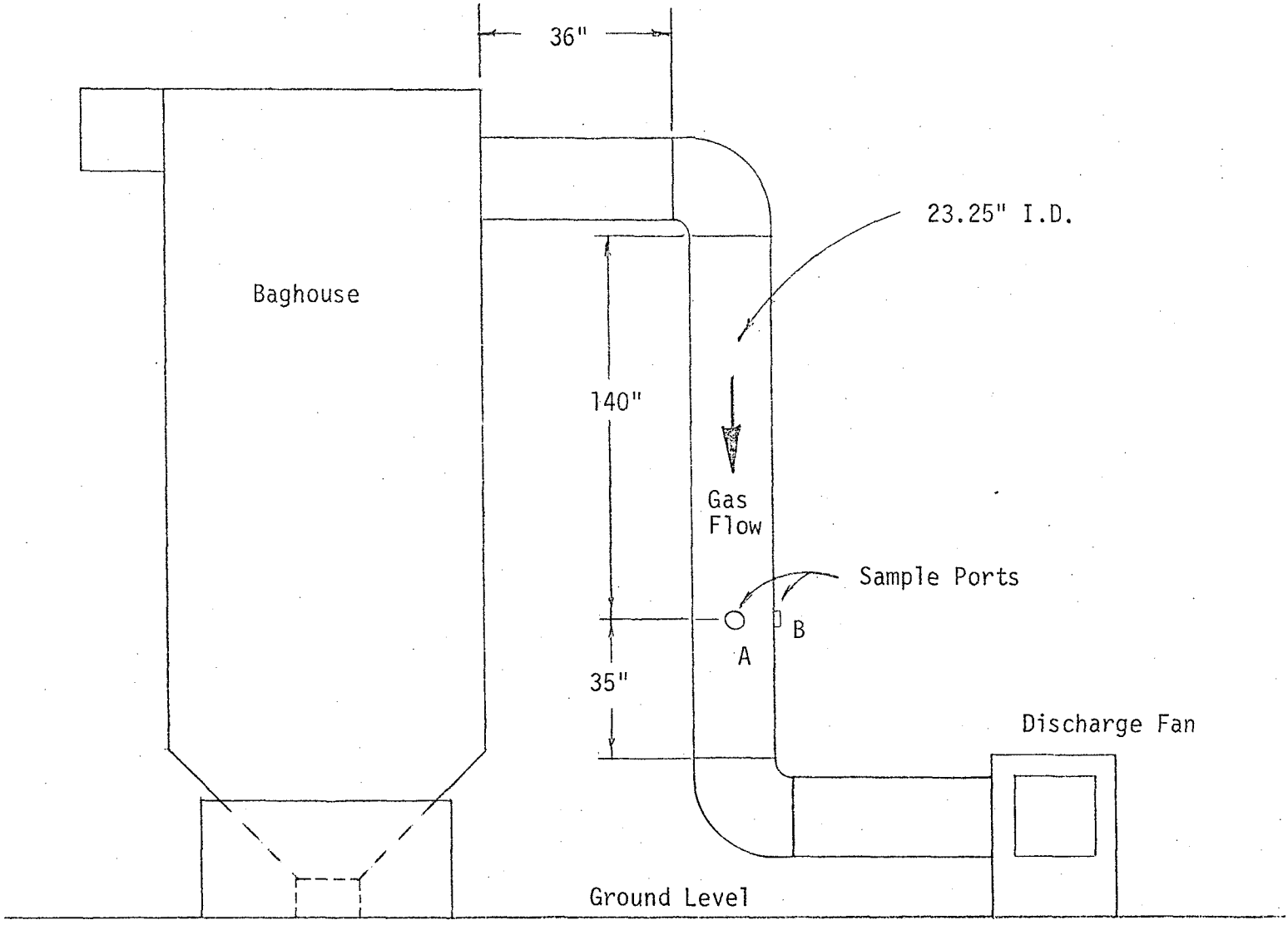


Figure 1

Sample Point Number	Distance from Inside of Port A or Port B (Inches)
1&2	1 1/3
3	2 5/16
4	3 1/3
5	4 2/3
6	6 1/4
7	8 1/4
8	14 3/4
9	17
10	18 1/2
11	19 27/32
12	20 15/16
13&14	22 1/8

SAMPLING AND ANALYTICAL PROCEDURES FOR PARTICULATE EMISSIONS FROM STATIONARY SOURCES

The method used was Method 5 of the Federal Register (36 F. R., March 31, 1971), Determination of Particulate Emissions From Stationary Sources.

A complete description of the sampling method used is in Appendix D.

The EPA performed the sample analysis.

APPENDIX A

Particulate Emission Calculations

EXPLANATION OF E.E.I. SOURCE SAMPLING CALCULATION SHEET

PB - Barometric pressure, inches Hg
PS - Stack pressure, inches Hg
AS - Stack area, sq. ft.
AS'- Effective area of positive stack gas flow, sq. feet
NPTS - Number of traverse points where the pitot velocity head was greater than zero
TS - Stack temperature, ^{o}R
TM - Meter temperature, ^{o}R
$\overline{H}$ - Average square root of velocity head, $\sqrt{\text{inches } H_2O}$
$\overline{\Delta H}$ - Average meter orifice pressure differential, inches H_2O
AN - Sampling nozzle area, square feet
CP - S-type pitot tube correction factor
VM - Recorded meter volume sample, cubic feet (meter conditions)
VC - Condensate and silica gel increase in impingers, milliliters
P_o - Pressure at the dry test meter orifice, $\left(PB + \frac{H}{13.6}\right)$ inches Hg
STP- Standard conditions, dry, $70^{o}F$, 29.92 inches Hg

- - - - - - - - - - - -

VWV- Conversion of condensate in milliliters to water vapor in cubic feet (STP)
VSTPD- Volume sampled, cubic feet (STP)
VT- Total water vapor volume and dry gas volume sampled, cubic feet (STP)
W- Moisture fraction of stack gas
FDA- Dry gas fraction
- Assumed moisture from preliminary check
MD- Molecular weight of stack gas, lbs/lb-mole (dry conditions)
MS- Molecular weight of stack gas, lbs/lb-mole (stack conditions)
GS- Specific gravity of stack gas, referred to air
EA- Excess air, %
$\sqrt{\overline{H \times TS}}$- Average square root of velocity head times stack temperature
$\overline{U}$- Stack gas velocity, feet per minute
QS- Stack gas flow rate, cubic feet per minute (stack conditions)
QD- Stack gas flow rate, cubic feet per minute (dry conditions)
QSTPD- Stack gas flow rate, cubic feet per minute (STP)
PISO- Percent isokinetic volume sampled (method described in Federal Register)
ESTP- Pollutant concentration, grains per std. cubic feet
E12- Pollutant concentration, grains per std. cubic feet (Corrected to 12% CO_2)
E50- Pollutant concentration, grains per std. cubic feet (Corrected to 50% EA)
EM- Pollutant emission rate, lbs. per hour

ENVIRONMENTAL ENGINEERING, INCORPORATED
SOURCE SAMPLING CALCULATIONS

PLANT- CARGILL INC. FAYETTEVILLE, N.C. DATE- 8/8-9/72
STACK- TRUCK DUMP BAG HOUSE RUN 1 FROM 1405,830-1410,
WEATHER CONDITIONS- CLEAR PB- 29.73 IN HG PS- 29.02 IN HG
AS'- 2.95 SQ. FEET TS- 541.2 DEGREES R TM- 543.1 DEGREES R H- 1.16 IN H2O
ΔH- 1.7 IN H2O AN- 0.000192 SQ. FEET CP- 0.83 VM- 90.084 CF VC- 38.6 ML
TOTAL TIME- 114 MIN NPTS- 28 ORSAT:

1) VWV = (0.0474)×(VC)	1) 1.83	SCF
2) VSTPD= ((530)×(VM)×(PB+(ΔH÷13.6)))÷(29.92×TM)	2) 87.712	SCF
3) VT = (VWV) + (VSTPD)	3) 89.542	SCF
4) W = (VWV) ÷ (VT)	4) 0.02	
5) FDA = (1.0 - W)	5) 0.98	
6) ASSUMED MOISTURE FRACTION	6) 0.02	
7) MD = (.44×CO2) + (.32×O2) + (.28×(CO+N2))	7) 28.85	
8) MS = (MD×FDA) + (18×W)	8) 28.63	
9) GS = (MS) ÷ (28.99)	9) 0.99	
10) EA = (100)×(O2-0.5×CO)÷((0.266×N2)-(O2-0.5×CO))	10) N.A.	%
11) AVG(√(H×TS)) = (1÷N)×SUM(√(H×TS))	11) 26.991	
12) U = (174×CP×(√(29.92÷PS×GS)))×AVG(√(H×TS))	12) 3983	FPM
13) QS = (U) × (AS')	13) 11743	ACFM
14) QD = (QS) × (FDA)	14) 11503	CFMD
15) QSTPD= (QD) × (530÷TS) × (PS÷29.92)	15) 10926	SCFM
16) PISO = ((0.00267×VC×TS)+(PO×TS×VM÷TM)) ÷ (TIME×U×PS×AN)	16) 108.3	%
17) ESTP = (15.43×Y) ÷ (VSTPD) UNITS : GRAINS/SCF		
18) E12 = (12×ESTP) ÷ (%CO2) UNITS : GRAINS/SCF		
19) E50 = (ESTP×(100+EA)) ÷ (150) UNITS : GRAINS/SCF		
20) EM = (0.00857)×(ESTP)×(QSTPD) UNITS : POUNDS/HOUR		

PARTICULATE LAB ANALYSIS(GM) (Y)		PARTICULATE CONCENTRATIONS(GR/SCF) (ESTP)	(E12)	(E50)	EMISSION RATE (EM) (LBS/HR
Total, front half	0.0379	0.0067			0.62
Total, back half	0.0145	0.0026			0.24
TOTAL	0.0524	0.0093			0.086

COMMENTS : Run was started 8/8/72 and not finished till 8/9/72

TEST CONDUCTED BY : _____

environmental engineering, inc.

ENVIRONMENTAL ENGINEERING, INCORPORATED
SOURCE SAMPLING CALCULATIONS

PLANT- CARGILL INC. FAYETTEVILLE, N.C. DATE- 8/9/72
STACK- TRUCK DUMP BAG HOUSE RUN 2 FROM 11:06-15:25
WEATHER CONDITIONS- CLEAR PB- 29.73 IN HG PS- 29.02 IN HG
AS'- 2.95 SQ. FEET TS- 550.2 DEGREES R TM- 555.6 DEGREES R H- 1.063 IN H2O
ΔH- 1.41 IN H2O AN- 0.000192 SQ. FEET CP- 0.83 VM- 85.767 CF VC- 30.1 ML
TOTAL TIME- 116 MIN NPTS- 28 ORSAT:

1) $VWV = (0.0474)\times(VC)$	1) 1.43	SCF
2) $VSTPD = ((530)\times(VM)\times(PB+(\Delta H\div 13.6)))\div(29.92\times TM)$	2) 81.572	SCF
3) $VT = (VWV) + (VSTPD)$	3) 82.999	SCF
4) $W = (VWV) \div (VT)$	4) 0.017	
5) $FDA = (1.0 - W)$	5) 0.983	
6) ASSUMED MOISTURE FRACTION	6) 0.02	
7) $MD = (.44\times CO2) + (.32\times O2) + (.28\times(CO+N2))$	7) 28.85	
8) $MS = (MD\times FDA) + (18\times W)$	8) 28.66	
9) $GS = (MS) \div (28.99)$	9) 0.99	
10) $EA = (100)\times(O2-0.5\times CO)\div((0.266\times N2)-(O2-0.5\times CO))$	10) N.A	%
11) $AVG(\sqrt{(H\times TS)}) = (1\div N)\times SUM(\sqrt{(H\times TS)})$	11) 24.928	
12) $U = (174\times CP\times(\sqrt{(29.92\div PS\times GS)})\times AVG(\sqrt{(H\times TS)})$	12) 3676.3	FPM
13) $QS = (U)\times(AS')$	13) 10845	ACFM
14) $QD = (QS)\times(FDA)$	14) 10659	CFMD
15) $QSTPD = (QD)\times(530\div TS)\times(PS\div 29.92)$	15) 9959	SCFM
16) $PISO = ((0.00267\times VC\times TS)+(Po\times TS\times VM\div TM))\div(TIME\times U\times PS\times AN)$	16) 108.6	%
17) $ESTP = (15.43\times Y)\div(VSTPD)$ UNITS : GRAINS/SCF		
18) $E12 = (12\times ESTP)\div(\%CO2)$ UNITS : GRAINS/SCF		
19) $E50 = (ESTP\times(100+EA))\div(150)$ UNITS : GRAINS/SCF		
20) $EM = (0.00857)\times(ESTP)\times(QSTPD)$ UNITS : POUNDS/HOUR		

PARTICULATE LAB ANALYSIS(GM) (Y)		PARTICULATE CONCENTRATIONS(GR/SCF) (ESTP) (E12) (E50)			EMISSION RATE (EM) (LBS/HR
Total, front half	0.0512	0.0097			0.83
Total, back half	0.0808	0.0153			1.30
TOTAL	0.1320	0.0250			2.13

COMMENTS : _____

TEST CONDUCTED BY : _____

environmental engineering, inc.

ENVIRONMENTAL ENGINEERING, INCORPORATED
SOURCE SAMPLING CALCULATIONS

PLANT- CARGILL INC. FAYETTEVILLE, N.C. DATE- 8/10/72
STACK- TRUCK DUMP BAG HOUSE RUN 3 FROM 8:25-10:20
WEATHER CONDITIONS- CLOUDY PB- 29.73 IN HG PS- 29.02 IN HG
AS'- 2.95 SQ. FEET TS- 532.6 DEGREES R TM- 531.8 DEGREES R H- 1.007 IN H2O
ΔH- 1.28 IN H2O AN- 0.000192 SQ. FEET CP- 0.83 VM'- 77.787 CF VC- 35.1 ML
TOTAL TIME- 112 MIN NPTS- 28 ORSAT:

1) VWV = (0.0474)×(VC)	1) 1.66	SCF
2) VSTPD= ((530)×(VM)×(PB+(ΔH÷13.6)))÷(29.92×TM)	2) 77.282	SCF
3) VT = (VWV) + (VSTPD)	3) 78.945	SCF
4) W = (VWV) ÷ (VT)	4) 0.021	
5) FDA = (1.0 - W)	5) 0.979	
6) ASSUMED MOISTURE FRACTION	6) 0.02	
7) MD = (.44×CO2) + (.32×O2) + (.28×(CO+N2))	7) 28.85	
8) MS = (MD×FDA) + (18×W)	8) 28.62	
9) GS = (MS) ÷ (28.99)	9) 0.99	
10) EA = (100)×(O2-0.5×CO)÷((0.266×N2)-(O2-0.5×CO))	10) N.A.	%
11) AVG(√(H×TS)) = (1÷N)×SUM(√(H×TS))	11) 23.237	
12) U = (174×CP×(√(29.92÷PS×GS)))×AVG(√(H×TS))	12) 3429.4	FPM
13) QS = (U) × (AS')	13) 10117	ACFM
14) QD = (QS) × (FDA)	14) 9904	CFMD
15) QSTPD= (QD) × (530÷TS) × (PS÷29.92)	15) 9559	SCFM
16) PISO = ((0.00267×VC×TS)+(PO×TS×VM÷TM)) ÷ (TIME×U×PS×AN)	16) 111.1	%
17) ESTP = (15.43×Y) ÷ (VSTPD) UNITS : GRAINS/SCF		
18) E12 = (12×ESTP) ÷ (%CO2) UNITS : GRAINS/SCF		
19) E50 = (ESTP×(100+EA)) ÷ (150) UNITS : GRAINS/SCF		
20) EM = (0.00857)×(ESTP)×(QSTPD) UNITS : POUNDS/HOUR		

PARTICULATE LAB ANALYSIS(GM) (Y)		PARTICULATE CONCENTRATIONS(GR/SCF) (ESTP)	(E12)	(E50)	EMISSION RATE (EM)	(LBS/HR
Total, front half	0.0097	0.0019			0.17	
Total, back half	0.0080	0.0016			0.14	
TOTAL	0.0177	0.0035			0.31	

COMMENTS : _____

TEST CONDUCTED BY : _____

environmental engineering, inc.

APPENDIX B

Plant Operating Data

Fayetteville, North Carolina - August 8-10, 1972

The control system is a baghouse, Kice, model S100-10, reverse-jet type, with a 3/4 hp airlock and a 30 hp exhaust fan serving a soybean truck unloading hopper.

Unloading - The hopper grate is baffled and 6,000 cfm. of air is exhausted from each side of the hopper. The air is pulled through the Kice fabric filter and exhausts through a fan about 4 feet above ground. An open end shed covers the receiving hopper. Normal truck unloading is approximately 32 trucks per eight hour day. Maximum unloading capacity is 10,000 bushels per hour.

The tests were conducted under conditions that were considered normal. Process weight data was produced from actual scale readings. Data related to the percent moisture and the percent foreign material was obtained from the Department of Agriculture personnel for each truck dumped (see process weight sheets attached).

The truck dump grating is covered by a building; however, there are no doors on either end. During the dumping of the trucks, visible emissions were detectable in some instances from the lip of the truck bed as the beans were discharged into the receiving hopper. These emissions varied from zero to 10-20 percent brown depending on the dirtiness of the grain, the type of opening at the end of the truck where the beans were discharged, and the velocity of the wind through the dump building. In

several instances the hopper would fill up to grate level thus decreasing the effectiveness of the pickup of the control system. Emissions in these instances at the grate were less than 10 second periods and emissions generally dissipated before being emitted from the dump building. The exhaust outlet of the baghouse control device was observed for a one-hour period on August 8, 1972, and no visible emissions were detectable. (See visual observation sheet attached.) Test personnel reported no visible emissions from the exhaust outlet for the bag filter during the tests.

Three two-hour tests, representative of normal conditions, were conducted.

TEST NO. 1

DATE 8-9-72

STATEMENT OF PROCESS WEIGHT

FIRM NAME CARGILL, INC.

ADDRESS P.O. BOX 1825 FAYETTVILLE N.C.

DATA ON OPERATING CYCLE TIME:

START OF OPERATION, TIME 8[20]

END OF OPERATION, TIME 10[30]

ELAPSED TIME, MINUTES = 120

IDLE TIME DURING CYCLE, MINUTES

NET TIME OF CYCLE, MINUTES

DATA ON MATERIAL CHARGED TO PROCESS DURING OPERATING CYCLE:

	TRUCK NO.	% MOISTURE	% FM	TIME	
MATERIAL	13079 SC	12.6	1.2		WEIGHT, LBS. 36960
MATERIAL	6566RH N.C.	13.4	1.8	8[42]	WEIGHT, LBS. 17,000
MATERIAL	10337 SC	12.7	2.8	[illegible]	WEIGHT, LBS. 41060
MATERIAL	1937KL N.C.	12.[illegible]	2.4	[illegible]	WEIGHT, LBS. 39720
MATERIAL	9010 TC N.C.	11.7	0.2	[illegible]	WEIGHT, LBS. 23700
MATERIAL	5473TL NC	10.0	2.4	[illegible]	WEIGHT, LBS. 24,900
SOLID FUEL	7429 KK N.C.	13.4	0.8	10[07]	WEIGHT, LBS. 42,620
	8573 K N.C.	13.5	0.2	10[32]	WEIGHT, LBS 53,340

TOTAL WEIGHT, LBS. 279,300

I CERTIFY THAT THE ABOVE STATEMENT IS TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF:

SIGNATURE John Bostick

TITLE

TEST NO. 2

PAGE 1 OF 1

DATE 8-9-72

STATEMENT OF PROCESS WEIGHT

FIRM NAME CARGILL, INC.

ADDRESS P.O. BOX 1825 28302 FAYETTEVILLE, N.C.

DATA ON OPERATING CYCLE TIME:

START OF OPERATION, TIME 11^06 AM

END OF OPERATION, TIME 3^20 PM

ELAPSED TIME, MINUTES = 120 (TESTING)

IDLE TIME DURING CYCLE, MINUTES

NET TIME OF CYCLE, MINUTES

DATA ON MATERIAL CHARGED TO PROCESS DURING OPERATING CYCLE:

		% MOISTURE	% FM	TIME	
MATERIAL	3934 KS N.C.	13.0	4.5	11^06 AM	WEIGHT, LBS. 47500
MATERIAL	14 TV NC	14.4	1.5		WEIGHT, LBS. 15,540
MATERIAL	6566 AH N.C.	13.2	0.2	11^36 AM	WEIGHT, LBS. 17420
MATERIAL	55195 NC	12.2	1.0	1^22	WEIGHT, LBS. 4440
MATERIAL	13088 SC.	12.6	1.0	2^30	WEIGHT, LBS. 42,100
MATERIAL	20512 F NC	11.6	2.4	2^40	WEIGHT, LBS. 38,320
SOLID FUEL	5035 R N.C.	11.4	2.8	2^52	WEIGHT, LBS. 30,340
	6566 RH N.C.	13.0	2.0	3^12	WEIGHT, LBS. 15,300

TOTAL WEIGHT, LBS. 210,960

I CERTIFY THAT THE ABOVE STATEMENT IS TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF:

SIGNATURE John Kuttle

TITLE Supervisor

TEST NO. 3

PAGE 1 OF 1

DATE 8-10-72

STATEMENT OF PROCESS WEIGHT

FIRM NAME CARGILL, INC

ADDRESS P.O.B. 1825 FAYETTVILLE N.C. 28302

DATA ON OPERATING CYCLE TIME:

START OF OPERATION, TIME 8 23

END OF OPERATION, TIME 10 43

ELAPSED TIME, MINUTES 140

IDLE TIME DURING CYCLE, MINUTES

NET TIME OF CYCLE, MINUTES

DATA ON MATERIAL CHARGED TO PROCESS DURING OPERATING CYCLE:

		TRUCK NO.	% MOISTURE	% FM	TIME		
#1	MATERIAL	10375 SC	13.3	2.8	8 35	WEIGHT, LBS.	40420
	MATERIAL	9434 KN N.C.	12.7	1.0	8 37	WEIGHT, LBS.	32100
	MATERIAL	9431 KM N.C.	12.4	1.2	8 51	WEIGHT, LBS.	20120
	MATERIAL	13079 SC	12.3	0.9	9 05	WEIGHT, LBS.	44140
	MATERIAL	10337 SC	9.6	1.0	9 31	WEIGHT, LBS.	42920
#6	MATERIAL	1939 KL N.C.	10.5	1.3	9 32	WEIGHT, LBS.	38170
#7	SOLID FUEL	7435 KK N.C.	12.9	4.0	9 49	WEIGHT, LBS.	47220
	MATERIAL	3934 KS N.C.	12.8	2.2	10 23	WEIGHT, LBS.	45020
						TOTAL WEIGHT, LBS.	316,020

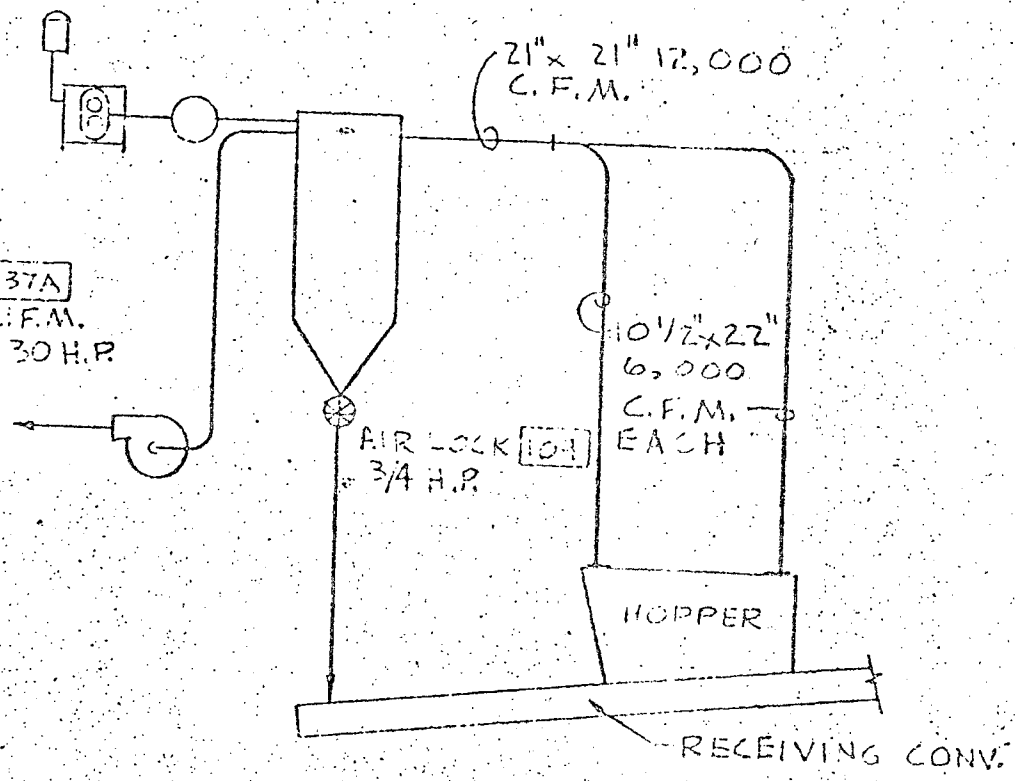
I CERTIFY THAT THE ABOVE STATEMENT IS TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF:

SIGNATURE John Bostick

TITLE SCALE OPERATOR

FILTER KICE 732
MODEL 5100-10
1100 S.F. CLOTH
10.9:1 RATIO

AIR BLOWER 737B
.5 H.P.



SYSTEM NO. 2 FLOW

REVISION	LOCATION	DESIGNED	TRUCK PIT SYSTEM NO. 2	JOB NO.
ORIGINAL ISSUE			DUST COLLECTION	FAY-1
ADDED FILTER DATA		DRAWN SPS		SHEET NO. DC-2 / ISSUE B
		CHECKED GJC	CARGILL, INCORPORATED	

APPENDIX C

Field Data Sheets

ENVIRONMENTAL ENGINEERING INC.
Gainesville, Florida

SOURCE SAMPLING FIELD DATA SHEET

Plant Cargill INC Fayetteville NC.
Sampling Location Truck Dump Bag House
Date 8-8-72 Run No. 2
Time Start 14:05 E.S.T. Time End 14:10 10:35
Sampling Time/Point 4 min. 114 (total)
DB 84 °F, WB ____ °F, VF @ DP ____ "Hg
Moisture 2 %, FDA ____, Gas Density Factor ____
Barometric Press 29.73 "Hg, Stack Press 29.62 "Hg
Weather Clear
Temp. 85 °F, W/D ____, W/S ____
Sample Box No. 1 Meter Box No. 5
Meter ΔH@ 1.68 Pitot Corr. Factor 0.83
Nozzle Dia. .1875 in., Probe Length 4 ft
Probe Heater Setting —
Stack Dimensions: Inside Diameter 23.25 in
Inside Area ____ ft²
Height ____ ft

velocity H. is unsteady

* last Power

Mat'l Processing Rate ____
Final Gas Meter Reading 461.534 ft³
Initial Gas Meter Reading 371.450 ft³
Total Condensate in Impingers 21 ml
Moisture in Silica Gel 17.6 gm
Silica Gel Container No. 27 Filter No. 50
Orsat: CO_2 ____
O_2 ____
CO ____
N_2 ____
Excess Air ____
Test Conducted by: ____

Remarks: * stopped after 5 min, started next day.

Port and Traverse Point No.	Distance from End of Port (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Gas Sample Temp. @ Dry Gas Meter (°F)		Sample Box Temp. (°F)	Last Impinger Test (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual		In	Out			
Port A										Stop watch		
14	~~22 5/8~~ 23 1/8	1205	371.450	1.5	1.85	1.85	~~90~~	~~96~~	78	0	—	~~2.0~~
13	22 5/8	~~1205~~	378.5	1.5	1.85	1.85	90	96	98	~~0~~		2.0
12	20 15/16		382.0	1.6	1.99	1.99	78	77	78	8		1.0
11	19 27/32		385.3	1.9	2.31	2.31	78	77	78	12		1.0
10	18 1/2		387.7	1.95	2.4	2.40	78	77	78	16		1.2
9	17		391.7	1.9	2.31	2.31	78	78	78	20		1.0
8	14 3/4		394.8	1.6	1.99	1.99	78	79	78	24		.5

RUN 1

Port and Traverse Point No.	Distance from End of Port (in)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Gas Sample Temp. @ Dry Gas Meter (°F)		Sample Box Temp. (°F) Stop watch	Last Impinger Temp. (°F)	Vacuum on Sample Train
					Calc.	Actual		In	Out			
7	8 1/4		398.3	1.50	1.85	1.85	78	80	78	28		.5
6	6 1/4		402.3	1.40	1.75	1.75	78	80	78	32	73	.5
5	4 2/3		404.5	1.20	1.49	1.49	80	81	79	36		.2
4	3 1/3		407.9	1.40	1.75	1.75	80	81	79	40		1.0
3	2 5/16		—	.35	.435	.435	80	81	79	44		—
2	1 5/8		~~415.800~~	1.1	1.35	1.35	80	82	80	48		1.0
1	~~3/32~~	END	415.860	1.1	1.35	1.35	80	82	80	52	—	1.0
PORT B.	1 5/16											
14		—	421.4	~~.95~~	1.19	1.19	82	83	81	0	—	.5
13			~~421.46~~	0.95	1.19	1.19	82	83	81	4		.5
12			424.1	0.97	1.20	1.20	82	84	81	8	75	.5
11			427.1	1.1	1.36	1.36	82	85	82	12		.5
10			430.0	1.1	1.36	1.36	82	85	82	16		.5
9			432.8	1.15	1.40	1.40	82	86	83	20		.5
8			435.6	1.20	1.49	1.49	82	86	83	24		.5
7			439.2	1.70	2.1	2.1	82	87	83	28		1.
6			443.0	1.50	1.85	1.85	82	87	84	2		1.
5			445.9	1.40	1.75	1.75	82	88	84	6		1.
4			449.2	1.25	1.51	1.51	82	88	85	10		1
3			452.7	1.80	2.2	2.2	82	88	85	14		1
2				1.70	2.1	2.1	82	88	85	18		1
1	END	—	461.534	~~1.70~~	~~2.1~~	~~2.1~~	~~82~~	~~84~~	~~85~~	22	—	~~1~~
			Ran extra 2 minutes									

15 6 6 6 11

ENVIRONMENTAL ENGINEERING, INC.
Gainesville, Florida

SOURCE SAMPLING FIELD DATA SHEET

Plant Cargill INC Fayetteville NC.
Sampling Location TRUCK DUMP. Bag House
Date 8-9-72 Run No. 2
Time Start 11:06 Time End 15:25
Sampling Time/Point 4/pt (16 total)
DB 88 °F, WB ____ °F, VF @ DP ____ "Hg
Moisture 2 %, FDA ____, Gas Density Factor ____
Barometric Press 29.73 Hg, Stack Press 2902 "Hg
Weather Clear
Temp. 85 °F, W/D ____, W/S ____
Sample Box No. 1 Meter Box No. 5
Meter ΔH@ 1.60 Pitot Corr. Factor 0.83
Nozzle Dia. .375 in., Probe Length 4 ft
Probe Heater Setting ____
Stack Dimensions: Inside Diameter 23.25 in
Inside Area ____ ft2
Height ____ ft

Mat'l Processing Rate ____
Final Gas Meter Reading 547.440 ft3
Initial Gas Meter Reading 461.673 ft3
Total Condensate in Impingers 16 ml
Moisture in Silica Gel 14.1 gm
Silica Gel Container No. 31 Filter No. 51
Orsat: CO_2 ____
O_2 ____
CO ____
N_2 ____
Excess Air ____
Test Conducted by: G. Allen
K McFall
Remarks: Stopped testing @ 11:50 No more Trucks

Port and Traverse Point No. (Scott Port B)	Distance from End of Port (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Gas Sample Temp. @ Dry Gas Meter (°F)		Sample Box Temp. (°F) (Stop Watch)	Last Impinger Test (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual		In	Out			
14		1106	461.673	~~1.0~~	~~1.25~~	~~1.25~~	~~88~~	~~91~~	~~90~~	0	—	~~1~~
13		1106	467.3	1.0	1.25	1.25	88	91	90	6		1
12			469.9	0.94	1.16	1.16	88	92	90	8		.8
11			472.6	0.94	1.16	1.16	88	93	90	12		.8
10			475.4	1.0	1.25	1.25	88	93	91	16		1
9			478.3	1.0	1.25	1.25	88	93	91	20		1
8			481.1	1.05	1.30	1.30	89	94	92	24		

RUN 2

Port and Traverse Point No.	Distance from End of Port (in)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Gas Sample Temp. @ Dry Gas Meter (°F)		Sample Box Temp. (°F) STOP Watch	Last Impinger Temp. (°F)	Vacuum on Sample Train
					Calc.	Actual		In	Out			
7			484.2	1.35	1.68	1.68	89	95	92	28	—	1.9
6			487.9	1.40	1.75	1.75	89	95	92	2		2
5			490.7	1.30	1.60	1.60	89	95	92	6		1.9
4			493.7	1.20	1.49	1.49	89	96	93	10		1.7
3		13:10	497.1	1.50	1.85	1.85	91	98	99	14		.5
2			~~500.235~~	1.20	1.49	1.49	91	98	98	18		.5
1		—	502.235	~~1.30~~	~~1.49~~	~~1.49~~	~~91~~	~~98~~	~~98~~	22	—	~~.5~~
Port A.	(Run 4)		minutes Because a Truck was Dumping							26		
14		—	502.235	~~1.35~~	~~1.55~~	~~1.55~~	~~91~~	~~98~~	99	0	—	~~.5~~ 2.0
13		14:15	512.3	1.25	1.55	1.55	91	98	99	4		.5
12			515.5	1.30	1.60	1.60	91	97	99	8		—
11			518.8	1.30	1.60	1.60	92	97	99	12		—
10			521.8	1.20	1.49	1.49	92	97	99	16		—
9			524.5	1.20	1.49	1.49	92	97	99	20		—
8			527.8	1.15	1.42	1.42	92	97	98	24		—
7			530.7	1.0	1.25	1.25	92	97	98	28		—
6			533.4	0.85	1.06	1.06	92	97	98	2		—
5			~~536.3~~	0.90	1.1	1.10	92	97	98	6		—
4			539.1	1.1	1.35	1.35	92	97	98	10		—
3		15:09	541.7	1.0	1.25	1.25	92	97	98	14		—
2			~~544.1~~ 544.0	1.1	1.35	1.35	93	97	98	18		
1		—	~~547.220~~	~~1.1~~	~~1.35~~	~~1.35~~	~~93~~	~~97~~	~~98~~	22	—	—
										26		

ENVIRONMENTAL ENGINEERING, INC.
Gainesville, Florida

SOURCE SAMPLING FIELD DATA SHEET

Plant Cargill INC. Fayetteville NC
Sampling Location Truck Dump Bag House
Date 8-10-72 Run No. 3
Time Start 8:25 Time End 10:20
Sampling Time/Point 4 min/pt (1/12 Test 1)
DB ____ °F, WB ____ °F, VF & DP ____ "Hg
Moisture 2 %, FDA ____, Gas Density Factor ____
Barometric Press 29.73 "Hg, Stack Press 29.02 "Hg
Weather cloudy.
Temp. ____ °F, W/D ____, W/S ____
Sample Box No. 1 Meter Box No. 5
Meter ΔH@ 1.68 Pitot Corr. Factor 0.83
Nozzle Dia. .1875 in., Probe Length 4 ft
Probe Heater Setting —
Stack Dimensions: Inside Diameter 23.25 in
Inside Area ____ ft²
Height ____ ft

Mat'l Processing Rate ____
Final Gas Meter Reading 625.680 ft³
Initial Gas Meter Reading 547.901 ft³
Total Condensate in Impingers 20 ml
Moisture in Silica Gel 15.1 gm
Silica Gel Container No. 30 Filter No. 52
Orsat: CO_2 ____
O_2 ____
CO ____
N_2 ____
Excess Air ____
Test Conducted by: G. Allen
K. McFall

Remarks: ~~1/4~~ Bag house is Cleaning Bag 5.

Port and Traverse Point No.	Distance from End of Port (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Gas Sample Temp. @ Dry Gas Meter (°F)		Sample Box Temp. (°F)	Last Impinger Test (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual		In	Out	STOP Watch		
Port A												
14		0	547.901	—	—	—	—	—	—	—	—	—
13		8:25	553.0	1.0	1.22	1.22	71	71	72	0		1.2
12			555.8	1.2	1.5	1.5	71	71	72	8	67	.5
11			558.9	1.3	1.6	1.6	71	71	72	12		.5
10			562.2	1.25	1.52	1.52	71	71	72	16		.5
9			565.1	1.20	1.5	1.5	73	71	72	20		.5
8			568.1	1.15	1.42	1.42	74	71	72	24		.5

Same as Run #1
Same as Run #2

RUN 3

Port and Traverse Point No.	Distance from End of Port (in)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Gas Sample Temp. @ Dry Gas Meter (°F)		Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train
					Calc.	Actual		In	Out			
7			570.7	1.0	1.22	1.22	74	71	72	28		-5
6			573.4	0.95	1.19	1.19	74	71	72	2		-5
5			576.0	0.85	1.05	1.05	74	71	72	6		-5
4			578.8	0.92	1.15	1.15	74	71	72	10		-5
3			581.7	1.40	1.75	1.75	74	71	72	14		-5
2			587.950	1.2	1.5	1.5	74	71	72	18		-5
1		—	593.1	1.2	1.5	1.5	74	71	72	22	—	-5
Port B.										26		
14		—	593.1	0.25	0.97	0.97	74	72	72	0	—	-5
* 13			~~593.1~~	0.75	0.97	0.97	74	72	72	4	—	-5
12			595.7	0.75	0.97	0.97	73	72	72	8	—	-5
11			598.2	0.75	0.97	0.97	72	72	72	12		-5
10			600.6	0.75	0.97	0.97	72	72	72	16		-5
9			603.1	0.70	0.88	0.88	72	72	72	20		-5
8			606.4	0.85	1.05	1.05	72	72	72	24		-5
7			608.7	1.1	1.35	1.35	72	72	72	28		-5
6			611.5	1.05	1.30	1.30	72	72	72	2		-5
5			614.0	0.92	1.15	1.15	72	72	72	6		-5
4			617.0	1.25	1.55	1.55	72	72	72	10		-5
3			619.9	0.85	1.05	1.05	72	72	72	14		-5
2			~~625.688~~	1.30	1.60	1.60	72	72	72	18		-5
1		—	~~625.688~~	1.30	1.60	1.60	72	72	72	26	—	-5
										26		

APPENDIX D

Complete Sampling Procedures

COMPLETE SAMPLING PROCEDURES FOR PARTICULATE STACK EMISSIONS

Sampling Procedure

Prior to performing the actual particulate emission tests, certain preliminary stack parameters had to be estimated or determined for the source. This preliminary data included the average temperature, velocity head, moisture content, stack diameter, and number of sampling points.

The stack gas temperature was determined by using bimetallic thermometers and mercury bulb thermometers.

Velocity head measurements were determined across the stack diameter by using a calibrated S-type pitot tube with an inclined manometer. This data was used to select the sampling nozzle diameter.

The approximate moisture content of the stack gas was determined by the wet bulb and dry bulb thermometer technique.

The sampling traverse points were selected according to Method 1 of the Federal Register (Volume 36, Number 247, Part II, December 23, 1971).

The stack emissions were sampled by using the following sample train: a stainless steel nozzle; a glass-lined probe; a Gelman Type A glass fiber filter; two impingers with 100 ml of distilled water; one dry impinger; one impinger with approximately 180 grams of silica gel (the second impinger had a standard tip, while the first, third and fourth impingers had modified tips with 1/2-inch ID openings); a thermometer on the last impinger; a flexible sample line; an air-tight pump; a dry test meter; and finally, a calibrated orifice with an inclined manometer. Figure 2 shows a schematic arrangement of the sampling train.

Because the stack temperature was less than 100°F and the moisture content was low, the probe and the filter holder portions of the sampling train were not heated.

The impinger portion of the sampling train was iced down to collect the condensable moisture in the stack gas.

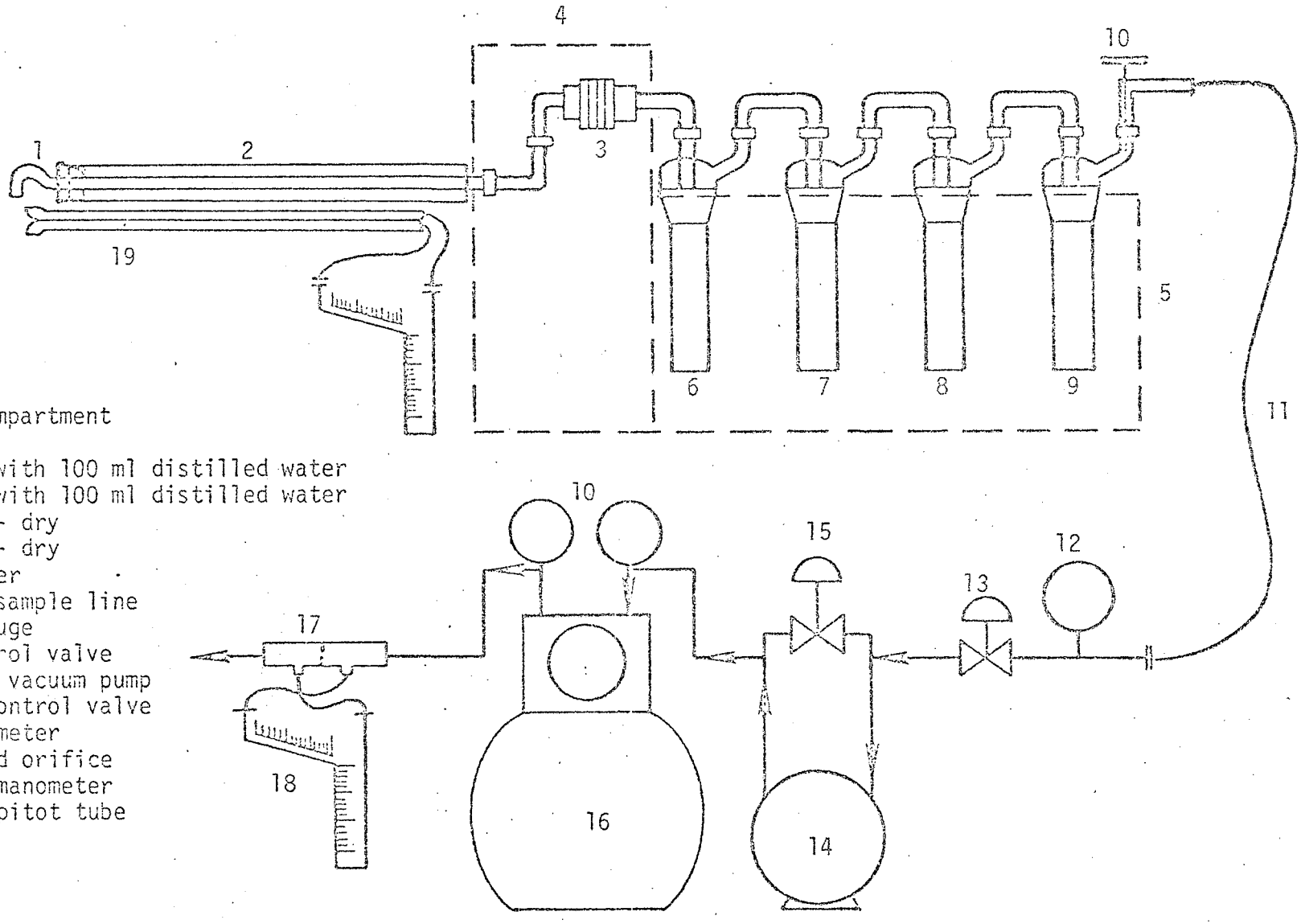
Each point sampled across the stack diameter was sampled at an isokinetic sampling rate.

Sample Recovery

Samples were recovered in accordance with procedures outlined in Method 5 of the Federal Register (36 F.R., March 31, 1971), Determination of Particulate Emissions from Stationary Sources.

The sampling train glassware, exclusive of the glass lined probe and the fritted disc filter, were soaked in chromic acid cleaning solution for two hours previous to the preparation of sample blanks. The probes were thoroughly washed in chromic acid solution prior to testing. They were not soaked due to their cumbersome length. All sampling glassware was rinsed extensively with distilled water following the acid wash.

All samples were turned over to the Project Officer for additional labeling and analysis.



1. Nozzle
2. Probe
3. Filter
4. Heated Compartment
5. Ice Bath
6. Impinger with 100 ml distilled water
7. Impinger with 100 ml distilled water
8. Impinger - dry
9. Impinger - dry
10. Thermometer
11. Flexible sample line
12. Vacuum gauge
13. Main control valve
14. Air tight vacuum pump
15. By-pass control valve
16. Dry test meter
17. Calibrated orifice
18. Inclined manometer
19. "S" type pitot tube

Figure 2

APPENDIX E

Field Test Log

TEST LOG

August 7, 1972

10 a.m. - Left Gainesville, Florida for Fayettefille, N. C.

4 p.m. - Arrived in Fayetteville, picked up the equipment and went to Cargill, Inc.'s plant on River Road. Met Mr. Paul Hankey of Cargill, Inc. and left equipment at the plant.

August 8, 1972

8 a.m. - Arrived at plant, met with Paul Hankey of Cargill, Inc., Tom Ward and Bill Polglase of EPA.

9 a.m. - Started setting up equipment and built scaffolding.

1 p.m. - Made preliminary tests and finished setting up.

3 p.m. - Started 1st run, only tested 5 minutes because no trucks were dumping.

August 9, 1972

7:30 a.m. - Arrived at plant and set up to test.

8:30 a.m. - Began 1st test.

10:35 a.m. - Finished 1st test.

11:06 a.m. - Started 2nd test.

1:25 p.m. - Finished 2nd test. Had to stop several times during the test because no trucks were dumping.

August 10, 1972

7:20 a.m. - Arrived at plant and set up to test.

8:25 a.m. - Began 3rd test.

10:30 a.m. - Finished 3rd test. Gave all samples to Tom Ward.

9:30 p.m. - Arrived in Gainesville, Florida.

APPENDIX F

Project Participants

PROJECT PARTICIPANTS

ENVIRONMENTAL ENGINEERING, INC.

Name	Title
John Koogler, Ph.D., P.E.	Project Director
George Allen, Sr. Technician	Project Manager
Ken McFall, Technician	Environmental Specialist

ENVIRONMENTAL PROTECTION AGENCY

Thomas E. Ward	Project Test Officer
Bill Polglase	Project Engineer