(Tests 3 & 5 described on page 303, LA APC Manual (AP-40))

A STUDY

OF

FIVE SOURCE TESTS ON

EMISSIONS FROM SECONDARY LEAD SMELTERS

SECONDARY LEAD SMELTING
AP-42 Section 7.11
Reference Number 8

by

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EXCELLENT!

CONTAINS:

- PART. SIZE
- PART. FACTORS
- SO_2 "
- CO "
- H_2SO_4 MIST "
- ORG. ACID "

* * * *

County of Los Angeles -

Air Pollution Control District

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Director of Engineering

* * * *

Environmental Protection Agency

Order No. 2PO-68-02-3326

February 11, 1972

AIR POLLUTION CONTROL DISTRICT - COUNTY OF [illegible]

SUMMARY OF LEAD MELTING TESTS

Test No.	Type of Equipment	Size of Furnace	Material Charged	Process Weight	Emissions Discharged from baghouse - dust and fumes	Emissions Discharged SO_2 - NO_2	Opacity of Emissions from [illegible] and control system.
1	Lead [illegible]ola Furnace Controlled by an [illegible]terburner and [illegible]house	66" x 50"	Battery Plates, By-Products, slag, silica, limestone, iron and coke	12,984 lbs/hr.	1.3 lbs/hr.	0.117% by vol.	None from baghouse. Periodic emissions of 40-60% from charging opening of furnace.
2	Lead [illegible]ola Furnace Controlled by an [illegible]terburner and [illegible]house	42" dia.	Battery Plates, By-Products, slag, silica, limestone, iron and coke	7,590 lbs/hr.	Not measured	0.0[illegible]% by vol.	None
3	Lead [illegible]ola Furnace Controlled by an [illegible]terburner and [illegible]house	30" dia.	Battery Plates, By-Products, slag, silica, limestone, iron and coke	2,670 lbs/hr.	3.9 lbs/hr.	0.03% by vol.	None from baghouse. Emissions from the charging opening averaged 1 min. and 30 sec. of 30% to 60% for 3 hr. test period.
4	Lead [illegible]ola Furnace Controlled by an [illegible]terburner and [illegible]house	42" dia.	Battery Plates, By-Products, slag, silica, limestone, iron and coke	7,428 lbs/hr.	5.2 lbs/hr.	Not measured	Emissions from baghouse exhaust varied between 10% and 30% opacity during test.
5	Lead [illegible]reverberatory Furnace Controlled by a [illegible]house	9' W. x 19' L. x 7' H.	Battery Plates and sludge	2500 lbs/hr.	1.2 lbs/hr.	0.[illegible]% by vol.	None

SUMMARY REPORT OF A SOURCE TEST ON A LEAD CUPOLA FURNACE VENTED TO AN AFTERBURNER AND BAGHOUSE CONTROL SYSTEM.

LEAD TEST NO. 1

EQUIPMENT AND PROCESS DESCRIPTION

A lead cupola is built and operated similar to an iron cupola. It consists of a steel shell lined with refractory. Air, under high pressure, is introduced at the bottom for combustion of the coke which provides the heat and a reducing atmosphere. Unburned CO and other contaminants are exhausted from the top into an afterburner where the combustibles are burned. The hot gases then pass through a settling chamber followed by a series of cyclones and radiant cooling columns. Before going into the baghouse, cooling air is mixed with the hot gases to reduce the temperature to a level that the cloth filter bags can withstand.

Material charged to the cupola contained a weighted mix of used automobile battery plates (called groups), plant generated by-products (dross and baghouse catch), cupola slag, silica, limestone, iron turnings, shredded iron and coke. Some of the used battery groups charged to the cupola were wet, having been recently separated from the battery case and some were dry, having been held in storage for a period of time. The baghouse catch contained approximately 95 per cent lead oxide, thus providing an economic incentive to keep losses at a low level.

Metallic lead flowed from the cupola in a continuous stream into a holding pot. From the holding pot the lead was cast into large ingots called "buttons" or "sows". Gases from the cupola were prevented from escaping through the tap hole by a liquid seal. A slight emission from the molten lead occasionally occurred so that this opening was hooded and vented to a separate control system consisting of a small baghouse called "the sanitary system".

The impurities, iron, silica and limestone formed a slag which floated on top of the molten lead in the cupola and was periodically removed. During this period the cupola was open to the atmosphere causing dense emissions to be emitted from the slag opening. These emissions were contained in an enclosed hood and vented to the sanitary baghouse system.

The charging opening at the top of the cupola was also hooded and vented to the sanitary system although, the material charged formed a seal at the opening. However, periodic emissions of 40% to 80% opacity were observed eminating from the top (charge opening) of the cupola for approximately one minute during the one hour test.

The cupola and control system operates 24 hours a day until a breakdown occurs or relining is required. During the test the equipment was operated in a normal manner. No emissions were observed from the baghouse exhaust.

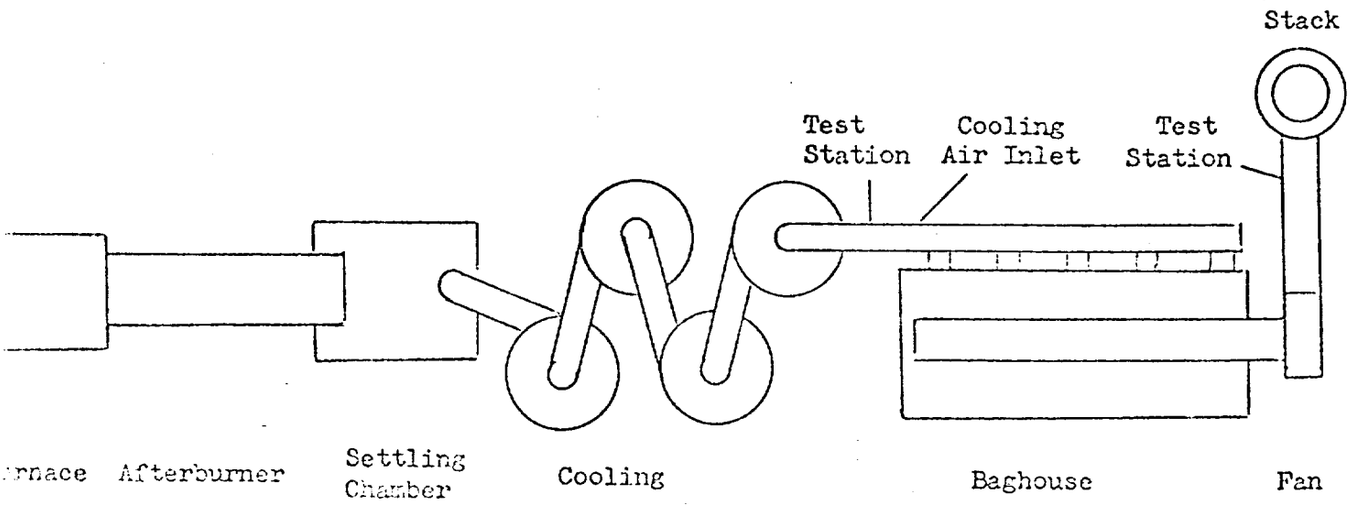
SAMPLING

Sampling was performed in accordance with the Air Pollution Control District's test manual. Measurements were made for dust and fumes, organic acids and

OPERATIONS

The equipment was operated in a normal manner and tested for one hour. During the test 12,634 lbs. of material consisting of battery plates, baghouse dust, furnace slag, silica material, limestone, iron turnings and coke was processed. No emissions were observed from the baghouse exhaust during the test. Periodic emissions of 40% to 80% opacity were observed for one minute twenty seconds from the charging opening of the cupola. The charging hood doors were open when the emissions were observed.

EQUIPMENT DIAGRAM



TEST NO. Lead Dust No. 1

PAGE 3

DATE

SUMMARY: EMISSIONS TO ATMOSPHERE

NAME OF FIRM

LOCATION OF PLANT

TYPE OF OPERATION Lead Refining

UNIT TESTED Baghouse

		MEASURED EMISSIONS		ALLOWABLE EMISSIONS	
RULE 52	PARTICULATE MATTER		GRAINS PER SCF		GRAINS PER SCF
RULE 53A	SULFUR COMPOUNDS AS SO_2	0.117	% BY VOL.		% BY VOL.
RULE 53B	COMBUSTION CONTAMINANTS		GRAINS PER SCF AT 12% CO_2		GRAINS PER SCF AT 12% CO_2
RULE 54	DUST AND FUMES	1.3	LBS. PER HR.	11.88	LBS. PER HR.
	CO_2	1.9	% BY VOL.		
	ALDEHYDES AS HCHO	35	PPM BY VOL.		
	HYDROCARBONS AS HEXANE		PPM BY VOL.		
	NO_X AS NO_2	11	PPM BY VOL.		
	ORGANIC ACIDS AS ACETIC ACID	4	PPM BY VOL.		
	OTHER				
	Pb	0.11	Lb. Per Hr. or 8.4% of Dust and Fumes		

20 900

GAS TEMPERATURE, °F 152

EFFICIENCY OF CONTROL EQUIPMENT, % 92+ (Baghouse for dust and fumes)

NO. Lead Test No. 1 — SUMMARY OF DATA AND RESULTS — PAGE 4 — DATE

SITE, EQUIPMENT, AND TEST CONDITIONS:

1. NAME OF FIRM
2. BASIC EQUIPMENT: Lead Melting Cupola Furnace
3. CONTROL EQUIPMENT: Afterburner, Cyclone, Baghouse
4. EQUIPMENT TESTED: Baghouse
5. PROCESS WEIGHT, LBS PER HOUR: 12,984
6. PROCESS DESCRIPTION:
7. TESTING CONDITION AND LOCATION: Inlet of Baghouse | Outlet of Baghouse

FLOW AND ANALYSIS:

	Inlet of Baghouse	Outlet of Baghouse
8. GAS TEMPERATURE, °F	260	152
9. GAS VELOCITY, FPS	45.7	91.9
10. GAS FLOW RATE, SCFM	9900	20,900
11. GAS ANALYSIS, VOL %, DRY BASIS:		
CARBON DIOXIDE	4.2	
OXYGEN	16.8	
CARBON MONOXIDE	1.5	
NITROGEN	77.5	
12. GAS ANALYSIS, VOL %, STACK BASIS:		
WATER VAPOR	8.7	
CARBON DIOXIDE	3.8	
OXYGEN	15.3	
CARBON MONOXIDE	1.4	
NITROGEN	70.8	

CONTAMINANTS MEASURED:

13. MATERIAL COLLECTED	Org. Acids	Sulfur as SO_2	Dust and fumes	Dust and fumes
14. TOTAL GAS VOLUME SAMPLED, SCF	26.9	26.9	49.1	51.6
15. WEIGHT COLLECTED, GRAMS	0.008	2.395	8.412	0.025
16. MATERIAL CONCENTRATION:				
GRAINS PER SCF	0.0046	1.38	2.64	0.0075
GRAINS PER SCF AT 12% CO_2				
VOLUME PER CENT		0.117		
PARTS PER MILLION BY VOLUME	4	1170		
17. MATERIAL FLOW RATE, LBS PER HOUR	0.39	117	224	1.3

EFFICIENCY OF CONTROL EQUIPMENT:

18. MATERIAL IN, LBS PER HOUR
19. MATERIAL OUT, LBS PER HOUR
20. EFFICIENCY, %: 99+

(OUTLET)

Run No. 1 PAGE 5

LOCATION Inlet to Baghouse DATE

SAMPLING TRAIN DATA AND CALCULATIONS

TIME	GAS METER: READING CU. FT. V_M	GAS METER: VAC. IN. HG P_M	GAS METER: TEMP. °F T_M	IMPINGER TEMP. °F T_I	V_m	P_m	T_M	T_I	
	Dust and Fumes 30.84 T-C				Organic Acids and SO_2 83.80				
+5	35.3	6.2		68	87.3	6.1		80	
+10	40.5	6.4		62	91.0	7.0		78	
+15	45.6	6.6		78	94.6	7.6		74	
+20	50.7	6.8		72	99.0	8.4		70	
+25	55.8	7.0		70	103.5	9.0		66	
+30	60.9	7.0		68	108.0	9.4		62	
+35	65.9	7.2		67	112.5	9.5		62	
+40	71.0	7.2		64	115.7	9.9		61	
+45	76.0	7.5		62	116.75	*		60	
+50	81.2	7.4		64	117.2	10.5		58	
+55	86.2	7.2		62	117.6	10.6		56	
+60	91.35	7.4		61	118.15	10.8		58	
[illegible]	60.51	7.0	60	70	34.35	9.0	60	66	
	Inv. vol	Av.		Av.	Wet. vol	Av.		Av.	
	* Impinger temporarily plunged								

MATERIAL COLLECTED Dust and Fumes Organic Acids and SO_2

WEIGHT COLLECTED, GRAMS:

		SO_2 - 2.395
Whatman Thimble	0.082	
Water Soluble Residue	1.815	HAC - 0.008
Recovered Solids	6.500	
$H_2SO_4 \cdot 2H_2O$	-(0.045)	
TOTAL WEIGHT	8.412	

SAMPLING POINT

SAMPLING NOZZLE I.D., MM 6.35

ATMOS. PRESSURE, P_A, IN. HG 29.9

	Dust and Fumes	SO_2 - Org. Acid
STACK GAS FLOW RATE, SCFM	9900	9900
WATER VAPOR CONDENSED, LIQUID VOLUME, ML	60	65
WATER VAPOR CONDENSED, VAPOR VOLUME, 0.0464 x C, SCF	2.8	3.0
TOTAL GAS VOLUME SAMPLED, D + E, SCF	49.1	26.9
MATERIAL CONCENTRATION, 15.43 x A/F, GRAINS/SCF	2.64	SO_2 1.38 HAC 0.0046

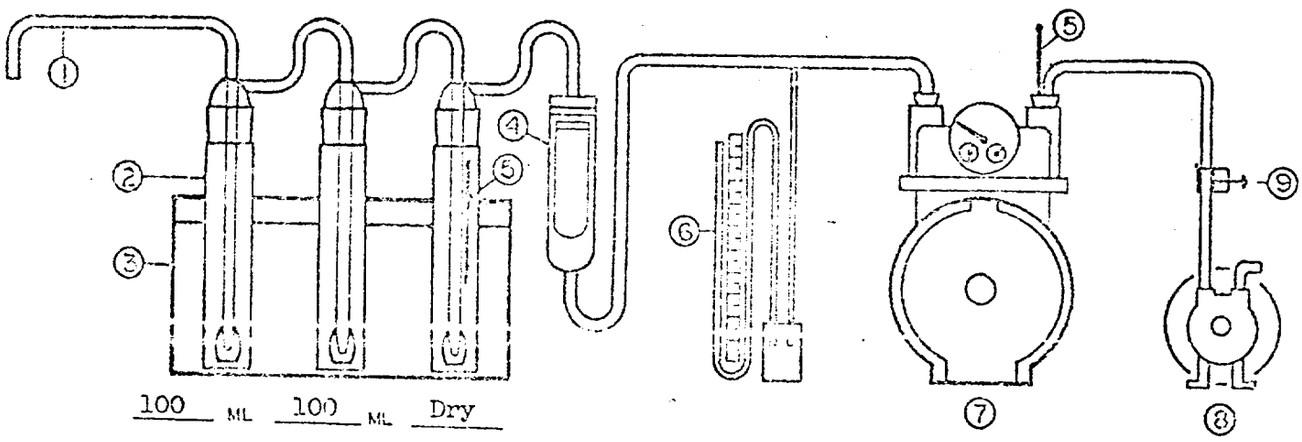
T No. Lead Test No. 1

DATE _____

SAMPLING APPARATUS

FOR

DUST AND FUMES



1. SAMPLING PROBE
2. IMPINGER (DUST CONCENTRATION SAMPLER)
3. ICE BATH CONTAINER
4. DRY FILTER Whatman paper thimble
5. THERMOMETER
6. MERCURY MANOMETER
7. SPRAGUE DRY GAS METER (ZEPHYR NO. 1A)
8. VACUUM PUMP
9. HOSE CLAMP TO CONTROL GAS FLOW RATE

IMPINGER SOLUTION deionized water

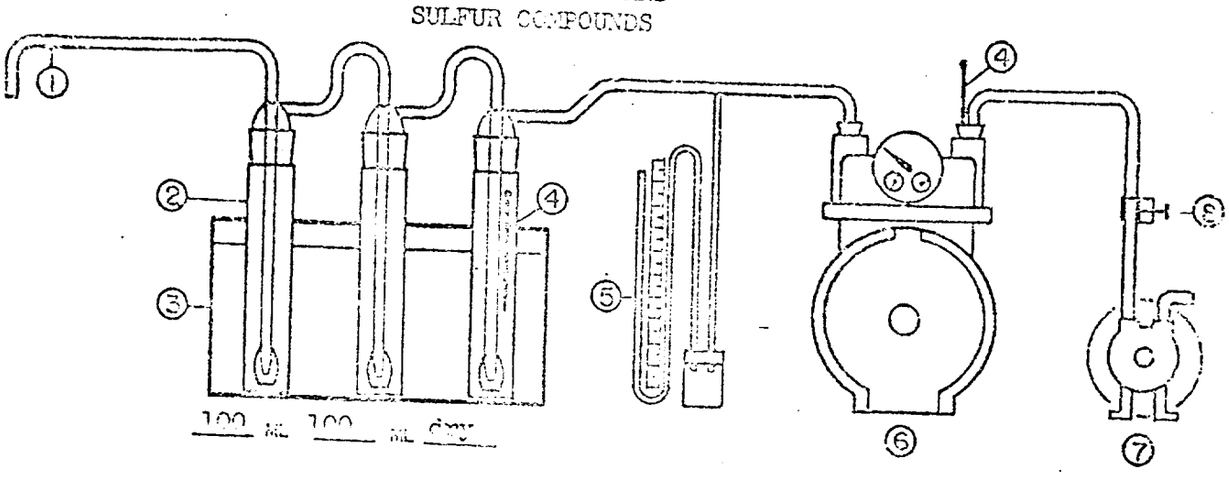
TEST NO. Lead Test No. 1

PAGE 7

DATE

SAMPLING APPARATUS

FOR
ORGANIC ACIDS AND
SULFUR COMPOUNDS



1. SAMPLING PROBE
2. IMPINGER (DUST CONCENTRATION SAMPLER)
3. ICE BATH CONTAINER
4. THERMOMETER
5. MERCURY MANOMETER
6. SPRAGUE DRY GAS METER (ZEPHYR NO. 1A)
7. VACUUM PUMP
8. HOSE CLAMP TO CONTROL GAS FLOW RATE

IMPINGER SOLUTION 5% sodium hydroxide solution

PEDRO STREET, LOS ANGELES, CALIF. 90013 - MADISON 9-4711 / COUNTY OF LOS ANGELES

SUMMARY REPORT OF A SOURCE TEST ON A LEAD CUPOLA FURNACE VENTED TO AN AFTERBURNER AND BAGHOUSE CONTROL SYSTEM

LEAD TEST NO. 2

EQUIPMENT AND PROCESS DESCRIPTION ← (SAME AS NO.1)

A lead cupola is built and operated similar to an iron cupola. It consists of a steel sheet lined with refractory. Air, under high pressure, is introduced at the bottom for combustion of the coke which provides the heat and a reducing atmosphere. Unburned CO and other contaminants are exhausted from the top into an afterburner where the combustibles are burned. The hot gases then pass through a settling chamber followed by a series of radiant cooling columns. Before going into the baghouse, cooling air is mixed with the hot gases to reduce the temperature to a level that the cloth filter bags can withstand.

Material charged to the cupola contained a weighted mix of used automobile battery plates (called groups), plant generated by-products (dross and baghouse catch) cupola slag, silica, limestone, iron turnings, shredded iron and coke. Some of the used battery groups charged to the cupola were wet with sulfuric acid from the batteries.

Metallic lead flowed from the cupola in a continuous stream into a holding pot. From the holding pot the lead was cast into large ingots called "buttons" or "sows". Gases from the cupola were prevented from escaping through the tap hole by a liquid seal. A slight emission from the molten lead occasionally occurred so that this opening was hooded and vented to a separate control system consisting of a small baghouse called "the sanitary system".

The impurities, iron, silica and limestone formed a slag which floated on top of the molten lead in the cupola and was periodically removed. During this period the cupola was open to the atmosphere causing dense emissions to be emitted from the slag opening. These emissions were contained in an enclosed hood and vented to the sanitary baghouse system.

The charging opening at the top of the cupola was also hooded and vented to the sanitary system although the material charged formed a seal around the opening.

The cupola and control system operates 24 hours a day until a breakdown occurs or relining is required. During the test the equipment was operated in a normal manner. No emissions were observed from the baghouse exhaust.

SAMPLING

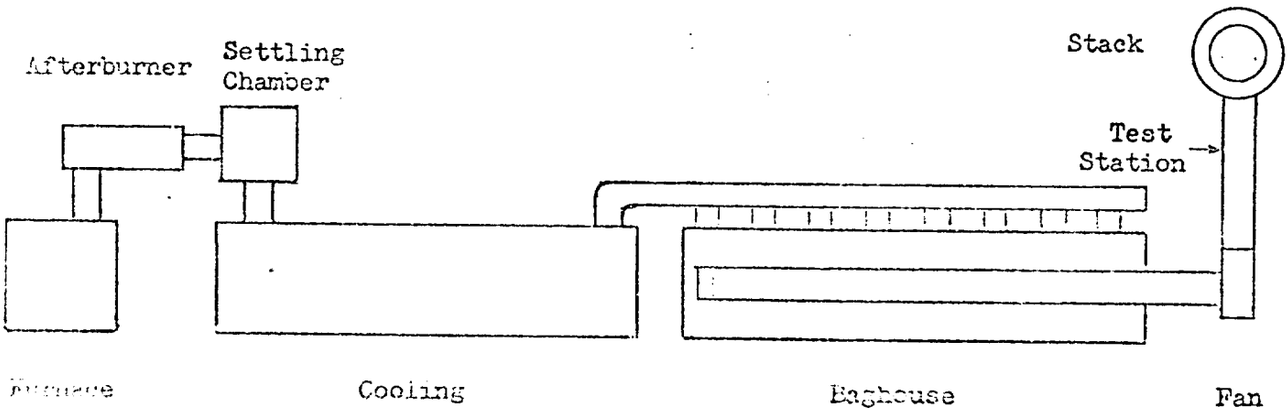
Sampling was performed in accordance with the Air Pollution Control District's test manual. Measurements were made for sulfur compounds only. For sampling apparatus see page 6.

OBSERVATIONS

The equipment was operated in a normal manner and tested for one hour. [During the test 7,500 lbs. of material consisting of battery plates, baghouse dust, [illegible] observations were made concerning the furnace charging, tapping and slagging operations.]

Test No. 2

EQUIPMENT DIAGRAM



NO. Lead Dust No. 2

DATE

SUMMARY: EMISSIONS TO ATMOSPHERE

NAME OF FIRM

LOCATION OF PLANT

TYPE OF OPERATION Lead Refining

UNIT TESTED Baghouse

		MEASURED EMISSIONS		ALLOWABLE EMISSIONS	
RULE 52	PARTICULATE MATTER		GRAINS PER SCF		GRAINS PER SCF
RULE 53A	SULFUR COMPOUNDS AS SO_2	0.041	% BY VOL.		% BY VOL.
RULE 53B	COMBUSTION CONTAMINANTS		GRAINS PER SCF AT 12% CO_2		GRAINS PER SCF AT 12% CO_2
RULE 54	DUST AND FUMES		LBS. PER HR.		LBS. PER HR.
	CO_2		% BY VOL.		
	ALDEHYDES AS HCHO		PPM BY VOL.		
	HYDROCARBONS AS HEXANE		PPM BY VOL.		
	NO_X AS NO_2		PPM BY VOL.		
	ORGANIC ACIDS AS ACETIC ACID		PPM BY VOL.		
	OTHER				

GAS TEMPERATURE, ^{o}F 122

Lead Test No. 2

SUMMARY OF DATA AND RESULTS

PAGE 4
DATE

T SITE, EQUIPMENT, AND TEST CONDITIONS:

1. NAME OF FIRM
2. BASIC EQUIPMENT Lead Melting Cupola Furnace
3. CONTROL EQUIPMENT Afterburner, Baghouse
4. EQUIPMENT TESTED Baghouse Outlet
5. PROCESS WEIGHT, LBS PER HOUR 2,590
6. PROCESS DESCRIPTION
7. TESTING CONDITION AND LOCATION

S FLOW AND ANALYSIS:

8. GAS TEMPERATURE, °F 122
9. GAS VELOCITY, FPS
10. GAS FLOW RATE, SCFM
11. GAS ANALYSIS, VOL %, DRY BASIS:
    - CARBON DIOXIDE
    - OXYGEN
    - CARBON MONOXIDE
    - NITROGEN
12. GAS ANALYSIS, VOL %, STACK BASIS:
    - WATER VAPOR 2.4
    - CARBON DIOXIDE
    - OXYGEN
    - CARBON MONOXIDE
    - NITROGEN

CONTAMINANTS MEASURED:

13. MATERIAL COLLECTED SO_2 H_2SO_4
14. TOTAL GAS VOLUME SAMPLED, SCF
15. WEIGHT COLLECTED, GRAMS
16. MATERIAL CONCENTRATION:

	SO_2	H_2SO_4
GRAINS PER SCF	0.482	0.0009
GRAINS PER SCF AT 12% CO_2		
VOLUME PER CENT	0.041	0.00005
PARTS PER MILLION BY VOLUME	408	0.5

17. MATERIAL FLOW RATE, LBS PER HOUR

CIENCY OF CONTROL EQUIPMENT:

18. MATERIAL IN, LBS PER HOUR
19. MATERIAL OUT, LBS PER HOUR
20. EFFICIENCY, %

...NO. Lead Test No. 2

...LING STATION Exhaust Outlet DATE

SAMPLING TRAIN DATA AND CALCULATIONS

TIME	GAS METER READING CU. FT. V_M	GAS METER VAC. IN. HG P_M	GAS METER TEMP. °F T_M	IMPINGER TEMP. °F T_I	Stack Temp. Ts °F				
11:45	32.88								
+5	36.16	4.50	67	53					
+10	39.57	4.50	66	53	122				
+15	42.73	4.00	65	54	123				
+20	45.68	3.40	64	53					
+25	48.48	3.40	62	52	120				
+30	51.31	3.40	62	50					
+35	53.59	2.60	61	50	120				
+40	55.86	2.60	61	48					
+45	58.12	2.60	61	48	122				
+50	60.38	2.60	60	48	123				
+55	62.63	2.60	60	48					
+60	64.85	2.60	60	47					
Totals	31.80	3.2	62	50	122				
	Net	Av.	Av.	Av.	Av.				

MATERIAL COLLECTED SO_2 and H_2SO_4

WEIGHT COLLECTED, GRAMS:

SO_2 0.897

H_2SO_4 0.0017

SAMPLING POINT

SAMPLING NOZZLE I.D., MM

ATMOS. PRESSURE, P_A, IN. HG

. TOTAL WEIGHT

. STACK GAS FLOW RATE, SCFM

. WATER VAPOR CONDENSED, LIQUID VOLUME, ML 7

. WATER VAPOR CONDENSED, VAPOR VOLUME, 0.0464 x C, SCF 0.3

. TOTAL GAS VOLUME SAMPLED, D + E, SCF 28.7

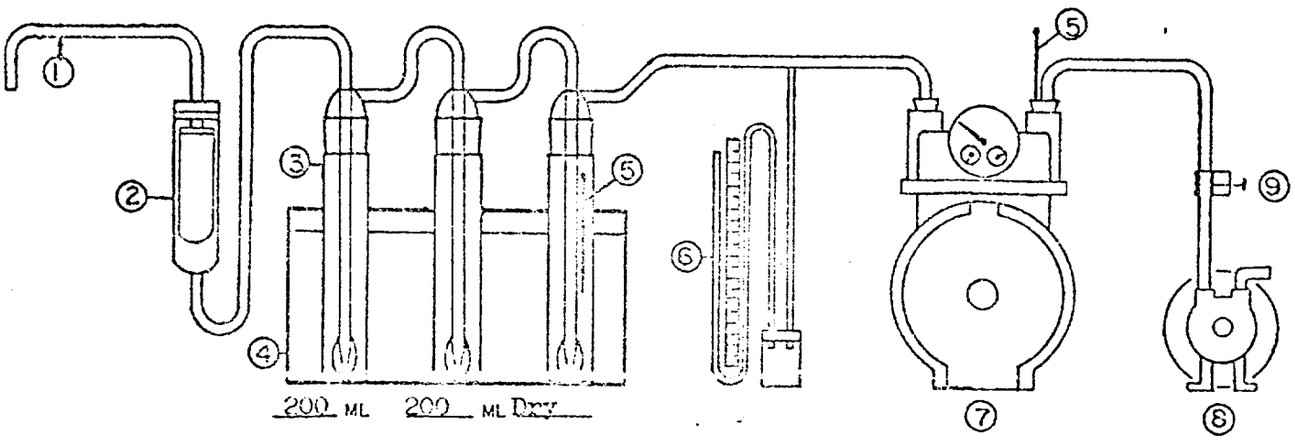
. MATERIAL CONCENTRATION, 15.43 x A/F, GRAINS/SCF SO_2 0.482 H_2SO_4 0.0009

TEST NO. Lead Test No. 2

PAGE 6

DATE

SAMPLING APPARATUS
FOR
SO_2 AND H_2SO_4



1. SAMPLING PROBE
2. DRY FILTER Whatman Paper Thimble
3. IMPINGER (DUST CONCENTRATION SAMPLER)
4. ICE BATH CONTAINER
5. THERMOMETER
6. MERCURY MANOMETER
7. SPRAGUE DRY GAS METER (ZEPHYR NO. 1A)
8. VACUUM PUMP
9. HOSE CLAMP TO CONTROL GAS FLOW RATE

IMPINGER SOLUTION 200 ml. of 5% H_2SO_4 in each of first two impingers

PEDRO STREET, LOS ANGELES, CALIF. 90013 - MADISON 9-4711 / COUNTY OF LOS ANGELES

SUMMARY REPORT OF A SOURCE TEST ON A LEAD CUPOLA FURNACE VENTED TO AN AFTERBURNER AND BAGHOUSE CONTROL SYSTEM

LEAD TEST NO. 3

SAME AS NO.1

EQUIPMENT AND PROCESS DESCRIPTION

A lead cupola is built and operated similar to an iron cupola. It consists of a steel shell lined with refractory. Air, under high pressure, is introduced at the bottom for combustion of the coke which provides the heat and a reducing atmosphere. Unburned CO and other contaminates are exhausted from the top into an afterburner where the combustibles are burned. The hot gases then pass through a settling chamber followed by a series of radiant cooling columns before going into the baghouse.

Material charged to the cupola contained a weighted mix of used automobile battery plates (called groups), plant generated by-products (dross and baghouse catch) cupola slag, silica, limestone, iron turnings, shredded iron and coke.

Metallic lead flowed from the cupola in a continuous stream into a holding pot. From the holding pot the lead was cast into large ingots called "buttons" or "sows". Gases from the cupola were prevented from escaping through the tap hole by a liquid seal.

The impurities, iron, silica and limestone formed a slag which floated on top of the molten lead and was periodically removed.

The material charged formed a seal around the charge opening. [However, periodic emissions of 30% to 60% opacity were observed eminating from the charge opening for approximately 1½ minutes during the one hour test.]

The cupola and control system operates 24 hours a day until a breakdown occurrs or relining is required. During the test the equipment was operated in a normal manner. No emissions were observed from the baghouse exhaust.

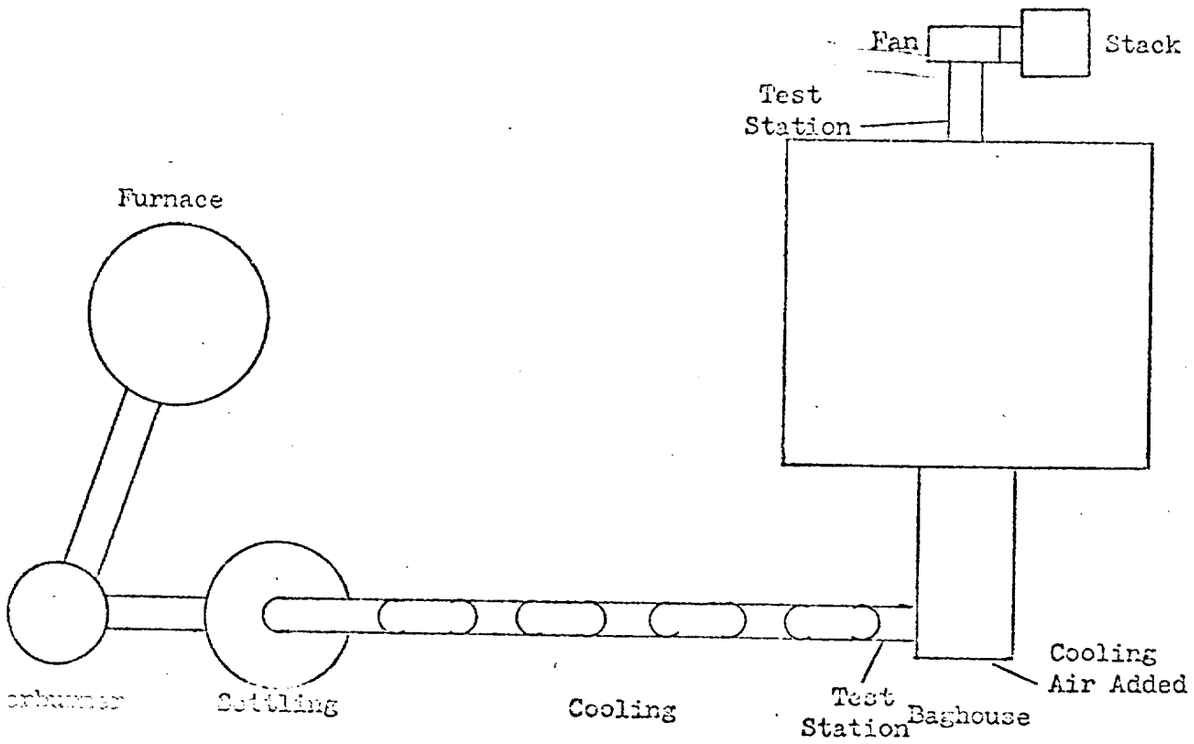
SAMPLING

Sampling was performed in accordance with the Air Pollution Control District's test manual. [Measurements were made for dust and fumes and sulfur compounds.] For sampling apparatus see pages 9 and 10.

OBSERVATIONS

The equipment was operated in a normal manner and tested for one hour. During the test 2,607 lbs. of material consisting of battery plates, baghouse dust, furnace slag, silica material, limestone, iron turnings and coke was processed. No emissions were observed from the baghouse exhaust during the test. [Periodic emissions of 30% to 60% opacity for 1 minute 30 seconds were observed from the charging opening.]

EQUIPMENT DIAGRAM



TEST NO. Lead Test No. 3

PAGE 3

DATE

SUMMARY: EMISSIONS TO ATMOSPHERE

NAME OF FIRM

LOCATION OF PLANT

TYPE OF OPERATION Lead Refining

UNIT TESTED Baghouse

		MEASURED EMISSIONS		ALLOWABLE EMISSIONS	
RULE 52	PARTICULATE MATTER		GRAINS PER SCF		GRAINS PER SCF
RULE 53A	SULFUR COMPOUNDS AS SO_2	0.03	% BY VOL.	0.2	% BY VOL.
RULE 53B	COMBUSTION CONTAMINANTS		GRAINS PER SCF AT 12% CO_2		GRAINS PER SCF AT 12% CO_2
RULE 54	DUST AND FUMES	3.9	LBS. PER HR.	4.81	LBS. PER HR.
	CO_2		% BY VOL.		
	ALDEHYDES AS HCHO		PPM BY VOL.		
	HYDROCARBONS AS HEXANE		PPM BY VOL.		
	NO_X AS NO_2		PPM BY VOL.		
	ORGANIC ACIDS AS ACETIC ACID		PPM BY VOL.		
	OTHER H_2O	3.9	% by Vol.		
	SO_3	none found			

GAS TEMPERATURE, °F 175

Lead Cupola No. 3 SUMMARY OF DATA AND RESULTS

PLE, EQUIPMENT, AND TEST CONDITIONS:

1. NAME OF FIRM
2. BASIC EQUIPMENT Lead Melting Cupola Furnace
3. CONTROL EQUIPMENT Afterburner and Baghouse
4. EQUIPMENT TESTED Baghouse Outlet
5. PROCESS WEIGHT, LBS PER HOUR 2,670
6. PROCESS DESCRIPTION
7. TESTING CONDITION AND LOCATION

FLOW AND ANALYSIS:	Baghouse Inlet	Baghouse Outlet
8. GAS TEMPERATURE, °F	500	175
9. GAS VELOCITY, FPS	22.6	33.2
10. GAS FLOW RATE, SCFM	2120	13,000
11. GAS ANALYSIS, VOL %, DRY BASIS:		
CARBON DIOXIDE		
OXYGEN		
CARBON MONOXIDE		
NITROGEN		
12. GAS ANALYSIS, VOL %, STACK BASIS:		
WATER VAPOR		
CARBON DIOXIDE		
OXYGEN		
CARBON MONOXIDE		
NITROGEN		

CONTAMINANTS MEASURED:	Dust & Fumes	Dust & Fumes	SO_2
13. MATERIAL COLLECTED			
14. TOTAL GAS VOLUME SAMPLED, SCF			
15. WEIGHT COLLECTED, GRAMS			
16. MATERIAL CONCENTRATION:			
GRAINS PER SCF	12.3	0.035	
GRAINS PER SCF AT 12% CO_2			
VOLUME PER CENT			0.03
PARTS PER MILLION BY VOLUME			334
17. MATERIAL FLOW RATE, LBS PER HOUR	229	3.9	

EFFICIENCY OF CONTROL EQUIPMENT:

18. MATERIAL IN, LBS PER HOUR
19. MATERIAL OUT, LBS PER HOUR
20. EFFICIENCY, % 98.3

Load Test No. 3

PARTICLE SIZE DISTRIBUTION

Range, Microns	Baghouse Outlet
0 to 2	0.9
2 to 5	6.4
5 to 10	13.7
10 to 50	51.8
50 to 100	27.2
100 to 250	0.0
+250	0.0

BAGHOUSE OUTLET

Micromerograph Analysis for Particle Size Distribution

d = Particle Size, Microns	% by Weight Smaller than d
110.2	100.0
73.7	89.5
61.5	82.7
49.2	72.1
36.9	57.3
30.7	48.0
27.0	42.5
24.6	38.8
22.1	35.1
19.7	31.8
17.2	29.1
14.8	26.8
12.3	24.1
11.1	22.5
9.8	20.7
8.6	17.3
8.2	16.6
7.9	15.3
7.4	14.7
7.0	13.4
6.6	12.3
6.2	11.1
5.7	9.7
4.9	6.9
4.1	4.7
3.3	3.0
2.5	1.0
2.0	0.9
1.6	0.4
1.2	0.0

Specific Gravity = 5.93 at 80°F

Run No. 3 PAGE 1

STATION Baghouse Outlet DATE

GAS VELOCITY DATA

POINT	VEL. HEAD IN. H_2O	TEMP. °F	VELOCITY FT/SEC	VEL. HEAD IN. H_2O	TEMP. °F	VELOCITY FT/SEC	VEL. HEAD IN. H_2O	TEMP. °F	VELOCITY FT/SEC
R	0.145	182	27.9	0.14	182	27.4			
1	0.33	182	40.9	0.30	182	40.2			
2	0.27	182	36.1	0.30	182	39.6			
3	0.30	182	38.8	0.28	182	37.2			
R	0.14	182	27.4	0.16	182	29.4			
4	0.26	182	37.4	0.27	182	38.1			
5	0.14	182	27.4	0.14	182	27.4			
6	0.13	182	26.4	0.11	182	24.2			
R	0.45	182	27.9	0.15	182	28.3			
7	0.28	182	38.9	0.27	182	38.1			
8	0.22	182	34.4	0.20	182	32.8			
9	0.20	182	32.8	0.18	182	31.2			
R	0.15	182	28.3	0.15	182	28.3			
10	0.25	182	36.7	0.23	182	35.1			
11	0.25	182	36.7	0.25	182	36.7			
12	0.25	182	36.7	0.23	182	35.1			
R	0.16	182	29.4	0.16	182	29.4			

INDICATED VELOCITY (TRAVERSE) FT/SEC 34.6

INDICATED VELOCITY (REFERENCE PT.) FT/SEC 28.4

PITOT TUBE FACTOR, A/B 1.21

PITOT CORRECTION FACTOR 1.0

GAS DENSITY CORRECTION FACTOR

GAS PRESSURE IN STACK, IN. HG. ABS.

GAS PRESS. CORREC. FACTOR, $\sqrt{29.9/P}$

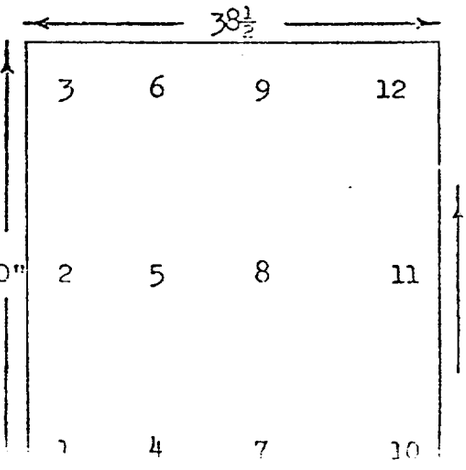
CORRECTED VELOCITY, AxDxExG, FT/SEC

OR BxCxDxExG, FT/SEC

AREA OF FLUE, SQ. FT. 8.0

FLOW RATE, HxJx60, CFM

FLOW RATE, (P/29.9)x520xL/(P+460), SCFM



R-1 60[illegible]

TEST NO. Lead Test No. 3

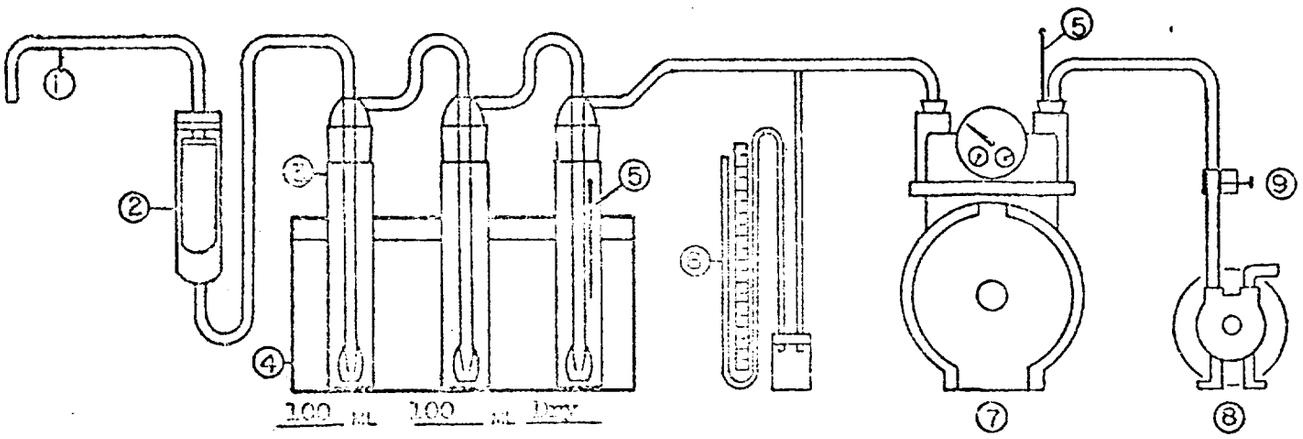
PAGE 8

DATE _____

SAMPLING APPARATUS

FOR

DUST AND FUMES



1. SAMPLING PROBE
2. DRY FILTER Whatman Thimble
3. IMPINGER (DUST CONCENTRATION SAMPLER)
4. ICE BATH CONTAINER
5. THERMOMETER
6. MERCURY MANOMETER
7. SPRAGUE DRY GAS METER (ZEPHYR NO. 1A)
8. VACUUM PUMP
9. HOSE CLAMP TO CONTROL GAS FLOW RATE

IMPINGER SOLUTION _____

Distilled water

_____

_____

16-55-D15

ST NO. Lead Test No. 3

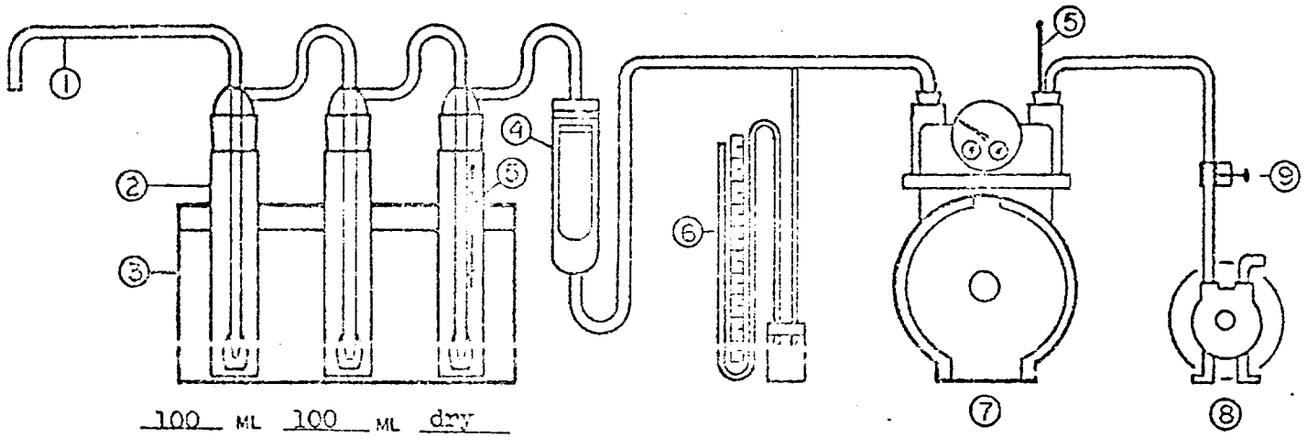
PAGE 9

DATE _____

SAMPLING APPARATUS

FOR

DUST AND FUMES



1. SAMPLING PROBE
2. IMPINGER (DUST CONCENTRATION SAMPLER)
3. ICE BATH CONTAINER
4. DRY FILTER _____
5. THERMOMETER
6. MERCURY MANOMETER
7. SPRAGUE DRY GAS METER (ZEPHYR NO. 1A)
8. VACUUM PUMP
9. HOSE CLAMP TO CONTROL GAS FLOW RATE

IMPINGER SOLUTION Distilled Water

_____

_____

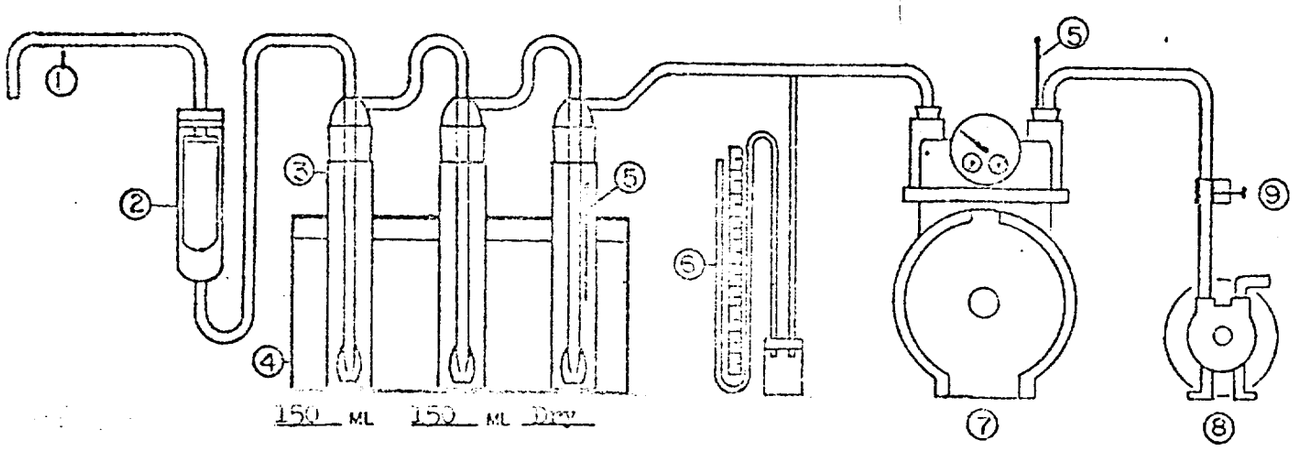
_____

TEST NO. Lead Test No. 3

PAGE 28

DATE

SAMPLING APPARATUS
FOR
SO_2 AND SO_3



1. SAMPLING PROBE
2. DRY FILTER Whatman thimble
3. IMPINGER (DUST CONCENTRATION SAMPLER)
4. ICE BATH CONTAINER
5. THERMOMETER
6. MERCURY MANOMETER
7. SPRAGUE DRY GAS METER (ZEPHYR NO. 1A)
8. VACUUM PUMP
9. HOSE CLAMP TO CONTROL GAS FLOW RATE

IMPINGER SOLUTION

5% NaOH Solution

16-55-D15

SUMMARY REPORT OF A SOURCE TEST ON A LEAD CUPOLA FURNACE VENTED TO AN AFTERBURNER AND BAGHOUSE CONTROL SYSTEM

LEAD TEST NO. 4

EQUIPMENT AND PROCESS DESCRIPTION ← SAME AS NO. 1

A lead cupola is built and operated similar to an iron cupola. It consists of a steel sheet lined with refractory. Air, under high pressure, is introduced at the bottom for combustion of the coke which provides the heat and a reducing atmosphere. Unburned CO and other contaminates are exhausted from the top into an afterburner where the combustibles are burned. The hot gases then pass through a settling chamber and are cooled by passing through a series of radiant cooling columns and a spray chamber where the temperature is reduced to a level that the cloth filter bags can withstand.

Material charged to the cupola contained a weighted mix of used automobile battery plates (called groups), plant generated by-products (dross and baghouse catch) cupola slag, silica, limestone, iron turnings, shredded iron and coke.

Metallic lead flowed from the cupola in a continuous stream into a holding pot. From the holding pot the lead was cast into large ingots called "buttons" or "sows". The impurities, iron, silica and limestone formed a slag which floated on top of the molten lead and was periodically removed.

The cupola and control system operates 24 hours a day until a breakdown occurs or relining is required. During the test the equipment was operated in a normal manner. [Emissions observed from the baghouse exhaust varied between 10% and 30% opacity throughout the test.]

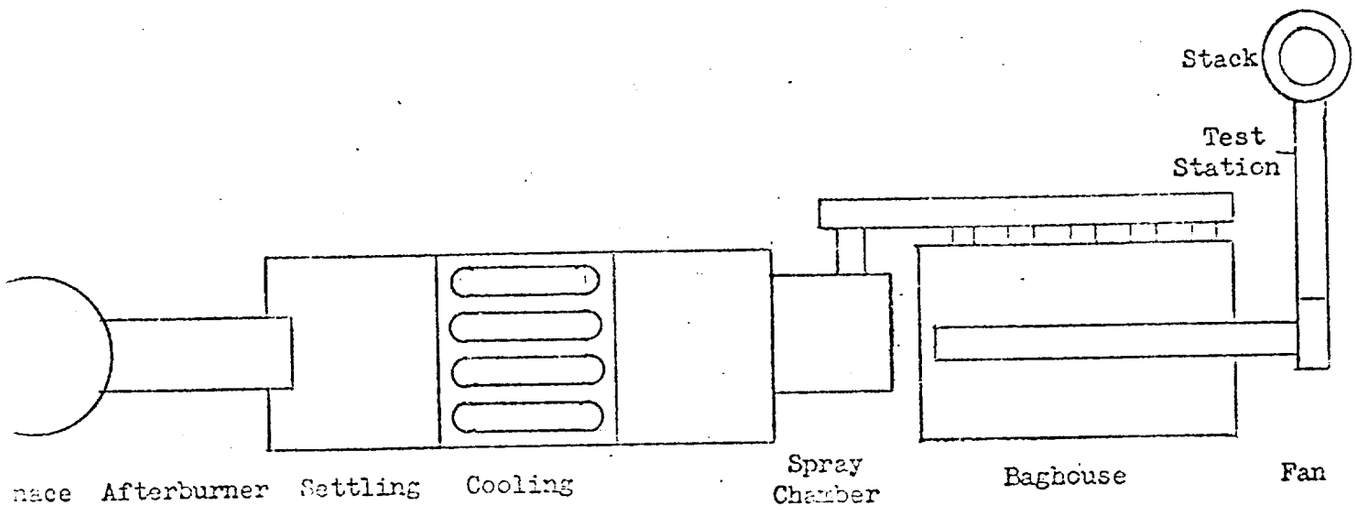
SAMPLING

Sampling was performed in accordance with the Air Pollution Control District's test manual. [Measurements were made for dust and fumes only.] For sampling apparatus see page 5.

OBSERVATIONS

The equipment was operated in a normal manner and tested for one hour. [During the test 7,428 lbs. of material consisting of battery plates, baghouse dust, furnace slag, silica material, limestone, iron turnings and coke was processed.] Emissions observed from the baghouse exhaust during the test varied between 10% and 30% opacity. No observations were made concerning the furnace charging, tapping and slagging operations.

QUIPMENT DIAGRAM



TEST NO. Lead Test No. 4

DATE _____

SUMMARY: EMISSIONS TO ATMOSPHERE

NAME OF FIRM _____

LOCATION OF PLANT _____

TYPE OF OPERATION Lead Refining

UNIT TESTED Baghouse

		MEASURED EMISSIONS		ALLOWABLE EMISSIONS	
RULE 52	PARTICULATE MATTER	_____	GRAINS PER SCF	_____	GRAINS PER SCF
RULE 53A	SULFUR COMPOUNDS AS SO_2	_____	% BY VOL.	_____	% BY VOL.
RULE 53B	COMBUSTION CONTAMINANTS	_____	GRAINS PER SCF AT 12% CO_2	_____	GRAINS PER SCF AT 12% CO_2
RULE 54	DUST AND FUMES	5.2	LBS. PER HR.	8.34	LBS. PER HR.
	CO_2	_____	% BY VOL.		
	ALDEHYDES AS HCHO	_____	PPM BY VOL.		
	HYDROCARBONS AS HEXANE	_____	PPM BY VOL.		
	NO_x AS NO_2	_____	PPM BY VOL.		
	ORGANIC ACIDS AS ACETIC ACID	_____	PPM BY VOL.		
	OTHER _____	_____	_____		
	_____	_____	_____		

GAS TEMPERATURE, °F 110

EFFICIENCY OF CONTROL EQUIPMENT, % _____

SUMMARY OF DATA AND RESULTS

PAGE _____
DATE _____

SITE, EQUIPMENT, AND TEST CONDITIONS:

1. NAME OF FIRM _____
2. BASIC EQUIPMENT Lead Melting Cupola Furnace
3. CONTROL EQUIPMENT _____
4. EQUIPMENT TESTED Baghouse Outlet
5. PROCESS WEIGHT, LBS PER HOUR 7,428
6. PROCESS DESCRIPTION _____

7. TESTING CONDITION AND LOCATION _____

FLOW AND ANALYSIS:

8. GAS TEMPERATURE, °F _____
9. GAS VELOCITY, FPS 33.9
0. GAS FLOW RATE, SCFM 7500
1. GAS ANALYSIS, VOL %, DRY BASIS:
   - CARBON DIOXIDE _____
   - OXYGEN _____
   - CARBON MONOXIDE _____
   - NITROGEN _____
2. GAS ANALYSIS, VOL %, STACK BASIS:
   - WATER VAPOR _____
   - CARBON DIOXIDE _____
   - OXYGEN _____
   - CARBON MONOXIDE _____
   - NITROGEN _____

CONTAMINANTS MEASURED:

3. MATERIAL COLLECTED _____

4. TOTAL GAS VOLUME SAMPLED, SCF _____
5. WEIGHT COLLECTED, GRAMS _____
6. MATERIAL CONCENTRATION:
   - GRAINS PER SCF 0.084
   - GRAINS PER SCF AT 12% CO_2 _____
   - VOLUME PER CENT _____
   - PARTS PER MILLION BY VOLUME _____
7. MATERIAL FLOW RATE, LBS PER HOUR 5.2

EFFICIENCY OF CONTROL EQUIPMENT:

8. MATERIAL IN, LBS PER HOUR _____
9. MATERIAL OUT, LBS PER HOUR _____
0. EFFICIENCY, % _____

Test No. 4

PAGE 5

STATION Outlet of Baghouse

DATE

GAS VELOCITY DATA

SIZE	POINT	VEL. HEAD IN. H_2O	TEMP. °F	VELOCITY FT/SEC	VEL. HEAD IN H_2O	TEMP. °F	VELOCITY FT/SEC	VEL. HEAD IN. H_2O	TEMP. °F	VELOCITY FT/SEC
45	1	0.25	210	29.1						
	2	0.22	210	35.3						
	3	0.26	210	38.3						
	4	0.27	210	39.0						
	5	0.28	210	39.8						
	6	0.29	210	40.5						
	7	0.28	210	39.8						
	8	0.19	210	30.1						
42	1	0.16	210	30.1						
	2	0.20	210	35.6						
	3	0.24	210	35.8						
	4	0.25	210	38.3						
	5	0.28	210	39.8						
	6	0.25	210	39.8						
	7	0.26	210	38.3						
	8	0.15	210	29.1						

INDICATED VELOCITY (TRAVERSE) FT/SEC 33.9

INDICATED VELOCITY (REFERENCE PT.) FT/SEC

FLUE FACTOR, A/B

PITOT CORRECTION FACTOR

GAS DENSITY CORRECTION FACTOR

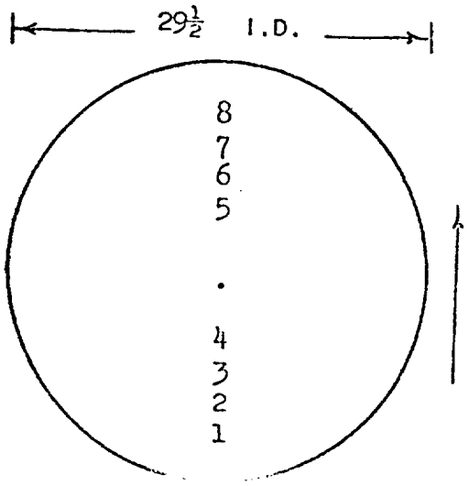
GAS PRESSURE IN STACK, IN. HG. ABS.

GAS PRESS. CORREC. FACTOR, $\sqrt{29.9/F}$

CORRECTED VELOCITY, AxDxExG, FT/SEC

OR BxCxDxExG, FT/SEC

AREA OF FLUE, SQ. FT. 4.75



FLOW RATE, HxJx60, CFM 9660

FLOW RATE, (F/29.9)x520xL/(P+460), SCFM 7500

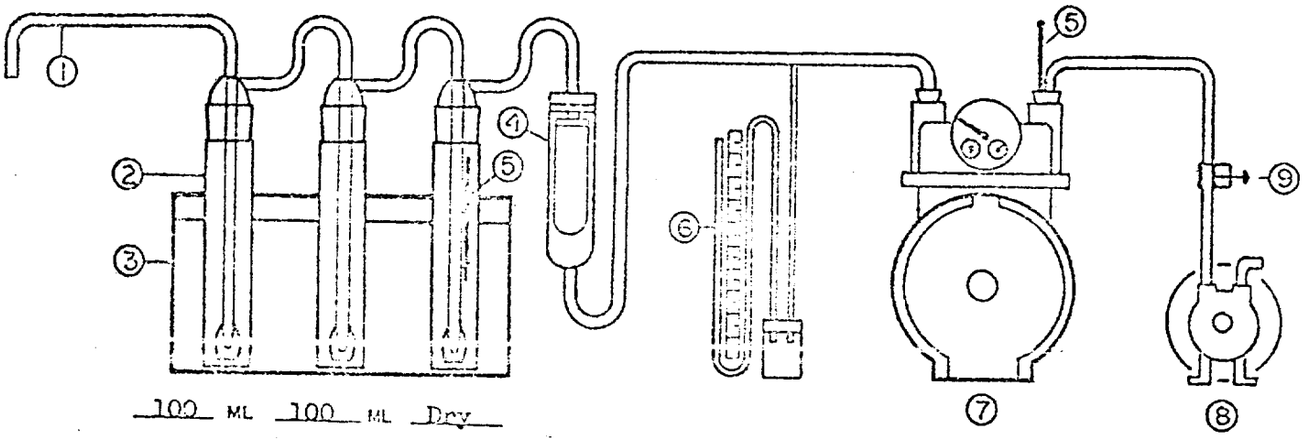
R-1 60D493

ST NO. 4

PAGE 6

DATE

SAMPLING APPARATUS



1. SAMPLING PROBE
2. IMPINGER (DUST CONCENTRATION SAMPLER)
3. ICE BATH CONTAINER
4. DRY FILTER Whetman thimble
5. THERMOMETER
6. MERCURY MANOMETER
7. SPRAGUE DRY GAS METER (ZEPHYR NO. 1A)
8. VACUUM PUMP
9. HOSE CLAMP TO CONTROL GAS FLOW RATE

IMPINGER SOLUTION Distilled Water

16-5(D)16

SUMMARY REPORT OF A SOURCE TEST ON A LEAD REVERBERATORY FURNACE VENTED TO A BAGHOUSE CONTROL SYSTEM

LEAD TEST NO. 5

EQUIPMENT DESCRIPTION

A gas fired lead reverberatory furnace is similar to other reverberatory furnaces. It consists of an outer shell built in the shape of a rectangular box lined with refractory brick. The burners are usually placed at one end and the material to be melted is charged through an opening near the burner. The furnace is operated 24 hours a day until breakdown occurs or the lining must be replaced.

During the test the material charged consisted of used battery plates known as "groups" and battery sludge. The battery groups and sludge was partially air dried in storage. Wood and plastic spacers between the battery plates was also charged to the furnace causing high exhaust duct temperatures. Charging was continuous and the furnace was tapped periodically. Slag or dross consisting of oxides and impurities floated on top of the molten lead and was periodically removed.

The products of combustion and other gases were vented to a baghouse. Cooling air was mixed with the hot exhaust gases ahead of the baghouse to reduce the temperature to a level that the cloth filter bags could withstand.

Hoods, provided over the charge opening, slag opening and top opening were vented to a separate baghouse from the one venting the furnace proper.

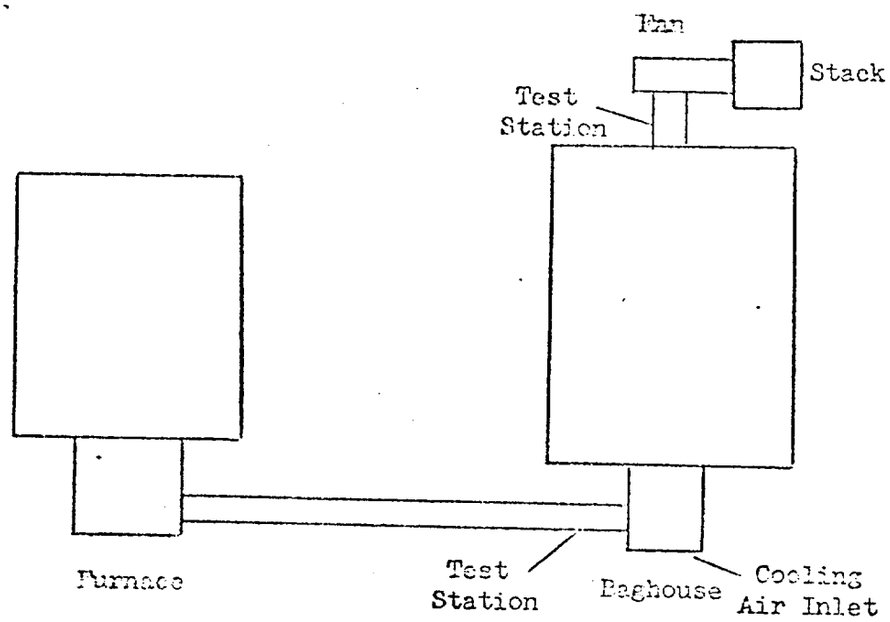
SAMPLING

Sampling was performed in accordance with the Air Pollution Control District's test manual. Measurements were made for dust and fumes, particle size analysis, sulfur dioxide and sulfur trioxide. For sampling apparatus see pages 9 and 10.

OBSERVATIONS

The equipment was operated in a normal manner and tested for one hour. During the test 2500 lbs. of material consisting of battery groups and battery sludge was processed. No emissions were observed from the baghouse exhaust during the test.

EQUIPMENT DIAGRAM



TEST NO. Lead Test No. 5

DATE _____

SUMMARY: EMISSIONS TO ATMOSPHERE

NAME OF FIRM _____

LOCATION OF PLANT _____

TYPE OF OPERATION Lead Melting Reverberatory Furnace

UNIT TESTED Baghouse Outlet

		MEASURED EMISSIONS		ALLOWABLE EMISSIONS	
RULE 52	PARTICULATE MATTER	_____	GRAINS PER SCF	_____	GRAINS PER SCF
RULE 53A	SULFUR COMPOUNDS AS SO_2	0.104	% BY VOL.	0.2	% BY VOL.
RULE 53B	COMBUSTION CONTAMINANTS	_____	GRAINS PER SCF AT 12% CO_2	_____	GRAINS PER SCF AT 12% CO_2
RULE 54	DUST AND FUMES	1.2	LBS. PER HR.	4.64	LBS. PER HR.
	CO_2	_____	% BY VOL.		
	ALDEHYDES AS HCHO	_____	PPM BY VOL.		
	HYDROCARBONS AS HEXANE	_____	PPM BY VOL.		
	NO_x AS NO_2	_____	PPM BY VOL.		
	ORGANIC ACIDS AS ACETIC ACID	_____	PPM BY VOL.		
	OTHER _____	_____	_____	_____	
	_____	_____	_____	_____	

GAS TEMPERATURE, °F 327

EFFICIENCY OF CONTROL EQUIPMENT, % 99.2

Test No. 5

SUMMARY OF DATA AND RESULTS

DATE

TE, EQUIPMENT, AND TEST CONDITIONS:

1. NAME OF FIRM
2. BASIC EQUIPMENT Lead Melting Reverberatory Furnace
3. CONTROL EQUIPMENT Baghouse
4. EQUIPMENT TESTED Outlet of Baghouse
5. PROCESS WEIGHT, LBS PER HOUR 2500
6. PROCESS DESCRIPTION
7. TESTING CONDITION AND LOCATION

LOW AND ANALYSIS:

8. GAS TEMPERATURE, °F 327
9. GAS VELOCITY, FPS 32.8
10. GAS FLOW RATE, SCFM 10,400
11. GAS ANALYSIS, VOL %, DRY BASIS:
    - CARBON DIOXIDE
    - OXYGEN
    - CARBON MONOXIDE
    - NITROGEN
12. GAS ANALYSIS, VOL %, STACK BASIS:
    - WATER VAPOR
    - CARBON DIOXIDE
    - OXYGEN
    - CARBON MONOXIDE
    - NITROGEN

CONTAMINANTS MEASURED:	Dust and Fumes	Sulfur Compounds
13. MATERIAL COLLECTED		
14. TOTAL GAS VOLUME SAMPLED, SCF		
15. WEIGHT COLLECTED, GRAMS		
16. MATERIAL CONCENTRATION:		
GRAINS PER SCF	0.013	1.23
GRAINS PER SCF AT 12% CO_2		
VOLUME PER CENT		
PARTS PER MILLION BY VOLUME		1039
17. MATERIAL FLOW RATE, LBS PER HOUR	1.2	109.6

CIENCY OF CONTROL EQUIPMENT:

18. MATERIAL IN, LBS PER HOUR
19. MATERIAL OUT, LBS PER HOUR
20. EFFICIENCY, % 99.2

PARTICLE SIZE DISTRIBUTION

The particle size distribution of the baghouse outlet was determined by microscopic examination.

Size Range	Per Cent	Characteristics
1 - 2 microns	40	White
2 -10 microns	60	White agglomerates

Load Test No. 5 PAGE 9

TING STATION Baghouse Outlet DATE

GAS VELOCITY DATA

TIME	POINT	VEL. HEAD IN. H_2O	TEMP. °F	VELOCITY FT/SEC	VEL. HEAD IN. H_2O	TEMP. °F	VELOCITY FT/SEC	VEL. HEAD IN. H_2O	TEMP. °F	VELOCITY FT/SEC
00	R	0.19	240	33.5	0.20	270	[illegible]	0.18	280	33.5
	1	0.29	230	41.0	0.34	270	[illegible]	0.33	280	45.4
	2	0.25	230	38.3	0.24	270	[illegible]	0.23	280	37.9
	3	0.26	230	38.8	0.26	270	[illegible]	0.24	280	38.7
	R	0.27	230	34.9	0.20	270	[illegible]	0.12	280	34.5
	4	0.27	250	40.1	0.26	270	[illegible]	0.30	280	41.2
	5	0.16	260	31.2	0.18	270	[illegible]	0.16	280	31.6
	6	0.25	260	38.9	0.20	270	[illegible]	0.15	280	30.6
	R	0.20	270	35.1	0.19	280	[illegible]	0.18	280	33.5
	7	0.36	270	47.0	0.35	280	[illegible]	0.36	280	47.4
	8	0.23	270	37.6	0.37	280	[illegible]	0.19	280	34.5
	9	0.17	270	32.3	0.13	280	[illegible]	0.13	280	28.4
	R	0.29	260	34.8	0.19	280	[illegible]	0.19	280	34.5
	10	0.36	270	48.4	0.39	280	[illegible]	0.41	290	50.9
	11	0.39	270	49.0	0.42	280	[illegible]	0.33	290	45.7
	12	0.35	270	46.4	0.39	280	[illegible]	0.28	290	42.0
	R	0.22	270	36.8	0.21	280	[illegible]	0.19	290	34.7

INDICATED VELOCITY (TRAVERSE) FT/SEC 40.9

INDICATED VELOCITY (REFERENCE PT.) FT/SEC 34.7

FLUE FACTOR, A/B 1.18

PITOT CORRECTION FACTOR 1.0

GAS DENSITY CORRECTION FACTOR

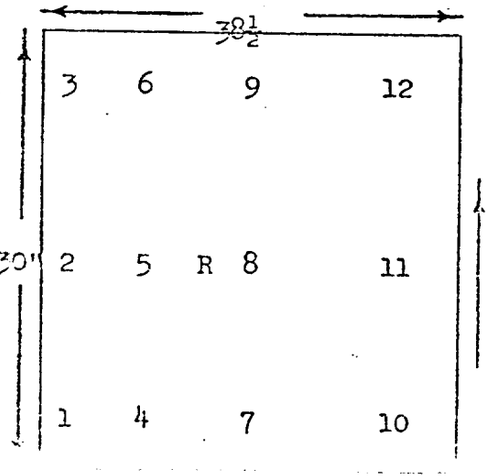
GAS PRESSURE IN STACK, IN. HG. ABS.

GAS PRESS. CORREC. FACTOR, $\sqrt{29.9/F}$

CORRECTED VELOCITY, AxDxExG, FT/SEC

OR BxCxDxExG, FT/SEC

AREA OF FLUE, SQ. FT. 8.02



FLOW RATE, HxJx60, CFM 19700

FLOW RATE, (F/29.9)x520xL/(K+460), SCFM 14000

R-1 600185

Test Port No. 5 PAGE 7

G STATION Barnegat Inlet DATE

SAMPLING TRAIN DATA AND CALCULATIONS

TIME	GAS METER READING CU. FT. V_M	GAS METER VAC. IN. HG P_M	GAS METER TEMP. °F T_M	IMPINGER TEMP. °F T_I					
						1			
10:05	75.83								
10:10	79.6	4.0	84	62					
10:15	83.2	4.0	85	62					
10:20	86.6	4.0	85	63					
10:25	90.1	4.0	86	64					
10:30	93.6	4.0	87	63					
10:35	97.0	4.0	88	64					
10:40	100.5	4.0	88	61					
10:45	104.0	4.0	89	60					
10:50	107.4	4.0	90	61					
10:55	110.9	4.0	90	61					
11:00	114.5	4.0	92	63					
11:05	117.62	4.0	94	64					
		4.0	88	62					
60 min.	41.99	Av.	Av.	Av.					

MATERIAL COLLECTED Sulfur compounds as sulfur dioxide

WEIGHT COLLECTED, GRAMS:

SO_2 & SO_3 in impinger solution = 2.8075 as SO_2

SO_2 in lead sulfate = 0.0

SAMPLING POINT

SAMPLING NOZZLE I.D., MM 7 mm

ATMOS. PRESSURE, P_A, IN. HG

A. TOTAL WEIGHT

B. STACK GAS FLOW RATE, SCFM 10,400

C. WATER VAPOR CONDENSED, LIQUID VOLUME, ML 13

D. WATER VAPOR CONDENSED, VAPOR VOLUME, 0.0464 x C, SCF 0.76

F. TOTAL GAS VOLUME SAMPLED, D + E, SCF 35.1

G. MATERIAL CONCENTRATION, 15.43 x A/F, GRAINS/SCF 1.23

SAMPLING STATION Baghouse Outlet DATE

SAMPLING TRAIN DATA AND CALCULATIONS

TIME	GAS METER READING CU. FT. V_M	GAS METER VAC. IN. HG P_M	GAS METER TEMP. °F T_M	IMPINGER TEMP. °F T_I	V.H. at R	Stack T°P	VSL at R		
0:00	19.13								
0:10	22.6	6.0	92	57	0.16	330	32.6		
0:15	26.9	5.9	93	58	0.13	330	29.5		
0:20	31.7	5.7	94	57	0.11	330	27.1		
0:25	36.4	5.5	94	59	0.11	330	27.1		
0:30	40.5	5.0	96	60	0.10	330	25.7		
0:35	44.6	4.6	96	59	0.15	330	31.6		
0:40	48.2	3.6	95	58	0.11	330	27.3		
0:45	51.8	3.8	96	56	0.09	330	27.5		
0:50	55.5	3.8	97	55	0.10	320	25.6		
0:55	59.1	3.8	95	55	0.13	320	29.3		
1:00	62.8	3.8	97	56	0.12	210	28.1		
1:05	66.34	3.8	96	56	0.10	320	25.8		
[illegible]	70.04	4.6	95	57		327	27.8		
Total	Total	Av.	Av.	Av.		Av.	Av.		
				Average velocity = 27.8 x 1.16 = 32.8					

MATERIAL COLLECTED Dust and Fumes

WEIGHT COLLECTED, GRAMS:

Impingers = 0.0261

Thimble = 0.006

SAMPLING POINT

SAMPLING NOZZLE I.D., MM 7 mm

TOTAL WEIGHT 0.0321

ATMOS. PRESSURE, P_A, IN. HG

STACK GAS FLOW RATE, SCFM $32.8 \times 8.02 \times 60 \times \frac{520}{707} = 10,400$

WATER VAPOR CONDENSED, LIQUID VOLUME, ML 13

WATER VAPOR CONDENSED, VAPOR VOLUME, 0.0464 x C, SCF 0.76

GAS VOLUME METERED, $17.4 \times V_m \times (P_a - P_m)/(460 + T_m)$, SCF 49.00

MATERIAL CONCENTRATION, 15.43 x A/F, GRAINS/SCF 0.013

MATERIAL FLOW RATE, 0.00857 x B x G, LBS/HR 1.2

T NO. Lead Test No. 5

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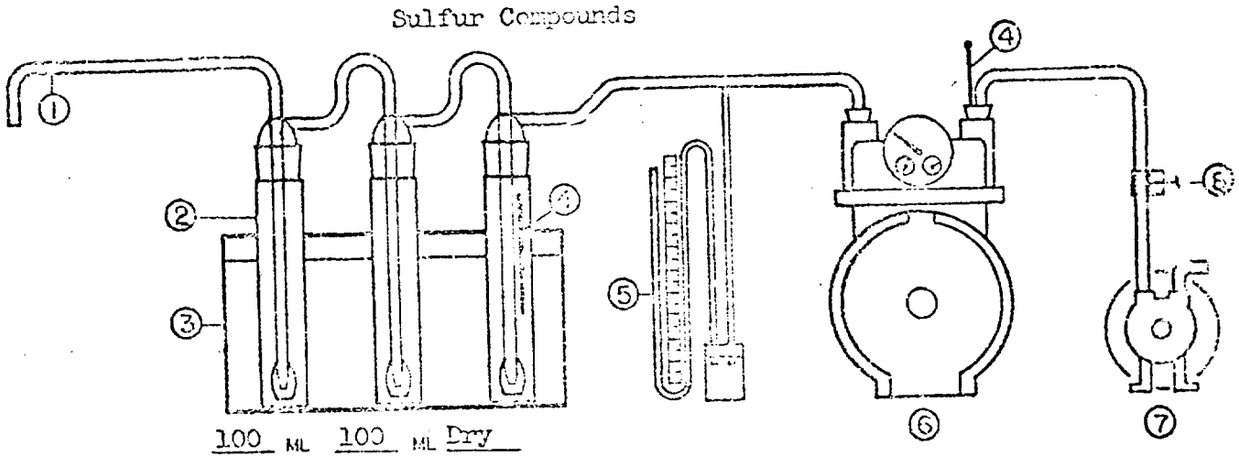
DATE

SAMPLING APPARATUS

For

Sulfur Compounds



1. SAMPLING PROBE
2. IMPINGER (DUST CONCENTRATION SAMPLER)
3. ICE BATH CONTAINER
4. THERMOMETER
5. MERCURY MANOMETER
6. SPRAGUE DRY GAS METER (ZEPHYR NO. 1A)
7. VACUUM PUMP
8. HOSE CLAMP TO CONTROL GAS FLOW RATE

IMPINGER SOLUTION

5% sodium hydroxide

TEST NO. Lead Test No. 5

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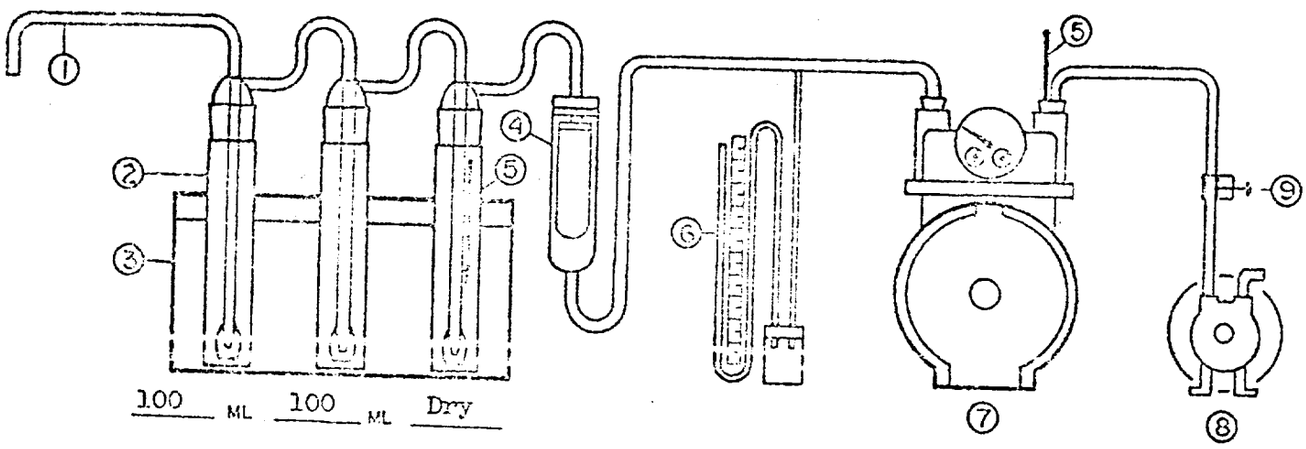
DATE

SAMPLING APPARATUS

For

Dust and Fumes



1. SAMPLING PROBE
2. IMPINGER (DUST CONCENTRATION SAMPLER)
3. ICE BATH CONTAINER
4. DRY FILTER Whatman thimble
5. THERMOMETER
6. MERCURY MANOMETER
7. SPRAGUE DRY GAS METER (ZEPHYR NO. 1A)
8. VACUUM PUMP
9. HOSE CLAMP TO CONTROL GAS FLOW RATE

IMPINGER SOLUTION

Distilled water