Air Contaminant Emissions from Intermittent Operations in Los Angeles County

SECONDARY ALUMINUM
OPERATIONS
AP-42 Section 7.8
Reference Number
2

APCD AIR POLLUTION CONTROL DISTRICT
434 South San Pedro Street, Los Angeles 13, California—Madison 9-4711 / COUNTY OF LOS ANGELES

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(19)

Robert T.

[illegible]

The data obtained [illegible] of the potential aerosol air contaminants from metal melting furnaces is being collected by air pollution control equipment. The air pollution control devices have been installed primarily on the high emission rate equipment such as direct arc steel melting furnaces and grey iron cupolas.

It is significant to note that only [illegible]% of all types of furnaces in Los Angeles County are equipped with controls which collect an estimated 46 tons per day of aerosols. The uncontrolled furnaces and the contaminants which escape collection by the control equipment allow 6 tons of aerosols to be released to the Los Angeles atmosphere daily. This is shown graphically in Figure [illegible]

The bar graph in Figure 2 shows the air pollution potential from each of the major classifications of metal melting equipment. Electric arc furnaces, if uncontrolled, would emit 21.[illegible] tons per day of air pollution. However, as shown by Figure 3, the actual emission is reduced to 2 tons per day by the use of the present control equipment. Further reductions will be realized following the completion of the baghouse at Bethlehem Steel Company.

Tables I and II give the numerical quantities of aerosols being prevented from release to the Los Angeles atmosphere. The values were determined by survey of the industry and source test data. The specific tests and methods [illegible] may be found in the applicable section [illegible] are listed in Table [illegible]

[illegible]

[illegible]

The number of each type of feature included in the data base is listed in Table II. A brief description of each of these features appears in Appendix A. The extent to which each type of feature is included in the various types of locations is indicated and indicates the comparative capabilities of the operations. Although the list is not entirely complete, it includes all the major features and most of the small operations.

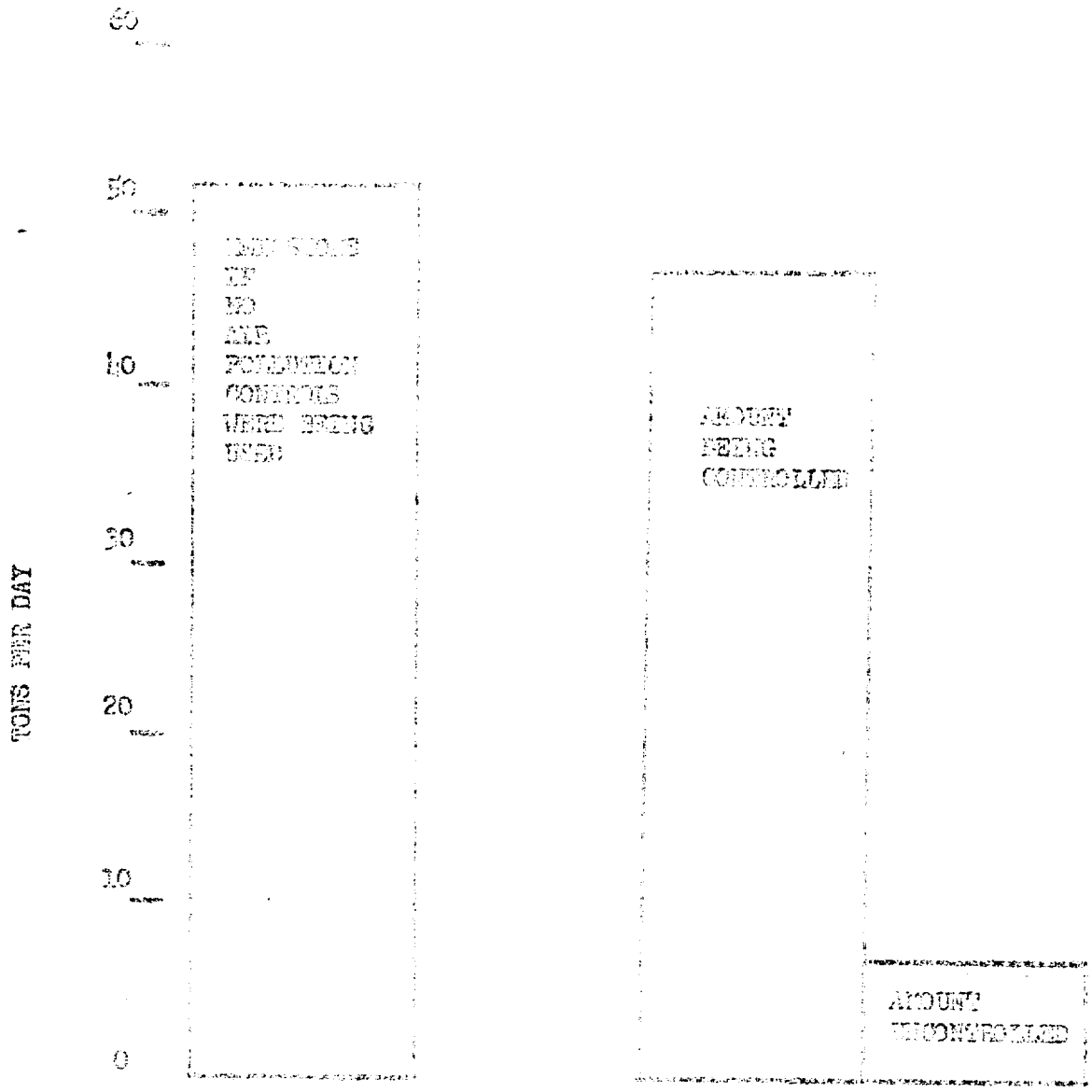
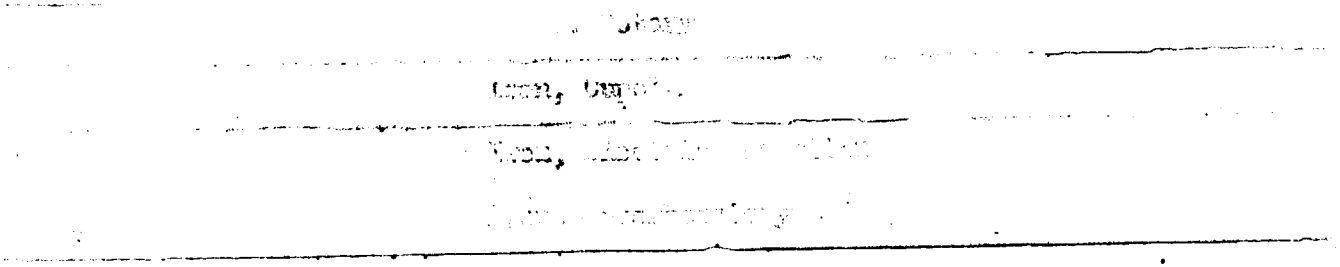


Figure 1. Aerosol Emissions From Furnaces



Aluminum Chlorination Stations

Aluminum, Crucible

Aluminum, Reverberatory

Aluminum, Sweating

Brass, Crucible

Brass, Electric

Brass, Reverberatory

Brass, Rotary

Iron, Cupola

Iron, Electric Induction

Iron, Reverberatory

Lead, Cupola

Lead, Pot

Lead, Reverberatory

Magnesium, Pot

Steel, Arc

Steel, Induction

Steel, Open Hearth

Zinc, Galvanizing

Zinc, Kiln

Zinc, Pot

Zinc, Sweating

[illegible]					
[illegible], Electric	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible], Reverberatory	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible], Rotary	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible], Cupola	7.49 (105)[b]	0 0	1.15 (3.3)[b]	1.15 (3.3)[b]	0.25 (102)[b]
[illegible], Electric Induction	0.06	0.06	Nil	0.06	Nil
[illegible], Reverberatory	0.05	0.05	Nil	0.05	Nil
[illegible], Cupola	9.02 (1.92)[c]	0 0	0.15 (1.73)[c]	0.15 (1.73)[c]	8.87 (0.19)[c]
[illegible], Pot	0.14	0.12	Nil	0.12	0.02
[illegible], Reverberatory	5.92 (1.20)[c]	0 0	0.05 (1.03)[c]	0.05 (1.03)[c]	5.87 (0.17)[c]
[illegible], Pot	0.07	0.07	0	0.07	0
[illegible], Etc.	21.7	0	2.0	2.0	19.7
[illegible], Induction	Nil	Nil	Nil	Nil	Nil
[illegible], Open Hearth	2.6	0	0.1	0.1	2.3
[illegible], Salt-glazing	0.01	0.01	Nil	0.05	Nil
[illegible], Coke	0.1	0	Nil	Nil	0.1
[illegible], Pot	0.02	0.01	Nil	0.01	Nil
[illegible]	0.30	0	0.01	0.01	0.21
[illegible]	[illegible]	0.10	[illegible] [b] [illegible]	[illegible]	[illegible]

[illegible]	[illegible]
Farm Drama	[illegible]
Farming Soil Problems	[illegible]
Road Building	[illegible]
Small Case Histories	[illegible]
Total	[illegible]

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Brass, Crucible	[illegible]	0.7
Brass, Electric	[illegible]	[illegible]
Brass, Reverberatory	[illegible]	1.0
Brass, Rotary	20.0	[illegible]
Iron, Cupola	17.4	2.7
Iron, Electric Induction	2.0	1.6
Iron, Reverberatory	[illegible]	[illegible]
Lead, Cupola	300.0	[illegible]
Lead, Pot	0.1	--
Lead, Reverberatory	150.0	[illegible]
Magnesium, Pot	[illegible]	--
Steel, Arc	[illegible]	[illegible]
Steel, Induction	0.1	--
Steel, Open Hearth	[illegible]	0.7
[illegible]	[illegible]	--
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Aluminum, Crucible for Oil Fuels	(30)	33	33	100
Aluminum, Investible	1,054	33	3	9
Aluminum, Reverberatory	16,382	75	6	8
Aluminum, Heating	577	21	5	24
Brass, Crucible	4,600	80?	3½	4
Brass, Reverbe	1,725	36	25	70
Brass, Reverberatory	738	7	7	100
Brass Rotary	1,045	27	16	59
Iron, Cupola	39,170	98	35	36
Iron, Electric Induction	1,133	9	1	11
Iron, Reverberatory	1,043	12	0	0
Lead, Cupola	1,353	3	3	100
Lead, Pot	55,978	144	49	34
Lead, Reverberatory	1,746	13	13	100
Magnesium, Pot	705	93	0	0
Steel, Arc	64,095	50	50	100
Steel, Induction	590	42	7	17
Steel, Open Hearth	13,500	5	1	20
Zinc, [illegible]	[illegible]	19	5	26
Zinc, [illegible]	850	1	1	100
Zinc, [illegible]	[illegible]	173	7	[illegible]
[illegible]	[illegible]	3	1	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Note: This does not catagorically identify the emissions reported here as being from Aluminum recovery operations only, as not applicable to Aluminum melting for castings production. AAM

[redacted]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	9/19/59	65.1	31.7	5.3	35	[illegible]
	9/20/59	50	30.7	----	1.2	
	9/ 9/60	50	30.7	----	1.0	
	9/ 9/60	50	30.6	5.3	35.0	
	9/ 9/60	50	30.2	0.6	2.0	
	9/ 9/60	50	29.8	----	2.0	
	9/12/60	50	29.5	----	2.0	
	9/16/60	850	20?	6	2.0	
	9/ 9/60	850	29.0	1.5	2.0	
	9/ 9/60	369.2	30.3	2.0	----	
				Average	3.2	

[illegible] Aluminum Melting

The emission factor for aluminum melting crucible furnaces has been revised by averaging the two available tests. Neither furnace was equipped with an air pollution control device. The emission factor is identical to the one reported in the previous total pollution survey. For the purpose of the survey the emissions from electric induction furnaces are assumed to be the same as the crucible type and are included in data below.

Aluminum melting crucible furnaces are seldom vented to air pollution control equipment except when considerable reclaiming or refining operations are being conducted. However, by applying a 90% efficiency factor for an effective air pollution control device the control emission factor can be calculated.

Emission factors for the furnaces are as follows:

Without control equipment	1.9 lbs. per ton
With control equipment	0.2 lbs. per ton

Results of the industry survey showed that 4282 tons per month of aluminum were processed in 68 furnaces during 1963.

Losses to the atmosphere were:

$$\frac{1.9}{2000} \times \frac{4282}{22.5} = 0.18 \quad \text{tons per day}$$

ALUMINUM CRUCIBLE FURNACE TEST DATA

Name	Test No.	Date	Process Weight Lbs/Hr	Emissions, Lbs/Hr	Lbs/Ton
Ostendorf	687	4-11-52	125	$(.184 + \frac{184}{5^{1.4}}) = 0.22$	3.4
Rogers	----	2- 9-48	108	0.01	0.2
				AVERAGE	1.9

[illegible]

[illegible]

Emission factor based on entrained dust:

Without control equipment [illegible] lbs. per ton

With control equipment [illegible] lbs. per ton

[illegible] of the 16 blast furnaces operated in the Pittsburgh district [illegible] tons were processed in 63 uncontrolled furnaces and 6,190 tons were produced in 9 furnaces equipped with air pollution controls.

Losses to atmosphere if no air pollution control equipment at all were used:

$$\frac{4.3}{2000} \times \frac{16,297}{22.5} = 1.57 \text{ tons per day}$$

Losses to atmosphere at the present state of air pollution control:

Losses from the uncontrolled furnaces

$$\frac{4.3}{2000} \times \frac{11,197}{22.5} = 1.34 \text{ tons per day}$$

Losses from the controlled furnaces

$$\frac{1.3}{2000} \times \frac{2100}{22.5} = 0.12 \text{ tons per day}$$

[illegible]

[illegible] tons per day

[illegible]

[illegible]

[redacted] [redacted]

[redacted] BASIS AND CALCULATIONS

	Test No.	Test Date	Metal Charged LBS/HR	Metal Melted TONS/HR	Uncontrolled Loss LBS/HR	Control Device	Controlled Loss LBS/HR	Uncontrolled Loss Factor LBS/TON		Controlled Loss Factor LBS/TON
[redacted]	[redacted]	8/5/58	3000	1.50	0.87	---	---	[redacted]		[redacted]
[redacted]	[redacted]	9/20/57	[redacted]	0.44	0.23	---	---	[redacted]		[redacted]
[redacted]	--	10/13/59	2200	1.10	0.859	---	---	[redacted]		[redacted]
[redacted]	[redacted]	[redacted]	1020	0.55	6.27	Baghouse	0.83	[redacted]		[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	0.92	6.6b	---	---	[redacted]		[redacted]
[redacted]	[redacted]	5/31/[illegible]	2760	1.38	6.62	---	---	[redacted]		[redacted]
[redacted]	[redacted]	5/28/57	2560	1.28	6.0	Precip.	0.52	[redacted]	66/	[redacted]
[redacted]	C-3bb	12/13/56	3700	1.85	7.1	Precip.	2.0	[redacted]	71/	[redacted]
	C-3bba	12/11/56	3700	1.85	10.0	Precip.	1.7	[redacted]	83/	0.9
							Average	[redacted]	76%	[redacted]

[illegible]

[illegible]

Emission factor based on gaseous emissions:

Without control equipment	[illegible] lbs. per ton
With control equipment	[illegible] lbs. per ton

Emission factor based on process weight rate:

Without control equipment	32.2 lbs. per ton
With control equipment	3.2 lbs. per ton

The records of the industry survey showed that 575 tons per month of aluminum were processed by crushing. 185 tons were processed in 12 uncontrolled furnaces and 390 tons were processed in 9 furnaces equipped with air pollution controls.

Losses to atmosphere in an air pollution control equipment at all tons used:

$$\frac{32.2}{2,000} \times \frac{575}{30.5} = 0.3 \text{ tons per day}$$

(1·5 + 12·5)

WILSON CO.	[illegible]	[illegible]	[illegible]
PEARSON CO.	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

The emission factor [illegible] by using stack test data and including the losses due to pouring the metal to molds. The majority of the data have been accumulated in recent years. The individual emission factors have been adjusted to compensate for the emissions which escaped controls [illegible].

Emission factors for crucible furnaces are as follows:

Without control Equipment	2.9 lbs per ton
With Control Equipment	0.7 lbs per ton

Results of the industry survey showed that 1618 tons per month of brass were processed in 207 crucible furnaces. 1513 tons were processed in 195 uncontrolled furnaces and 105 tons were processed in 12 controlled furnaces.

Losses to atmosphere if no air pollution control equipment at all were used

$$\frac{2.9}{2000} \times \frac{1618}{22.5} = 0.10 \text{ tons per day.}$$

Losses to atmosphere at the present state of air pollution controls

Losses from control furnaces

$$\frac{0.7}{2000} \times \frac{105}{22.5} = 0.002 \text{ tons per day}$$

Losses due to the uncontrolled furnaces

[illegible]

Total [illegible]

[illegible]

[illegible]

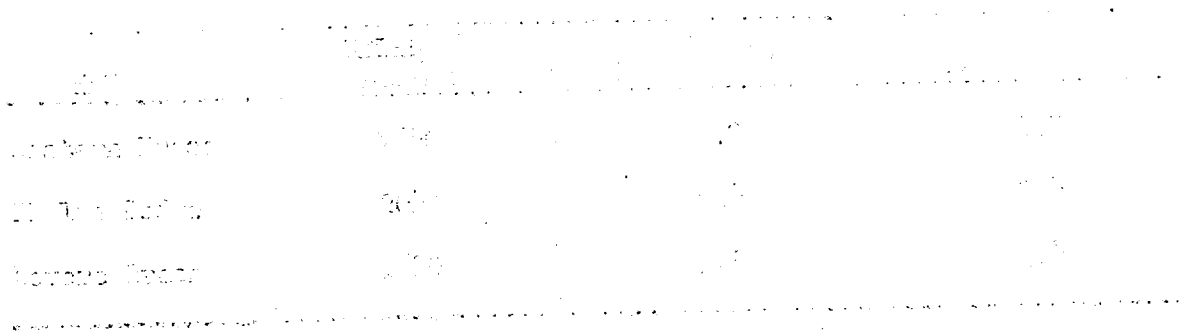
[illegible]

BRASS MELTING CRUCIBLE FURNACE TEST DATA

NAME	DATE	TEST NO	METAL WEIGHT LBS/HR	METAL WEIGHT TONS/HR	LOSS LBS/HR	% CAPTURE	APPARENT EMISSION FACTOR LBS/TON	[illegible]
[illegible] Alloys	5/27/58	C-533	146	0.073	0.47	100	6.5	[illegible]
Grayson Controls	7/10/62	C-312(a)	373	0.187	0.241	50	1.3	[illegible]
Grayson Controls	7/10/62	C-312(b)	373	0.187	0.355	60	1.9	[illegible]
Grayson Controls	8/14/62	C-312(c)	536	0.269	0.176	50	0.7	[illegible]
Grayson Controls	8/14/62	C-312(d)	536	0.269	0.216	50	0.8	[illegible]
Grayson Controls	8/14/62	C-312(e)	450	0.225	0.307	50	1.4	[illegible]
Grayson Controls	8/14/62	C-312(f)	450	0.225	0.445	50	2.0	[illegible]
Kenosha Bronze	12/13/54	C-150	236	0.118	0.03	50	0.7	[illegible]
Olds Alloy	6/13/56	C-530	273	0.137	0.51	25	3.7	[illegible]
Pelcast	10/2/57	C-407	100	0.050	0.05	25	1.0	[illegible]
Peter-Pfister	3/1/54	C-73	478	0.239	0.822	100	3.4	[illegible]
Superior Brass	3/18/54	C-73	226	0.113	0.181	(a)	1.6	[illegible]
Unique	3/18/59	C-442	340	0.170	0.93	100	5.5	[illegible]
Unique	3/25/59	C-441	388	0.194	2.45	(a)	12.6	[illegible]
West Coast	3/12/55	C-151	150	0.075	0.29	100	3.9	[illegible]
Alloy Brass.	5/16/49		462	0.231	0.75	100	3.3	[illegible]
Arrowhead Brass	11/21/49		675	0.328	0.636	(a)	1.9	[illegible]
Pierson Prod.	3/17/49		260	0.130	0.48	(a)	3.7	3.7
							Average	[illegible]

(a) Assumed to be 100%

(b) Adj. Emission Factor = $\frac{\text{apparent emission factor}}{\text{fract. capture}}$



The collection factor used in this study is:

Without control equipment 66.2 lbs. per ton

With control equipment 1.4 lbs. per ton

The records of the industry survey showed that 13 tons per month of lumber were processed in a wooden box furnace during 2000, all of which were ventilated to baghouses.

Losses to the atmosphere in an air pollution control equipment were used:

$$\frac{66.2}{2000} \times \frac{22.5}{1} = 0.83 \text{ tons per hr.}$$

Losses to the atmosphere using air pollution control equipment:

$$\frac{1.4}{2000} \times \frac{22.5}{1} = 0.02 \text{ tons per hr.}$$

Amount prevented from going to the atmosphere:

0.83 - 0.02 = 0.81 tons per hr.

[illegible] REVERBERATORY FURNACE TEST DATA

Date	Metal %, Lbs/Hr	Uncontrolled Dust, Lbs/Hr	Controlled Dust, Lbs/Hr	[illegible]
2/25/[illegible]	[illegible]	26.1		[illegible]
4/21/[illegible]	[illegible]	15.6		[illegible]
8/ 2/[illegible]	[illegible]	21.2		[illegible]
7/ 6/[illegible]	[illegible]	3.69		[illegible]

[illegible]

[illegible] Control Equipment:

[illegible] % = Pounding Loss

= [illegible].0 + 0.5 = [illegible].5 Lbs. Per Ton

[illegible] Control Equipment at 95% Reduction Efficiency:

= (21.0)(0.05) + Pounding Loss

= 1.0 + 0.5 = 1.6 Lbs. Per Ton

Force Drain		15%		
Lever Drain		30%	1.35	
Force Drain		15%		
Valley Drain		40%		

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

The emission factor for gray iron cupola furnaces has been determined by including estimated losses from the charging doorway and metal pouring losses along with the usual losses generated during the melting operation. Source test data were used to calculate the emission factor.

Emission factor for cupolas are as follows:

Without control equipment:	aerosols	17.4 lbs. per ton
	carbon monoxide	247 lbs. per ton
With control equipment:	aerosols	2.7 lbs. per ton
	carbon monoxide	7.7 lbs. per ton

Results of the industry survey showed that 19,170 tons per month of iron were processed in 36 gray iron cupolas during 1963.

Losses to atmosphere if no air pollution control equipment were used:

aerosols $\frac{17.4}{2000} \times \frac{19,170}{22.5} = 7.4$ tons per day

carbon monoxide $\frac{247}{2000} \times \frac{19,170}{22.5} = 105$ tons per day

Losses to atmosphere using air pollution control equipment:

aerosols $\frac{2.7}{2000} \times \frac{19,170}{22.5} = 1.15$ tons per day

carbon monoxide $\frac{7.7}{2000} \times \frac{19,170}{22.5} = 3.3$ tons per day

Amount prevented from going to the atmosphere:

aerosols $7.4 - 1.2 = 6.2$ tons per day

carbon monoxide $105 - 3.3 = 103$ tons per day

COMBUSTION CARBON MONOXIDE TEST DATA

[illegible]	[illegible]	EXHAUST VOLUME CU FT/MIN	EXHAUST VOLUME CU FT/SEC	VOLUME CO CU FT	WEIGHT CO LBS/MIN	[illegible]	[illegible]
[illegible]	[illegible]	0.377	2,230	10.4	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	0.373	2,200	12.9	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	0.377	2,230	13.2	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	0.332	37,000	0.2	1.20	[illegible]	[illegible]
[illegible]	[illegible]	0.303	20,300	0.2	1.50	[illegible]	[illegible]
[illegible] [illegible]	[illegible]	0.376	17,700	0.06	0.58	[illegible]	[illegible]
[illegible]	[illegible]	0.083	11,000	0.02	0.16	[illegible]	[illegible]
[illegible]	[illegible]	0.089	11,000	1.6	16.6	[illegible]	[illegible]
				[illegible]		[illegible]	[illegible]

[illegible]

$$2330 \times 0.306 \times \frac{20}{379} = 16.6 \text{ lbs CO/min}$$

ANTIQUA DUST AND FIBRE TEST DATA

1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

GRAY IRON POURING EMISSION DATA

[illegible]	TEST DATES	METAL POURED LBS/HR	DUST & FUMES LBS/HR	EMISSION FACTOR LBS/TON	
Alabama Pipe Co.	5-21-64	6887	5.0	1.45	

[illegible]

Electric induction furnaces [illegible] County as replacements for the cupolas [illegible] for reverberatory type furnaces. Stack tests [illegible] specific operation; however, the [illegible] of contamination of the material charged. [illegible] factor is the same as that determined for the [illegible] acce., which is 2.0 pounds per ton. It is anticipated that certain equipment would reduce the emission factor to 1.6 lb/ton. Results of the industry survey showed that a total of 1412 tons per month of metal were processed in 9 furnaces. 1253 tons were processed in 8 uncontrolled and 159 tons were processed in 1 controlled furnace.

Losses to the atmosphere if no air pollution controls were used:

$$\frac{2.0}{2000} \times \frac{1412}{22.5} = 0.06 \text{ tons per day}$$

Losses to atmosphere at the present state if air pollution control

Losses from controlled furnaces

$$\frac{1.6}{2000} \times \frac{159}{22.5} = 0.004 \text{ tons/day}$$

Losses from the uncontrolled furnaces

$$\frac{2.0}{2000} \times \frac{1253}{22.5} = [illegible] \text{ tons per day}$$

[illegible]

IRON MELTING - [illegible]

This type of furnace is used to a limited extent in Los Angeles County for the smaller iron foundries. The average emission factor has previously been reported as 0.5 lbs. per ton and no new furnace tests have been performed since that time. However pouring losses have been determined from test to add 1.5 lbs/ton to the emission. The uncontrolled emission factor is then: 1.5 + 0.5 = 2.0 lbs/ton.

It is estimated that control equipment would reduce the furnace emission from 0.5 to 0.1. The controlled emission factor is therefore:

0.1 + pouring loss =

0.1 + 1.5 = 1.6 lbs/ton

Results of the industry survey showed that a total of 1043 tons per month of metal were melted in 12 uncontrolled furnaces.

Losses to the atmosphere as a result of the operation of the furnaces:

$$\frac{2.0}{2000} \times \frac{1043}{22.5} = 0.05 \text{ tons per day}$$

[illegible]

[illegible] cupola [illegible] charged [illegible] coke charge. Industry [illegible] recommended [illegible] sulfur compound emissions [illegible] pounds.

Emission factors for cupola are as follows:

Without Control Equipment: Aerosols 300 lbs. per ton

Sulfur compounds 63.0 lbs. per ton

With Control Equipment: Aerosols 5.1 lbs. per ton

Sulfur compounds 50.5 lbs. per ton

Results of the industry survey showed that 1353 tons per month of lead were reclaimed in these cupolas during 1963.

Losses to the atmosphere if no air pollution control equipment were used:

Aerosols $\frac{300}{2,000} \times \frac{1353}{22.5} = 9.02$ tons per day

Sulfur compounds $\frac{63.0}{2000} \times \frac{1353}{22.5} = 1.92$ tons per day

Losses to the atmosphere using air pollution control equipment:

Aerosols $\frac{5.1}{2,000} \times \frac{1353}{22.5} = 0.15$ tons per day

Sulfur compounds $\frac{50.5}{2,000} \times \frac{1353}{22.5} = 1.73$ tons per day

Amount prevented from going to the atmosphere:

Aerosols [illegible]

Sulfur compounds [illegible]

LEAD MELTING CUPOLA FURNACE EMISSION DATA

[illegible]	[illegible]	TOTAL RECOVERED (a) LBS/HR	UNCONTROLLED EMISSIONS				CONTROLLED EMISSIONS			
			AEROSOLS LBS/HR - LBS/TON		SULFUR COMPOUNDS LBS/HR - LBS/TON		AEROSOLS LBS/HR - LBS/TON		[illegible] LBS/HR - LBS/TON	
[illegible] Type	[illegible]	1530	229	300	48.5	63.8	3.2	4.2	[illegible]	[illegible]

(a) Total recovered from operations of this type averages 67½ % of the lead bearing material charged.

[illegible] EMISSION FACTORS

The emission factor for lead pot furnaces are determined by using the [illegible] available tests. Neither furnace was equipped with an air pollution control device.

Lead pot furnaces are not vented to air pollution control equipment except when reclaiming or refining operations are being conducted. Stack analysis test data are not available for controlled lead pot furnaces; however, by applying a 90% efficiency factor for an effective air pollution control device, the control emission factor can be determined.

Emissions factors for the furnaces are as follows:

Without Control Equipment	0.1 lbs. per ton
With Control Equipment	0.01 lbs. per ton

Results of the industry survey show that 55,970 tons per month of lead were processed in 95 uncontrolled furnaces during 1963. A total of 8,949 tons per month of lead were processed in 49 furnaces equipped with air pollution controls.

Losses to the atmosphere if no air pollution control equipment were used:

$$\frac{0.1}{2,000} \times \frac{64,927}{22.5} = 0.14 \text{ tons per day}$$

Losses to the atmosphere at the present state of air pollution control:

Losses from the controlled furnaces

$$\frac{0.01}{2,000} \times \frac{8949}{22.5} = 0.002 \text{ tons per day}$$

Losses due to the uncontrolled furnaces

$$\frac{0.1}{2,000} \times \frac{55,970}{22.5} = 0.12 \text{ tons per day}$$

Total emissions to the atmosphere:

0.12 + 0.002 = 0.12 tons per day

Amount prevented from entering the atmosphere:

0.14 - 0.12 = 0.01 tons per day

[illegible]	WBSP ID.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Smith Energy	[illegible]	[illegible]	0.532	[illegible]
[illegible]	Smith Energy	[illegible]	[illegible]	[illegible]	[illegible]
				[illegible]	0.1

to the aerosols.

Emission factors for this process are as follows:

Sulfuric acid mist emitted [illegible] lbs. per ton

Sulfur dioxide emitted 10.0 lbs. per ton

Sulfur dioxide basis only emitted 2.1 lbs. per ton

Sulfur originally 105 lbs. per ton

Results of the laboratory survey showed that 1,000 tons per month of acid were processed in 12 furnaces during 1963. All the total 360 tons were burned from sulfur originally 2 furnaces.

Losses to the atmosphere if no air pollution control equipment on all units were

Aerosols $\frac{360}{2,000} \times \frac{32}{32.1} = 5.02$ tons per day

Sulfur dioxide $\frac{360}{2,000} \times \frac{64}{32.1} = 7.20$ tons per day

Losses to the atmosphere using air pollution control equipment:

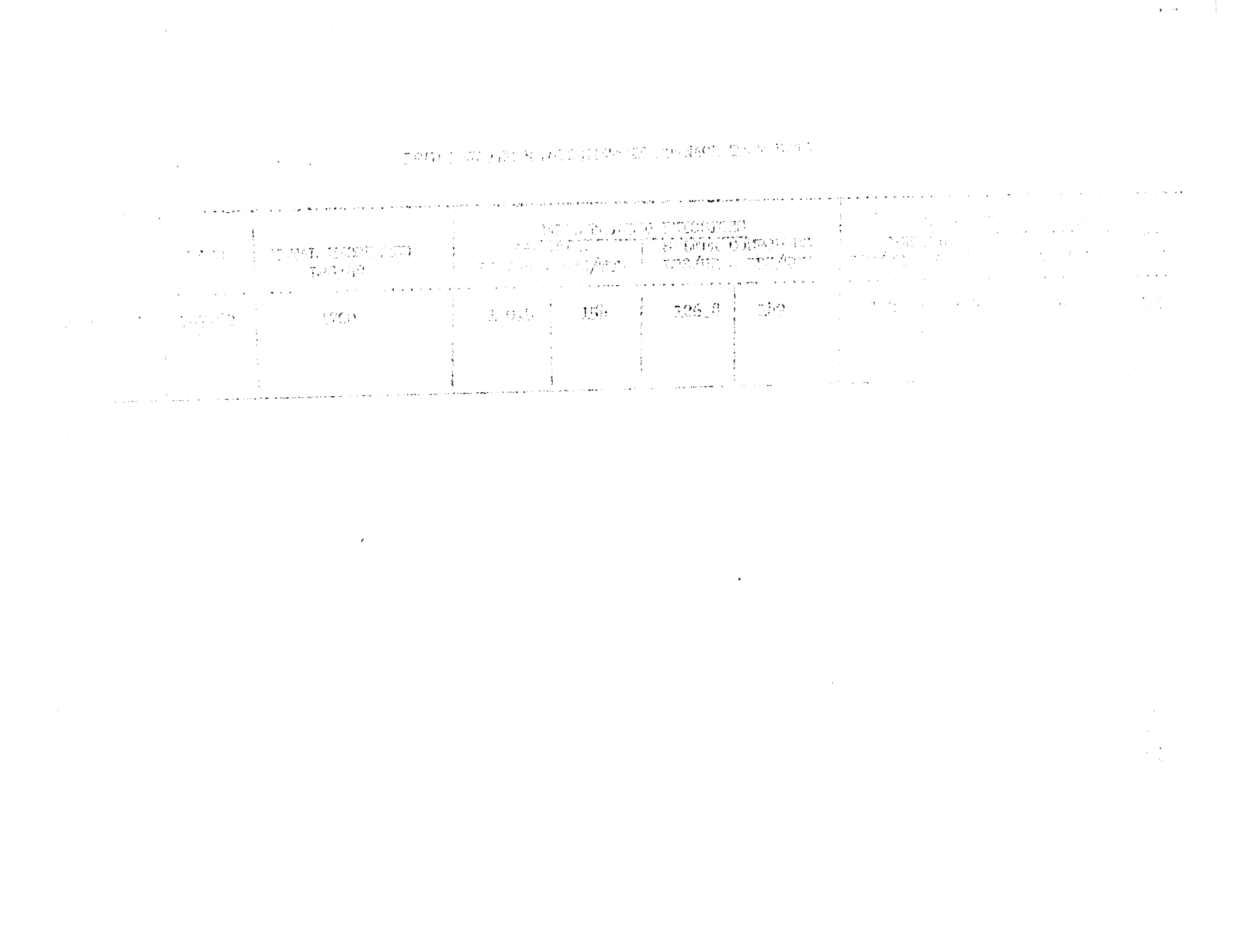
Aerosols $\frac{360}{2,000} \times \frac{32}{32.1} = 0.07$ tons per day

Sulfur dioxide $\frac{360}{2,000} \times \frac{64}{32.1} = 0.14$ tons per day

Amount removed by [illegible] control units:

Aerosols = 5.02 - 0.07 = 4.95 tons per day

Sulfur dioxide = 7.20 - 0.14 = 7.06 tons per day



[illegible]

[illegible] only one flare is used for each [illegible] the [illegible] ingot and their [illegible] [illegible]. Tests indicate losses average 0.2 pound per hour from the furnaces [illegible], due to the relatively small process weight of about 100 pounds per hour, the emission factor, based on pounds per ton, is 4.4.

Air pollution control equipment is not used on the furnaces and losses to the Los Angeles atmosphere are based on the uncontrolled emission factor.

Results of the industry survey showed a total of 705 tons per month of magnesium were processed in 91 furnaces.

Losses to the atmosphere as a result of the operation of the furnaces:

$$\frac{4.4}{2000} \times \frac{705}{22.5} = 0.07 \text{ tons per day.}$$

MAGNESIUM MELTING FURNACE TEST DATA

[illegible]	TEST NO.	DATE	METAL WEIGHT LBS/HR	UNCONTROLLED LOSS, LBS/HR	[illegible]
[illegible] Alloy Prod.	C-601	4/24/59	67.	0.26	[illegible]
Osborn	687	4/30/52	100	0.045	[illegible]
H & S Metal	C-532	7/9/58	125	0.38	
				Average	[illegible]

[illegible]

The emission factor for [illegible] determined by [illegible] during the melting phase of operation. Recent test data [illegible] culate the emission factor.

The test data accumulated by A.D. Little Company showed that losses of [illegible] per ton of metal charged were due to charge charging and tapping slag. This amount was added to the average value obtained from tests of air pollution control systems to give the overall emission factor.

Emission factor for furnaces are as follows:

Without Control Equipment	15.0 lbs. per ton
With Control Equipment	1.4 lbs. per ton

Results of the industry survey showed that 65,055 tons per month of steel were processed in 50 electric arc furnaces in Los Angeles County during 1961.

Losses to atmosphere if no air pollution control equipment were used:

$$\frac{15}{2,000} \times \frac{65,055}{22.5} = 21.7 \text{ tons per day.}$$

Losses to atmosphere using air pollution control equipment:

$$\frac{1.4}{2,000} \times \frac{65,055}{22.5} = 2.0 \text{ tons per day.}$$

Amount prevented from going to the atmosphere:

[illegible] tons per day by [illegible].

DIRECT ARC STEEL MELTING FURNACE TEST DATA

[illegible]	FURNACE SIZE TONS	METAL MELTED LBS/HR	FUMES CAPTURED BY HOODS LBS/TON	FUMES RELEASED BY COLLECTOR LBS/TON	FUMES ESCAPING DUE TO CHARGING & TAPPING LBS/TON	TOTAL FUMES WITHOUT CONTROLS LBS/TON	[illegible]
[illegible]	17	13,700	24.4	0.35	0.8	25.5	[illegible]
[illegible]	35	4,250	34.4	0.27	0.8	35.5	[illegible]
[illegible]	4th	6,500	10.4	0.39	0.6	11.4	[illegible]
[illegible]	24	17,650	6.7	0.69	0.6	7.9	[illegible]
[illegible]	19	22,200	35.0	1.35	0.6	36.9	[illegible]
[illegible]	19	22,000	34.5	1.00	0.6	36.1	[illegible]
						35.0	1.5

AVERAGE EMISSIONS

[illegible]

Fabrication plant grinding fumaces are used for the powder charge for grinding alloy heats and melt shop fabrication mix charged to the furnaces to avoid contamination. Furnaces occur only for a few minutes during the heats. The average emission factor is estimated to be 0.1 lbs. per ton of refined metal.

Results of the industry survey showed a total of 590 tons per month of metal were processed in 21 furnaces.

Losses to atmosphere as a result of the operation of the furnaces:

$$\frac{0.1}{2,000} \times \frac{590}{22.5} = 0.002 \text{ tons per day}$$

11	8.45	20.8	4.500
12	**8.45**	**45.1**	**5.270**
13	8.45	101.5	5.390
14	8.45	63.1	5.800

[illegible]

[illegible]

The Survey Unit is [illegible] equipped with the pollution controls. The total mine water used was 500 tons per month.

Losses to the atmosphere as a result of 8 hours per day operation of the equipment is as follows:

$$\frac{0.68}{2,000} \times 8 \times 30 = 0.05 \text{ tons per day}$$

$$= 100 \text{ lbs per day}$$

$$= 5.3 \text{ lbs/ton of zinc.}$$

[illegible]	[illegible]	[illegible]
Advance Galvanizing	[illegible]	0.65
Advance Galvanizing	[illegible]	0.61
Bruce	4-16-59	0.46
Bruce	4-16-59	0.69
L. A. Galvanizing	5-31-59	0.55
Superior Pacific	3-26-59	0.33
	AVERAGE	0.62

[illegible]

The emission factors for dust collection processing kilns were determined in a recent stack test. Only one kiln is located in the nearby town, the emissions would be considerable if no air pollution control equipment were being used.

The emission factor for the kiln:

Without Control Equipment	88.8 lbs. per ton
With Control Equipment	1.0 lbs. per ton

Results of industry survey showed that 200 tons per month of material were processed in the one kiln.

Losses to the atmosphere if no air pollution control equipment were used:

$$\frac{88.8}{2,000} \times \frac{200}{22.5} = 0.4 \text{ tons per day}$$

Losses to the atmosphere using air pollution control equipment:

$$\frac{1.0}{2,000} \times \frac{200}{22.5} = 0.004 \text{ tons per day}$$

Amount prevented from going to the atmosphere:

$$0.4 - 0.004 = 0.4 \text{ tons per day}$$

[illegible] CRUDE CHARGING RATE TEST DATA

	[illegible]	PROCESS RATE LBS/HR	CONTROLLED LBS/HR	CONTROLLED LBS/HR	CONTROLLED LBS/HR
[illegible]	[illegible]	2701	123.3	[illegible]	[illegible]

[illegible] dryer as well as the [illegible] out of the dryer

Emission factor based on measured data:

Without Control Equipment	10.8 lbs. per ton
With Control Equipment	0.4 lbs. per ton

The results of the inspection survey showed that 1215 tons per month of lime were recovered by operating the eight furnaces. All the furnaces were equipped with air pollution control equipment.

Losses to atmosphere if no air pollution control equipment were used:

$$\frac{10.8}{2,000} \times \frac{1215}{22.5} = 0.30 \text{ tons per day}$$

Losses to atmosphere using air pollution control equipment:

$$\frac{0.4}{2,000} \times \frac{1215}{22.5} = 0.01 \text{ tons per day}$$

Amount prevented from going to the atmosphere:

$0.30 - 0.01 = 0.29$ tons per day

ZERO EMISSIONS FURNACE TEST DATA

[illegible]	ZLTD DESIRED TEMPERATURE DEG/FH	[illegible] DEG/HR	[illegible] OPERATOR NOT/HR	[illegible]	[illegible]
[illegible]	2500	13.5	0.5	[illegible]	[illegible]

[illegible]

[illegible] dust due to the foundry operations [illegible] reading a silica of [illegible] of 1.3% [illegible] is considered that the foundry building [illegible] building should, then these foundries [illegible] also have the dust emission to the outside atmosphere as that indicated by the test.

A test conducted on a water scrubber venturi type sand reclaiming system showed an emission of 0.30 lbs. per ton. By combining this test with the shakeout test and considering that only a minor number of foundries are equipped with baghouses, the emission factor can be estimated at 0.3 lbs. per ton of sand handled.

The amount of sand used for casting metal is proportional to the metal poured and an average of 3 lbs. of sand to 1 lb. of metal is estimated for all metals cast in sand.

Results of the survey showed that 11,000 tons per month of all metals were cast in sand.

Inserting in the equation:

$$E = \frac{0.3}{2000} \times \frac{11,000}{30} \times 3 = 1.65 \text{ tons per day}$$

FOUNDRY SAND HANDLING

[illegible]	TEST NO.	METAL	CONTROLS	SAND PROCESSING LBS/HR	TOTAL LOSSES LBS/HR		LOSSES LBS/TON	
					With control	Without		
[illegible] Foundries Co.	C-548	Gray Iron	Settling Chamber	27,000	4.5	6.0	[illegible]	[illegible]
[illegible] Castings	C-432	Steel Castings	Sonneble Scrubber	50,000	7.54	---	[illegible]	---

Furnace	[illegible]
Aluminum, Crucible	1,935
Aluminum, Reverberatory	16
Brass, Crucible	4,735
Brass, Reverberatory	13
Brass, Rotary	733
Brass, Electric	4,521
Iron, Cupola	19,270
Iron, Electric	1,418
Iron, Reverberatory	1,043
Lead, Pot	60
Magnesium, Pot	150
Steel, Arc	2,907
Steel, Induction	100
TOTAL	36,801

[illegible] 1,000 [illegible] 1,250 gallons of oil per day. It was estimated that [illegible] contained 2% of oil so that the total [illegible] 2% of 1,250 or 25 gallons per day. The total oil [illegible] 5 pounds per gallon. The total oil [illegible] as follows:

$$\frac{500 \times 1,000 \times .02}{8} = 1,250 \text{ gallons of oil per day.}$$

Average combustion contaminants in exhaust gas from six trucks [illegible] 0.301, 0.306, 0.330, 0.164 and 0.372, or .095 lbs. per hour per gallon of oil. With an average 5 hours pressure time, the contamination [illegible] 0.26 lbs. per gallon used.

$$\text{Emission to atmosphere} = \frac{1,250}{2,000} \times 0.26 = 0.16 \text{ tons per day.}$$

Air contaminants due to combustion of fuels is being reported separately and the above figure includes those also.

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]

MISCELLANEOUS EQUIPMENT USED IN THE METALLURGICAL INDUSTRY

Results of the industry survey showed that in addition to the main divisions of metallurgical equipment there were 51 miscellaneous sources of air contaminants. The total air contaminant emission is considered to be minor in air pollution potential due to the small number of sources and since air pollution control devices are being used on 35% of the equipment. In some instances the emissions from the uncontrolled sources is not known by actual test data but by comparison to similar equipment the losses can be estimated. In one instance the data is not available although attempts were made to obtain the data from the company which operates the equipment. In that instance, the air contaminants being generated are radioactive and the effluent is monitored by the company. The air contaminants are regulated by the Atomic Energy Commission.

A list of the equipment included in this category is as follows:

1. Wax burnout ovens.
2. Uranium carbide melting furnaces.
3. Zirconium melting furnaces.
4. Titanium melting furnaces.
5. Gold and silver reclaiming furnaces.
6. Cerrobend metal equipment.
7. Tin reclaiming equipment.
8. Abrasive blasting conducted only in foundries (all other abrasive blasting was reported separately)
9. Virgin zinc remelting furnaces.
10. Brass melting cupola furnaces.