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II. SUMMARY

A series of tests were performed on the B8 Baghouse exhaust at the G. H. Hensley, Inc. facility in Dallas, TX on January 17, 1995.

Sampling was performed following procedures detailed in Title 40: Code of Federal Regulations.

Results of this test series are summarized in Table 1.

Emissions rates are as follows:

<u>Run #</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>Average</u>
Carbon Monoxide Emissions, lbs/hr	23.47	35.4	25.83	28.23
NO _x Emissions, lbs/hr	9.29	12.57	16.56	12.8
VOC as C ₃ H ₈ Emissions, lbs/hr	3.73	2.75	2.45	2.98
Particulate Matter Emissions, lbs/hr	1.56	0.87	0.91	1.11

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SUMMARY OF EMISSIONS TEST DATA

Table : 1
 Plant : G. H. Hensley, Dallas, TX
 Location : B-8 Baghouse Exhaust
 Operator : J. Salinas, M. Peterson, R. Taylor
 Test Date : 17-Jan-95
 Repetition :

	1	2	3
STACK GAS			
Temperature, F	113.6	113.5	118.0
Velocity, fps	58.24	59.94	58.86
Volume Flow, acfm	51038.3	52527.4	51582.3
scfm	46105.3	47714.2	46702.6
scfh	2766316	2862850	2802157
Moisture, %	0.99%	0.76%	0.31%
CO ₂ , %	0.00	0.00	0.00
O ₂ , %	21.00	21.00	21.00
SAMPLE			
Start Time, hrs:min	7:54 AM	9:37 AM	11:50 AM
Finish Time, hrs:min	8:57 AM	10:42 AM	12:55 PM
Sample Volume, scf	35.242	36.397	34.535
Isokinetic Ratio, %	97.93867	97.73762	94.74697
PARTICULATE			
Front Half			
Sample Weight, mg	6.80	1.80	0.60
Concentration, gr/scf	0.002977	0.000763	0.000268
Emissions, lbs/hr	1.176947	0.312186	0.107346
Back Half			
Sample Weight, mg	2.20	3.20	4.50
Concentration, gr/scf	0.000963	0.001357	0.002011
Emissions, lbs/hr	0.380777	0.554997	0.805098
Total Particulate, lbs/hr	1.557724	0.867182	0.912444
CARBON MONOXIDE			
Concentration, ppm	116.7	170.25	126.8
Emissions, lbs/hr	23.46629	35.42888	25.82757
NITROGEN OXIDE AS NO₂			
Concentration, ppm	28.12	36.8	49.5
Emissions, lbs/hr	9.289422	12.58108	16.56415
VOC AS C₃H₈			
Concentration, ppm	11.8	8.41	7.65
Emissions, lbs/hr	3.728638	2.750179	2.448614

III. PROCEDURES

The procedure for emissions sampling followed USEPA test methods as detailed in Title 40: Code of Federal Regulations. The following methods were used:

Method	Title
1	Sample and Velocity Traverses for Stationary Sources
2	Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
3	Gas Analysis for CO ₂ , O ₂ , Excess Air and Dry Molecular Weight
4	Determination of Moisture Content in Stack Gas
5	Determination of Particulate Emissions from Stationary Sources
7E	Determination of Nitrogen Oxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)
10	Determination of Carbon Monoxide Emissions from Stationary Sources
25A	Determination of Total Gaseous Organic Concentration Using a Flame Ionization Detector

O₂ and CO₂ were determined using a Fyrite analyzer.

Particulate sampling was performed using an Apex Method 5 sampling train with a stainless steel probe and a 0.1867 inch stainless steel nozzle. Sampling was performed for 2.5 minutes at each of 24 points, 12 points per traverse.

VOC sampling was performed using a Rosemount Model 400A continuous FID which was spanned with 200 ppm, 29.98 ppm, and a 5.07 ppm C₃H₈ certified standards.

NO_x sampling was performed using a ThermoEnvironmental Model 10 continuous NO_x analyzer which was spanned with 254 ppm, 95.8 ppm, and 30.06 ppm NO_x certified standards.

CO sampling was performed using a Horiba continuous CO monitor which was spanned with 400 ppm, 98 ppm and 50.7 ppm CO certified standards.

II. SUMMARY

A series of tests were performed on the B9, B6, B10 and B15 baghouse exhausts at the G. H. Hensley, Inc. facility in Dallas, TX on January 19-24, 1995.

Sampling was performed following procedures detailed in Title 40: Code of Federal Regulations.

Results of this test series are summarized in Table 1-4.

Emissions rates are as follows:

<u>Run #</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>Average</u>
B9 Baghouse (<i>shake out</i>)				
VOC as C3H8				
Emissions, lbs/hr	8.08	4.58	4.87	5.84
Particulate Matter				
Concentration, gr/scf	0.005	0.0015	0.002	0.003
Allowable, gr/scf	0.01	0.01	0.01	0.01
Emissions, lbs/hr	1.075	0.29	0.54	0.635
Allowable, lbs/hr	2.57	2.57	2.57	2.57
B6 Baghouse (<i>sand mixing</i>)				
VOC as C3H8				
Emissions, lbs/hr	0.31	0.45	0.39	0.38
Particulate Matter				
Concentration, gr/scf	0.0062	0.011	0.01	0.009
Allowable, gr/scf	0.01	0.01	0.01	0.01
Emissions, lbs/hr	0.1	0.21	0.18	0.16
Allowable, lbs/hr	0.52	0.52	0.52	0.52
B10 Baghouse (<i>sand cool + reclamation</i>)				
VOC as C3H8				
Emissions, lbs/hr	0.7	0.56	0.28	0.51
Particulate Matter				
Concentration, gr/scf	0.0008	0.001	0.006	0.0026
Allowable, gr/scf	0.01	0.01	0.01	0.01
Emissions, lbs/hr	0.05	0.07	0.36	0.16
Allowable, lbs/hr	0.52	0.52	0.52	0.52

B15 Baghouse - sand reclaim
VOC as C3H8

Emissions, lbs/hr	0.18	0.24	0.21	0.21
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Particulate Matter

Concentration, gr/scf	0.006	0.005	0.004	0.005
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Allowable, gr/scf	0.01	0.01	0.01	0.01
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Emissions, lbs/hr	0.28	0.22	0.19	0.23
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Allowable, lbs/hr	0.52	0.52	0.52	0.52
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{ Total VOC, Mold Torch Dry and No-Bake Molds

Emissions, lbs/hr	8.96	5.83	5.75	6.84
Allowable, lbs/hr	23.8	23.8	23.8	23.8

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SUMMARY OF EMISSIONS TEST DATA

Table : 1
 Plant : G. H. Hensley
 Location : B9 Baghouse Exhaust
 Operator : M. Peterson, J. Salinas, R. Taylor
 Test Date : 19-Jan-95
 Repetition :

	1	2	3
STACK GAS			
Temperature, F	62.0	65.5	62.5
Velocity, fps	46.12	47.57	44.45
Volume Flow, acfm	21791.9	22481.0	21002.4
scfm	21257.8	21773.2	20437.9
scfh	1275467	1306392	1226275
Moisture, %	0.95%	0.99%	1.08%
CO ₂ , %	0.00	0.00	0.00
O ₂ , %	21.00	21.00	21.00
SAMPLE			
Start Time, hrs:min	12:05 PM	4:51 PM	5:52 PM
Finish Time, hrs:min	1:46 PM	5:33 PM	7:06 PM
Sample Volume, scf	63.298	66.785	62.951
Isokinetic Ratio, %	99.79379	102.7978	103.227
PARTICULATE			
Front Half			
Sample Weight, mg	9.80	2.70	4.90
Concentration, gr/scf	0.002389	0.000624	0.001201
Emissions, lbs/hr	0.435422	0.116458	0.21047
Back Half			
Sample Weight, mg	14.40	4.00	7.60
Concentration, gr/scf	0.00351	0.000924	0.001863
Emissions, lbs/hr	0.639804	0.17253	0.326444
Total Particulate, lbs/hr	1.075227	0.288988	0.536914
VOC AS C3H8			
Concentration, ppm	55.47	30.68	34.75
Emissions, lbs/hr	8.081532	4.578205	4.867537



National Emission Standards for Hazardous Air Pollutants (NESHAP) for Iron and Steel Foundries - Background Information for Proposed Standards

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EPA-453/R-02-013
December 2002

National Emission Standards for Hazardous Air Pollutants (NESHAP) for
Iron and Steel Foundries--
Background Information for Proposed Standards

Prepared by:
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Prepared for:
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Emission Standards Division

Contract No. 68-D01-73
Work Assignment No. 1-14

U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Emission Standards Division
Metals Group
Research Triangle Park, NC

APPENDIX F

SOURCE TEST PARTICULATE MATTER DATA FOR ELECTRIC ARC FURNACE BAGHOUSES

F.1 INTRODUCTION

This appendix presents the individual sampling run data for the source tests available to characterize the control performance for baghouses applied to EAF (Chapter 4). Summary test data are given in Table F-1 along with information on furnace melting rates and capacities and a description of the control systems and the processes they serve.

The data in Table F-1 represent a range of furnace sizes and types of baghouses. The design furnace melting rates range from 2.5 to 15 tons per hour, and ventilation rates range from 31,000 to 225,000 acfm. The baghouses include both negative and positive pressure operating modes and employ both shaker and pulse jet cleaning systems. Some were installed about 30 years ago, and some are relatively new (rebuilt). The design air-to-cloth ratios cover a range of 2.3 to 5.7 ft/min. No information is available on the ages of the bags in service when the tests were conducted.

The reported results were checked to ensure the weights of PM from the filter and the probe catch were above detection limits. When the reported catch was less than 3 mg, a detection limit value of 3 mg and the sample volume were used to estimate the detection limit in gr/dscf. Values calculated in this manner are reported as “less than” (<).

TABLE F-1. PM TEST RESULTS FOR BAGHOUSES SERVING EAF

Foundry IN-7 (tested December 1997)								
Run	PM loading (gr/dscf)	PM mass flow rate (lb/hr)	Flow rate (dscfm)	Flow rate (acfm)	Temp, (°F)	Air-to-cloth ratio (ft/min)	Melt rate (tph)	Baghouse design and service data
1	0.0006	0.15	29,200				3.7	Negative pressure; shaker cleaning. Fabric: Dacron/cotton. Design gas flow rate: 31,200 acfm. Design operating temperature: 100 °F. Design air-to-cloth ratio: 2.51 ft/min. Rebuilt 1985. Serves one EAF, 3.6 tons/hr design melt rate.
2	0.0004	0.11	32,100				3.7	
3	0.0005	0.13	30,300				3.1	
Average	0.0005	0.13	30,500				3.5	
Foundry IA-09 (tested August 1996)								
Run	PM loading (gr/dscf)	PM mass flow rate (lb/hr)	Flow rate (dscfm)	Flow rate (acfm)	Temp, (°F)	Air-to-cloth ratio (ft/min)	Melt rate (tph)	Baghouse design and service data
1	0.00083	0.62	85,099	87,520	127	2.4	5.65	Positive pressure; shaker cleaning. Fabric: 10.5 oz. polyester. Design gas flow rate: 85,000 acfm Design operating temperature: 90 °F. Design air-to-cloth ratio: 2.36 ft/min. Installed 1974. Serves two EAFs, 6.0 tons/hr design melt rate each, one holding furnace with 61 tons capacity, and one holding furnace with 40 tons capacity.
2	0.00063	0.47	85,200	87,030	129	2.4		
3	0.00041	0.29	79,414	81,406	126	2.3		
Average	0.00062	0.46	83,238	85,319	127	2.4		

Foundry IA-09 (tested July 2002)								
Run	PM loading (gr/dscf)	PM mass flow rate (lb/hr)	Flow rate (dscfm)	Flow rate (acfm)	Temp, (°F)	Air-to-cloth ratio (ft/min)	Melt rate (tph)	Baghouse design and service data
1	0.0007	0.51	85,927	93,624	127	2.6	5.65	Positive pressure; shaker cleaning. Fabric: 10.5 oz. polyester. Design gas flow rate: 85,000 acfm Design operating temperature: 90 °F. Design air-to-cloth ratio: 2.36 ft/min. Installed 1974. Serves two EAFs, 6.0 tons/hr design melt rate each, one holding furnace with 61 tons capacity, and one holding furnace with 40 tons capacity.
2	0.0007	0.50	83,992	89,854	117	2.5		
3	0.0006	0.42	80,727	86,978	121	2.4		
Average	0.00067	0.48	83,549	90,152	122	2.5		
Foundry IA-09 (tested May 1995)								
Run	PM loading, gr/dscf	PM mass flow rate, lb/hr	Flow rate, dscfm	Flow rate, acfm	Temp, °F	Air-to-cloth ratio, ft/min	Melt rate (tph)	Baghouse design and service data
1	0.0013	1.0	87,520				---	Positive pressure; shaker cleaning. Fabric: 10.5 oz. polyester. Design gas flow rate: 85,000 acfm Design operating temperature: 90 °F. Design air-to-cloth ratio: 2.36 ft/min. Installed 1974. Serves two EAFs, 6.0 tons/hr design melt rate each, one holding furnace with 61 tons capacity, and one holding furnace with 40 tons capacity.
2	0.001	0.63	87,030				---	
3	0.00072	0.50	81,406				---	
Average	0.0010	0.71	85,319				5.65 total	

Foundry TX-19 (January 1995)								
Run	PM loading, gr/dscf	PM mass flow rate, lb/hr	Flow rate, dscfm	Flow rate, acfm	Temp, °F	Air-to-cloth ratio, ft/min	Melt rate (tph)	Baghouse design and service data
1	0.0030	1.18	46,100	51,000	114	2.34		Negative pressure; shaker cleaning. Fabric: 10.5 oz. seamless polyester. Design gas flow rate: 50,000 acfm. Design operating temperature: 250 °F. Design air-to-cloth ratio: 2.30 ft/min. Serves two EAFs, 5 tons/hr design melt rate each.
2	<0.0013	<0.5	47,700	52,500	114	2.41		
3	<0.0013	<0.5	46,700	51,600	118	2.37		
Average	<0.002	<0.7	46,800	51,700	115	2.37		
Foundry AL-11 (tested September 1995)								
Run	PM loading, gr/dscf	PM mass flow rate, lb/hr	Flow rate, dscfm	Flow rate, acfm	Temp, °F	Air-to-cloth ratio, ft/min	Melt rate (tph)	Baghouse design and service data
1	0.0019	1.77	109,000	122,000	121	3.05	9.1, 9.4	Negative pressure; pulse jet cleaning. Fabric: 18 oz. polyester dual density felt. Design gas flow rate: 140,000 acfm. Design operating temperature: 200 °F. Design air-to-cloth ratio: 3.50 ft/min. Rebuilt 1995. Serves two EAFs, 9.25 tons/hr design melt rate each.
2	0.0017	1.58	108,000	123,000	130	3.08	9.4, 9.5	
3	0.0009	0.87	113,000	127,000	126	3.18	9.1, 9.5	
Average	0.0015	1.41	110,000	124,000	126	3.10	9.2, 9.5	

Foundry MN-3 (tested May 1993)								
Run	PM loading, gr/dscf	PM mass flow rate, lb/hr	Flow rate, dscfm	Flow rate, acfm	Temp, °F	Air-to-cloth ratio, ft/min	Melt rate (tph)	Baghouse design and service data
1	0.0021	2.64	146,200	155,600	84	2.27	4.8, 3.9	Negative pressure; shaker cleaning. Fabric: polyester. Design gas flow rate: 180,000 acfm Design operating temperature: 100°F Design air-to-cloth ratio: 2.4 ft/min Installed 1980. Serves two EAFs, 4.3 tons/hr design melt rate each.
2	0.0019	2.29	142,200	150,000	85	2.19	4.8, 4.4	
3	0.0019	2.45	151,000	157,100	85	2.30	6.3, 4.4	
Average	0.0020	2.46	146,500	154,200	85	2.25	5.3, 4.2	
Foundry MI-09 (tested October 1996)								
Run	PM loading (gr/dscf)	PM mass flow rate (lb/hr)	Flow rate (dscfm)	Flow rate (acfm)	Temp, (°F)	Air-to-cloth ratio (ft/min)	Melt rate (tph)	Baghouse design and service data
1	0.0044	1.03	26,702	31,467	144		12	Positive pressure; shaker cleaning. Fabric: Polyester. Design gas flow rate: 200,000 acfm. Design operating temperature: 170 °F. Design air-to-cloth ratio: 2.33 ft/min. Built 1987. Serves three EAF, 15 tons/hr design melt rate.
2	0.0030	0.69	26,365	31,868	159			
3	0.0017	0.39	26,716	31,447	143			
4	0.0015	0.35	26,544	31,654	151			
Average	0.0027	0.62	26,582	31,609	149			

Foundry OH-1 (tested March 1994)								
Run	PM loading, gr/dscf	PM mass flow rate, lb/hr	Flow rate, dscfm	Flow rate, acfm	Temp, °F	Air-to-cloth ratio, ft/min	Melt rate (tph)	Baghouse design and service data
1	0.0025	4.45	208,000	234,000	96			Design gas flow rate: 225,000 acfm. Design operating temperature: 150 °F. Design air-to-cloth ratio: Serves three EAFs, 13 tons/hr design melt rate each.
2	0.0030	5.26	205,000	230,000	103			
3	0.0025	4.42	206,000	230,000	102			
Average	0.0027	4.71	206,000	231,000	100			
Foundry OH-1 (tested May 1997)								
Run	PM loading, gr/dscf	PM mass flow rate, lb/hr	Flow rate, dscfm	Flow rate, acfm	Temp, °F	Air-to-cloth ratio, ft/min	Melt rate (tph)	Baghouse design and service data
1	0.0063							
2	0.0076							
3	0.0059							
Average	0.0066							

Foundry WI-45 (tested September 1990)								
Run	PM loading, gr/dscf	PM mass flow rate, lb/hr	Flow rate, dscfm	Flow rate, acfm	Temp, °F	Air-to-cloth ratio, ft/min	Melt rate (tph)	Baghouse design and service data
1	0.0033	1.97	33,550				2.07	Positive pressure; shaker cleaning. Fabric: polyester/cotton. Design gas flow rate: 35,000 Design operating temperature: 125 °F. Design air-to-cloth ratio: 5.7 ft/min. Installed 1979. Serves one EAF, 2.5 tons/hr design melt rate and sand mulling.
2	0.0025	1.45	33,800				2.16	
3	0.0035	1.77	33,667				2.46	
Average	0.0031	1.73	33,700				2.23	
Foundry IA-17 (tested January 1995)								
Run	PM loading, gr/dscf	PM mass flow rate, lb/hr	Flow rate, dscfm	Flow rate, acfm	Temp, °F	Air-to-cloth ratio, ft/min	Melt rate (tph)	Baghouse design and service data
1	0.0069	5.35	82,000				8.3, 11.6	Negative pressure; shaker cleaning. Fabric: woven Dacron. Design gas flow rate: 120,383. Design operating temperature: 182 °F. Design air-to-cloth ratio: 2.59 ft/min. Installed 1972. Serves two EAFs, 12 tons/hr design melt rate each.
2	0.0029	2.55	92,100				9.6, 14.1	
3	0.0035	2.68	85,200					
Average	0.0044	3.53	86,400					

Foundry PA-11 (tested November 1994)								
Run	PM loading, gr/dscf	PM mass flow rate, lb/hr	Flow rate, dscfm	Flow rate, acfm	Temp, °F	Air-to-cloth ratio, ft/min	Melt rate (tph)	Baghouse design and service data
1	0.0058	4.9	99,000				15.1	Negative pressure; shaker cleaning. Fabric: polyester. Design gas flow rate: 120,000. Design operating temperature: 130 °F. Design air-to-cloth ratio: 3.2 ft/min. Installed 1977. Serves one EAF, 15 tons/hr design melt rate.
2	0.0080	6.3	92,000				15.1	
3	0.0103	7.6	86,000				8.2	
Average	0.0080	6.3	92,000				12.8	

APPENDIX G

SOURCE TEST PARTICULATE MATTER DATA FOR POURING, COOLING AND SHAKEOUT