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RESULTS OF THE JULY 11 - 13, 1995 STATE AIR EMISSION PERFORMANCE TESTING AT THE LTV STEEL MINING PLANT COMPANY PELLET PLANT IN HOYT LAKES, MINNESOTA (PERMIT NO. 48B-95-I/O-1)

Submitted to:

LTV STEEL MINING COMPANY
P.O. Box 847
Hoyt Lakes, Minnesota 55750

Attention:

Dennis Koschak

Approved by:

Daniel Despen
Manager
Stationary Source Testing Department

Report Number 5-6005
August 28, 1995
SP/slp

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1 INTRODUCTION

During July 11 - 13, 1995 Interpoll Laboratories Personnel conducted a State Particulate, Sulfur Dioxide, Oxides of Nitrogen, and Carbon Monoxide Emission Compliance Test of the LTV Steel Mining Facility Located in Hoyt Lakes, Minnesota. On-site testing was performed by Mark Kaehler, Ed Trowbridge, Steve Kelker, and Lee Hansen. Coordination between testing activities and plant operation was provided by Wayne Kivela of LTV. The tests were not witnessed by a member of Minnesota Pollution Control Agency.

The induration furnace tested has two stacks, the top gas stack (058) and the bottom gas stack (085). The furnace can burn either natural gas or No. 6 fuel oil. The testing was performed firing natural gas. The source was operating with a feed rate of approximately 58 LTPH and an output of 52 LTPH. Particulate emissions are controlled by a multi-clone.

Particulate evaluations were performed in accordance with EPA Methods 1 - 5, CFR Title 40, Part 60, Appendix A (revised July 1, 1993). Previous data collected at this test site was used to allow selection of the appropriate nozzle diameter required for isokinetic sample withdrawal. An Interpoll Labs sampling train which meets or exceeds specifications in the above-cited reference was used to extract particulate samples by means of a stainless steel-lined probe. Wet catch samples were collected in the back half of the Method 5 sampling train and analyzed in accordance with EPA Method 202.

Sulfur dioxide, oxides of nitrogen, oxygen, and carbon monoxide evaluations were performed in accordance with EPA Methods 3A, 4, 6C, and 7E, CFR Title 40, Part 60 Appendix B (revised July 1, 1993). A slip stream of exhaust gas was drawn from the exhaust gas stream using test ports provided by the plant using a heat-traced probe and filter assembly. After passing through the filter, the gas passed through two chilled condensers operating in series to remove moisture. The particulate-free dry gas was then transported to the SO_2, NO_x, O_2, and CO_2 analyzers with the excess exhausted to the atmosphere through a calibrated orifice which was used to ensure that the flow from the stack exceeds the requirements of the three analyzers. A three-way valve on the probe was used to introduce standard gas for the "system bias check". The analog response of each analyzer was recorded with a computer datalogger and backed up with a strip chart recorder.

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An integrated flue gas sample was extracted simultaneously with each particulate sample using a specially designed gas sampling system. Integrated flue gas samples were collected in 44-liter Tedlar bags housed in a protective aluminum container. After sampling was complete, the bags were returned to the laboratory for Orsat analysis. Prior to sampling, the Tedlar bags are leak checked at 15 IN.HG. vacuum with an in-line rotameter. Bags with any detectable inleakage are discarded. Integrated flue gas samples collected during each particulate sampling were also analyzed for carbon monoxide as per EPA Method 10 (NDIR).

Testing of Source 085 (Botton Gas Stack) was conducted from two test ports oriented at 90 degrees on the stack. The test ports are located 19.4 diameters downstream and 3.7 diameters upstream of the nearest flow disturbances. A 12-point traverse was used to collect representative samples. Each traverse point was sampled 5 minutes to give a total sampling time of 60 minutes per run.

Testing of Source 058 (Top Gas Stack) was conducted from two test ports oriented at 90 degrees on the stack. The test ports are located 1.6 diameters downstream and 0.8 diameters upstream of the nearest flow disturbance. A 24-point traverse was used to collect representative samples. Each traverse point was sampled 2.5 minutes to give a total sampling time of 60 minutes per run.

The important results of the test are summarized in Section 2. Detailed results are presented in Section 3. Field data and all other supporting information are presented in the appendices.

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2 SUMMARY AND DISCUSSION

The results of the air emission tests are summarized in Tables 1 - 5. An overview of the results is presented in the table below:

PARAMETER	NO. 085 BOTTOM GAS	NO. 058 TOP GAS
Particulate		
. . . . . (GR/DSCF)	0.0299	0.0248
. . . . . (LB/HR)	2.3	8.3
Sulfur Dioxide		
. . . . . (ppm,d)	< 1	≤ 5
. . . . . (LB/HR)	< 0.083	≤ 2.1
Oxides of Nitrogen		
. . . . . (ppm,d)	≤ 1	31
. . . . . (LB/HR)	≤ 0.06	8.6
Carbon Monoxide		
. . . . . (ppm,d)	1	21
. . . . . (LB/HR)	0.045	3.7

No other difficulties were encountered in the field or in the laboratory evaluation of the samples. On the basis of these facts and a complete review of the data and results, it is our opinion that the results reported herein are accurate and closely reflect the actual values which existed at the time the test was performed.

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Table 2b. Summary of the Results of the July 12, 1995 Particulate Emission Compliance Test on the No. 58 Top Gas Stack at the LTV Steel Plant Located in Hoyt Lakes, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		07-12-95	07-12-95	07-12-95
Time runs were done	(HRS)	942/1044	1117/1219	1242/1343
Volumetric flow				
actual	(ACFM)	56216	58774	57021
standard	(DSCFM)	38074	40362	39047
Gas temperature	(DEG-F)	146	144	146
Moisture content	(%V/V)	16.85	15.90	15.90
Gas composition	(%V/V,dry)			
carbon dioxide		2.20	2.10	2.20
oxygen		16.10	16.30	16.10
nitrogen		81.70	81.60	81.70
Isokinetic variation	(%)	99.3	98.2	99.1
Particulate concentration				
actual	(GR/ACF)	.0124	.006810	.0135
standard	(GR/DSCF)	.0184	.009920	.0198
Part. emission rate	(LB/HR)	5.99	3.43	6.61

Note: Dry Catch Only

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Table 2a. Summary of the Results of the July 12, 1995 Particulate Emission Compliance Test on the No. 58 Top Gas Stack at the LTV Steel Plant Located in Hoyt Lakes, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		07-12-95	07-12-95	07-12-95
Time runs were done	(HRS)	942/1044	1117/1219	1242/1343
Volumetric flow				
actual	(ACFM)	56216	58774	57021
standard	(DSCFM)	38074	40362	39047
Gas temperature	(DEG-F)	146	144	146
Moisture content	(%V/V)	16.85	15.90	15.90
Gas composition	(%V/V,dry)			
carbon dioxide		2.20	2.10	2.20
oxygen		16.10	16.30	16.10
nitrogen		81.70	81.60	81.70
Isokinetic variation	(%)	99.3	98.2	99.1
Particulate concentration				
actual	(GR/ACF)	.0188	.0134	.0185
standard	(GR/DSCF)	.0277	.0195	.0271
Part. emission rate	(LB/HR)	9.05	6.74	9.06

Note: Dry + Method 202 Condensible Particulate Material

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Table 1b. Summary of the Results of the July 11, 1995 Particulate Emission Compliance Test on the F3 Bottom Gas Stack at the LTV Steel Plant Located in Hoyt Lakes, Minnesota.

ITEM	Run 1	Run 2	Run 3
Date of test	07-11-95	07-11-95	07-11-95
Time runs were done (HRS)	1100/1103	1218/1319	1330/1431
Volumetric flow			
actual (ACFM)	11580	11646	11726
standard (DSCFM)	8930	9054	9130
Gas temperature (DEG-F)	150	150	151
Moisture content (%V/V)	5.69	4.93	4.71
Gas composition (%V/V,dry)			
carbon dioxide	0.00	0.00	0.00
oxygen	20.90	20.90	20.90
nitrogen	79.10	79.10	79.10
Isokinetic variation (%)	99.0	99.5	99.9
Particulate concentration			
actual (GR/ACF)	.0215	.0166	.0165
standard (GR/DSCF)	.0279	.0213	.0211
Part. emission rate (LB/HR)	2.14	1.66	1.65

Note: Dry Catch Only

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Table 1a. Summary of the Results of the July 11, 1995 Particulate Emission Compliance Test on the F3 Bottom Gas Stack at the LTV Steel Plant Located in Hoyt Lakes, Minnesota. (Source No. 085)

ITEM		Run 1	Run 2	Run 3
Date of test		07-11-95	07-11-95	07-11-95
Time runs were done	(HRS)	1100/1103	1218/1319	1330/1431
Volumetric flow				
actual	(ACFM)	11579	11645	11725
standard	(DSCFM)	8930	9053	9129
Gas temperature	(DEG-F)	150	150	151
Moisture content	(%V/V)	5.69	4.93	4.71
Gas composition	(%V/V,dry)			
carbon dioxide		0.03	0.03	0.03
oxygen		20.90	20.90	20.90
nitrogen		79.07	79.07	79.07
Isokinetic variation	(%)	99.0	99.5	99.9
Particulate concentration				
actual	(GR/ACF)	.0230	.0293	.0171
standard	(GR/DSCF)	.0299	.0377	.0220
Part. emission rate	(LB/HR)	2.29	2.93	1.72

Note: Dry + Method 202 Condensible Particulate Material

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3 RESULTS

The results of all field and laboratory evaluations are presented in this section. Gas moisture is presented first followed by the computer printout of the particulate, sulfur dioxide, oxides of nitrogen, and carbon monoxide results. Preliminary measurements including test port locations are given in the appendices.

The results have been calculated on a personal computer using programs written in Extended BASIC specifically for source testing calculations. EPA-published equations have been used as the basis of the calculation techniques in these programs. The particulate emission rate has been calculated using the product of the concentration times flow method.

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OPERATING DATA SUMMARY FOR COMBUSTION SOURCES

Company Name: LTV STEEL MINING

Date of Performance Test: _____

Summary prepared by: _____ (Signature)

A. Fuel Input

1. Itemize all fuels and materials that are added to the combustion process during the test period. Attach ultimate/proximate analysis of the fuel.

TEST __	FUEL TYPE & ORIGIN (e.g. Eastern Coal)	RATE OF FUEL INPUT (list units)	MOISTURE CONTENT (as received)	HEAT CONTENT (e.g. BTU/LB, BTU/GAL) (as received)	HEAT INPUT (10^6 BTU/HR)
Run 1	Nat'l Gas	MCF/Hr		1.01	4.80
Run 2	Nat'l Gas	MCF/Hr		1.01	4.80
Run 3	Nat'l Gas	MCF/Hr		1.01	4.81

2. Are the above fuels substantially the same as those normally burned ? yes
   If not, explain _____

3. Are the above fuels normally burned in the proportions shown above ? yes
   If not, explain _____

4. Describe any changes anticipated for procurement of fuels within the next twelve (12) months.
   Curtailments may require switch to #6 Oil.

B. Equipment & Operating Data:

1. Furnace No. F-3
2. Furnace Manufacturer: Surface Combustion
3. Type of Firing: Nat'l Gas, #6 Oil
4. Was the furnace operated under normal operating conditions? yes
   If not, explain _____
5. Specify normal soot blowing frequency:
   a) source operating time blowing soot: 0 minutes/shift
   b) number of shifts per day ___

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OPERATING DATA SUMMARY FOR PROCESS SOURCES

Company Name: LTV Steel Mining
Date of Performance Test: _____
Summary Prepared By: _____ (Signature)

A. Equipment & Operating Data

1. Process Equipment No./Ident. F-3
2. Process Equipment Description Pelletizing Furnace (Vertical Shaft)
3. Process equipment operating under normal operating conditions? Yes
   If not, explain _____

1. Process rate during the test (specify units ; amount of raw material or finished product per hour, wet or dry basis)
   Run 1. 58 LTPH Feed (wet) In 52.03 LTPH Out Run 2. 57.8 LTPH (wet) 51.76 Run 3. 58 LTPH (wet) 52.03 LTPH (Dry) out

B. Instrument Data on Process Equipment

Include copy of production records or instrumentation which indicates rate of production or operation of the equipment, i.e. units per hour, lbs. per hour, pressure, air flow, etc.

C. Air Pollution Control Equipment

1. Type of control equipment Multi-Clone And Counter-Current Gas-Slurry Exhaust.
2. Air pressure drop (range during test)
   Run 1. NA Run 2. NA Run 3. NA
3. Air flow (range during test)
   Run 1. _____ Run 2. _____ Run 3. _____
4. Was the control equipment operating normally? Yes
   If not, explain _____
5. Data and procedures of last major maintenance/cleaning of control equipment Last Major 5/95

NOTE: This form provides only a summary of the operating conditions during the performance test. Additional and more detailed records are required to meet the requirements of Minn. Rule pt. 7017.2035, subp. 3. The record of operating conditions must also be certified in accordance with Minn. Rule pt. 7017.2040, subp. 5. This form is to be submitted as part of the performance test report.

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6. Specify soot blowing times during the test: start 0 end

When was the last time before the test that you blew soot: N/A
(date & time)

7. Specify normal ash-pulling frequency:
   a) source operating time pulling ashes: Not Reqd. minutes/shift
   b) number of shifts per day -0-

8. Specify ash pulling times during the test: start end

When was the last time before the test that you pulled ashes:
(date & time)

9. Date and procedures of last maintenance/cleaning of the boiler (please attach records)

C. Instrument Data

1. Include a copy of chart records during test for the combustion efficiency indices (CO, O_2, CO_2, combustibles, steam flow, air flow, etc.) Label as appropriate.

D. Air Pollution Control Equipment

1. Type of control equipment Multi-Clone AND Counter-Current Flow Gas Slurry Stack
2. Air pressure drop (range during test)
   Run 1. N/A Run 2. N/A Run 3. N/A
3. Air flow (range during test)
   Run 1. Run 2. Run 3.
4. Was the control equipment operating normally? Yes
   If not, explain
5. Date and procedures of last maintenance/cleaning of control equipment.
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NOTE: This form provides only a summary of the operating conditions during the performance test. Additional and more detailed records are required to meet the requirements of Minn. Rule pt. 7017.2035. The record of operating conditions must also be certified in accordance with Minn. Rule pt. 7017.2040, sub. 5. This form is to be submitted as part of the performance test report

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Source category: Taconite Ore Processing
Plant name : LTV Steel Mining Co.
Process : Indurating furnace

Filename: TAC4-57.WQ1
Location: Hoyt Lakes, MN
Test date: 7/12/95

Date: 10/11/96
Ref. No.: 4-57
Process rate basis: Production

Source	Type of control	Pollutant	Run No.	Test Method	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, g	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Rat.
Natural gas-fired vertical shaft furnace bottom gas stack	rotoclone	filterable PM	1	EPA 5	NS	NS	8,930	NS	0.028	2.14	58.3	0.018	0.037	
		filterable PM	2		NS	NS	9,054	NS	0.021	1.65	58.0	0.014	0.029	
		filterable PM	3		NS	NS	9,130	NS	0.021	1.65	58.3	0.014	0.028	
									PPM		Average	0.016	0.031	C
		cond. PM	1	EPA 5	NS	NS	8,930	NS	0.0020	0.15	58.3	0.0013	0.0026	
		cond. PM	2		NS	NS	9,054	NS	0.0164	1.27	58.0	0.011	0.022	
		cond. PM	3		NS	NS	9,130	NS	0.00090	0.070	58.3	0.00060	0.0012	
									PPM		Average	0.0043	0.0086	C
		CO2	1	Orsat	NA	NA	8,930	NA	0.03	37	58.3	0.32	0.63	
		CO2	2		NA	NA	9,054	NA	0.03	37	58.0	0.32	0.64	
		CO2	3		NA	NA	9,130	NA	0.03	38	58.3	0.32	0.65	
											Average	0.32	0.64	C
Natural gas-fired vertical shaft furnace top gas stack	heat recup./ wet scrubber	filterable PM	1	EPA 5	NS	NS	38,074	NS	0.018	6.00	58.3	0.052	0.10	
		filterable PM	2		NS	NS	40,362	NS	0.010	3.43	58.0	0.030	0.059	
		filterable PM	3		NS	NS	39,047	NS	0.020	6.63	58.3	0.057	0.11	
									PPM		Average	0.046	0.092	C
		cond. PM	1	EPA 5	NS	NS	38,074	NS	0.0093	3.04	58.3	0.026	0.052	
		cond. PM	2		NS	NS	40,362	NS	0.0096	3.31	58.0	0.029	0.057	
		cond. PM	3		NS	NS	39,047	NS	0.0073	2.44	58.3	0.021	0.042	
									PPM		Average	0.025	0.050	C
		CO2	1	Orsat	NA	NA	38,074	NA	2.2	11,499	58.3	100	200	
		CO2	2		NA	NA	40,362	NA	2.1	11,636	58.0	100	200	
		CO2	3		NA	NA	39,047	NA	2.2	11,793	58.3	100	200	
											Average	100	200	C

Basis for rating: Incomplete documentation.
Problems noted:
Other notes: Additional information provided in Attachment 4 of Reference 53.