Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

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Interpoll Laboratories, IncInterpoll Laboratories, Inc

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Report Sect. 4
Reference 43

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ENGINEERING

RESULTS OF THE SEPTEMBER NO_x EMISSION TESTS ON THE INDURATION FURNACE SCRUBBERS

Submitted to:

Inland Steel Mining Company
P.O. Box 1
Virginia, Minnesota 55792

Attention:

Gus Josephson

Approved by:

Daniel Despen
Manager
Field Testing Support Group

Report Number 1-3412
October 18, 1991
DD/djd

Ref BR 4-43

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1 INTRODUCTION

On September 12 and 13, 1991, Interpoll Laboratories personnel conducted engineering oxides of nitrogen emission tests on the Induration Furnace Scrubbers at the Inland Steel Mining Facility in Virginia, Minnesota. During these tests the furnaces were firing acid pellets as opposed to flux pellets. On-site testing was performed by Ed Trowbridge and Mark Kaehler. Coordination between testing activities and plant operation was provided by Gus Josephson of Inland Steel. The test was not witnessed by a member of the Minnesota Pollution Control Agency.

Evaluations were performed in accordance with EPA Method 7E, CFR Title 40, Part 60, Appendix A (revised July 1990). A slip stream of exhaust gas was drawn from the exhaust gas stream using test port(s) provided by the Plant. The sample gas was drawn from the test ports using a heat-traced probe and filter assembly. After passing through the filter, the gas passed through a perm-tube dryer moisture removal system. The particulate-free dry gas was then transported to the analyzer 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 two analyzers. A three-way valve on the probe was used to introduce standard gas for the "system bias check".

The analog response of the NO_x analyzer was recorded with a strip chart recorder. The NO_x analyzer was calibrated with Scott Specialty and Linde standard gases.

2 SUMMARY AND DISCUSSION

The results of the NO_x concentrations and emission rates on each of the four Induration Furnace Scrubber Stacks tested is summarized in Table 1. The Unit "A" NO_x concentration and emission rate averaged 35 ppm,d and 38 LB/HR respectively. The Unit "B" NO_x concentration and emission rate averaged 35 ppm,d and 36 LB/HR, the Unit "C" NO_x concentration and emission rate averaged 48 ppm,d and 47 LB/HR, and Unit "D" concentration and emission rate averaged 66 ppm,d and 64 LB/HR.

Table 1 Summary of the Results of the September 12 and 13, 1991 Oxides of Nitrogen Determinations Test on the Induration Furnace Scrubbers at the Inland Steel Mining Facility in Virginia, Minnesota.

Test/Run	Concentration (ppm,d)	Emission Rate (LB/HR)
(UNIT "A")		
1/1	35	38
1/2	36	39
1/3	35	38
Avg.	35	38
(UNIT "B")		
2/1	36	37
2/2	35	36
2/3	34	35
Avg.	35	36
(UNIT "C")		
3/1	46	45
3/2	48	47
3/3	49	48
Avg.	48	47
(UNIT "D")		
4/1	61	59
4/2	62	60
4/3	76	73
Avg.	66	64

APPENDIX A

VOLUMETRIC FLOW RATE DETERMINATIONS

Test No. 1
Unit A Scrubber Stack

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	09-12-91
Time of Determination.....(HRS)	1015
Barometric pressure.....(IN.HG)	28.36
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	12
Shape of duct.....	Round
Stack diameter.....(IN)	105
Duct area.....(SQ.FT)	60.13
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.47
Avg. gas temp.....(DEG-F)	114
Moisture content.....(% V/V)	9.64
Avg. linear velocity.....(FT/SEC)	53.5
Gas density.....(LB/ACF)	.06113
Molecular weight.....(LB/LBMOLE)	28.01
Mass flow of gas.....(LB/HR)	707445
Volumetric flow rate.....	
actual.....(ACFM)	192889
dry standard.....(DSCFM)	151697

Test No. 2
Unit B Scrubber Stack

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	09-12-91
Time of Determination.....(HRS)	1455
Barometric pressure.....(IN.HG)	28.37
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	12
Shape of duct.....	Round
Stack diameter.....(IN)	105
Duct area.....(SQ.FT)	60.13
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.45
Avg. gas temp.....(DEG-F)	123
Moisture content.....(% V/V)	10.66
Avg. linear velocity.....(FT/SEC)	52.4
Gas density.....(LB/ACF)	.06005
Molecular weight.....(LB/LBMOLE)	28.01
Mass flow of gas.....(LB/HR)	680691
Volumetric flow rate.....	
actual.....(ACFM)	188925
dry standard.....(DSCFM)	144859

Test No. 3
Unit C Scrubber Stack

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	09-13-91
Time of Determination.....(HRS)	945
Barometric pressure.....(IN.HG)	28.38
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	12
Shape of duct.....	Round
Stack diameter.....(IN)	105
Duct area.....(SQ.FT)	60.13
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.75
Avg. gas temp.....(DEG-F)	128
Moisture content.....(% V/V)	12.65
Avg. linear velocity.....(FT/SEC)	51.2
Gas density.....(LB/ACF)	.05901
Molecular weight.....(LB/LBMOLE)	28.01
Mass flow of gas.....(LB/HR)	654581
Volumetric flow rate.....	
actual.....(ACFM)	184888
dry standard.....(DSCFM)	137217

Test No. 4
Unit D Scrubber Stack

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	09-13-91
Time of Determination.....(HRS)	1055
Barometric pressure.....(IN.HG)	28.38
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	12
Shape of duct.....	Round
Stack diameter.....(IN)	105
Duct area.....(SQ.FT)	60.13
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.88
Avg. gas temp.....(DEG-F)	134
Moisture content.....(% V/V)	14.07
Avg. linear velocity.....(FT/SEC)	51.6
Gas density.....(LB/ACF)	.05808
Molecular weight.....(LB/LBMOLE)	28.01
Mass flow of gas.....(LB/HR)	648321
Volumetric flow rate.....	
actual.....(ACFM)	186029
dry standard.....(DSCFM)	134403