AP32 Section:	12.5.1
Background Chapter	3
Reference:	3
Title:	Source Emissions Test Report for Triad Engineering, Inc. Performed at Steel Dynamics, Inc. Steel Processing Mill, Butler, IN, on the Twin Shell Electric Arc Furnace Baghouse Outlet-Exhaust Stack. Prepared for: Mr. Barry Smith, Triad Engineering, Inc., Fort Wayne, IN. G/SA Project No. 96-T-004. September 19 and 20, 1996.

G/SA

GUENTHER / SHACKELFORD ASSOCIATES

ENVIRONMENTAL CONSULTANTS & AIR QUALITY TESTING CONTRACTORS

COMPLIANCE TEST

SOURCE EMISSIONS TEST REPORT
FOR
TRIAD ENGINEERING, INC.
EPA METHODS 5, 6C, 7E, 10, 25A AND 202
PERFORMED AT
STEEL DYNAMICS, INC.
STEEL PROCESSING MILL
BUTLER, INDIANA
ON THE
TWIN SHELL ELECTRIC ARC FURNACE
BAGHOUSE OUTLET-EXHAUST STACK

SEPTEMBER 19 & 20, 1996

G/SA PROJECT NO. 96-T-004

Prepared for:

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SOURCE EMISSIONS COMPLIANCE TESTING
EPA Methods 5, 6C, 7E, 10, 25A and 202
Twin Shell Electric Arc Furnace
Baghouse Outlet-Exhaust Stack
Performed for
Triad Engineering, Inc.
at
Steel Dynamics, Inc.
Steel Processing Mill
Butler, Indiana

September 19 and 20, 1996

Project No. 96-T-004

1.0 INTRODUCTION

This report presents the results of the source emissions testing conducted by Guenther/Shackelford Associates (G/SA) at Steel Dynamics, Inc. (SDI), near Butler, Indiana for Triad Engineering, Inc. (TEI).

The primary purpose of this testing program was to obtain particulate matter (PM), sulfur dioxide (SO_2), nitrogen oxides (NO_X), carbon monoxide (CO), total gaseous organic (TGO), a.k.a. volatile organic compounds (VOC), and condensible particulate matter (CPM) or PM_{10} (particulate matter ≤ 10 microns in particle size) samples from the effluent gas stream of the common baghouse serving the Twin Shell Electric Arc Furnace (EAF) and associated equipment at SDI's Steel Processing Mill for determination of compliance with the Indiana Department of Environmental Management (IDEM) PM/PM_{10}, SO_2, NO_X, CO and VOC emission regulations established for this process.

Also, continuous emissions monitoring (CEM) data to determine plume opacity compliance of the gas vented from the baghouse to the exhaust stack to atmosphere.

G/SA's responsibility was to collect and analyze PM/PM10 samples, conduct instrument monitoring for SO_2, NO_X, CO and VOC, and perform data reduction for emission concentrations evaluation. SDI's responsibilitiy was to provide CEM opacity data and processing operating data per compliance test requirements.

The following report provides information pertaining to the actual sampling and analytical results.

The emissions testing conducted on the EAF Baghouse Outlet was performed Thursday, September 19 and Friday, September 20, 1996.

The following requirements were specific for the testing program:

1. Pretest, on-site and post-test equipment calibrations performed and calibration data provided.
2. Three (3), four (4) hour, minimum, PM/PM10 emissions test runs performed, consecutively, at the outlet (exhaust stack) of the EAF Baghouse per IDEM Rule 326 IAC 3-2.1 and NSPS 40 CFR 60, Subpart AAa.
3. Three (3), one (1) hour, minimum, SO_2, NO_X, CO and VOC emissions

test runs performed, consecutively, at the outlet (exhaust stack) of the EAF Baghouse.

4. Process manufacturing capacities and control devices maintained at required operating conditions and production rates recorded during the emissions sampling periods.

5. All sampling and analysis performed in accordance with current IDEM and EPA test methodologies and analytical procedures for PM/PM10, SO_2, NO_X, CO and VOC emissions determinations.

6. PM/PM10 emissions from the common baghouse vented to the exhaust stack shall not exceed a concentration of 0.0032 gr/dscf and a rate of 28.8 lb/hr at a gas flow rate of 1,300,000 acfm, and 3% average opacity pursuant to IDEM Rule 316 IAC 6-1-10.1, Subsection (e).

7. SO_2 emissions from the EAF shall not exceed a concentration of 0.20 lb/ton of steel produced pursuant to IDEM Rule 326 IAC 2-1-1.

8. NO_X emissions from the EAF shall not exceed a concentration of 0.51 lb/ton of steel produced pursuant to IDEM Rule 326 IAC 2-1-1.

9. CO emissions from the EAF shall not exceed a concentration of 2.0 lb/ton of steel produced pursuant to IDEM Rule 326 IAC 2-1-1.

10. VOC emissions from the EAF shall not exceed a concentration of 0.13 lb/ton of steel produced pursuant to IDEM Rule 326 IAC 2-1-1.

The PM/PM10 emissions testing and PM gravimetric analysis were conducted by G/SA

whose headquarters is in Crown Point, Indiana, and G/SA's affiliate, Source Assessment Technologies, LLC (S.A.T.) whose headquarters is in Wheatland, Missouri. The CPM analysis was subcontracted by G/SA's analytical broker, Sampling & Analytical Management, Inc. (SAMI), whose headquarters is in Medina, Ohio, to Chester LabNet-Portland whose headquarters is in Tigard, Oregon, The CEM testing for SO_2, NO_x, CO and VOC was performed by G/SA's testing subcontractor, Total Source Analysis, Inc. (TSA), whose headquarters is in Wellington, Ohio. The testing program was arranged and coordinated by TEI whose headquarters is in Milwaukee, Wisconsin, with an office in Fort Wayne, Indiana.

The emission testing was performed in accordance with EPA Reference Methods 1, 2, 3, 3A, 5, 6C, 7E, 10 25A and 202, Title 40, Part 60, Appendix A of the U.S. Code of Federal Regulations and IDEM Rule 326 IAC 3-2.1.

The testing program was coordinated with the following personnel:

Tim Whitman, Project Manager, SDI

Barry Smith, Project Manager, TEI

The emission testing was performed by the following personnel:

Fred Guenther, Test Supervisor, G/SA

Terry Shackelford, Test Engineer, G/SA (S.A.T.)

Doug Hartman, Test Engineer, TSA

The emissions testing was observed by the following personnel:

Steve Friend, Environmental Scientist, Air Compliance Section, IDEM

Jarrod Fisher, Environmental Scientist, Air Compliance Section, IDEM

2.0 TEST RESULTS SMMARY

The source emissions testing was performed utilizing EPA Methods 1, 2, 3, 3A, 5, 6C, 7E, 10, 25A and 202 at the Baghouse Outlet (Exhaust Stack) sampling location. A summary of the test results is given below:

RUN NO.	GAS FLOW RATE, ACFM	PM CONCEN., GR/DSCF	PM EMISSION RATE, LB/HR
1	1,253,494	0.00256	22.6
2	1,300,618	0.00214	18.7
3	1,287,424	0.00143	12.6
Avg.	1,280,512	0.00204	18.0

RUN NO.	PM CONCENTRATION LB/TON OF *CHARGE*	PM CONCENTRATION, LB/TON OF *TAP*
1	0.128	0.137
2	0.106	0.113
3	0.072	0.076
Avg.	0.102	0.108

RUN NO.	GAS FLOW RATE, ACFM	PM/PM_{10} CONCEN., GR/DSCF	PM/PM_{10} EMISSION RATE, LB/HR
1	1,253,494	0.06287	556.3
2	1,300,618	0.00684	59.9
3	1,287,424	0.05397	475.9
Avg.	1,280,512	0.04123	364.0

RUN NO.	PM/PM_{10} CONCENTRATION, LB/TON OF *CHARGE*	PM/PM_{10} CONCENTRATION, LB/TON OF *TAP*
1	3.148	3.361
2	0.339	0.361
3	2.719	2.863
Avg.	2.069	2.195

RUN NO.	GAS FLOW RATE, ACFM	SO_2 CONCEN., LB/DSCF	SO_2 EMISSION RATE, LB/HR
1	1,253,494	8.91E-07	55.2
2	1,300,618	1.08E-06	66.0
3	1,287,424	9.25E-07	57.1
Avg.	1,280,512	9.64E-07	59.4

RUN NO.	SO_2 CONCENTRATION, LB/TON OF *CHARGE*	SO_2 CONCENTRATION, LB/TON OF *TAP*
1	0.307	0.333
2	0.377	0.397
3	0.326	0.344
Avg.	0.337	0.358

RUN NO.	GAS FLOW RATE, ACFM	NO_X CONCEN., LB/DSCF	NO_X EMISSION RATE, LB/HR
1	1,253,494	1.17E-06	72.2
2	1,300,618	1.61E-06	98.7
3	1,287,424	2.19E-06	135.4
Avg.	1,280,512	1.66E-06	102.1

RUN NO.	NO_X CONCENTRATION, LB/TON OF *CHARGE*	NO_X CONCENTRATION, LB/TON OF *TAP*
1	0.401	0.435
2	0.564	0.594
3	0.774	0.816
Avg.	0.579	0.615

RUN NO.	GAS FLOW RATE, ACFM	CO CONCEN., LB/DSCF	CO EMISSION RATE, LB/HR
1	1,253,494	1.62E-06	100.0
2	1,300,618	1.39E-06	85.2
3	1,287,424	8.96E-07	55.3
Avg.	1,280,512	1.30E-06	80.2

RUN NO.	CO CONCENTRATION, LB/TON OF *CHARGE*	CO CONCENTRATION, LB/TON OF *TAP*
1	0.556	0.603
2	0.487	0.513
3	0.316	0.333
Avg.	0.453	0.483

RUN NO.	GAS FLOW RATE, ACFM	VOC CONCEN., LB/DSCF	VOC EMISSION RATE, LB/HR
1	1,253,494	1.31E-07	8.11
2	1,300,618	1.27E-07	7.80
3	1,287,424	1.92E-07	11.83
Avg.	1,280,512	Avg. 1.50E-07	Avg. 9.25

RUN NO.	VOC CONCENTRATION, LB/TON OF *CHARGE*	VOC CONCENTRATION, LB/TON OF *TAP*
1	0.0450	0.0488
2	0.0445	0.0470
3	0.0676	0.0713
Avg.	0.0524	Avg. 0.0557

A complete list of test parameters for each Method 5, 5/202, 6C, 7E, 10 and 25A emissions test run performed at the sampling location including lb/ton of *charge* can be found in Tables 1 through 6. Also, the same parameters and test methods performed at the sampling location including lb/ton of *tap* can be found in Tables 1A through 6A.

Sample calculations and examples of the equations used to generate the test results can be found in Appendix G. For futher information pertaining to the overall testing program, the process tested and the manufacturing facility, see Appendix I at the end of this report.

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EPA METHOD 5
PARTICULATE EMISSIONS TEST RESULTS
TABLE 1

CLIENT: TRIAD / SDI JOB NO.: G/SA 96-T-004
SOURCE TESTED: Steel Processing Mill – Twin Shell EAF DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	19-Sep-96	20-Sep-96	20-Sep-96
Sampling Location	B.O. (Stack)	B.O. (Stack)	B.O. (Stack)
Process Charge Rate (TPH)	***176.7***	***176.7***	***175.0***
Test Time, Start-Stop (24 Hour)	1028-1836	1102-1555	1802-2228
Sampling Time (Minutes)	360	240	240
Stack Area (Ft^2)	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.84	0.84	0.84
Dry Gas Meter Correction Factor (Dimensionless)	1.0460	1.0460	1.0460
Nozzle Area (Ft^2)	0.000171	0.000322	0.000322
Barometric Pressure (In. Hg)	29.26	29.18	29.18
Static Pressure (In. H2O)	-0.600	-0.600	-0.600
Absolute Pressure (In. Hg)	29.22	29.14	29.14
Dry Gas Meter Sample Volume (DCF)	198.383	260.172	258.254
Average Dry Gas Meter Temperature (°F)	86.0	92.3	91.3
Average Orifice Meter Delta H (In. H2O)	0.997	3.995	3.828
Volume Condensate Collected (Ml)	14.8	58.9	57.4
Average CO2 Concentration (%)	0.5	0.7	0.7
Average O2 Concentration (%)	20.7	20.4	20.4
Average Square Root of Delta P (In. H2O½)	1.077	1.094	1.092
Average Stack Gas Temperature (°F)	163.8	187.6	177.2
Total Particulate Matter Collected Excluding CPM (G)	**0.0326**	**0.0355**	**0.0236**

CALCULATED DATA

Dry Gas Meter Sample Volume at Standard Conditions (SCF)	196.758	256.342	254.817
Water Vapor Volume at Standard Conditions (SCF)	0.697	2.772	2.702
Moisture Fraction (Dimensionless)	0.004	0.011	0.010
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.91	28.93	28.93
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.87	28.81	28.81
Stack Gas Velocity (FPS)	66.5	69.0	68.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,253,494	1,300,618	1,287,424
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,032,194	1,021,583	1,028,763
Isokinetic Sampling (%)	97.4	102.1	100.8
Particulate Emission Concentration (Gr/DSCF)	0.00256	0.00214	0.00143
Particulate Emission Concentration (Lb/DSCF)	3.65E-07	3.05E-07	2.04E-07
Particulate Emission Rate (Lb/Hr)	22.6	18.7	12.6
Particulate Emission Concentration (Lb/Ton of Charge)	*0.128*	*0.106*	*0.072*

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**1,280,512**
Average Particulate Emission Concentration (Gr/DSCF)	**0.00204**
Average Particulate Emission Concentration (Lb/DSCF)	**2.92E-07**
Average Particulate Emission Rate (Lb/Hr)	**18.0**
Average Particulate Emission Concentration (Lb/Ton of Charge)	***0.102***

Signature of Reviewer: Fred H. Quentler

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EPA METHOD 5
PARTICULATE EMISSIONS TEST RESULTS
TABLE 1A

CLIENT: TRIAD / SDI JOB NO.: G/SA 96-T-004
SOURCE TESTED: Steel Processing Mill - Twin Shell EAF DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	19-Sep-96	20-Sep-96	20-Sep-96
Sampling Location	B.O. (Stack)	B.O. (Stack)	B.O. (Stack)
Process Tap Rate (TPH)	***165.5***	***166.0***	***166.2***
Test Time, Start-Stop (24 Hour)	1028-1836	1102-1555	1802-2228
Sampling Time (Minutes)	360	240	240
Stack Area (Ft^2)	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.84	0.84	0.84
Dry Gas Meter Correction Factor (Dimensionless)	1.0460	1.0460	1.0460
Nozzle Area (Ft^2)	0.000171	0.000322	0.000322
Barometric Pressure (In. Hg)	29.26	29.18	29.18
Static Pressure (In. H2O)	-0.600	-0.600	-0.600
Absolute Pressure (In. Hg)	29.22	29.14	29.14
Dry Gas Meter Sample Volume (DCF)	198.383	260.172	258.254
Average Dry Gas Meter Temperature (°F)	86.0	92.3	91.3
Average Orifice Meter Delta H (In. H2O)	0.997	3.995	3.828
Volume Condensate Collected (Ml)	14.8	58.9	57.4
Average CO2 Concentration (%)	0.5	0.7	0.7
Average O2 Concentration (%)	20.7	20.4	20.4
Average Square Root of Delta P (In. $H2O^{1/2}$)	1.077	1.094	1.092
Average Stack Gas Temperature (°F)	163.8	187.6	177.2
Total Particulate Matter Collected Excluding CPM (G)	**0.0326**	**0.0355**	**0.0236**

CALCULATED DATA

Dry Gas Meter Sample Volume at Standard Conditions (SCF)	196.758	256.342	254.817
Water Vapor Volume at Standard Conditions (SCF)	0.697	2.772	2.702
Moisture Fraction (Dimensionless)	0.004	0.011	0.010
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.91	28.93	28.93
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.87	28.81	28.81
Stack Gas Velocity (FPS)	66.5	69.0	68.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,253,494	1,300,618	1,287,424
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,032,194	1,021,583	1,028,763
Isokinetic Sampling (%)	97.4	102.1	100.8
Particulate Emission Concentration (Gr/DSCF)	0.00256	0.00214	0.00143
Particulate Emission Concentration (Lb/DSCF)	3.65E-07	3.05E-07	2.04E-07
Particulate Emission Rate (Lb/Hr)	22.6	18.7	12.6
Particulate Emission Concentration (Lb/Ton of Tap)	*0.137*	*0.113*	*0.076*

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**1,280,512**
Average Particulate Emission Concentration (Gr/DSCF)	**0.00204**
Average Particulate Emission Concentration (Lb/DSCF)	**2.92E-07**
Average Particulate Emission Rate (Lb/Hr)	**18.0**
Average Particulate Emission Concentration (Lb/Ton of Tap)	***0.108***

Signature of Reviewer: Fred H. Quentter

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EPA METHOD 5 / 202
PARTICULATE / CONDENSIBLE EMISSIONS TEST RESULTS
TABLE 2

CLIENT: TRIAD / SDI JOB NO.: G/SA 96-T-004
SOURCE TESTED: Steel Processing Mill - Twin Shell EAF DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	19-Sep-96	20-Sep-96	20-Sep-96
Sampling Location	B.O. (Stack)	B.O. (Stack)	B.O. (Stack)
Process Charge Rate (TPH)	***176.7***	***176.7***	***175.0***
Test Time, Start-Stop (24 Hour)	1028-1836	1102-1555	1802-2228
Sampling Time (Minutes)	360	240	240
Stack Area (Ft^2)	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.84	0.84	0.84
Dry Gas Meter Correction Factor (Dimensionless)	1.0460	1.0460	1.0460
Nozzle Area (Ft^2)	0.000171	0.000322	0.000322
Barometric Pressure (In. Hg)	29.26	29.18	29.18
Static Pressure (In. H2O)	-0.600	-0.600	-0.600
Absolute Pressure (In. Hg)	29.22	29.14	29.14
Dry Gas Meter Sample Volume (DCF)	198.383	260.172	258.254
Average Dry Gas Meter Temperature (°F)	86.0	92.3	91.3
Average Orifice Meter Delta H (In. H2O)	0.997	3.995	3.828
Volume Condensate Collected (Ml)	14.8	58.9	57.4
Average CO2 Concentration (%)	0.5	0.7	0.7
Average O2 Concentration (%)	20.7	20.4	20.4
Average Square Root of Delta P (In. $H2O^{1/2}$)	1.077	1.094	1.092
Average Stack Gas Temperature (°F)	163.8	187.6	177.2
Total Particulate Matter Collected Including CPM (G)	**0.8015**	**0.1136**	**0.8910**

CALCULATED DATA

Dry Gas Meter Sample Volume at Standard Conditions (SCF)	196.758	256.342	254.817
Water Vapor Volume at Standard Conditions (SCF)	0.697	2.772	2.702
Moisture Fraction (Dimensionless)	0.004	0.011	0.010
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.91	28.93	28.93
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.87	28.81	28.81
Stack Gas Velocity (FPS)	66.5	69.0	68.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,253,494	1,300,618	1,287,424
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,032,194	1,021,583	1,028,763
Isokinetic Sampling (%)	97.4	102.1	100.8
Particulate Emission Concentration (Gr/DSCF)	0.06287	0.00684	0.05397
Particulate Emission Concentration (Lb/DSCF)	8.98E-06	9.77E-07	7.71E-06
Particulate Emission Rate (Lb/Hr)	556.3	59.9	475.9
Particulate Emission Concentration (Lb/Ton of Charge)	*3.148*	*0.339*	*2.719*

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**1,280,512**
Average Particulate Emission Concentration (Gr/DSCF)	**0.04123**
Average Particulate Emission Concentration (Lb/DSCF)	**5.89E-06**
Average Particulate Emission Rate (Lb/Hr)	**364.0**
Average Particulate Emission Concentration (Lb/Ton of Charge)	***2.069***

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EPA METHOD 5 / 202
PARTICULATE / CONDENSIBLE EMISSIONS TEST RESULTS
TABLE 2A

CLIENT: TRIAD / SDI JOB NO.: G/SA 96-T-004
SOURCE TESTED: Steel Processing Mill – Twin Shell EAF DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	19-Sep-96	20-Sep-96	20-Sep-96
Sampling Location	B.O. (Stack)	B.O. (Stack)	B.O. (Stack)
Process Tap Rate (TPH)	***165.5***	***166.0***	***166.2***
Test Time, Start-Stop (24 Hour)	1028-1836	1102-1555	1802-2228
Sampling Time (Minutes)	360	240	240
Stack Area (Ft^2)	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.84	0.84	0.84
Dry Gas Meter Correction Factor (Dimensionless)	1.0460	1.0460	1.0460
Nozzle Area (Ft^2)	0.000171	0.000322	0.000322
Barometric Pressure (In. Hg)	29.26	29.18	29.18
Static Pressure (In. H2O)	-0.600	-0.600	-0.600
Absolute Pressure (In. Hg)	29.22	29.14	29.14
Dry Gas Meter Sample Volume (DCF)	198.383	260.172	258.254
Average Dry Gas Meter Temperature (°F)	86.0	92.3	91.3
Average Orifice Meter Delta H (In. H2O)	0.997	3.995	3.828
Volume Condensate Collected (Ml)	14.8	58.9	57.4
Average CO2 Concentration (%)	0.5	0.7	0.7
Average O2 Concentration (%)	20.7	20.4	20.4
Average Square Root of Delta P (In. H2O½)	1.077	1.094	1.092
Average Stack Gas Temperature (°F)	163.8	187.6	177.2
Total Particulate Matter Collected Including CPM (G)	**0.8015**	**0.1136**	**0.8910**

CALCULATED DATA

Dry Gas Meter Sample Volume at Standard Conditions (SCF)	196.758	256.342	254.817
Water Vapor Volume at Standard Conditions (SCF)	0.697	2.772	2.702
Moisture Fraction (Dimensionless)	0.004	0.011	0.010
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.91	28.93	28.93
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.87	28.81	28.81
Stack Gas Velocity (FPS)	66.5	69.0	68.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,253,494	1,300,618	1,287,424
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,032,194	1,021,583	1,028,763
Isokinetic Sampling (%)	97.4	102.1	100.8
Particulate Emission Concentration (Gr/DSCF)	0.06287	0.00684	0.05397
Particulate Emission Concentration (Lb/DSCF)	8.98E-06	9.77E-07	7.71E-06
Particulate Emission Rate (Lb/Hr)	556.3	59.9	475.9
Particulate Emission Concentration (Lb/Ton of Tap)	*3.361*	*0.361*	*2.863*

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**1,280,512**
Average Particulate Emission Concentration (Gr/DSCF)	**0.04123**
Average Particulate Emission Concentration (Lb/DSCF)	**5.89E-06**
Average Particulate Emission Rate (Lb/Hr)	**364.0**
Average Particulate Emission Concentration (Lb/Ton of Tap)	***2.195***

Signature of Reviewer: Fred H. Quentler

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EPA METHOD 6C
SULFUR DIOXIDE EMISSIONS TEST RESULTS
TABLE 3

CLIENT: TRIAD / SDI JOB NO.: G/SA 96-T-004
SOURCE TESTED: Steel Processing Mill – Twin Shell EAF DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	20-SEP-96	20-Sep-96	20-Sep-96
Sampling Location	B.O. (Stack)	B.O. (Stack)	B.O. (Stack)
Process Charge Rate (TPH)	***180.0***	***175.0***	***175.0***
Test Time, Start-Stop (24 Hour)	1105-1205	1225-1325	1340-1440
Sampling Time (Minutes)	60	60	60
Stack Area (Ft^2)	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.84	0.84	0.84
Dry Gas Meter Correction Factor (Dimensionless)	1.0460	1.0460	1.0460
Barometric Pressure (In. Hg)	29.26	29.18	29.18
Static Pressure (In. H2O)	-0.600	-0.600	-0.600
Absolute Pressure (In. Hg)	29.22	29.14	29.14
Dry Gas Meter Sample Volume (DCF)	198.383	260.172	258.254
Average Dry Gas Meter Temperature (°F)	86.0	92.3	91.3
Average Orifice Meter Delta H (In. H2O)	0.997	3.995	3.828
Volume Condensate Collected (Ml)	14.8	58.9	57.4
Average CO2 Concentration (%)	0.7	0.7	0.7
Average O2 Concentration (%)	20.4	20.4	20.5
Average Square Root of Delta P (In. H2O½)	1.077	1.094	1.092
Average Stack Gas Temperature (°F)	163.8	187.6	177.2
Average Corrected SO2 Concentration (PPMV)	**5.36**	**6.47**	**5.56**

CALCULATED DATA

Dry Gas Meter Sample Volume at Standard Conditions (SCF)	196.758	256.342	254.817
Water Vapor Volume at Standard Conditions (SCF)	0.697	2.772	2.702
Moisture Fraction (Dimensionless)	0.004	0.011	0.010
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.93	28.93	28.93
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.89	28.81	28.82
Stack Gas Velocity (FPS)	66.5	69.0	68.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,253,494	1,300,618	1,287,424
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,032,194	1,021,583	1,028,763
SO2 Emission Concentration (Lb/DSCF)	8.91E-07	1.08E-06	9.25E-07
SO2 Emission Rate (Lb/Hr)	55.2	66.0	57.1
SO2 Emission Concentration (Lb/Ton of Charge)	*0.307*	*0.377*	*0.326*

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**1,280,512**
Average SO2 Emission Concentration (Lb/DSCF)	**9.64E-07**
Average SO2 Emission Rate (Lb/Hr)	**59.4**
Average SO2 Emission Concentration (Lb/Ton of Charge)	***0.337***

Signature of Reviewer: Fred H. Quentler

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EPA METHOD 6C
SULFUR DIOXIDE EMISSIONS TEST RESULTS
TABLE 3A

CLIENT: TRIAD / SDI — JOB NO.: G/SA 96-T-004
SOURCE TESTED: Steel Processing Mill - Twin Shell EAF — DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	20-SEP-96	20-Sep-96	20-Sep-96
Sampling Location	B.O. (Stack)	B.O. (Stack)	B.O. (Stack)
Process Tap Rate (TPH)	***166.0***	***166.0***	***166.0***
Test Time, Start-Stop (24 Hour)	1105-1205	1225-1325	1340-1440
Sampling Time (Minutes)	60	60	60
Stack Area (Ft^2)	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.84	0.84	0.84
Dry Gas Meter Correction Factor (Dimensionless)	1.0460	1.0460	1.0460
Barometric Pressure (In. Hg)	29.26	29.18	29.18
Static Pressure (In. H2O)	-0.600	-0.600	-0.600
Absolute Pressure (In. Hg)	29.22	29.14	29.14
Dry Gas Meter Sample Volume (DCF)	198.383	260.172	258.254
Average Dry Gas Meter Temperature (°F)	86.0	92.3	91.3
Average Orifice Meter Delta H (In. H2O)	0.997	3.995	3.828
Volume Condensate Collected (Ml)	14.8	58.9	57.4
Average CO2 Concentration (%)	0.7	0.7	0.7
Average O2 Concentration (%)	20.4	20.4	20.5
Average Square Root of Delta P (In. H2O½)	1.077	1.094	1.092
Average Stack Gas Temperature (°F)	163.8	187.6	177.2
Average Corrected SO2 Concentration (PPMV)	**5.36**	**6.47**	**5.56**

CALCULATED DATA

Dry Gas Meter Sample Volume at Standard Conditions (SCF)	196.758	256.342	254.817
Water Vapor Volume at Standard Conditions (SCF)	0.697	2.772	2.702
Moisture Fraction (Dimensionless)	0.004	0.011	0.010
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.93	28.93	28.93
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.89	28.81	28.82
Stack Gas Velocity (FPS)	66.5	69.0	68.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,253,494	1,300,618	1,287,424
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,032,194	1,021,583	1,028,763
SO2 Emission Concentration (Lb/DSCF)	8.91E-07	1.08E-06	9.25E-07
SO2 Emission Rate (Lb/Hr)	55.2	66.0	57.1
SO2 Emission Concentration (Lb/Ton of Tap)	*0.333*	*0.397*	*0.344*

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**1,280,512**
Average SO2 Emission Concentration (Lb/DSCF)	**9.64E-07**
Average SO2 Emission Rate (Lb/Hr)	**59.4**
Average SO2 Emission Concentration (Lb/Ton of Tap)	***0.358***

Signature of Reviewer: Fred H. Quentler

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EPA METHOD 7E
NITROGEN OXIDES EMISSIONS TEST RESULTS
TABLE 4

CLIENT: TRIAD / SDI JOB NO.: G/SA 96-T-004
SOURCE TESTED: Steel Processing Mill – Twin Shell EAF DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	20-SEP-96	20-Sep-96	20-Sep-96
Sampling Location	B.O. (Stack)	B.O. (Stack)	B.O. (Stack)
Process Charge Rate (TPH)	***180.0***	***175.0***	***175.0***
Test Time, Start-Stop (24 Hour)	1105-1205	1225-1325	1340-1440
Sampling Time (Minutes)	60	60	60
Stack Area (Ft^2)	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.84	0.84	0.84
Dry Gas Meter Correction Factor (Dimensionless)	1.0460	1.0460	1.0460
Barometric Pressure (In. Hg)	29.26	29.18	29.18
Static Pressure (In. H2O)	-0.600	-0.600	-0.600
Absolute Pressure (In. Hg)	29.22	29.14	29.14
Dry Gas Meter Sample Volume (DCF)	198.383	260.172	258.254
Average Dry Gas Meter Temperature (°F)	86.0	92.3	91.3
Average Orifice Meter Delta H (In. H2O)	0.997	3.995	3.828
Volume Condensate Collected (Ml)	14.8	58.9	57.4
Average CO2 Concentration (%)	0.7	0.7	0.7
Average O2 Concentration (%)	20.4	20.4	20.5
Average Square Root of Delta P (In. H2O½)	1.077	1.094	1.092
Average Stack Gas Temperature (°F)	163.8	187.6	177.2
Average Corrected NOx Concentration as NO2 (PPMV)	**9.76**	**13.48**	**18.37**

CALCULATED DATA

Dry Gas Meter Sample Volume at Standard Conditions (SCF)	196.758	256.342	254.817
Water Vapor Volume at Standard Conditions (SCF)	0.697	2.772	2.702
Moisture Fraction (Dimensionless)	0.004	0.011	0.010
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.93	28.93	28.93
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.89	28.81	28.82
Stack Gas Velocity (FPS)	66.5	69.0	68.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,253,494	1,300,618	1,287,424
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,032,194	1,021,583	1,028,763
NOx Emission Concentration (Lb/DSCF)	1.17E-06	1.61E-06	2.19E-06
NOx Emission Rate (Lb/Hr)	72.2	98.7	135.4
NOx Emission Concentration (Lb/Ton of Charge)	*0.401*	*0.564*	*0.774*

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**1,280,512**
Average NOx Emission Concentration (Lb/DSCF)	**1.66E-06**
Average NOx Emission Rate (Lb/Hr)	**102.1**
Average NOx Emission Concentration (Lb/Ton of Charge)	***0.579***

Signature of Reviewer: Fred H. Quentler

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EPA METHOD 7E
NITROGEN OXIDES EMISSIONS TEST RESULTS
TABLE 4A

CLIENT: TRIAD / SDI JOB NO.: G/SA 96-T-004
SOURCE TESTED: Steel Processing Mill – Twin Shell EAF DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	20-SEP-96	20-Sep-96	20-Sep-96
Sampling Location	B.O. (Stack)	B.O. (Stack)	B.O. (Stack)
Process Tap Rate (TPH)	***166.0***	***166.0***	***166.0***
Test Time, Start-Stop (24 Hour)	1105-1205	1225-1325	1340-1440
Sampling Time (Minutes)	60	60	60
Stack Area (Ft^2)	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.84	0.84	0.84
Dry Gas Meter Correction Factor (Dimensionless)	1.0460	1.0460	1.0460
Barometric Pressure (In. Hg)	29.26	29.18	29.18
Static Pressure (In. H2O)	-0.600	-0.600	-0.600
Absolute Pressure (In. Hg)	29.22	29.14	29.14
Dry Gas Meter Sample Volume (DCF)	198.383	260.172	258.254
Average Dry Gas Meter Temperature (°F)	86.0	92.3	91.3
Average Orifice Meter Delta H (In. H2O)	0.997	3.995	3.828
Volume Condensate Collected (Ml)	14.8	58.9	57.4
Average CO2 Concentration (%)	0.7	0.7	0.7
Average O2 Concentration (%)	20.4	20.4	20.5
Average Square Root of Delta P (In. H2O½)	1.077	1.094	1.092
Average Stack Gas Temperature (°F)	163.8	187.6	177.2
Average Corrected NOx Concentration as NO2 (PPMV)	**9.76**	**13.48**	**18.37**

CALCULATED DATA

Dry Gas Meter Sample Volume at Standard Conditions (SCF)	196.758	256.342	254.817
Water Vapor Volume at Standard Conditions (SCF)	0.697	2.772	2.702
Moisture Fraction (Dimensionless)	0.004	0.011	0.010
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.93	28.93	28.93
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.89	28.81	28.82
Stack Gas Velocity (FPS)	66.5	69.0	68.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,253,494	1,300,618	1,287,424
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,032,194	1,021,583	1,028,763
NOx Emission Concentration (Lb/DSCF)	1.17E-06	1.61E-06	2.19E-06
NOx Emission Rate (Lb/Hr)	72.2	98.7	135.4
NOx Emission Concentration (Lb/Ton of Tap)	*0.435*	*0.594*	*0.816*

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**1,280,512**
Average NOx Emission Concentration (Lb/DSCF)	**1.66E-06**
Average NOx Emission Rate (Lb/Hr)	**102.1**
Average NOx Emission Concentration (Lb/Ton of Tap)	***0.615***

Signature of Reviewer: Fred H. Quentter

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EPA METHOD 10
CARBON MONOXIDE EMISSIONS TEST RESULTS
TABLE 5

CLIENT: TRIAD / SDI JOB NO.: G/SA 96-T-004
SOURCE TESTED: Steel Processing Mill - Twin Shell EAF DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	20-SEP-96	20-Sep-96	20-Sep-96
Sampling Location	B.O. (Stack)	B.O. (Stack)	B.O. (Stack)
Process Charge Rate (TPH)	***180.0***	***175.0***	***175.0***
Test Time, Start-Stop (24 Hour)	1105-1205	1225-1325	1340-1440
Sampling Time (Minutes)	60	60	60
Stack Area (Ft^2)	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.84	0.84	0.84
Dry Gas Meter Correction Factor (Dimensionless)	1.0460	1.0460	1.0460
Barometric Pressure (In. Hg)	29.26	29.18	29.18
Static Pressure (In. H2O)	-0.600	-0.600	-0.600
Absolute Pressure (In. Hg)	29.22	29.14	29.14
Dry Gas Meter Sample Volume (DCF)	198.383	260.172	258.254
Average Dry Gas Meter Temperature (°F)	86.0	92.3	91.3
Average Orifice Meter Delta H (In. H2O)	0.997	3.995	3.828
Volume Condensate Collected (Ml)	14.8	58.9	57.4
Average CO2 Concentration (%)	0.7	0.7	0.7
Average O2 Concentration (%)	20.4	20.4	20.5
Average Square Root of Delta P (In. H2O½)	1.077	1.094	1.092
Average Stack Gas Temperature (°F)	163.8	187.6	177.2
Average Corrected CO Concentration (PPMV)	**22.22**	**19.11**	**12.32**

CALCULATED DATA

Dry Gas Meter Sample Volume at Standard Conditions (SCF)	196.758	256.342	254.817
Water Vapor Volume at Standard Conditions (SCF)	0.697	2.772	2.702
Moisture Fraction (Dimensionless)	0.004	0.011	0.010
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.93	28.93	28.93
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.89	28.81	28.82
Stack Gas Velocity (FPS)	66.5	69.0	68.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,253,494	1,300,618	1,287,424
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,032,194	1,021,583	1,028,763
CO Emission Concentration (Lb/DSCF)	1.62E-06	1.39E-06	8.96E-07
CO Emission Rate (Lb/Hr)	100.0	85.2	55.3
CO Emission Concentration (Lb/Ton of Charge)	*0.556*	*0.487*	*0.316*

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**1,280,512**
Average CO Emission Concentration (Lb/DSCF)	**1.30E-06**
Average CO Emission Rate (Lb/Hr)	**80.2**
Average CO Emission Concentration (Lb/Ton of Charge)	***0.453***

Signature of Reviewer: Fred H. Quentler

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EPA METHOD 10
CARBON MONOXIDE EMISSIONS TEST RESULTS
TABLE 5A

CLIENT: TRIAD / SDI JOB NO.: G/SA 96-T-004
SOURCE TESTED: Steel Processing Mill - Twin Shell EAF DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	20-SEP-96	20-Sep-96	20-Sep-96
Sampling Location	B.O. (Stack)	B.O. (Stack)	B.O. (Stack)
Process Tap Rate (TPH)	***166.0***	***166.0***	***166.0***
Test Time, Start-Stop (24 Hour)	1105-1205	1225-1325	1340-1440
Sampling Time (Minutes)	60	60	60
Stack Area (Ft^2)	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.84	0.84	0.84
Dry Gas Meter Correction Factor (Dimensionless)	1.0460	1.0460	1.0460
Barometric Pressure (In. Hg)	29.26	29.18	29.18
Static Pressure (In. H2O)	-0.600	-0.600	-0.600
Absolute Pressure (In. Hg)	29.22	29.14	29.14
Dry Gas Meter Sample Volume (DCF)	198.383	260.172	258.254
Average Dry Gas Meter Temperature (°F)	86.0	92.3	91.3
Average Orifice Meter Delta H (In. H2O)	0.997	3.995	3.828
Volume Condensate Collected (Ml)	14.8	58.9	57.4
Average CO2 Concentration (%)	0.7	0.7	0.7
Average O2 Concentration (%)	20.4	20.4	20.5
Average Square Root of Delta P (In. H2O½)	1.077	1.094	1.092
Average Stack Gas Temperature (°F)	163.8	187.6	177.2
Average Corrected CO Concentration (PPMV)	**22.22**	**19.11**	**12.32**

CALCULATED DATA

Dry Gas Meter Sample Volume at Standard Conditions (SCF)	196.758	256.342	254.817
Water Vapor Volume at Standard Conditions (SCF)	0.697	2.772	2.702
Moisture Fraction (Dimensionless)	0.004	0.011	0.010
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.93	28.93	28.93
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.89	28.81	28.82
Stack Gas Velocity (FPS)	66.5	69.0	68.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,253,494	1,300,618	1,287,424
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,032,194	1,021,583	1,028,763
CO Emission Concentration (Lb/DSCF)	1.62E-06	1.39E-06	8.96E-07
CO Emission Rate (Lb/Hr)	100.0	85.2	55.3
CO Emission Concentration (Lb/Ton of Tap)	*0.603*	*0.513*	*0.333*

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**1,280,512**
Average CO Emission Concentration (Lb/DSCF)	**1.30E-06**
Average CO Emission Rate (Lb/Hr)	**80.2**
Average CO Emission Concentration (Lb/Ton of Tap)	***0.483***

Signature of Reviewer: Fred H. Quentter

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EPA METHOD 25A
TOTAL GASEOUS ORGANIC EMISSIONS TEST RESULTS
TABLE 6

CLIENT: TRIAD / SDI — JOB NO.: G/SA 96-T-004
SOURCE TESTED: Steel Processing Mill – Twin Shell EAF — DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	20-SEP-96	20-Sep-96	20-Sep-96
Sampling Location	B.O. (Stack)	B.O. (Stack)	B.O. (Stack)
Process Charge Rate (TPH)	***180.0***	***175.0***	***175.0***
Test Time, Start-Stop (24 Hour)	1105-1205	1225-1325	1340-1440
Sampling Time (Minutes)	60	60	60
Stack Area (Ft^2)	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.84	0.84	0.84
Dry Gas Meter Correction Factor (Dimensionless)	1.0460	1.0460	1.0460
Barometric Pressure (In. Hg)	29.26	29.18	29.18
Static Pressure (In. H2O)	-0.600	-0.600	-0.600
Absolute Pressure (In. Hg)	29.22	29.14	29.14
Dry Gas Meter Sample Volume (DCF)	198.383	260.172	258.254
Average Dry Gas Meter Temperature (°F)	86.0	92.3	91.3
Average Orifice Meter Delta H (In. H2O)	0.997	3.995	3.828
Volume Condensate Collected (Ml)	14.8	58.9	57.4
Average CO2 Concentration (%)	0.7	0.7	0.7
Average O2 Concentration (%)	20.4	20.4	20.5
Average Square Root of Delta P (In. H2O½)	1.077	1.094	1.092
Average Stack Gas Temperature (°F)	163.8	187.6	177.2
Average TGO Concentration as Carbon (PPMV)	**4.20**	**4.08**	**6.15**

CALCULATED DATA

Dry Gas Meter Sample Volume at Standard Conditions (SCF)	196.758	256.342	254.817
Water Vapor Volume at Standard Conditions (SCF)	0.697	2.772	2.702
Moisture Fraction (Dimensionless)	0.004	0.011	0.010
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.93	28.93	28.93
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.89	28.81	28.82
Stack Gas Velocity (FPS)	66.5	69.0	68.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,253,494	1,300,618	1,287,424
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,032,194	1,021,583	1,028,763
TGO Emission Concentration (Lb/DSCF)	1.31E-07	1.27E-07	1.92E-07
TGO Emission Rate (Lb/Hr)	8.11	7.80	11.83
TGO Emission Concentration (Lb/Ton of Charge)	*0.0450*	*0.0445*	*0.0676*

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**1,280,512**
Average TGO Emission Concentration (Lb/DSCF)	**1.50E-07**
Average TGO Emission Rate (Lb/Hr)	**9.25**
Average TGO Emission Concentration (Lb/Ton of Charge)	***0.0524***

Signature of Reviewer: Fred H. Quentter

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EPA METHOD 25A
TOTAL GASEOUS ORGANIC EMISSIONS TEST RESULTS
TABLE 6A

CLIENT: TRIAD / SDI JOB NO.: G/SA 96-T-004
SOURCE TESTED: Steel Processing Mill – Twin Shell EAF DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	20-SEP-96	20-Sep-96	20-Sep-96
Sampling Location	B.O. (Stack)	B.O. (Stack)	B.O. (Stack)
Process Tap Rate (TPH)	***166.0***	***166.0***	***166.0***
Test Time, Start-Stop (24 Hour)	1105-1205	1225-1325	1340-1440
Sampling Time (Minutes)	60	60	60
Stack Area (Ft^2)	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.84	0.84	0.84
Dry Gas Meter Correction Factor (Dimensionless)	1.0460	1.0460	1.0460
Barometric Pressure (In. Hg)	29.26	29.18	29.18
Static Pressure (In. H2O)	-0.600	-0.600	-0.600
Absolute Pressure (In. Hg)	29.22	29.14	29.14
Dry Gas Meter Sample Volume (DCF)	198.383	260.172	258.254
Average Dry Gas Meter Temperature (°F)	86.0	92.3	91.3
Average Orifice Meter Delta H (In. H2O)	0.997	3.995	3.828
Volume Condensate Collected (Ml)	14.8	58.9	57.4
Average CO2 Concentration (%)	0.7	0.7	0.7
Average O2 Concentration (%)	20.4	20.4	20.5
Average Square Root of Delta P (In. H2O½)	1.077	1.094	1.092
Average Stack Gas Temperature (°F)	163.8	187.6	177.2
Average TGO Concentration as Carbon (PPMV)	**4.20**	**4.08**	**6.15**

CALCULATED DATA

Dry Gas Meter Sample Volume at Standard Conditions (SCF)	196.758	256.342	254.817
Water Vapor Volume at Standard Conditions (SCF)	0.697	2.772	2.702
Moisture Fraction (Dimensionless)	0.004	0.011	0.010
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.93	28.93	28.93
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.89	28.81	28.82
Stack Gas Velocity (FPS)	66.5	69.0	68.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,253,494	1,300,618	1,287,424
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,032,194	1,021,583	1,028,763
TGO Emission Concentration (Lb/DSCF)	1.31E-07	1.27E-07	1.92E-07
TGO Emission Rate (Lb/Hr)	8.11	7.80	11.83
TGO Emission Concentration (Lb/Ton of Tap)	*0.0488*	*0.0470*	*0.0713*

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**1,280,512**
Average TGO Emission Concentration (Lb/DSCF)	**1.50E-07**
Average TGO Emission Rate (Lb/Hr)	**9.25**
Average TGO Emission Concentration (Lb/Ton of Tap)	***0.0557***

Signature of Reviewer: Fred H. Quentler

3.0 FACILITY DESCRIPTION

Steel Dynamics, Inc. owns and operates a steel processing mill which has the capacity to produce 225 tons of hot rolled coil steel per hour. Tons of iron, scrap steel and various metals are charged into an electric arc furnace (EAF) and transformed to molten steel for refining.

SDI is located at Dekalb County Roads 44 & 59 near Butler, Indiana.

The SDI steel processing mill consists basically of a twin shell EAF, which was the source tested for compliance purposes, two (2) ladle metallurgy refining stations, a water cooled mold, one (1) tunnel furnace with natural gas-fired burners, two (2) tundish preheaters with natural gas-fired burners, one (1) tundish dryer with a natural gas-fired burner, one (1) ladle dryout with a natural gas-fired burner, three (3) ladle preheaters with natural gas-fired burners, a slag processing operation consisting of a grizzly/feeder, covered conveyors, material sizing screens and storage piles, a carbon, lime and flux additive handling system with pneumatic conveyors, storage bins and enclosed conveyors to the blending area at the EAF, one (1) baghouse dust silo, an emissions evacuation collection system and collection canopies which exhaust to a common baghouse with a 99.85% particulate removal efficiency and a 125' high stack. The emissions testing was performed on the exhaust stack. See Figure 1.

During the PM/PM10 emissions test runs on September 19, 1996, the *charge* rate averaged 176.7 TPH and the *tap* rate averaged 165.5 TPH. On September 20, 1996 the *charge* rate averaged 175.9 TPH and the *tap* rate averaged 166.1 TPH. During the CEM test runs on September 20, 1996, the *charge* rate averaged 176.7 TPH and the *tap* rate averaged 166.0 TPH.

Process operating data recorded during the emissions testing can be found in Appendix C of this report.

4.0 TEST PROCEDURES

G/SA uses all current EPA accepted testing methodologies in it's Air Quality program as listed in The United States Code of Federal Regualtions, Title 40, Part 60, Appendix A. For this test program, the following specific methodologies were utilized:

EPA Method 1 - Sample and Velocity Traverses for Stationary Sources

EPA Method 2 - Determination of Stack Gas Velocity and Volummetric Flow Rate (Type S Pitot Tube)

EPA Method 3 - Gas Analysis for the Determination of Dry Molecular Weight

EPA Method 3A - Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)

EPA Method 5 - Determination of Particulate Emissions from Stationary Sources

EPA Method 6C - Determination of Sulfur Dioxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)

EPA Method 7E - Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)

EPA Method 9 - Visual Determination of the Opacity of Emissions from Stationary Sources *(Opacity CEM Data Substituded for this Method)*

EPA Method 10 - Determination of Carbon Monoxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)

EPA Method 25A - Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer

EPA Method 202 - Determination of Condensible Particulate Emissions from Stationary Sources

A complete listing of each test method is included in Appendix H of this document for reference purposes.

EPA Methods 2 and 5/202 were performed using one (1) Apex Instruments, Model 522, control unit and sampling train incorporating an 8', effective length, stainless-steel probe with a heated, borosilicate glass liner, a stainless-steel nozzle and Type S, stainless-steel pitot tube, a ¼" O.D., stainless-steel static pressure/gas sampling tube and a Type K (Chromel/Alumel) thermocouple; an aluminum filter oven and three (3) borosilicate glass filter holders with silicon rubber gasketed, glass frit filter supports, and 0.3 micron (99.9% retention), Whatman 8.5 cm, Type 934-AH, glass microfiber filters; a foam insulated, aluminum sampling unit with two (2) Greenburg-Smith and two (2) modified Greenburg-Smith glass impinger bottles, and a stainless-steel umbilical adapter with a Type K (Chromel/Alumel) gas exit thermocouple; and a 60' umbilical with various interconnecting fittings and plugs. Sample pH levels were determined with a pHep, Model micropHep 3, pH Stick Meter. Impinger contents were purged with zero grade N_2 gas utilizing a Dwyer, Model RMA-23-SSV, Rate-Master Flowmeter (5-50 LPM range), a Dwyer, Model RMA-26, Rate-Master Flowmeter (0.5-5 LPM range), and various length ¼" O.D. Teflon tubing, regulators, interconnecting fittings and valves.

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

EMISSION TEST REPORT
FOR
MELT SHOP BAGHOUSE STACK

Prepared for:
STEEL DYNAMICS, INC.
4500 COUNTY ROAD 59
BUTLER, INDIANA

Dames & Moore Job No. 27892-006-140
September 18, 1997

1.0 INTRODUCTION

This report presents the results of the melt shop baghouse compliance tests conducted at Steel Dynamics, Inc.'s (SDI's) steel mill located in Butler, Indiana. These tests were conducted to determine the sulfur dioxide (SO_2), nitrogen oxides (NO_x), and volatile organic compounds (VOCs) from a steel melt shop operation with a single stack baghouse control device. This test battery is a retest of data collected in April 1997 which was determined to have inaccurate calibrations. The retest was conducted at the request of SDI and the Indiana Department of Environmental Management (IDEM). This report is an addendum report to the April test report, dated June 4, 1997. The State of Indiana air permit number for the baghouse source is 033-3692. The source test data will be used to confirm compliance with NSPS 40 CFR 60 Subpart AAa as well as the state operating permit.

Personnel responsible for sampling and report preparation were:

Barry Smith - Steel Dynamics, Inc.
Brian Gregory - Dames & Moore
James Gray - Affiliated Environmental Services

The Dames & Moore originating office address is:

721 Emerson Road
Suite 220
St. Louis, Missouri 63141
(314) 993-4599

Mr. Scott Stacey of the IDEM provided oversight of the testing activities. Testing was coordinated with mill personnel to insure the testing was performed during proper operating conditions. All testing was conducted on August 5, 1997.

I, Brian Gregory _____, of Dames & Moore certify that the emission rates and test method procedures documented in this report are accurate and in compliance with procedures listed in 40 CFR Part 60.

2.0 TESTING RESULTS

Table I presents the results of the tests performed on the baghouse stack exhaust. Each of the three Continuous Emission Monitor (CEM) test runs were conducted over a one hour period. The following is a description of test activities which were carried out during the Continuous Emission Monitor (CEM) tests:

August 5, 1997

- 0730-1600 finish set-up, conduct method 205 testing of monitoring systems, coordinate with operations and IDEM on test start time;
- 1617-1717 Run 1 - flow rate data and outlet SO_2, NO_x, and VOC data;
- 1759-1859 Run 2 - flow rate data and outlet SO_2, NO_x, and VOC data;
- 1936-2036 Run 3 - flow rate data and outlet SO_2, NO_x, and VOC data

Based upon stack conditions and measured parameters, the emission rates listed in Table I were subsequently calculated. The average emissions of VOC's expressed as propane was 0.02 lb/ton of steel produced, oxides of nitrogen average emission rate was 0.42 lb/ton of steel produced, and the average sulfur dioxide emission rate was 0.20 lb/ton of steel produced. Steel production ranged from 172 ton/hr to 197 ton/hr which were below the maximum production rate of 225 ton/hr. A complete tabular listing of the measured stack conditions and parameters for the tests are included in Table I. Raw instrument data and averages are presented in Appendix A for the CEM test constituents.

TABLE I
CEM TEST RESULTS

PARAMETERS	RUN 1	RUN 2	RUN 3
OXYGEN (%)	21	21	21
CARBON DIOXIDE (%)	0	0	0
STACK TEMP. (°F)	183	171	166
VOL. FLOW (DSCFM)	900,942	933,565	957,963
MOISTURE (%)	1.4	1.4	1.1
VOC (ppm as propane)	1.21	0.28	0.20
VOC EMISSIONS (lb/hr as propane)	7.2	1.7	1.3
VOC EMISSIONS (lb/ton as propane)	0.04	0.01	0.01
NO_x (ppmdv)	12.1	9.6	12.8
NO_x EMISSIONS (lb/hr)	78.1	64.2	87.8
NO_x EMISSIONS (lb/ton)	0.45	0.33	0.47
SO_2 (ppmdv)	2.0	4.7	5.6
SO_2 EMISSIONS (lb/hr)	17.9	43.7	53.5
SO_2 (lb/ton)	0.10	0.22	0.29
Steel Production Rate (tons)	172	197	187

All emission rates are reported at EPA standard conditions unless otherwise noted. Emissions expressed as lb/ton indicate lb per ton of steel produced.

Awaiting ESS
JAE

OFFICE OF AIR MANAGEMENT
TEST OBSERVATION REPORT

Agency: IDEM

Date(s) of Test: August 5, 1997

Company Name: Steel Dynamics

Plant ID: 033-00043

Plant Location: 4500 CR 59

Title V? yes

City: Butler

Reported by: SWS SWS

County: Dekalb

Pollutants: NOX, SO2, VOC

Reasons for Test: Retest-Previous test thrown out due to errors by testers

Test Methods: 1-4, 6C, 7E, 25A, 205

Person(s) Interviewed: Jim Gray(AES), Brian Gregory(Dames and Moore), Barry Smith(SDI)

Test Observer(s): SWS

Facility(s) Tested: EAF-Baghouse

Process Description: Scrap is put into the furnaces and melted by EAF. There is an over head hood and a vent connected to the EAF. The vent ductwork is water cooled. The LMF is also tied into the exhaust to the baghouse.

Test Summary / Comments:

I arrived on site at 8 am. I met with Barry Smith and Brian Gregory. They wanted to make sure that I would have all the information that I needed. I told them to record the process data as in the previous tests. Barry Smith did not have a problem with that. I told them that I would be paying a lot of attention to the gases since that is where the problem was last time. I then performed a DGM audit which passed. I obtained the gas cylinder numbers and checked to make sure that the cylinders were all protocol one gases and that the gases were not expired. All the gases were protocol one gases except the zero gas was CEM grade zero air and were not expired. Gas concentrations were 551 ppm SO2, 56 ppm SO2, 272 ppm NOX, 543 ppm NOX, 45.4 ppm propane, and 100 ppm propane. According to Method 205 the dilution system has to pass for one analyzer and the diluter would be good for all gases used for that field test. The first attempt failed when the mid supply gas failed to meet the 2% criteria. The next failed when the dilutions failed to meet the criteria. The chosen amounts of dilution to be used during the testing were used. 70, 60, 50, 40, and 30% dilutions were used on the NOX analyzer. The 2% criteria was met for all dilutions and mid supply cal gas. The mid supply gas was within 10% of one of the dilutions. Calibration for the analyzers than took place with testing beginning at 4:17.

SSS

Indiana Department of Environmental Management
Office of Air Management

Office Memorandum

To: Phil Perry
Date: May 3, 1999

From: Scott Stacy GWS
Thru: Ed S. Surla

Subj: Steel Dynamics, Inc.
Butler, Indiana
Source ID No. 033-00043
Permit No. CP033-9187-00043(LMF)
CP033-8091-00043(EAF)

The subject company has submitted a report concerning the stack emissions testing at the subject source. The test was conducted by G/SA. The purpose of the testing was to determine the compliance status of the facility with regard to the emission limitations stated below. The Protocol was approved by Scott Stacy, and the field test was observed by Scott Stacy. I have reviewed the report and found the sampling procedures used and results to be acceptable to this Office. A copy of the test report is filed in the Compliance Data Section. The following is a summary of the test results:

Date of Test:	November 17-20, 1998
Identification and Unit No. of Facility Tested:	EAF 1 and 2
APC Operating Parameters:	Baghouse
	Average Pressure Drop: 7.93"H2O
	Pressure Drop Range:7-9.2"H2O
Pollutant:	PM/PM10, CO, VOC, Opacity, SO2, NOX
Test Methods:	1-5, 9, 10, 202, 25A, 7E, 6C, 3A
NSPS Subpart AAA	0.0052 gr/dscf PM
	3% opacity
Permit 8091 Condition	
11	0.0032 gr/dscf PM/PM10, 35.7 lbs/hr PM/PM10, 1,300,000 dscfm
12	3% opacity
14	0.51 lbs NOX/ton steel produced, 204 lbs/hr NOX
15	2.0 lbs CO/ton steel produced, 800 lbs/hr CO
16	0.13 lbs VOC/ton of steel produced, 52.0 lbs/hr VOC
17	0.20 lbs SO2/ton of steel produced*, 80 lbs/hrSO2*
Permit 9187 Condition	
17	LMF and the EAF stack combined for
	0.20 lbs SO2/ton steel produced*, 80 lb/hr SO2*
Maximum Permitted Operating Rate:	400 tons/hr
Average Operating Rate During Test:	319 tons/hr (79.8%)
Average Measured Emissions:	0.00106 gr/dscf PM
	11.75 lbs/hr PM(filterable)(for informational purposes)
	21.39 lbs/hr PM10(condensible)(for informational purposes)
	33.15 lbs/hr PM/PM10(filterable PM+condensible PM)
	0.00299 gr/dscf PM/PM10
	174.47lbs/hr NOX 0.551 lbs NOX/ton steel produced
	21.49 lbs/hr VOC 0.0713 lbs VOC/ton steel produced

	123.44 lbs/hr SO2 EAF*	0.376 lbs SO2/ton steel produced EAF*
	159.69 lbs/hr SO2 Total*	0.486 lbs SO2/ton steel produced Total*

Highest 6 minute Opacity:	2.8%
Average Opacity:	1.12%

STATUS: IN COMPLIANCE (at 79.8% of Maximum Permitted Rate) VOC, PM/PM10
Out of Compliance(at 79.8% of Maximum Permitted Rate) NOX, SO2***

***Note: SO2 is listed under both permits. Permit 8091 is for the EAFs only. Permit 9187 is an overall SO2 limit for both the EAF and the LMF Baghouse stacks. The SO2 and NOX were retested on 2/2/99.**
Note: CO was tested but was thrown out on site from spiking out of range during the testing. This is being retested on 2/2/99.

Note: The PM/PM10 emission limit with the capacity operated at requires that SDI have production limit of 335 tph of steel. SDI will send in quarterly production data. Once this 335 tph production limit is reached, testing will be required until the 95% rule is met. A letter is being sent to SDI concerning this issue. SDI has a request for a permit amendment for changing the PM/PM10 emission limit to filterable PM10 or PM pending.

Date of Test:	November 17-20, 1998
Identification and Unit No. of Facility Tested:	LMF
APC Operating Parameters:	Baghouse
	Average Pressure Drop: 5.17"H2O
	Pressure Drop Range:2.6-7.1"H2O

Pollutant:	PM/PM10, CO, VOC, Opacity, SO2, NOX
Test Methods:	1-5, 9, 10, 202, 25A, 7E, 6C, 3A

Permit 9187 Condition	
15	0.0032 gr/dscf PM/PM10, 200,000 dscfm, 5.49 lbs/hr PM/PM10
16	3% opacity
17	LMF and the EAF stack combined for
	0.20 lbs SO2/ton steel produced*, 80 lb/hr SO2*
18	0.025 lbs NOX/ton steel produced, 10 lbs/hr NOX
19	0.1 lbs CO/ton of steel produced, 40 lbs/hr CO
20	0.013 lbs VOC/ton of steel produced, 5.21 lbs/hr VOC

Maximum Permitted Operating Rate:	400 tons/hr	
Average Operating Rate During Test:	319 tons/hr	
Average Measured Emissions:	1.88 lbs/hr PM(filterable)(for informational purposes)	
	91.19 lbs/hr PM10(condensible)(for informational purposes)	
	93.07 lbs/hr PM/PM10(filterable PM+condensible PM)	
	0.0794 gr/dscf PM/PM10	
	12.67lbs/hr NOX	0.039 lbs NOX/ton steel produced
	2.07 lbs/hr VOC	0.00672 lbs VOC/ton steel produced
	36.25 lbs/hr SO2 LMF*	0.1104 lbs SO2/ton steel produced LMF*
	159.69 lbs/hr SO2 Total*	0.486 lbs SO2/ton steel produced Total*

Highest 6 minute Opacity: 0%
Average Opacity: 0%

STATUS: IN COMPLIANCE (at 79.8% of Maximum Permitted Rate) VOC
Out of COMPLIANCE(at 79.8% of Maximum Permitted Rate)** NOX, SO2*, PM/PM10***

*Note: SO2 is listed under both permits. Permit 8091 is for the EAFs only. Permit 9187 is an overall SO2 limit for both the EAF and the LMF Baghouse stacks. The CO testing was thrown out due to not using the correct number of gases for Method 10. Retesting was performed on 2/2/99.

***The PM/PM10 problems were due to the LMF baghouse just starting operating. This baghouse had been running for 1 week before the test and was not in full operation during that week. The filter caking that occurs in all baghouse filter bags did not have time to get to a thickness that would give maximum performance. Retesting on the PM/PM10 occurred on 2/2/99. SDI has a request for a permit amendment for changing the PM/PM10 emission limit to filterable PM10 or PM pending. The PM/PM10 test on 2/2/99 was in compliance.

**During the testing there were operational problems that caused the higher emissions. The longer processing time, slag layer problems, and higher than normal power usage caused the higher emissions. The slag layer was having problems forming so more carbon was injected. This carbon has a low level of Sulfur in it which causes the SO2 emission rates to increase for the EAF. The slag layer controls the amount of contact with the air and the metal. With the higher power usage for a long period of time, the EAF NOX was increased more than normal due to the heat of the metal combusting the air above the molten metal. This created a higher than normal NOX emissions. The Slag layer keeps the heat in the metal and also keeps the metal from contacting the outside air. The LMF is affected by what occurs at the EAF. The LMF removes the sulfur from the molten metal. This Sulfur readily becomes SO2. The higher Sulfur levels requires more stirring to reduce the level of Sulfur. The increased stirring required to remove this Sulfur causes the nitrogen in the molten metal to be released. This causes an increase of NOX emissions. The SO2 and NOX were retested on 2/2/99.

cc: WPS/ General Files-Dekalb County
Terry Coleman-Northern Regional Office
Scott Stacy

G/SA

GUENTHER / SHACKELFORD ASSOCIATES

ENVIRONMENTAL CONSULTANTS & TESTING CONTRACTORS

SOURCE EMISSIONS TEST REPORT

PERFORMED FOR
STEEL DYNAMICS, INC.
BUTLER, INDIANA

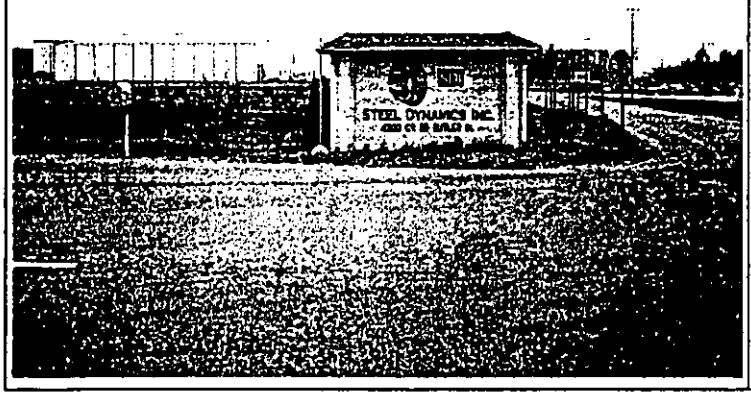
TWIN SHELL ELECTRIC ARC FURNACE LADLE METALLURGICAL STATION

EPA METHODS 1, 2, 3, 5, 6C, 7E, 9, 10, 25A AND 202

NOVEMBER 17-20, 1998
G/SA PROJECT NO. 98-T-065

Prepared for:

Mr. Barry Smith
Environmental Engineer
Steel Dynamics, Inc.
4500 County Road 59
Butler, IN 46271



SDI™

COMPLIANCE TEST REPORT

STEEL PROCESSING MILL
EAF/LMS
BAGHOUSE OUTLETS
TEST DATA AND RESULTS

SOURCE EMISSIONS COMPLIANCE TESTING
EPA Methods 5, 6C, 7E, 9, 10, 25A and 202
Performed on the
Twin Shell Electric Arc Furnace
Baghouse Outlet
and
Ladle Metallurgical Station
Baghouse Outlet
at
Steel Dynamics, Inc.
Steel Processing Mill
Butler, Indiana

November 17 - 20, 1998

Project No. 98-T-065

1.0 INTRODUCTION

This report presents the results of the source emissions compliance testing conducted by Guenther/Shackelford Associates (G/SA) for Steel Dynamics, Inc. (SDI), near Butler, Indiana.

The primary purpose of this testing program was to obtain PM_{10} (particulate matter ≤ 10 microns in particle size) samples of particulate matter (PM) and condensible particulate matter (CPM) , and to determine sulfur dioxide (SO_2), nitrogen oxides (NO_X), carbon monoxide (CO), total gaseous organic (TGO) or volatile organic compounds (VOC) a.k.a. total hydrocarbons (THC) concentrations from the effluent gas streams of the baghouses serving the Twin Shell Electric Arc Furnace (EAF), Ladle Metallurgical Station (LMS) and associated equipment at SDI's Steel Processing Mill operations to

establish outlet emission rates. Also, to collect continuous emissions monitoring (CEM) data and to conduct visible emissions (VE) observations to determine plume opacities of the gases vented from the EAF and LMS Baghouses through their exhaust stacks to atmosphere, respectively.

G/SA's responsibility was to collect and analyze PM/CPM samples, conduct VE observations and instrument monitoring for SO_2, NO_X, CO and VOC, and perform data reduction for emission concentrations evaluation. SDI's responsibility was to provide CEM opacity data and process operating data per compliance test requirements.

The following report provides information pertaining to the Steel Processing Mill's operations, emissions testing and analytical results.

The emissions testing conducted on the EAF and LMS Baghouse Outlets was performed on Tuesday, November 17, Wednesday, November 18 and Friday, November 20, 1998.

The following requirements were specific for the testing program:

1. Equipment calibrations performed and calibration data provided.
2. Three (3), consecutive four (4) hour, minimum, PM/CPM emissions test runs performed, simultaneously, at the outlets (exhaust stacks) of the EAF and LMS Baghouses per IDEM Rule 326 IAC 3-2.1 and NSPS 40 CFR 60, Subpart AAa.

3. Three (3), consecutive ~~two (2)~~ four (4) hour, minimum, SO_2, NO_X, CO and VOC emissions test runs performed, simultaneously, at the outlets (exhaust stacks) of the EAF and LMS Baghouses.

4. Continuous six (6) minute, minimum, plume opacity averages recorded by the EAF's exhaust stack opacity monitor during the PM/CPM emissions testing.

5. Three (3), consecutive one (1) hour, minimum, VE observations performed on the outlet exhaust of the LMS Baghouse.

6. Process manufacturing capacities and control devices maintained at required operating conditions, and production rates recorded during the emissions testing periods.

7. All testing, observations, monitoring and analyses performed in accordance with current U.S. Environmental Protection Agency (EPA) test methodologies and analytical procedures for PM, SO_2, NO_X, VE, CO, VOC and CPM emissions determinations.

8. PM/CPM emissions from each of the EAF and LMS baghouses shall not exceed an average concentration of 0.0032 gr/dscf and a 3% average VE opacity pursuant to IDEM Rule ~~316 IAC 6-1-10.1, Subsection (e)~~ 326 IAC 12-1-1.

9. SO_2 emissions from the EAF and LMS shall not exceed a combined average concentration of 0.20 lb/ton of steel produced pursuant to IDEM Rule 326 IAC 2-1-1.

10. NO_X emissions from the EAF and LMS shall not exceed an individual

average concentration of 0.51 lb/ton and 0.025 lb/ton, respectively, of steel produced pursuant to IDEM Rule 326 IAC 2-1-1.

11. CO emissions from the EAF and LMS shall not exceed an individual average concentration of 2.0 lb/ton and 0.10 lb/ton, respectively, of steel produced pursuant to IDEM Rule 326 IAC 2-1-1.

12. VOC emissions from the EAF and LMS shall not exceed an individual average concentration of 0.13 lb/ton and 0.013 lb/ton, respectively, of steel produced pursuant to IDEM Rule 326 IAC 2-1-1.

Note: EPA Method 5 (PM) and 201A/202 (PM_{10}/CPM) testing were not required to be performed in this case because all of the PM emissions from the EAF and LMS Baghouses are assumed to be ≤ 10 microns in particle size. Therefore, only EPA Method 5/202 (PM/CPM) sampling was conducted per IDEM's approval.

The emissions testing program was supervised by G/SA, whose headquarters is in Crown Point, Indiana. G/SA also performed VE observations on the LMS Baghouse Outlet, data reduction and prepared in part the final report. The PM/CPM emissions testing conducted at the EAF Baghouse Outlet sampling location was performed by G/SA and G/SA's affiliate, Source Assessment Technologies, LLC (S.A.T.), whose headquarters is in Wheatland, Missouri. S.A.T. also performed the PM/CPM analyses and the PM/CPM, SO_2, NO_X, VE, CO and VOC data reduction, and in part the final report preparation. The PM/CPM emissions testing conducted at the LMS Baghouse Outlet

sampling location was performed by G/SA's subcontractor, Total Source Analysis, Inc. (TSA), whose headquarters is in Wellington, Ohio. TSA also performed the CEM testing for SO_2, NO_X, CO and VOC, and carbon dioxide (CO_2) and oxygen (O_2) content as well at both the EAF and LMS Baghouse Outlet sampling locations.

The emissions testing was performed in accordance with EPA Reference Methods 1, 2, 3A, 4, 5 (PM), 6C (SO_2), 7E (NO_X), 9 (VE), 10 (CO), and 25A (VOC), Title 40, Part 60, Appendix A, and Method 202 (CPM), Title 40, Part 51, Appendix M of the U.S. Code of Federal Regulations and IDEM Rule 326 IAC 3-2.1.

The testing program was approved by and/or coordinated with the following personnel:

Barry Smith, Project Manager, SDI

The emissions testing was performed by the following personnel:

Fred Guenther, Test Supervisor, G/SA

Terry Shackelford, Test Engineer, G/SA (S.A.T.)

Ron Segert, Test Technician, G/SA

Hal Stiles, Test Engineer, TSA

Gus Dria, Test Engineer, TSA

John Sutton, Test Technician, TSA

Ken Eavenson, Test Technician, TSA

The emissions testing was observed by the following personnel:

Scott Stacy, Environmental Scientist, Air Compliance Section, IDEM

2.0 TEST RESULTS SUMMARY

The source emissions testing was performed utilizing EPA Methods 1, 2, 3A, 4, 5, 6C, 7E, 9, 10, 25A and 202 at the EAF and LMS Baghouse Outlet sampling locations. A summary of the test results is given below:

SAMPLING LOCATION	RUN NO.	PM/CPM *(Gr/DSCF)*	OPACITY (%)
EAF	1	0.00485	1.0
Baghouse	2	0.00209	1.0
Outlet	3	0.00204	1.0

SAMPLING LOCATION	RUN NO.	SO_2 *Lb/Ton Process Weight*	NO_x *Lb/Ton Process Weight*
EAF	1	0.223	0.514
Baghouse	2	0.371	0.697
Outlet	3	0.224	0.443
	4	0.413	0.587
	5	0.491	0.671

SAMPLING LOCATION	RUN NO.	CO *Lb/Ton Process Weight*	VOC *Lb/Ton Process Weight*
EAF	1	Invalid	0.0327
Baghouse	2	"	0.0865
Outlet	3	0.497	0.0507
	4	Invalid	N/A
	5	"	N/A

SAMPLING LOCATION	RUN NO.	PM/CPM *(Gr/DSCF)*	OPACITY (%)
LMS	1	0.0690	0
Baghouse	2	0.0781	0
Outlet	3	0.0902	0

SAMPLING LOCATION	RUN NO.	SO_2 *Lb/Ton Process Weight*	NO_x *Lb/Ton Process Weight*
LMS	1	0.063	0.0122
Baghouse	2	Invalid	Invalid
Outlet	3	"	"
	4	0.124	0.0594
	5	0.144	0.0455

SAMPLING LOCATION	RUN NO.	CO *Lb/Ton Process Weight*	VOC *Lb/Ton Process Weight*
LMS	1	0.0078	0.00320
Baghouse	2	0.0488	0.00347
Outlet	3	0.0513	0.00315

A complete list of test parameters for each Method 5/202, 6C, 7E, 10 and 25A emissions test run performed at the sampling locations can be found in Tables 1 through 10.

Sample calculations and examples of the equations used to generate the test results can be found in Appendix G.

TABLES

EAF BAGHOUSE OUTLET

G/SA . . . . . ENVIRONMENTAL TESTING CONSULTANTS
P.O. Box 807, Crown Point, IN 46307 TEL (219) 663-5394 / FAX (219) 662-7037

TABLE 1
EPA METHOD 5 / 202
TOTAL PARTICULATE EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: TWIN SHELL EAF ~ BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	17-Nov-98	18-Nov-98	18-Nov-98
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	1141-1625	0820-1247	1500-1931
Sampling Time (Minutes)	240	240	240
Average Process ~~Charge~~ Rate (TPH)	***382.6***	***275.8***	***303.7***
Stack Area (Ft^2) Ta P	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	1.0290	1.0290	1.0290
Nozzle Area (Ft^2)	0.000171	0.000171	0.000171
Barometric Pressure (In. Hg)	29.21	29.35	29.35
Static Pressure (In. H2O)	-0.910	-0.890	-0.890
Dry Gas Meter Sample Volume (DCF)	165.405	165.613	167.675
Average Dry Gas Meter Temperature (°F)	62.2	61.5	62.6
Average Orifice Meter Delta H (In. H2O)	1.628	1.652	1.712
Volume Condensate Collected (Ml)	36.8	46.0	46.9
Average CO2 Concentration (%)	1.1	1.0	1.1
Average O2 Concentration (%)	20.4	20.5	20.4
Average Square Root of Delta P (In. $H2O^{1/2}$)	1.330	1.354	1.372
Average Stack Gas Temperature (°F)	153.8	148.3	148.0
Total Particulate Matter (Grams, G)	**0.0530**	**0.0230**	**0.0227**

CALCULATED DATA

Absolute Pressure (In. Hg)	29.14	29.28	29.28
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	168.736	169.982	171.760
Water Vapor Volume at Standard Conditions (SCF)	1.732	2.165	2.208
Moisture Fraction (Dimensionless)	0.010	0.013	0.013
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.99	28.98	28.99
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.88	28.84	28.85
Stack Gas Velocity (FPS)	81.5	82.5	83.6
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,536,238	1,555,087	1,575,822
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,274,386	1,303,977	1,322,015
Isokinetic Sampling (%)	101.5	99.8	99.6
TPM Emission Concentration (Gr/DSCF)	0.00485	0.00209	0.00204
TPM Emission Concentration (Lb/DSCF)	6.93E-07	2.98E-07	2.91E-07
TPM Emission Rate (Lb/Hr)	53.0	23.3	23.1

Signature of Reviewer: Fred H. Quentter

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TABLE 1A
EPA METHOD 5 / 202
PARTICULATE EMISSIONS TEST RESULTS (FRONT-HALF)

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: TWIN SHELL EAF - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	17-Nov-98	18-Nov-98	18-Nov-98
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	1141-1625	0820-1247	1500-1931
Sampling Time (Minutes)	240	240	240
Average Process ~~Charge~~ Rate (TPH)	***382.6***	***275.8***	***303.7***
Stack Area (Ft^2) Tap	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	1.0290	1.0290	1.0290
Nozzle Area (Ft^2)	0.000171	0.000171	0.000171
Barometric Pressure (In. Hg)	29.21	29.35	29.35
Static Pressure (In. H2O)	-0.910	-0.890	-0.890
Dry Gas Meter Sample Volume (DCF)	165.405	165.613	167.675
Average Dry Gas Meter Temperature (°F)	62.2	61.5	62.6
Average Orifice Meter Delta H (In. H2O)	1.628	1.652	1.712
Volume Condensate Collected (Ml)	36.8	46.0	46.9
Average CO2 Concentration (%)	1.1	1.0	1.1
Average O2 Concentration (%)	20.4	20.5	20.4
Average Square Root of Delta P (In. H2O½)	1.330	1.354	1.372
Average Stack Gas Temperature (°F)	153.8	148.3	148.0
Filtered Particulate Matter (Grams, G)	**0.0186**	**0.0086**	**0.0078**

CALCULATED DATA

Absolute Pressure (In. Hg)	29.14	29.28	29.28
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	168.736	169.982	171.760
Water Vapor Volume at Standard Conditions (SCF)	1.732	2.165	2.208
Moisture Fraction (Dimensionless)	0.010	0.013	0.013
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.99	28.98	28.99
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.88	28.84	28.85
Stack Gas Velocity (FPS)	81.5	82.5	83.6
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,536,238	1,555,087	1,575,822
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,274,386	1,303,977	1,322,015
Isokinetic Sampling (%)	101.5	99.8	99.6
FPM Emission Concentration (Gr/DSCF)	0.00170	0.00078	0.00070
FPM Emission Concentration (Lb/DSCF)	2.43E-07	1.12E-07	1.00E-07
FPM Emission Rate (Lb/Hr)	18.6	8.7	7.9

Signature of Reviewer: Fred H. Quantstar

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TABLE 1B
EPA METHOD 5 / 202
PARTICULATE EMISSIONS TEST RESULTS (BACK-HALF)

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: TWIN SHELL EAF - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

	1	2	3
Run Number			
Date	17-Nov-98	18-Nov-98	18-Nov-98
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	1141-1625	0820-1247	1500-1931
Sampling Time (Minutes)	240	240	240
Average Process ~~Charge~~ Rate (TPH)	***382.6***	***275.8***	***303.7***
Stack Area (Ft^2) Ta P	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	1.0290	1.0290	1.0290
Nozzle Area (Ft^2)	0.000171	0.000171	0.000171
Barometric Pressure (In. Hg)	29.21	29.35	29.35
Static Pressure (In. H2O)	-0.910	-0.890	-0.890
Dry Gas Meter Sample Volume (DCF)	165.405	165.613	167.675
Average Dry Gas Meter Temperature (°F)	62.2	61.5	62.6
Average Orifice Meter Delta H (In. H2O)	1.628	1.652	1.712
Volume Condensate Collected (Ml)	36.8	46.0	46.9
Average CO2 Concentration (%)	1.1	1.0	1.1
Average O2 Concentration (%)	20.4	20.5	20.4
Average Square Root of Delta P (In. H2O½)	1.330	1.354	1.372
Average Stack Gas Temperature (°F)	153.8	148.3	148.0
Condensed Particulate Matter (Grams, G)	**0.0344**	**0.0144**	**0.0149**

CALCULATED DATA

Absolute Pressure (In. Hg)	29.14	29.28	29.28
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	168.736	169.982	171.760
Water Vapor Volume at Standard Conditions (SCF)	1.732	2.165	2.208
Moisture Fraction (Dimensionless)	0.010	0.013	0.013
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.99	28.98	28.99
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.88	28.84	28.85
Stack Gas Velocity (FPS)	81.5	82.5	83.6
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,536,238	1,555,087	1,575,822
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,274,386	1,303,977	1,322,015
Isokinetic Sampling (%)	101.5	99.8	99.6
CPM Emission Concentration (Gr/DSCF)	0.00315	0.00131	0.00134
CPM Emission Concentration (Lb/DSCF)	4.50E-07	1.87E-07	1.91E-07
CPM Emission Rate (Lb/Hr)	34.4	14.6	15.2

Signature of Reviewer: Fred H. Quentler

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TABLE 1C
EPA METHOD 5 / 202
PARTICULATE EMISSIONS TEST RESULTS (INORGANICS)

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: TWIN SHELL EAF - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

	1	2	3
Run Number			
Date	17-Nov-98	18-Nov-98	18-Nov-98
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	1141-1625	0820-1247	1500-1931
Sampling Time (Minutes)	240	240	240
Average Process ~~Charge~~ Rate (TPH)	***382.6***	***275.8***	***303.7***
Stack Area (Ft^2) Ta P	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	1.0290	1.0290	1.0290
Nozzle Area (Ft^2)	0.000171	0.000171	0.000171
Barometric Pressure (In. Hg)	29.21	29.35	29.35
Static Pressure (In. H2O)	-0.910	-0.890	-0.890
Dry Gas Meter Sample Volume (DCF)	165.405	165.613	167.675
Average Dry Gas Meter Temperature (°F)	62.2	61.5	62.6
Average Orifice Meter Delta H (In. H2O)	1.628	1.652	1.712
Volume Condensate Collected (Ml)	36.8	46.0	46.9
Average CO2 Concentration (%)	1.1	1.0	1.1
Average O2 Concentration (%)	20.4	20.5	20.4
Average Square Root of Delta P (In. $H2O^{1/2}$)	1.330	1.354	1.372
Average Stack Gas Temperature (°F)	153.8	148.3	148.0
Inorganic Particulate Matter (Grams, G)	**0.0089**	**0.0043**	**0.0049**

CALCULATED DATA

Absolute Pressure (In. Hg)	29.14	29.28	29.28
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	168.736	169.982	171.760
Water Vapor Volume at Standard Conditions (SCF)	1.732	2.165	2.208
Moisture Fraction (Dimensionless)	0.010	0.013	0.013
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.99	28.98	28.99
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.88	28.84	28.85
Stack Gas Velocity (FPS)	81.5	82.5	83.6
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,536,238	1,555,087	1,575,822
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,274,386	1,303,977	1,322,015
Isokinetic Sampling (%)	101.5	99.8	99.6
IPM Emission Concentration (Gr/DSCF)	0.000814	0.000390	0.000440
IPM Emission Concentration (Lb/DSCF)	1.16E-07	5.58E-08	6.29E-08
IPM Emission Rate (Lb/Hr)	8.89	4.36	4.99

Signature of Reviewer: Fred H. Quentter

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TABLE 1D
EPA METHOD 5 / 202
PARTICULATE EMISSIONS TEST RESULTS (ORGANICS)

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: TWIN SHELL EAF - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	17-Nov-98	18-Nov-98	18-Nov-98
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	1141-1625	0820-1247	1500-1931
Sampling Time (Minutes)	240	240	240
Average Process ~~Charge~~ Rate (TPH)	***382.6***	***275.8***	***303.7***
Stack Area (Ft^2) Ta P	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	1.0290	1.0290	1.0290
Nozzle Area (Ft^2)	0.000171	0.000171	0.000171
Barometric Pressure (In. Hg)	29.21	29.35	29.35
Static Pressure (In. H2O)	-0.910	-0.890	-0.890
Dry Gas Meter Sample Volume (DCF)	165.405	165.613	167.675
Average Dry Gas Meter Temperature (°F)	62.2	61.5	62.6
Average Orifice Meter Delta H (In. H2O)	1.628	1.652	1.712
Volume Condensate Collected (Ml)	36.8	46.0	46.9
Average CO2 Concentration (%)	1.1	1.0	1.1
Average O2 Concentration (%)	20.4	20.5	20.4
Average Square Root of Delta P (In. $H2O^{1/2}$)	1.330	1.354	1.372
Average Stack Gas Temperature (°F)	153.8	148.3	148.0
Organic Particulate Matter (Grams, G)	**0.0255**	**0.0101**	**0.0100**

CALCULATED DATA

Absolute Pressure (In. Hg)	29.14	29.28	29.28
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	168.736	169.982	171.760
Water Vapor Volume at Standard Conditions (SCF)	1.732	2.165	2.208
Moisture Fraction (Dimensionless)	0.010	0.013	0.013
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.99	28.98	28.99
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.88	28.84	28.85
Stack Gas Velocity (FPS)	81.5	82.5	83.6
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,536,238	1,555,087	1,575,822
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,274,386	1,303,977	1,322,015
Isokinetic Sampling (%)	101.5	99.8	99.6
OPM Emission Concentration (Gr/DSCF)	0.00233	0.00092	0.00090
OPM Emission Concentration (Lb/DSCF)	3.33E-07	1.31E-07	1.28E-07
OPM Emission Rate (Lb/Hr)	25.5	10.3	10.2

Signature of Reviewer: Fred H. Quentter

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TABLE 2
EPA METHOD 6C
SULFUR DIOXIDE EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: TWIN SHELL EAF - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	17-Nov-98	18-Nov-98	18-Nov-98
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	1141-1625	0820-1247	1500-1931
Sampling Time (Minutes)	240	240	240
Average Process ~~Charge~~ Rate (TPH)	***382.6***	***275.8***	***303.7***
Stack Area (Ft^2) 78	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	1.0290	1.0290	1.0290
Barometric Pressure (In. Hg)	29.21	29.35	29.35
Static Pressure (In. H2O)	-0.910	-0.890	-0.890
Dry Gas Meter Sample Volume (DCF)	165.405	165.613	167.675
Average Dry Gas Meter Temperature (°F)	62.2	61.5	62.6
Average Orifice Meter Delta H (In. H2O)	1.628	1.652	1.712
Volume Condensate Collected (Ml)	36.8	46.0	46.9
Average CO2 Concentration (%)	1.1	1.0	1.1
Average O2 Concentration (%)	20.4	20.5	20.4
Average Square Root of Delta P (In. H2O½)	1.330	1.354	1.372
Average Stack Gas Temperature (°F)	153.8	148.3	148.0
Average Corrected SO2 Concentration (PPMV)	**6.71**	**7.87**	**5.16**

CALCULATED DATA

Absolute Pressure (In. Hg)	29.14	29.28	29.28
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	168.736	169.982	171.760
Water Vapor Volume at Standard Conditions (SCF)	1.732	2.165	2.208
Moisture Fraction (Dimensionless)	0.010	0.013	0.013
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.99	28.98	28.99
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.88	28.84	28.85
Stack Gas Velocity (FPS)	81.5	82.5	83.6
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,536,238	1,555,087	1,575,822
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,274,386	1,303,977	1,322,015
SO2 Emission Concentration (Gr/DSCF)	0.00781	0.00916	0.00601
SO2 Emission Concentration (Lb/DSCF)	1.12E-06	1.31E-06	8.58E-07
SO2 Emission Rate (Lb/Hr)	85.3	102.4	68.1
SO2 Emission Concentration (Lb/Ton Process Weight)	*0.223*	*0.371*	*0.224*

Signature of Reviewer: Fred H. Quentin

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TABLE 2A
EPA METHOD 6C
SULFUR DIOXIDE EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: TWIN SHELL EAF - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	4	5
Date	20-Nov-98	20-Nov-98
Sampling Location	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	0917-1249	1410-1734
Sampling Time (Minutes)	180	180
Average Process ~~Charge~~ Rate (TPH)	***329.0***	***303.9***
Stack Area (Ft^2) Tap	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	1.0290	1.0290
Barometric Pressure (In. Hg)	29.06	29.06
Static Pressure (In. H2O)	-0.940	-0.980
Dry Gas Meter Sample Volume (DCF)	134.671	133.217
Average Dry Gas Meter Temperature (°F)	65.4	62.8
Average Orifice Meter Delta H (In. H2O)	1.850	1.850
Volume Condensate Collected (Ml)	31.5	24.8
Average CO2 Concentration (%)	1.1	1.1
Average O2 Concentration (%)	20.4	20.4
Average Square Root of Delta P (In. H2O½)	1.338	1.390
Average Stack Gas Temperature (°F)	128.6	128.2
Average Corrected SO2 Concentration (PPMV)	**10.43**	**11.00**

CALCULATED DATA

Absolute Pressure (In. Hg)	28.99	28.99
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	135.905	135.108
Water Vapor Volume at Standard Conditions (SCF)	1.483	1.167
Moisture Fraction (Dimensionless)	0.011	0.009
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.99	28.99
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.87	28.90
Stack Gas Velocity (FPS)	80.6	83.6
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,519,273	1,575,822
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,306,185	1,358,465
SO2 Emission Concentration (Gr/DSCF)	0.0121	0.0128
SO2 Emission Concentration (Lb/DSCF)	1.73E-06	1.83E-06
SO2 Emission Rate (Lb/Hr)	135.9	149.1
SO2 Emission Concentration (Lb/Ton Process Weight)	*0.413*	*0.491*

Signature of Reviewer: Fred H. Quentter

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TABLE 3
EPA METHOD 7E
NITROGEN OXIDES EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: TWIN SHELL EAF – BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	17-Nov-98	18-Nov-98	18-Nov-98
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	1141-1625	0820-1247	1500-1931
Sampling Time (Minutes)	240	240	240
Average Process ~~Charge~~ Rate (TPH)	***382.6***	***275.8***	***303.7***
Stack Area (Ft^2)	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	1.0290	1.0290	1.0290
Barometric Pressure (In. Hg)	29.21	29.35	29.35
Static Pressure (In. H2O)	-0.910	-0.890	-0.890
Dry Gas Meter Sample Volume (DCF)	165.405	165.613	167.675
Average Dry Gas Meter Temperature (°F)	62.2	61.5	62.6
Average Orifice Meter Delta H (In. H2O)	1.628	1.652	1.712
Volume Condensate Collected (Ml)	36.8	46.0	46.9
Average CO2 Concentration (%)	1.1	1.0	1.1
Average O2 Concentration (%)	20.4	20.5	20.4
Average Square Root of Delta P (In. $H2O^{1/2}$)	1.330	1.354	1.372
Average Stack Gas Temperature (°F)	153.8	148.3	148.0
Average Corrected NOx Concentration as NO2 (PPMV)	**21.54**	**20.59**	**14.21**

CALCULATED DATA

Absolute Pressure (In. Hg)	29.14	29.28	29.28
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	168.736	169.982	171.760
Water Vapor Volume at Standard Conditions (SCF)	1.732	2.165	2.208
Moisture Fraction (Dimensionless)	0.010	0.013	0.013
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.99	28.98	28.99
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.88	28.84	28.85
Stack Gas Velocity (FPS)	81.5	82.5	83.6
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,536,238	1,555,087	1,575,822
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,274,386	1,303,977	1,322,015
NOx Emission Concentration (Gr/DSCF)	0.0180	0.0172	0.0119
NOx Emission Concentration (Lb/DSCF)	2.57E-06	2.46E-06	1.70E-06
NOx Emission Rate (Lb/Hr)	196.7	192.3	134.6
NOx Emission Concentration (Lb/Ton Process Weight)	*0.514*	*0.697*	*0.443*

Signature of Reviewer: Fred H. Quentler

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TABLE 3A
EPA METHOD 7E
NITROGEN OXIDES EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: TWIN SHELL EAF - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	4	5
Date	20-Nov-98	20-Nov-98
Sampling Location	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	0917-1249	1410-1734
Sampling Time (Minutes)	180	180
Average Process ~~Charge~~ Rate (TPH)	***329.0***	***303.9***
Stack Area (Ft^2) . Tap	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	1.0290	1.0290
Barometric Pressure (In. Hg)	29.06	29.06
Static Pressure (In. H2O)	-0.940	-0.980
Dry Gas Meter Sample Volume (DCF)	134.671	133.217
Average Dry Gas Meter Temperature (°F)	65.4	62.8
Average Orifice Meter Delta H (In. H2O)	1.850	1.850
Volume Condensate Collected (Ml)	31.5	24.8
Average CO2 Concentration (%)	1.1	1.1
Average O2 Concentration (%)	20.4	20.4
Average Square Root of Delta P (In. H2O½)	1.338	1.390
Average Stack Gas Temperature (°F)	128.6	128.2
Average Corrected NOx Concentration as NO2 (PPMV)	**20.65**	**20.96**

CALCULATED DATA

Absolute Pressure (In. Hg)	28.99	28.99
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	135.905	135.108
Water Vapor Volume at Standard Conditions (SCF)	1.483	1.167
Moisture Fraction (Dimensionless)	0.011	0.009
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.99	28.99
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.87	28.90
Stack Gas Velocity (FPS)	80.6	83.6
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,519,273	1,575,822
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,306,185	1,358,465
NOx Emission Concentration (Gr/DSCF)	0.0173	0.0175
NOx Emission Concentration (Lb/DSCF)	2.47E-06	2.50E-06
NOx Emission Rate (Lb/Hr)	193.2	204.0
NOx Emission Concentration (Lb/Ton Process Weight)	*0.587*	*0.671*

Signature of Reviewer: Fred H. Quentin

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TABLE 4
EPA METHOD 10
CARBON MONOXIDE EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: TWIN SHELL EAF - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	"Invalid	"Invalid	18-Nov-98
Sampling Location	Test	Test	**Stack**
Test Time, Start-Stop (24 Hour)	Run"	Run"	1500-1931
Sampling Time (Minutes)			240
Average Process ~~Charge~~ Rate (TPH)			***303.7***
Stack Area (Ft^2) πr^2			314.159
Pitot Tube Coefficient (Dimensionless)			0.840
Dry Gas Meter Correction Factor (Dimensionless)			1.0290
Barometric Pressure (In. Hg)			29.35
Static Pressure (In. H2O)			-0.890
Dry Gas Meter Sample Volume (DCF)			167.675
Average Dry Gas Meter Temperature (°F)			62.6
Average Orifice Meter Delta H (In. H2O)			1.712
Volume Condensate Collected (Ml)			46.9
Average CO2 Concentration (%)			1.1
Average O2 Concentration (%)			20.4
Average Square Root of Delta P (In. H2O½)			1.372
Average Stack Gas Temperature (°F)			148.0
Average Corrected CO Concentration (PPMV)			**26.15**

CALCULATED DATA

Absolute Pressure (In. Hg)	29.28
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	171.760
Water Vapor Volume at Standard Conditions (SCF)	2.208
Moisture Fraction (Dimensionless)	0.013
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.99
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.85
Stack Gas Velocity (FPS)	83.6
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,575,822
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,322,015
CO Emission Concentration (Gr/DSCF)	0.0133
CO Emission Concentration (Lb/DSCF)	1.90E-06
CO Emission Rate (Lb/Hr)	150.8
CO Emission Concentration (Lb/Ton Process Weight)	*0.497*

Signature of Reviewer: Fred H. Quentler

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TABLE 5
EPA METHOD 25A
TOTAL GASEOUS ORGANIC EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: TWIN SHELL EAF - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	17-Nov-98	18-Nov-98	18-Nov-98
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	1141-1625	0820-1247	1500-1931
Sampling Time (Minutes)	240	240	240
Average Process ~~Charge~~ Rate (TPH)	***382.6***	***275.8***	***303.7***
Stack Area (Ft^2) T&P	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	1.0290	1.0290	1.0290
Barometric Pressure (In. Hg)	29.21	29.35	29.35
Static Pressure (In. H2O)	-0.910	-0.890	-0.890
Dry Gas Meter Sample Volume (DCF)	165.405	165.613	167.675
Average Dry Gas Meter Temperature (°F)	62.2	61.5	62.6
Average Orifice Meter Delta H (In. H2O)	1.628	1.652	1.712
Volume Condensate Collected (Ml)	36.8	46.0	46.9
Average CO2 Concentration (%)	1.1	1.0	1.1
Average O2 Concentration (%)	20.4	20.5	20.4
Average Square Root of Delta P (In. H2O½)	1.330	1.354	1.372
Average Stack Gas Temperature (°F)	153.8	148.3	148.0
Average TGO Concentration as Carbon (PPMV)	**5.25**	**9.78**	**6.23**

CALCULATED DATA

Absolute Pressure (In. Hg)	29.14	29.28	29.28
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	168.736	169.982	171.760
Water Vapor Volume at Standard Conditions (SCF)	1.732	2.165	2.208
Moisture Fraction (Dimensionless)	0.010	0.013	0.013
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.99	28.98	28.99
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.88	28.84	28.85
Stack Gas Velocity (FPS)	81.5	82.5	83.6
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,536,238	1,555,087	1,575,822
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,274,386	1,303,977	1,322,015
TGO Emission Concentration (Gr/DSCF)	0.00115	0.00213	0.00136
TGO Emission Concentration (Lb/DSCF)	1.64E-07	3.05E-07	1.94E-07
TGO Emission Rate (Lb/Hr)	12.5	23.9	15.4
TGO Emission Concentration (Lb/Ton Process Weight)	*0.0327*	*0.0865*	*0.0507*

Signature of Reviewer: Fred H. Quentzler

LMS BAGHOUSE OUTLET

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TABLE 6
EPA METHOD 5 / 202
TOTAL PARTICULATE EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: LMS SYSTEM – BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	17-Nov-98	18-Nov-98	18-Nov-98
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	1225-1719	0830-1246	1500-1912
Sampling Time (Minutes)	240	240	240
Average Process ~~Charge~~ Rate (TPH)	***382.6***	***275.8***	***303.7***
Stack Area (Ft^2) Tap	56.745	56.745	56.745
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	0.9940	0.9940	0.9940
Nozzle Area (Ft^2)	0.000322	0.000322	0.000322
Barometric Pressure (In. Hg)	29.15	29.30	29.30
Static Pressure (In. H2O)	-0.150	-0.150	-0.150
Dry Gas Meter Sample Volume (DCF)	192.344	179.438	187.041
Average Dry Gas Meter Temperature (°F)	68.7	64.9	67.5
Average Orifice Meter Delta H (In. H2O)	1.864	1.573	1.807
Volume Condensate Collected (Ml)	47.7	35.1	40.5
Average CO2 Concentration (%)	0.0	0.2	0.1
Average O2 Concentration (%)	20.9	20.7	20.7
Average Square Root of Delta P (In. H2O½)	0.786	0.753	0.770
Average Stack Gas Temperature (°F)	109.5	125.2	130.0
Total Particulate Matter (Grams, G)	**0.8357**	**0.8929**	**1.0699**

CALCULATED DATA

Absolute Pressure (In. Hg)	29.14	29.29	29.29
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	186.944	176.407	183.089
Water Vapor Volume at Standard Conditions (SCF)	2.245	1.652	1.906
Moisture Fraction (Dimensionless)	0.012	0.009	0.010
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.84	28.86	28.84
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.71	28.76	28.73
Stack Gas Velocity (FPS)	46.6	45.0	46.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	158,659	153,212	157,638
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	141,567	134,130	136,744
Isokinetic Sampling (%)	97.1	96.6	98.4
TPM Emission Concentration (Gr/DSCF)	0.0690	0.0781	0.0902
TPM Emission Concentration (Lb/DSCF)	9.86E-06	1.12E-05	1.29E-05
TPM Emission Rate (Lb/Hr)	83.7	89.8	105.7

Signature of Reviewer: Fred H. Quentler

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TABLE 6A
EPA METHOD 5 / 202
PARTICULATE EMISSIONS TEST RESULTS (FRONT-HALF)

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: LMS SYSTEM - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	17-Nov-98	18-Nov-98	18-Nov-98
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	1225-1719	0830-1246	1500-1912
Sampling Time (Minutes)	240	240	240
Average Process ~~Charge~~ Rate (TPH)	***382.6***	***275.8***	***303.7***
Stack Area (Ft^2) Tap	56.745	56.745	56.745
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	0.9940	0.9940	0.9940
Nozzle Area (Ft^2)	0.000322	0.000322	0.000322
Barometric Pressure (In. Hg)	29.15	29.30	29.30
Static Pressure (In. H2O)	-0.150	-0.150	-0.150
Dry Gas Meter Sample Volume (DCF)	192.344	179.438	187.041
Average Dry Gas Meter Temperature (°F)	68.7	64.9	67.5
Average Orifice Meter Delta H (In. H2O)	1.864	1.573	1.803
Volume Condensate Collected (Ml)	47.7	35.1	40.5
Average CO2 Concentration (%)	0.0	0.2	0.1
Average O2 Concentration (%)	20.9	20.7	20.7
Average Square Root of Delta P (In. $H2O^{1/2}$)	0.786	0.753	0.770
Average Stack Gas Temperature (°F)	109.5	125.2	130.0
Filtered Particulate Matter (Grams, G)	**0.0163**	**0.0161**	**0.0242**

CALCULATED DATA

Absolute Pressure (In. Hg)	29.14	29.29	29.29
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	186.944	176.407	183.087
Water Vapor Volume at Standard Conditions (SCF)	2.245	1.652	1.906
Moisture Fraction (Dimensionless)	0.012	0.009	0.010
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.84	28.86	28.84
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.71	28.76	28.73
Stack Gas Velocity (FPS)	46.6	45.0	46.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	158,659	153,212	157,638
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	141,567	134,130	136,744
Isokinetic Sampling (%)	97.1	96.6	98.4
FPM Emission Concentration (Gr/DSCF)	0.00135	0.00141	0.00204
FPM Emission Concentration (Lb/DSCF)	1.92E-07	2.01E-07	2.91E-07
FPM Emission Rate (Lb/Hr)	1.63	1.62	2.39

Signature of Reviewer: Fred H. Quentler

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TABLE 6B
EPA METHOD 5 / 202
PARTICULATE EMISSIONS TEST RESULTS (BACK-HALF)

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: LMS SYSTEM - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	17-Nov-98	18-Nov-98	18-Nov-98
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	1225-1719	0830-1246	1500-1912
Sampling Time (Minutes)	240	240	240
Average Process ~~Charge~~ Rate (TPH)	***382.6***	***275.8***	***303.7***
Stack Area (Ft^2) Tap	56.745	56.745	56.745
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	0.9940	0.9940	0.9940
Nozzle Area (Ft^2)	0.000322	0.000322	0.000322
Barometric Pressure (In. Hg)	29.15	29.30	29.30
Static Pressure (In. H2O)	-0.150	-0.150	-0.150
Dry Gas Meter Sample Volume (DCF)	192.344	179.438	187.041
Average Dry Gas Meter Temperature (°F)	68.7	64.9	67.5
Average Orifice Meter Delta H (In. H2O)	1.864	1.573	1.803
Volume Condensate Collected (Ml)	47.7	35.1	40.5
Average CO2 Concentration (%)	0.0	0.2	0.1
Average O2 Concentration (%)	20.9	20.7	20.7
Average Square Root of Delta P (In. H2O½)	0.786	0.753	0.770
Average Stack Gas Temperature (°F)	109.5	125.2	130.0
Condensed Particulate Matter (Grams, G)	**0.8194**	**0.8768**	**1.0457**

CALCULATED DATA

Absolute Pressure (In. Hg)	29.14	29.29	29.29
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	186.944	176.407	183.087
Water Vapor Volume at Standard Conditions (SCF)	2.245	1.652	1.906
Moisture Fraction (Dimensionless)	0.012	0.009	0.010
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.84	28.86	28.84
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.71	28.76	28.73
Stack Gas Velocity (FPS)	46.6	45.0	46.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	158,659	153,212	157,638
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	141,567	134,130	136,744
Isokinetic Sampling (%)	97.1	96.6	98.4
CPM Emission Concentration (Gr/DSCF)	0.0677	0.0767	0.0882
CPM Emission Concentration (Lb/DSCF)	9.66E-06	1.10E-05	1.26E-05
CPM Emission Rate (Lb/Hr)	82.1	88.2	103.3

Signature of Reviewer: Fred H. Quentler

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TABLE 6C
EPA METHOD 5 / 202
PARTICULATE EMISSIONS TEST RESULTS (INORGANICS)

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: LMS SYSTEM – BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	17-Nov-98	18-Nov-98	18-Nov-98
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	1225-1719	0830-1246	1500-1912
Sampling Time (Minutes)	240	240	240
Average Process ~~Charge~~ Rate (TPH)	***382.6***	***275.8***	***303.7***
Stack Area (Ft^2) Tap	56.745	56.745	56.745
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	0.9940	0.9940	0.9940
Nozzle Area (Ft^2)	0.000322	0.000322	0.000322
Barometric Pressure (In. Hg)	29.15	29.30	29.30
Static Pressure (In. H2O)	-0.150	-0.150	-0.150
Dry Gas Meter Sample Volume (DCF)	192.344	179.438	187.041
Average Dry Gas Meter Temperature (°F)	68.7	64.9	67.5
Average Orifice Meter Delta H (In. H2O)	1.864	1.573	1.803
Volume Condensate Collected (Ml)	47.7	35.1	40.5
Average CO2 Concentration (%)	0.0	0.2	0.1
Average O2 Concentration (%)	20.9	20.7	20.7
Average Square Root of Delta P (In. H2O½)	0.786	0.753	0.770
Average Stack Gas Temperature (°F)	109.5	125.2	130.0
Inorganic Particulate Matter (Grams, G)	**0.0225**	**0.0676**	**0.1074**

CALCULATED DATA

Absolute Pressure (In. Hg)	29.14	29.29	29.29
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	186.944	176.407	183.087
Water Vapor Volume at Standard Conditions (SCF)	2.245	1.652	1.906
Moisture Fraction (Dimensionless)	0.012	0.009	0.010
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.84	28.86	28.84
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.71	28.76	28.73
Stack Gas Velocity (FPS)	46.6	45.0	46.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	158,659	153,212	157,638
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	141,567	134,130	136,744
Isokinetic Sampling (%)	97.1	96.6	98.4
IPM Emission Concentration (Gr/DSCF)	0.00186	0.00591	0.00905
IPM Emission Concentration (Lb/DSCF)	2.65E-07	8.45E-07	1.29E-06
IPM Emission Rate (Lb/Hr)	2.3	6.8	10.6

Signature of Reviewer: Fred H. Quentter

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TABLE 6D
EPA METHOD 5 / 202
PARTICULATE EMISSIONS TEST RESULTS (ORGANICS)

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: LMS SYSTEM - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	17-Nov-98	18-Nov-98	18-Nov-98
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	1225-1719	0830-1246	1500-1912
Sampling Time (Minutes)	240	240	240
Average Process ~~Charge~~ Rate (TPH)	***382.6***	***275.8***	***303.7***
Stack Area (Ft^2)	56.745	56.745	56.745
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	0.9940	0.9940	0.9940
Nozzle Area (Ft^2)	0.000322	0.000322	0.000322
Barometric Pressure (In. Hg)	29.15	29.30	29.30
Static Pressure (In. H2O)	-0.150	-0.150	-0.150
Dry Gas Meter Sample Volume (DCF)	192.344	179.438	187.041
Average Dry Gas Meter Temperature (°F)	68.7	64.9	67.5
Average Orifice Meter Delta H (In. H2O)	1.864	1.573	1.803
Volume Condensate Collected (Ml)	47.7	35.1	40.5
Average CO2 Concentration (%)	0.0	0.2	0.1
Average O2 Concentration (%)	20.9	20.7	20.7
Average Square Root of Delta P (In. H2O½)	0.786	0.753	0.770
Average Stack Gas Temperature (°F)	109.5	125.2	130.0
Organic Particulate Matter (Grams, G)	**0.7969**	**0.8092**	**0.9383**

CALCULATED DATA

Absolute Pressure (In. Hg)	29.14	29.29	29.29
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	186.944	176.407	183.087
Water Vapor Volume at Standard Conditions (SCF)	2.245	1.652	1.906
Moisture Fraction (Dimensionless)	0.012	0.009	0.010
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.84	28.86	28.84
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.71	28.76	28.73
Stack Gas Velocity (FPS)	46.6	45.0	46.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	158,659	153,212	157,638
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	141,567	134,130	136,744
Isokinetic Sampling (%)	97.1	96.6	98.4
OPM Emission Concentration (Gr/DSCF)	0.0658	0.0708	0.0791
OPM Emission Concentration (Lb/DSCF)	9.40E-06	1.01E-05	1.13E-05
OPM Emission Rate (Lb/Hr)	79.8	81.4	92.7

Signature of Reviewer: Fred H. Quentler

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TABLE 7
EPA METHOD 6C
SULFUR DIOXIDE EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: LMS SYSTEM - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	17-Nov-98	"Invalid	"Invalid
Sampling Location	**Stack**	Test	Test
Test Time, Start-Stop (24 Hour)	1225-1719	Run"	Run"
Sampling Time (Minutes)	240		
Average Process ~~Charge~~ Rate (TPH)	***382.6***		
Stack Area (Ft^2) Tap	56.745		
Pitot Tube Coefficient (Dimensionless)	0.840		
Dry Gas Meter Correction Factor (Dimensionless)	0.9940		
Barometric Pressure (In. Hg)	29.15		
Static Pressure (In. H2O)	-0.150		
Dry Gas Meter Sample Volume (DCF)	192.344		
Average Dry Gas Meter Temperature (°F)	68.7		
Average Orifice Meter Delta H (In. H2O)	1.864		
Volume Condensate Collected (Ml)	47.7		
Average CO2 Concentration (%)	0.0		
Average O2 Concentration (%)	20.9		
Average Square Root of Delta P (In. H2O½)	0.786		
Average Stack Gas Temperature (°F)	109.5		
Average Corrected SO2 Concentration (PPMV)	**17.14**		

CALCULATED DATA

Absolute Pressure (In. Hg)	29.14
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	186.944
Water Vapor Volume at Standard Conditions (SCF)	2.245
Moisture Fraction (Dimensionless)	0.012
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.84
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.71
Stack Gas Velocity (FPS)	46.6
Stack Gas Flow Rate at Actual Conditions (ACFM)	158,659
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	141,567
SO2 Emission Concentration (Gr/DSCF)	0.0200
SO2 Emission Concentration (Lb/DSCF)	2.85E-06
SO2 Emission Rate (Lb/Hr)	24.2
SO2 Emission Concentration (Lb/Ton Process Weight)	*0.063*

Signature of Reviewer: Fred H. Quentin

G/SA . . . . . ENVIRONMENTAL TESTING CONSULTANTS
P.O. Box 807, Crown Point, IN 46307 TEL (219) 663-5394 / FAX (219) 662-7037

TABLE 7A
EPA METHOD 6C
SULFUR DIOXIDE EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: LMS SYSTEM – BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	4	5
Date	20-Nov-98	20-Nov-98
Sampling Location	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	0910-1230	1425-1752
Sampling Time (Minutes)	180	180
Average Process ~~Charge~~ Rate (TPH)	***329.0***	***303.9***
Stack Area (Ft^2) Tap	56.745	56.745
Pitot Tube Coefficient (Dimensionless)	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	0.9940	0.9940
Barometric Pressure (In. Hg)	29.06	29.06
Static Pressure (In. H2O)	-0.150	-0.150
Dry Gas Meter Sample Volume (DCF)	135.175	135.110
Average Dry Gas Meter Temperature (°F)	53.2	62.7
Average Orifice Meter Delta H (In. H2O)	1.661	1.661
Volume Condensate Collected (Ml)	21.3	24.7
Average CO2 Concentration (%)	0.1	0.1
Average O2 Concentration (%)	20.8	20.8
Average Square Root of Delta P (In. H2O½)	0.745	0.767
Average Stack Gas Temperature (°F)	113.5	117.0
Average Corrected SO2 Concentration (PPMV)	***30.52***	***31.98***

CALCULATED DATA

Absolute Pressure (In. Hg)	29.05	29.05
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	134.850	132.346
Water Vapor Volume at Standard Conditions (SCF)	1.003	1.163
Moisture Fraction (Dimensionless)	0.007	0.009
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.85	28.85
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.77	28.75
Stack Gas Velocity (FPS)	44.3	45.8
Stack Gas Flow Rate at Actual Conditions (ACFM)	150,828	155,935
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	133,903	137,320
SO2 Emission Concentration (Gr/DSCF)	0.0355	0.0372
SO2 Emission Concentration (Lb/DSCF)	5.08E-06	5.32E-06
SO2 Emission Rate (Lb/Hr)	40.8	43.8
SO2 Emission Concentration (Lb/Ton Process Weight)	*0.124*	*0.144*

Signature of Reviewer: Fred H. Quentter

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TABLE 8
EPA METHOD 7E
NITROGEN OXIDES EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: LMS SYSTEM - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	17-Nov-98	"Invalid	"Invalid
Sampling Location	**Stack**	**Test**	**Test**
Test Time, Start-Stop (24 Hour)	1225-1719	Run"	Run"
Sampling Time (Minutes)	240		
Average Process ~~Charge~~ Rate (TPH)	***382.6***		
Stack Area (Ft^2) Ta P	56.745		
Pitot Tube Coefficient (Dimensionless)	0.840		
Dry Gas Meter Correction Factor (Dimensionless)	0.9940		
Barometric Pressure (In. Hg)	29.15		
Static Pressure (In. H2O)	-0.150		
Dry Gas Meter Sample Volume (DCF)	192.344		
Average Dry Gas Meter Temperature (°F)	68.7		
Average Orifice Meter Delta H (In. H2O)	1.864		
Volume Condensate Collected (Ml)	47.7		
Average CO2 Concentration (%)	0.0		
Average O2 Concentration (%)	20.9		
Average Square Root of Delta P (In. $H2O^{1/2}$)	0.786		
Average Stack Gas Temperature (°F)	109.5		
Average Corrected NOx Concentration as NO2 (PPMV)	**4.59**		

CALCULATED DATA

Absolute Pressure (In. Hg)	29.14
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	186.944
Water Vapor Volume at Standard Conditions (SCF)	2.245
Moisture Fraction (Dimensionless)	0.012
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.84
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.71
Stack Gas *Velocity* (FPS)	46.6
Stack Gas Flow Rate at Actual Conditions (ACFM)	158,659
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	141,567
NOx Emission Concentration (Gr/DSCF)	0.0038
NOx Emission Concentration (Lb/DSCF)	5.48E-07
NOx Emission Rate (Lb/Hr)	4.7
NOx Emission Concentration (Lb/Ton Process Weight)	*0.0122*

Signature of Reviewer: Fred H. Quentler

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TABLE 8A
EPA METHOD 7E
NITROGEN OXIDES EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: LMS SYSTEM - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	4	5
Date	20-Nov-98	20-Nov-98
Sampling Location	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	0910-1230	1425-1752
Sampling Time (Minutes)	180	180
Average Process ~~Charge~~ Rate (TPH)	***329.0***	***303.9***
Stack Area (Ft^2) Tap	56.745	56.745
Pitot Tube Coefficient (Dimensionless)	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	0.9940	0.9940
Barometric Pressure (In. Hg)	29.06	29.06
Static Pressure (In. H2O)	-0.150	-0.150
Dry Gas Meter Sample Volume (DCF)	135.175	135.110
Average Dry Gas Meter Temperature (°F)	53.2	62.7
Average Orifice Meter Delta H (In. H2O)	1.661	1.661
Volume Condensate Collected (Ml)	21.3	24.7
Average CO2 Concentration (%)	0.1	0.1
Average O2 Concentration (%)	20.8	20.8
Average Square Root of Delta P (In. $H2O^{1/2}$)	0.745	0.767
Average Stack Gas Temperature (°F)	113.5	117.0
Average Corrected NOx Concentration as NO2 (PPMV)	**20.36**	**14.05**

CALCULATED DATA

Absolute Pressure (In. Hg)	29.05	29.05
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	134.850	132.346
Water Vapor Volume at Standard Conditions (SCF)	1.003	1.163
Moisture Fraction (Dimensionless)	0.007	0.009
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.85	28.85
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.77	28.75
Stack Gas Velocity (FPS)	44.3	45.8
Stack Gas Flow Rate at Actual Conditions (ACFM)	150,828	155,935
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	133,903	137,320
NOx Emission Concentration (Gr/DSCF)	0.0170	0.0117
NOx Emission Concentration (Lb/DSCF)	2.43E-06	1.68E-06
NOx Emission Rate (Lb/Hr)	19.5	13.8
NOx Emission Concentration (Lb/Ton Process Weight)	*0.0594*	*0.0455*

Signature of Reviewer: Fred H. Quentler

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TABLE 9
EPA METHOD 10
CARBON MONOXIDE EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: LMS SYSTEM – BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	17-Nov-98	18-Nov-98	18-Nov-98
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	1225-1719	0830-1246	1500-1912
Sampling Time (Minutes)	240	240	240
Average Process ~~Charge~~ Rate (TPH)	***382.6***	***275.8***	***303.7***
Stack Area (Ft^2) T&P	56.745	56.745	56.745
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	0.9940	0.9940	0.9940
Barometric Pressure (In. Hg)	29.15	29.30	29.30
Static Pressure (In. H2O)	-0.150	-0.150	-0.150
Dry Gas Meter Sample Volume (DCF)	192.344	179.438	187.041
Average Dry Gas Meter Temperature (°F)	68.7	64.9	67.5
Average Orifice Meter Delta H (In. H2O)	1.864	1.573	1.807
Volume Condensate Collected (Ml)	47.7	35.1	40.5
Average CO2 Concentration (%)	0.0	0.2	0.1
Average O2 Concentration (%)	20.9	20.7	20.7
Average Square Root of Delta P (In. H2O½)	0.786	0.753	0.770
Average Stack Gas Temperature (°F)	109.5	125.2	130.0
Average Corrected CO Concentration (PPMV)	**4.85**	**23.01**	**26.11**

CALCULATED DATA

Absolute Pressure (In. Hg)	29.14	29.29	29.29
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	186.944	176.407	183.089
Water Vapor Volume at Standard Conditions (SCF)	2.245	1.652	1.906
Moisture Fraction (Dimensionless)	0.012	0.009	0.010
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.84	28.86	28.84
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.71	28.76	28.73
Stack Gas Velocity (FPS)	46.6	45.0	46.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	158,659	153,212	157,638
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	141,567	134,130	136,744
CO Emission Concentration (Gr/DSCF)	0.0025	0.0117	0.0133
CO Emission Concentration (Lb/DSCF)	3.53E-07	1.67E-06	1.90E-06
CO Emission Rate (Lb/Hr)	3.0	13.5	15.6
CO Emission Concentration (Lb/Ton Process Weight)	*0.0078*	*0.0488*	*0.0513*

Signature of Reviewer: Fred H. Quentler

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P.O. Box 807, Crown Point, IN 46307 TEL (219) 663-5394 / FAX (219) 662-7037

TABLE 10
EPA METHOD 25A
TOTAL GASEOUS ORGANIC EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. JOB NO.: G/SA 98-T-065
SOURCE TESTED: LMS SYSTEM – BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	17-Nov-98	18-Nov-98	18-Nov-98
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	1225-1719	0830-1246	1500-1912
Sampling Time (Minutes)	240	240	240
Average Process ~~Charge~~ Rate (TPH)	***382.6***	***275.8***	***303.7***
Stack Area (Ft^2) Ta-P	56.745	56.745	56.745
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	0.9940	0.9940	0.9940
Barometric Pressure (In. Hg)	29.15	29.30	29.30
Static Pressure (In. H2O)	-0.150	-0.150	-0.150
Dry Gas Meter Sample Volume (DCF)	192.344	179.438	187.041
Average Dry Gas Meter Temperature (°F)	68.7	64.9	67.5
Average Orifice Meter Delta H (In. H2O)	1.864	1.573	1.807
Volume Condensate Collected (Ml)	47.7	35.1	40.5
Average CO2 Concentration (%)	0.0	0.2	0.1
Average O2 Concentration (%)	20.9	20.7	20.7
Average Square Root of Delta P (In. H2O½)	0.786	0.753	0.770
Average Stack Gas Temperature (°F)	109.5	125.2	130.0
Average Corrected TGO Concentration as Carbon (PPMV)	**4.62**	**3.81**	**3.74**

CALCULATED DATA

Absolute Pressure (In. Hg)	29.14	29.29	29.29
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	186.944	176.407	183.089
Water Vapor Volume at Standard Conditions (SCF)	2.245	1.652	1.906
Moisture Fraction (Dimensionless)	0.012	0.009	0.010
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.84	28.86	28.84
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.71	28.76	28.73
Stack Gas Velocity (FPS)	46.6	45.0	46.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	158,659	153,212	157,638
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	141,567	134,130	136,744
TGO Emission Concentration (Gr/DSCF)	0.00101	0.00083	0.00082
TGO Emission Concentration (Lb/DSCF)	1.44E-07	1.19E-07	1.17E-07
TGO Emission Rate (Lb/Hr)	1.22	0.96	0.96
TGO Emission Concentration (Lb/Ton Process Weight)	*0.00320*	*0.00347*	*0.00315*

Signature of Reviewer: Fred H. Quentter

3.0 FACILITY DESCRIPTION

Steel Dynamics, Inc. owns and operates a steel processing mill which has the capacity to produce ~~225~~ 400 tons of hot rolled coil steel per hour. Tons of iron, scrap steel and various metals are charged into an electric arc furnace (EAF) and transformed to molten steel which is then transferred to a ladle metallurgical station (LMS) for refining.

SDI is located at Dekalb County Roads 44 & 59 near Butler, Indiana.

The SDI steel processing mill consists basically of ~~a~~ 600 twin shell EAFs and a LMS system, which were the sources tested for compliance purposes, a water cooled mold, one (1) tunnel furnace with natural gas-fired burners, two (2) tundish preheaters with natural gas-fired burners, one (1) tundish dryer with a natural gas-fired burner, one (1) ladle dryout with a natural gas-fired burner, three (3) ladle preheaters with natural gas-fired burners, a slag processing operation consisting of a grizzly/feeder, covered conveyors, material sizing screens and storage piles, a carbon, lime and flux additive handling system with pneumatic conveyors, storage bins and enclosed conveyors to the blending area at the EAF, one (1) baghouse dust silo, an emissions side draft evacuation collection system and collection canopies which exhaust to two (2) pulse jet, fabric filter baghouses with 99.85% particulate removal efficiencies and 125' high exhaust stacks. The particulate and gaseous emissions testing was performed on these stacks. See Figures 1 and 2.

The LMS system is composed of two (2) small capacity electric arc heating stations and a central argon stir station. The LMS is capable of handling up to 400 tons of molten steel received from the EAF. Alloys such as ferromanganese, ferrovanadium and ferromagnesium are used to refine the steel to the desired specifications. The steel from the EAF is transferred to the heating stations where alloys are added for melting as the temperature is maintanined at approximately 3,000 °F. The ladle is then transferred to the argon stir station where the mixture is stirred magnetically and charged with an argon lance. Calcium-silicon wire is added at this stage to remove remaining impurities. If necessary, the process is repeated until the required specifications are achieved.

During the emissions testing on November 17, 18 and 20, 1998, the steel processing rates averaged 382.6 TPH, 289.8 TPH and 316.5 TPH, respectively.

Process operating data recorded during the emissions testing can be found in Appendix C of this report.

OFFICE OF AIR MANAGEMENT

OFFICE MEMORANDUM

To: Phil Perry

Date: April 30, 1999

From: Jarrod C. Fisher JCF

Thru: Ed Surla

Subj: Steel Dynamics Inc., Butler, IN
Source ID No. 033-00043
Permit Nos. 033-8091 and 033-9187

The subject company has submitted a report concerning the stack emissions testing at the subject source. The test was conducted by Guenther/Shakelford Associates. The purpose of the testing was to determine the compliance status of the Electric Arc Furnace and the Ladle Metallurgical Station with regards to the emission limitation stated below. The protocol was approved by Scott Stacy and Jarrod Fisher and the field tests were observed by Jarrod Fisher. I have reviewed this report and found the sampling procedures used and results to be acceptable to this Office. A copy of the test report is filed in the Compliance Data Section. The following is a summary of the test results:

Ladle Metallurgical Station
Date of test: February 2, 1999
Identification and Unit No. of Facility Tested: One Ladle Metallurgical Station (LMS)
Pollution Control Equipment: Baghouse
Operating Parameters: The average pressure drop across the baghouse was 6.85 inches of water. The range of pressure drops was 5.6-7.9 inches of water.

Pollutants: PM/PM-10
Test Methods: 1,2,3A,4,5,9,202
Permit No. 033-9187 Operation Condition No. 15 limit (326 IAC 2-2-3): 0.0032 gr/dscf and an average rate of 5.49 lb/hr
Allowable Opacity: 3%

Maximum Permitted Operating Rate: 400 TPH (2 Furnaces Total)
Average Operating Rate During Test: 329 TPH
Average Measured Emissions: PM (Method 5): 0.00034 gr/dscf and 0.47 lb/hr
PM/PM-10 (Method 5+202): 0.00186 gr/dscf and 2.53 lb/hr
Average Opacity: 0%
Highest 6-minute Opacity: 0%

Electric Arc Furnaces and Ladle Metallurgical Station
Dates of test: February 2-3, 1999
Identification and Unit No. of Facility Tested: Two (2) twin shell electric arc furnaces (EAF). One Ladle Metallurgical Station (LMS).
Pollution Control Equipment: Baghouses

Pollutants: SO2, NOX, and CO
Test Methods: 1,2,3A,4,6C,7E,10
Permit No. 033-9187 Operation Condition No. 17 SO2 limit (326 IAC 2-2-3): Combined average of 80.0 lb/hr and combined average concentration of 0.20 lb/ton of steel
Permit No. 033-8091 Operation Condition No. 14 (EAF) and Permit No. 033-9187 Operation Condition No. 18 (LMS) NOX limits (326 IAC 2-2-3): Individual average of 204.0 lb/hr and 0.51 lb/ton of steel for the EAFs. Individual average of 10.0 lb/hr and 0.025 lb/ton of steel for the LMS.
Permit No. 033-8091 Operation Condition No. 15 (EAF) and Permit No. 033-9187 Operation Condition No. 19 (LMS) CO limits (326 IAC 2-2-3): Individual average of 800.0 lb/hr and 2.0 lb/ton of steel for the EAFs. Individual average of 40.0 lb/hr and 0.10 lb/ton of steel for the LMS.

Maximum Permitted Operating Rate : 400 TPH (2 Furnaces Total)
Average Operating Rate During Test (SO2 and NOX tests): 329 TPH
Average Operating Rate During Test (CO test): 273 TPH

Average Measured SO2 Emissions:	EAF:	26.8 lb/hr	0.0815 lb/ton steel
	LMS:	14.2 lb/hr	0.0432 lb/ton steel
	Total:	**41.0 lb/hr**	**0.1247 lb/ton steel**
Average Measured NOX Emissions:	**EAF:**	**186.5 lb/hr**	**0.5669 lb/ton steel**
	LMS:	**5.3 lb/hr**	**0.0161 lb/ton steel**
Average Measured CO Emissions:	**EAF:**	**159.5 lb/hr**	**0.5842 lb/ton steel**
	LMS:	**7.6 lb/hr**	**0.0278 lb/ton steel**

STATUS: In Compliance for LMS sampling of PM/PM-10, SO2, NOX, and CO. In Compliance for EAF sampling of SO2 and CO. **Out of Compliance** for EAF sampling of NOX.

cc: WPS
JCF
Gen. File -- DeKalb Co.
Terry Coleman - Northern R.O.

Steel Dynamics, Inc.
EAF and LMS Stack Test
Steel Production During Emissions Testing
February 2-3, 1999

1 Tap/Furnace per Test Run

RUN NO.	Run Time (hours)	Furn 1, (tons)	Furn 2, (tons)	Furn 3, (tons)	Furn 4, (tons)	TOTAL, (tons)	AVERAGE (tons/hr)
1 (Feb 2)	2:00	166	154	160	163	643	322
2 (Feb 2)	2:00	168	169	161	165	663	332
3 (Feb 2)	2:00	183	166	155	159	663	332
4 (Feb 2)	2:00	165	167	161	155	648	324
5 (Feb 3)	1:00	164	152	160	-	476	476*
6 (Feb 3)	1:00	167	161	158	-	486	486*

PM-10 testing was conducted during Runs 1-3; SO2 and NOX testing was conducted during Runs 2-4; and CO testing was conducted during Runs 4-6.

*Note: On February 3rd 1999, SDI operated 3 of the 4 furnaces during the CO sampling. When calculating the average production during the compliance testing, CDS used the maximum production capacity of the previous day (329 TPH) and multiplied that by 75%. The resulting production capacity (247 TPH) takes into account the absence of 1 furnace during testing.

G/SA

GUENTHER / SHACKELFORD ASSOCIATES

ENVIRONMENTAL CONSULTANTS & TESTING CONTRACTORS

SOURCE EMISSIONS TEST REPORT

PERFORMED FOR
STEEL DYNAMICS, INC.
BUTLER, INDIANA

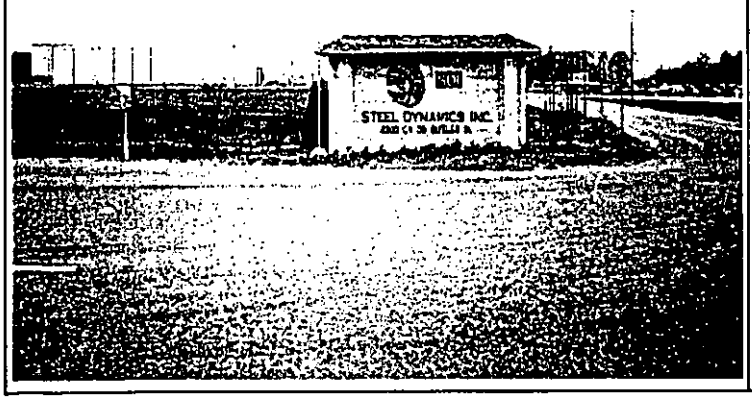
TWIN SHELL ELECTRIC ARC FURNACE LADLE METALLURGICAL STATION

EPA METHODS 1, 2, 3, 5, 6C, 7E, 9, 10 AND 202

FEBRUARY 2-3, 1999
G/SA PROJECT NO. 99-T-069

Prepared for:

Mr. Barry Smith
Environmental Engineer
Steel Dynamics, Inc.
4500 County Road 59
Butler, IN 46271



SDI™

COMPLIANCE TEST REPORT

STEEL PROCESSING MILL
EAF/LMS
BAGHOUSE OUTLETS
TEST DATA AND RESULTS

SOURCE EMISSIONS COMPLIANCE TESTING
EPA Methods 5, 6C, 7E, 9, 10 and 202
Performed on the
Ladle Metallurgical Station System
Baghouse Outlet
and
EPA Methods 6C, 7E and 10
Performed on the
Twin Shell Electric Arc Furnaces
Baghouse Outlet
at
Steel Dynamics, Inc.
Steel Processing Mill
Butler, Indiana

February 2 & 3, 1999

Project No. 99-T-069

1.0 INTRODUCTION

This report presents the results of the source emissions compliance testing conducted by Guenther/Shackelford Associates (G/SA) for Steel Dynamics, Inc. (SDI), near Butler, Indiana.

The primary purpose of this testing program was to obtain PM_{10} (particulate matter ≤ 10 microns in particle size) samples of particulate matter (PM) and condensible particulate matter (CPM) , and to determine sulfur dioxide (SO_2), nitrogen oxides (NO_X) and carbon monoxide (CO) concentrations from the effluent gas stream of the baghouse serving the Ladle Metallurgical Station (LMS) System, and to determine SO_2, NO_X and CO concentrations from the effluent gas stream of the baghouse serving the Twin Shell Electric Arc Furnaces

(EAF) and associated equipment at SDI's Steel Processing Mill operations to establish outlet emission rates. Also, to conduct visible emissions (VE) observations to determine plume opacities of the flue gas vented from the LMS Baghouse through its exhaust stack to atmosphere.

G/SA's responsibility was to collect and analyze PM/CPM samples, conduct VE observations and instrument monitoring for SO_2, NO_X, and CO, and perform data reduction for emission concentrations evaluation. SDI's responsibility was to maintain process operating parameters and to provide process operating data per compliance test requirements.

The following report provides information pertaining to the SDI Steel Processing Mill's operations, emissions testing and analytical results.

The emissions testing conducted on the LMS and EAF Baghouse Outlets was performed on Tuesday, February 2 and Wednesday, February 3, 1999.

The following requirements were specific for the testing program:

1. Equipment calibrations performed and calibration data provided.
2. Three (3), consecutive two (2) hour, minimum, PM/CPM emissions test runs performed at the outlet (exhaust stack) of the LMS Baghouse per IDEM Rule 326 IAC 3-2.1 and NSPS 40 CFR 60.
3. Three (3), consecutive one (1) hour, minimum, SO_2, NO_X, and CO emissions

test runs performed, simultaneously, at the outlets (exhaust stacks) of the LMS and EAF Baghouses.

4. Three (3), consecutive one (1) hour, minimum, VE observations performed on the outlet exhaust of the LMS Baghouse.

5. Process manufacturing capacities and control devices maintained at required operating conditions, and production rates recorded during the emissions testing periods.

6. All testing, observations, monitoring and analyses performed in accordance with current U.S. Environmental Protection Agency (EPA) test methodologies and analytical procedures for PM, SO_2, NO_X, VE, CO and CPM emissions determinations.

7. PM/CPM emissions from the LMS Baghouse shall not exceed an average concentration of 0.0032 gr/dscf and an average rate of 28.8 lb/hr, and a 3% average VE opacity pursuant to IDEM Rule 326 IAC 12-1-1.

8. SO_2 emissions from the LMS and EAF shall not exceed a combined average rate of 80.0 lb/hr and a combined average concentration of 0.20 lb/ton of steel pursuant to IDEM Rule 326 IAC 12-1-1.

9. NO_X emissions from the LMS and EAF shall not exceed individual average rates of 10.0 lb/hr and 204.0 lb/hr, respectively, and individual average concentrations of 0.025 lb/ton of steel and 0.51 lb/ton of steel, respectively, pursuant to IDEM Rule 326 IAC 12-1-1.

10. CO emissions from the LMS and EAF shall not exceed individual average

rates of 40.0 lb/hr and 800.0 lb/hr, respectively, and individual average concentrations of 0.10 lb/ton of steel and 2.0 lb/ton of steel, respectively, pursuant to IDEM Rule 326 IAC 12-1-1.

Note: EPA Method 5 (PM) and 201A/202 (PM_{10}/CPM) testing were not required to be performed in this case because all of the PM emissions from the LMS Baghouse are assumed to be ≤ 10 microns in particle size. Therefore, only EPA Method 5/202 (PM/CPM) sampling was conducted per IDEM's approval.

The emissions testing program was supervised by G/SA, whose headquarters is in Crown Point, Indiana. G/SA also performed VE observations on the LMS Baghouse Outlet, data reduction and prepared in part the final report. The PM/CPM emissions testing, and the stack gas flow rates, carbon dioxide (CO_2), oxygen (O_2) and moisture content determinations conducted at the LMS Baghouse Outlet sampling location were performed by G/SA's affiliate, Source Assessment Technologies, LLC (S.A.T.), whose headquarters is in Wheatland, Missouri. S.A.T. also performed the PM/CPM analyses and the PM/CPM, SO_2, NO_X and CO data reduction, and in part the final report preparation. The CEM emissions testing for SO_2, NO_X and CO, and carbon dioxide (CO_2) and oxygen (O_2) content, and stack gas flow rates and moisture content determinations conducted at the LMS Baghouse Outlet sampling location were performed by G/SA's subcontractor, Total Source Analysis, Inc. (TSA), whose headquarters is in Wellington, Ohio.

The emissions testing was performed in accordance with EPA Reference Methods 1, 2, 3, 3A, 4, 5 (PM), 6C (SO_2), 7E (NO_X), 9 (VE) and 10 (CO), Title 40, Part 60, Appendix A, and Method 202 (CPM), Title 40, Part 51, Appendix M of the U.S. Code of Federal Regulations and IDEM Rule 326 IAC 3-2.1.

The testing program was approved by and/or coordinated with the following personnel:

Barry Smith, Environmental Engineer, SDI

The emissions testing was performed by the following personnel:

Fred Guenther, Test Supervisor, G/SA

Terry Shackelford, Senior Test Engineer, G/SA (S.A.T.)

Jim McCulloch, Test Engineer, S.A.T.

Ron Segert, Test Technician, G/SA

Rick Howes, Test Engineer, TSA

Gus Dria, Test Engineer, TSA

John Kehl, Test Technician, TSA

Russ Arnt, Test Technician, TSA

The emissions testing was observed by the following personnel:

Jerod Fisher, Environmental Scientist, Air Compliance Section, IDEM

2.0 TEST RESULTS SUMMARY

The source emissions testing was performed utilizing EPA Methods 1, 2, 3, 3A, 4, 5, 6C, 7E, 9, 10 and 202 at the LMS Baghouse Outlet sampling location, and EPA Methods 1, 2, 3A, 4, 6C, 7E and 10 at the EAF Baghouse Outlet sampling location. A summary of the test results is given below:

SAMPLING LOCATION	RUN NO.		PM/CPM (Gr/DSCF)	PM/CPM Lb/Hr	OPACITY (%)
LMS	1		0.00209 ✓	2.72	0
Baghouse	2		0.00238 ✓	3.37	0
Outlet	3		0.00112 ✓	1.50	0
		Avg.	0.00186 OK	2.53	0

SAMPLING LOCATION	RUN NO.		SO_2 Lb/Hr	SO_2 Lb/Ton Process Weight
LMS	1		10.8 ✓	0.0218
Baghouse	2		13.2 ✓	0.0318
Outlet	3		18.7 ✓	0.0381
		Avg.	14.2 OK	0.0306

SAMPLING LOCATION	RUN NO.		NO_x Lb/Hr	NO_x Lb/Ton Process Weight
LMS	1		5.16 ✓	0.0104
Baghouse	2		5.11 ✓	0.0123
Outlet	3		5.69 ✓	0.0116
		Avg.	5.32 OK	0.0114

SAMPLING LOCATION	RUN NO.		CO Lb/Hr	CO Lb/Ton Process Weight
LMS	1		5.66 ✓	0.0115
Baghouse	2		9.40 ✓	0.0197
Outlet	3		7.65 ✓	0.0157
		Avg.	7.57 OK	0.0157

SAMPLING LOCATION	RUN NO.		SO_2 *Lb/Hr*	SO_2 *Lb/Ton Process Weight*
EAF	1		26.0 ✓	0.0526
Baghouse	2		21.0 ✓	0.0504
Outlet	3		33.9 ✓	0.0691
		Avg.	27.0 OK	0.0574

SAMPLING LOCATION	RUN NO.		NO_x *Lb/Hr*	NO_x *Lb/Ton Process Weight*
EAF	1		194.7 ✓	0.394
Baghouse	2		183.5 ✓	0.441
Outlet	3		182.4 ✓	0.372
		Avg.	186.9 OK	0.402

SAMPLING LOCATION	RUN NO.		CO *Lb/Hr*	CO *Lb/Ton Process Weight*
EAF	1		198.3 ✓	0.404
Baghouse	2		142.6 ✓	0.300
Outlet	3		137.6 ✓	0.283
		Avg.	159.5 OK	0.329

A complete list of test parameters for each Method 5/202, 6C, 7E and 10 emissions test run performed at the LMS sampling location, and each Method 6C, 7E and 10 emissions test run performed at the EAF sampling location can be found in Tables 1 through 4 and Tables 5 through 7, respectively.

Sample calculations and examples of the equations used to generate the test results can be found in Appendix F.

TABLES

LMS BAGHOUSE OUTLET

G/SA ..... ENVIRONMENTAL TESTING CONSULTANTS
P.O. Box 807, Crown Point, IN 46307 TEL (219) 663-5394 / FAX (219) 662-7037

TABLE 1
EPA METHOD 5 / 202
TOTAL PARTICULATE EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. PROJECT NO.: 99-T-069
SOURCE TESTED: LMS SYSTEM - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	02-Feb-99	02-Feb-99	02-Feb-99
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	0940-1149	1400-1609	1705-1913
Sampling Time (Minutes)	120	120	120
Average Process Tap Rate (TPH)	***482***	***494***	***416***
Stack Area (Ft^2)	56.745	56.745	56.745
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.84
Dry Gas Meter Correction Factor (Dimensionless)	0.9860	0.9860	0.9860
Nozzle Area (Ft^2)	0.000322	0.000322	0.000322
Barometric Pressure (In. Hg)	28.81	28.81	28.81
Static Pressure (In. H2O)	-0.310	-0.310	-0.310
Dry Gas Meter Sample Volume (DCF)	103.762	113.489	107.355
Average Dry Gas Meter Temperature (°F)	50.9	57.3	59.6
Average Orifice Meter Delta H (In. H2O)	3.093	3.750	3.369
Volume Condensate Collected (Ml)	22.2	22.7	22.1
Average CO2 Concentration (%)	0.0	0.1	0.1
Average O2 Concentration (%)	21.0	21.1	21
Average Square Root of Delta P (In. $H2O^{1/2}$)	0.855	0.922	0.866
Average Stack Gas Temperature (°F)	118.2	105.7	103.1
Total Particulate Matter (Grams, G)	**0.0139**	**0.0171**	**0.0076**

CALCULATED DATA

Absolute Pressure (In. Hg)	28.79	28.79	28.79
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	102.629	111.059	104.484
Water Vapor Volume at Standard Conditions (SCF)	1.045	1.068	1.040
Moisture Fraction (Dimensionless)	0.010	0.010	0.010
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.84	28.86	28.86
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.73	28.76	28.75
Stack Gas Velocity (FPS)	51.3	54.7	51.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	174,661	186,237	174,661
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	151,964	165,616	156,039
Isokinetic Sampling (%)	99.2	98.5	98.3
TPM Emission Concentration (Gr/DSCF)	0.00209	0.00238	0.00112
TPM Emission Concentration (Lb/DSCF)	2.99E-07	3.40E-07	1.60E-07
TPM Emission Rate (Lb/Hr)	2.72	3.37	1.50

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**178,520**
Average Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	**157,873**
Average TPM Emission Concentration (Gr/DSCF)	**0.00186**
Average TPM Emission Concentration (Lb/DSCF)	**2.66E-07**
Average TPM Emission Rate (Lb/Hr)	**2.53**

Signature of Reviewer:

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TABLE 1A
EPA METHOD 5 / 202
PARTICULATE EMISSIONS TEST RESULTS (FRONT-HALF)

CLIENT: STEEL DYNAMICS, INC. PROJECT NO.: 99-T-069
SOURCE TESTED: LMS SYSTEM - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

	1	2	3
Run Number			
Date	02-Feb-99	02-Feb-99	02-Feb-99
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	0940-1149	1400-1609	1705-1913
Sampling Time (Minutes)	120	120	120
Average Process Tap Rate (TPH)	***482***	***494***	***416***
Stack Area (Ft^2)	56.745	56.745	56.745
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.84
Dry Gas Meter Correction Factor (Dimensionless)	0.9860	0.9860	0.9860
Nozzle Area (Ft^2)	0.000322	0.000322	0.000322
Barometric Pressure (In. Hg)	28.81	28.81	28.81
Static Pressure (In. H2O)	-0.310	-0.310	-0.310
Dry Gas Meter Sample Volume (DCF)	103.762	113.489	107.355
Average Dry Gas Meter Temperature (°F)	0.0	0.0	0.0
Average Orifice Meter Delta H (In. H2O)	3.093	3.750	3.369
Volume Condensate Collected (Ml)	22.2	22.7	22.1
Average CO2 Concentration (%)	0.0	0.1	0.1
Average O2 Concentration (%)	21.0	21.1	21
Average Square Root of Delta P (In. H2O½)	0.855	0.922	0.866
Average Stack Gas Temperature (°F)	118.2	105.7	103.1
Filtered Particulate Matter (Grams, G)	**0.0018**	**0.0031**	**0.0022**

CALCULATED DATA

Absolute Pressure (In. Hg)	28.79	28.79	28.79
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	113.988	124.881	118.018
Water Vapor Volume at Standard Conditions (SCF)	1.045	1.068	1.040
Moisture Fraction (Dimensionless)	0.009	0.008	0.009
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.84	28.86	28.86
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.74	28.77	28.76
Stack Gas Velocity (FPS)	51.3	54.7	51.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	174,661	186,237	174,661
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	151,964	165,616	156,039
Isokinetic Sampling (%)	110.1	110.6	111.0
FPM Emission Concentration (Gr/DSCF)	0.000244	0.000383	0.000288
FPM Emission Concentration (Lb/DSCF)	3.48E-08	5.47E-08	4.11E-08
FPM Emission Rate (Lb/Hr)	0.317	0.544	0.385

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**178,520**
Average Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	**157,873**
Average FPM Emission Concentration (Gr/DSCF)	**0.000305**
Average FPM Emission Concentration (Lb/DSCF)	**4.36E-08**
Average FPM Emission Rate (Lb/Hr)	**0.415**

Signature of Reviewer: Fred H. Quentler

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TABLE 1B
EPA METHOD 5 / 202
PARTICULATE EMISSIONS TEST RESULTS (BACK-HALF)

CLIENT: STEEL DYNAMICS, INC. PROJECT NO.: 99-T-069
SOURCE TESTED: LMS SYSTEM - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	02-Feb-99	02-Feb-99	02-Feb-99
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	0940-1149	1400-1609	1705-1913
Sampling Time (Minutes)	120	120	120
Average Process Tap Rate (TPH)	***482***	***494***	***416***
Stack Area (Ft^2)	56.745	56.745	56.745
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.84
Dry Gas Meter Correction Factor (Dimensionless)	0.9860	0.9860	0.9860
Nozzle Area (Ft^2)	0.000322	0.000322	0.000322
Barometric Pressure (In. Hg)	28.81	28.81	28.81
Static Pressure (In. H2O)	-0.310	-0.310	-0.310
Dry Gas Meter Sample Volume (DCF)	103.762	113.489	107.355
Average Dry Gas Meter Temperature (°F)	0.0	0.0	0.0
Average Orifice Meter Delta H (In. H2O)	3.093	3.750	3.369
Volume Condensate Collected (Ml)	22.2	22.7	22.1
Average CO2 Concentration (%)	0.0	0.1	0.1
Average O2 Concentration (%)	21.0	21.1	21
Average Square Root of Delta P (In. H2O½)	0.855	0.922	0.866
Average Stack Gas Temperature (°F)	118.2	105.7	103.1
Condensed Particulate Matter (Grams, G)	**0.0121**	**0.0140**	**0.0054**

CALCULATED DATA

Absolute Pressure (In. Hg)	28.79	28.79	28.79
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	113.988	124.881	118.018
Water Vapor Volume at Standard Conditions (SCF)	1.045	1.068	1.040
Moisture Fraction (Dimensionless)	0.009	0.008	0.009
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.84	28.86	28.86
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.74	28.77	28.76
Stack Gas Velocity (FPS)	51.3	54.7	51.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	174,661	186,237	174,661
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	151,964	165,616	156,039
Isokinetic Sampling (%)	110.1	110.6	111.0
CPM Emission Concentration (Gr/DSCF)	0.00164	0.00173	0.00071
CPM Emission Concentration (Lb/DSCF)	2.34E-07	2.47E-07	1.01E-07
CPM Emission Rate (Lb/Hr)	2.13	2.46	0.94

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**178,520**
Average Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	**157,873**
Average CPM Emission Concentration (Gr/DSCF)	**0.00136**
Average CPM Emission Concentration (Lb/DSCF)	**1.94E-07**
Average CPM Emission Rate (Lb/Hr)	**1.85**

Signature of Reviewer: Fred H. Guenther

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TABLE 1C
EPA METHOD 5 / 202
PARTICULATE EMISSIONS TEST RESULTS (INORGANICS)

CLIENT: STEEL DYNAMICS, INC. PROJECT NO.: 99-T-069
SOURCE TESTED: LMS SYSTEM - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	02-Feb-99	02-Feb-99	02-Feb-99
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	0940-1149	1400-1609	1705-1913
Sampling Time (Minutes)	120	120	120
Average Process Tap Rate (TPH)	***482***	***494***	***416***
Stack Area (Ft^2)	56.745	56.745	56.745
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.84
Dry Gas Meter Correction Factor (Dimensionless)	0.9860	0.9860	0.9860
Nozzle Area (Ft^2)	0.000322	0.000322	0.000322
Barometric Pressure (In. Hg)	28.81	28.81	28.81
Static Pressure (In. H2O)	-0.310	-0.310	-0.310
Dry Gas Meter Sample Volume (DCF)	103.762	113.489	107.355
Average Dry Gas Meter Temperature (°F)	0.0	0.0	0.0
Average Orifice Meter Delta H (In. H2O)	3.093	3.750	3.369
Volume Condensate Collected (Ml)	22.2	22.7	22.1
Average CO2 Concentration (%)	0.0	0.1	0.1
Average O2 Concentration (%)	21.0	21.1	21
Average Square Root of Delta P (In. H2O½)	0.855	0.922	0.866
Average Stack Gas Temperature (°F)	118.2	105.7	103.1
Inorganic Particulate Matter (Grams, G)	**0.0058**	**0.0068**	**0.0044**

CALCULATED DATA

Absolute Pressure (In. Hg)	28.79	28.79	28.79
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	113.988	124.881	118.018
Water Vapor Volume at Standard Conditions (SCF)	1.045	1.068	1.040
Moisture Fraction (Dimensionless)	0.009	0.008	0.009
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.84	28.86	28.86
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.74	28.77	28.76
Stack Gas Velocity (FPS)	51.3	54.7	51.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	174,661	186,237	174,661
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	151,964	165,616	156,039
Isokinetic Sampling (%)	110.1	110.6	111.0
IPM Emission Concentration (Gr/DSCF)	0.000785	0.000840	0.000575
IPM Emission Concentration (Lb/DSCF)	1.12E-07	1.20E-07	8.22E-08
IPM Emission Rate (Lb/Hr)	1.02	1.19	0.77

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	178,520
Average Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	157,873
Average IPM Emission Concentration (Gr/DSCF)	0.000734
Average IPM Emission Concentration (Lb/DSCF)	1.05E-07
Average IPM Emission Rate (Lb/Hr)	1.00

Signature of Reviewer:

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TABLE 1D
EPA METHOD 5 / 202
PARTICULATE EMISSIONS TEST RESULTS (ORGANICS)

CLIENT: STEEL DYNAMICS, INC. PROJECT NO.: 99-T-069
SOURCE TESTED: LMS SYSTEM – BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	02-Feb-99	02-Feb-99	02-Feb-99
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	0940-1149	1400-1609	1705-1913
Sampling Time (Minutes)	120	120	120
Average Process Tap Rate (TPH)	***482***	***494***	***416***
Stack Area (Ft^2)	56.745	56.745	56.745
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.84
Dry Gas Meter Correction Factor (Dimensionless)	0.9860	0.9860	0.9860
Nozzle Area (Ft^2)	0.000322	0.000322	0.000322
Barometric Pressure (In. Hg)	28.81	28.81	28.81
Static Pressure (In. H2O)	-0.310	-0.310	-0.310
Dry Gas Meter Sample Volume (DCF)	103.762	113.489	107.355
Average Dry Gas Meter Temperature (°F)	0.0	0.0	0.0
Average Orifice Meter Delta H (In. H2O)	3.093	3.750	3.369
Volume Condensate Collected (Ml)	22.2	22.7	22.1
Average CO2 Concentration (%)	0.0	0.1	0.1
Average O2 Concentration (%)	21.0	21.1	21
Average Square Root of Delta P (In. H2O½)	0.855	0.922	0.866
Average Stack Gas Temperature (°F)	118.2	105.7	103.1
Organic Particulate Matter (Grams, G)	**0.0063**	**0.0072**	**0.0010**

CALCULATED DATA

Absolute Pressure (In. Hg)	28.79	28.79	28.79
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	113.988	124.881	118.018
Water Vapor Volume at Standard Conditions (SCF)	1.045	1.068	1.040
Moisture Fraction (Dimensionless)	0.009	0.008	0.009
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.84	28.86	28.86
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.74	28.77	28.76
Stack Gas Velocity (FPS)	51.3	54.7	51.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	174,661	186,237	174,661
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	151,964	165,616	156,039
Isokinetic Sampling (%)	110.1	110.6	111.0
OPM Emission Concentration (Gr/DSCF)	0.00085	0.00089	0.00013
OPM Emission Concentration (Lb/DSCF)	1.22E-07	1.27E-07	1.87E-08
OPM Emission Rate (Lb/Hr)	1.11	1.26	0.17

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**178,520**
Average Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	**157,873**
Average OPM Emission Concentration (Gr/DSCF)	**0.00062**
Average OPM Emission Concentration (Lb/DSCF)	**8.92E-08**
Average OPM Emission Rate (Lb/Hr)	**0.85**

Signature of Reviewer: Fred H. Quentel,

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TABLE 2
EPA METHOD 6C
SULFUR DIOXIDE EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. PROJECT NO.: 99-T-069
SOURCE TESTED: LMS SYSTEM - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	02-Feb-99	02-Feb-99	02-Feb-99
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	1400-1600	1705-1905	2031-2231
Sampling Time (Minutes)	120	120	120
Average Process Tap Rate (TPH)	***494***	***416***	***491***
Stack Area (Ft^2)	56.745✓	56.745	56.745
Pitot Tube Coefficient (Dimensionless)	0.840✓	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	0.9860✓	0.9860	0.9860
Barometric Pressure (In. Hg)	28.81✓	28.81	28.81
Static Pressure (In. H2O)	-0.310✓	-0.310	-0.310
Dry Gas Meter Sample Volume (DCF)	113.489	107.355	89.899
Average Dry Gas Meter Temperature (°F)	57.3	59.6	55.3
Average Orifice Meter Delta H (In. H2O)	3.750	3.369	2.039
Volume Condensate Collected (Ml)	22.7	22.1	7.5
Average CO2 Concentration (%)	0.1	0.1	0.1
Average O2 Concentration (%)	21.1	21.0	21.0
Average Square Root of Delta P (In. H2O½)	0.922	0.866	0.905
Average Stack Gas Temperature (°F)	105.7	103.1	97.1
Average Corrected SO2 Concentration (PPMV)	**6.51**	**8.50**	**11.40**

CALCULATED DATA

Absolute Pressure (In. Hg)	28.79	28.79	28.79
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	111.059	104.484	87.920
Water Vapor Volume at Standard Conditions (SCF)	1.068	1.040	0.353
Moisture Fraction (Dimensionless)	0.010	0.010	0.004
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.86	28.86	28.86
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.76	28.75	28.81
Stack Gas Velocity (FPS)	54.7	51.3	53.2
Stack Gas Flow Rate at Actual Conditions (ACFM)	186,237	174,661	181,130
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	165,616	156,039	164,552
SO2 Emission Concentration (Gr/DSCF)	0.0076	0.0099	0.0133
SO2 Emission Concentration (Lb/DSCF)	1.08E-06	1.41E-06	1.90E-06
SO2 Emission Rate (Lb/Hr)	10.8	13.2	18.7
SO2 Emission Concentration (Lb/Ton Process Weight)	*0.0218*	*0.0318*	*0.0381*

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**180,676**
Average Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	**162,069**
Average SO2 Emission Concentration (Gr/DSCF)	**0.0103**
Average SO2 Emission Concentration (Lb/DSCF)	**1.46E-06**
Average SO2 Emission Rate (Lb/Hr)	**14.2**
Average SO2 Emission Concentration (Lb/Ton Process Weight)	***0.0306***

Signature of Reviewer: Fred H. Quentter

G/SA ..... ENVIRONMENTAL TESTING CONSULTANTS
P.O. Box 807, Crown Point, IN 46307 TEL (219) 663-5394 / FAX (219) 662-7037

TABLE 3
EPA METHOD 7E
NITROGEN OXIDES EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. PROJECT NO.: 99-T-069
SOURCE TESTED: LMS SYSTEM - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	02-Feb-99	02-Feb-99	02-Feb-99
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	1400-1600	1705-1905	2031-2231
Sampling Time (Minutes)	120	120	120
Average Process Tap Rate (TPH)	***494***	***416***	***491***
Stack Area (Ft^2)	56.745	56.745	56.745
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	0.9860	0.9860	0.9860
Barometric Pressure (In. Hg)	28.81	28.81	28.81
Static Pressure (In. H2O)	-0.310	-0.310	-0.310
Dry Gas Meter Sample Volume (DCF)	113.489	107.355	89.899
Average Dry Gas Meter Temperature (°F)	57.3	59.6	55.3
Average Orifice Meter Delta H (In. H2O)	3.750	3.369	2.039
Volume Condensate Collected (Ml)	22.7	22.1	7.5
Average CO2 Concentration (%)	0.1	0.1	0.1
Average O2 Concentration (%)	21.1	21.0	21.0
Average Square Root of Delta P (In. $H2O^{1/2}$)	0.922	0.866	0.905
Average Stack Gas Temperature (°F)	105.7	103.1	97.1
Average Corrected NOx Concentration as NO2 (PPMV)	**4.35**	**4.57**	**4.83**

CALCULATED DATA

Absolute Pressure (In. Hg)	28.79	28.79	28.79
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	111.059	104.484	87.920
Water Vapor Volume at Standard Conditions (SCF)	1.068	1.040	0.353
Moisture Fraction (Dimensionless)	0.010	0.010	0.004
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.86	28.86	28.86
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.76	28.75	28.81
Stack Gas Velocity (FPS)	54.7	51.3	53.2
Stack Gas Flow Rate at Actual Conditions (ACFM)	186,237	174,661	181,130
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	165,616	156,039	164,552
NOx Emission Concentration (Gr/DSCF)	0.00364	0.00382	0.00404
NOx Emission Concentration (Lb/DSCF)	5.19E-07	5.46E-07	5.77E-07
NOx Emission Rate (Lb/Hr)	5.16	5.11	5.69
NOx Emission Concentration (Lb/Ton Process Weight)	*0.0104*	*0.0123*	*0.0116*

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**180,676**
Average Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	**162,069**
Average NOx Emission Concentration (Gr/DSCF)	**0.00383**
Average NOx Emission Concentration (Lb/DSCF)	**5.47E-07**
Average NOx Emission Rate (Lb/Hr)	**5.32**
Average NOx Emission Concentration (Lb/Ton Process Weight)	***0.0114***

Signature of Reviewer: Fred H. Quentin

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TABLE 4
EPA METHOD 10
CARBON MONOXIDE EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. PROJECT NO.: 99-T-069
SOURCE TESTED: LMS SYSTEM - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	02-Feb-99	03-Feb-99	03-Feb-99
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	2031-2231	1045-1145	1320-1420
Sampling Time (Minutes)	120	60	60
Average Process Tap Rate (TPH)	***491***	***476***	***486***
Stack Area (Ft^2)	56.745	56.745	56.745
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	0.9860	0.9860	0.9860
Barometric Pressure (In. Hg)	28.81	28.99	28.99
Static Pressure (In. H2O)	-0.310	-0.330	-0.330
Dry Gas Meter Sample Volume (DCF)	89.899	45.030	45.041
Average Dry Gas Meter Temperature (°F)	55.3	46.6	49.5
Average Orifice Meter Delta H (In. H2O)	2.039	2.039	2.039
Volume Condensate Collected (Ml)	7.5	5.4	6.1
Average CO2 Concentration (%)	0.1	0.1	0.1
Average O2 Concentration (%)	21.0	20.9	21.0
Average Square Root of Delta P (In. H2O½)	0.905	0.863	0.879
Average Stack Gas Temperature (°F)	97.1	108.8	102.4
Average Corrected CO Concentration (PPMV)	**7.88**	**13.83**	**11.00**

CALCULATED DATA

Absolute Pressure (In. Hg)	28.79	28.97	28.97
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	87.920	45.078	44.831
Water Vapor Volume at Standard Conditions (SCF)	0.353	0.254	0.287
Moisture Fraction (Dimensionless)	0.004	0.006	0.006
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.86	28.85	28.86
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.81	28.79	28.79
Stack Gas Velocity (FPS)	53.2	51.2	51.8
Stack Gas Flow Rate at Actual Conditions (ACFM)	181,130	174,321	176,363
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	164,552	155,765	159,383
CO Emission Concentration (Gr/DSCF)	0.00401	0.00704	0.00560
CO Emission Concentration (Lb/DSCF)	5.73E-07	1.01E-06	8.00E-07
CO Emission Rate (Lb/Hr)	5.66	9.40	7.65
CO Emission Concentration (Lb/Ton Process Weight)	*0.0115*	*0.0197*	*0.0157*

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**177,271**
Average Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	**159,900**
Average CO Emission Concentration (Gr/DSCF)	**0.00555**
Average CO Emission Concentration (Lb/DSCF)	**7.93E-07**
Average CO Emission Rate (Lb/Hr)	**7.57**
Average CO Emission Concentration (Lb/Ton Process Weight)	***0.0157***

Signature of Reviewer: Fred H. Quentler,

EAF BAGHOUSE OUTLET

G/SA ..... ENVIRONMENTAL TESTING CONSULTANTS
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TABLE 5
EPA METHOD 6C
SULFUR DIOXIDE EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. PROJECT NO.: 99-T-069

SOURCE TESTED: TWIN SHELL EAF – BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	02-Feb-99	02-Feb-99	02-Feb-99
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	1400-1600	1705-1905	2030-2230
Sampling Time (Minutes)	120	120	120
Average Process Tap Rate (TPH)	***494***	***416***	***491***
Stack Area (Ft^2)	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	1.0220	1.0220	1.0220
Barometric Pressure (In. Hg)	28.81	28.81	28.81
Static Pressure (In. H2O)	-1.150	-1.150	-1.150
Dry Gas Meter Sample Volume (DCF)	89.954	89.916	89.935
Average Dry Gas Meter Temperature (°F)	53.4	51.2	50.8
Average Orifice Meter Delta H (In. H2O)	1.819	1.819	1.819
Volume Condensate Collected (Ml)	28.7	27.9	27.2
Average CO2 Concentration (%)	1.2	1.2	1.3
Average O2 Concentration (%)	20.6	20.7	20.5
Average Square Root of Delta P (In. H2O½)	1.267	1.247	1.228
Average Stack Gas Temperature (°F)	155.0	150.1	167.3
Average Corrected SO2 Concentration (PPMV)	2.17	1.77	2.95

CALCULATED DATA

Absolute Pressure (In. Hg)	28.73	28.73	28.73
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	91.475	91.839	91.918
Water Vapor Volume at Standard Conditions (SCF)	1.351	1.313	1.280
Moisture Fraction (Dimensionless)	0.015	0.014	0.014
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	29.02	29.02	29.03
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.86	28.86	28.88
Stack Gas Velocity (FPS)	78.4	76.8	76.7
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,477,804	1,447,645	1,445,760
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,200,213	1,186,365	1,152,333
SO2 Emission Concentration (Gr/DSCF)	0.00253	0.00206	0.00343
SO2 Emission Concentration (Lb/DSCF)	3.61E-07	2.94E-07	4.91E-07
SO2 Emission Rate (Lb/Hr)	26.0	21.0	33.9
SO2 Emission Concentration (Lb/Ton Process Weight)	*0.0526*	*0.0504*	*0.0691*

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**1,457,070**
Average Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	**1,179,637**
Average SO2 Emission Concentration (Gr/DSCF)	**0.00267**
Average SO2 Emission Concentration (Lb/DSCF)	**3.82E-07**
Average SO2 Emission Rate (Lb/Hr)	**27.0**
Average SO2 Emission Concentration (Lb/Ton Process Weight)	***0.0574***

Signature of Reviewer: Fred H. Quentin

G/SA . . . . . ENVIRONMENTAL TESTING CONSULTANTS
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TABLE 6

EPA METHOD 7E
NITROGEN OXIDES EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. PROJECT NO.: 99-T-069
SOURCE TESTED: TWIN SHELL EAF – BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	02-Feb-99	02-Feb-99	02-Feb-99
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	1400-1600	1705-1905	2030-2230
Sampling Time (Minutes)	120	120	120
Average Process Tap Rate (TPH)	***494***	***416***	***491***
Stack Area (Ft^2)	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	1.0220	1.0220	1.0220
Barometric Pressure (In. Hg)	28.81	28.81	28.81
Static Pressure (In. H2O)	-1.150	-1.150	-1.150
Dry Gas Meter Sample Volume (DCF)	89.954	89.916	89.935
Average Dry Gas Meter Temperature (°F)	53.4	51.2	50.8
Average Orifice Meter Delta H (In. H2O)	1.819	1.819	1.819
Volume Condensate Collected (Ml)	28.7	27.9	27.2
Average CO2 Concentration (%)	1.2	1.2	1.3
Average O2 Concentration (%)	20.6	20.7	20.5
Average Square Root of Delta P (In. H2O½)	1.267	1.247	1.228
Average Stack Gas Temperature (°F)	155.0	150.1	167.3
Average Corrected NOx Concentration as NO2 (PPMV)	**22.64**	**21.59**	**22.10**

CALCULATED DATA

Absolute Pressure (In. Hg)	28.73	28.73	28.73
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	91.475	91.639	91.918
Water Vapor Volume at Standard Conditions (SCF)	1.351	1.313	1.280
Moisture Fraction (Dimensionless)	0.015	0.014	0.014
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	29.02	29.02	29.03
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.86	28.86	28.88
Stack Gas Velocity (FPS)	78.4	76.8	76.7
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,477,804	1,447,645	1,445,760
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,200,213	1,186,365	1,152,333
NOx Emission Concentration (Gr/DSCF)	0.0189	0.0180	0.0185
NOx Emission Concentration (Lb/DSCF)	2.70E-06	2.58E-06	2.64E-06
NOx Emission Rate (Lb/Hr)	194.7	183.5	182.4
NOx Emission Concentration (Lb/Ton Process Weight)	*0.394*	*0.441*	*0.372*

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**1,457,070**
Average Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	**1,179,637**
Average NOx Emission Concentration (Gr/DSCF)	**0.0185**
Average NOx Emission Concentration (Lb/DSCF)	**2.64E-06**
Average NOx Emission Rate (Lb/Hr)	**186.9**
Average NOx Emission Concentration (Lb/Ton Process Weight)	***0.402***

Signature of Reviewer: Fred H. Quentin

G/SA . . . . . ENVIRONMENTAL TESTING CONSULTANTS
P.O. Box 807, Crown Point, IN 46307 TEL (219) 663-5394 / FAX (219) 662-7037

TABLE 7
EPA METHOD 10
CARBON MONOXIDE EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. PROJECT NO.: 99-T-069
SOURCE TESTED: TWIN SHELL EAF – BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	02-Feb-99	03-Feb-99	03-Feb-99
Sampling Location	**Stack**	**Stack**	**Stack**
Test Time, Start-Stop (24 Hour)	2030-2230	1045-1145	1320-1420
Sampling Time (Minutes)	120	60	60
Average Process Tap Rate (TPH)	***491***	***476***	***486***
Stack Area (Ft^2)	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	1.0220	1.0220	1.0220
Barometric Pressure (In. Hg)	28.81	28.99	28.99
Static Pressure (In. H2O)	-1.150	-1.100	-1.100
Dry Gas Meter Sample Volume (DCF)	89.935	44.401	44.041
Average Dry Gas Meter Temperature (°F)	50.8	55.7	52.0
Average Orifice Meter Delta H (In. H2O)	1.819	1.819	1.819
Volume Condensate Collected (Ml)	27.2	7.4	7.7
Average CO2 Concentration (%)	1.3	1.0	1.1
Average O2 Concentration (%)	20.5	20.7	20.6
Average Square Root of Delta P (In. $H2O^{1/2}$)	1.228	1.208	1.260
Average Stack Gas Temperature (°F)	167.3	154.8	156.1
Average Corrected CO Concentration (PPMV)	**39.45**	**28.32**	**26.22**

CALCULATED DATA

Absolute Pressure (In. Hg)	28.73	28.91	28.91
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	91.918	45.231	45.189
Water Vapor Volume at Standard Conditions (SCF)	1.280	0.348	0.362
Moisture Fraction (Dimensionless)	0.014	0.008	0.008
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	29.03	28.99	29.00
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.88	28.90	28.91
Stack Gas Velocity (FPS)	76.7	74.4	77.7
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,445,760	1,402,406	1,464,609
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,152,333	1,154,634	1,203,303
CO Emission Concentration (Gr/DSCF)	0.0201	0.0144	0.0133
CO Emission Concentration (Lb/DSCF)	2.87E-06	2.06E-06	1.91E-06
CO Emission Rate (Lb/Hr)	198.3	142.6	137.6
CO Emission Concentration (Lb/Ton Process Weight)	*0.404*	*0.300*	*0.283*

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**1,437,592**
Average Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	**1,170,090**
Average CO Emission Concentration (Gr/DSCF)	**0.0159**
Average CO Emission Concentration (Lb/DSCF)	**2.28E-06**
Average CO Emission Rate (Lb/Hr)	**159.5**
Average CO Emission Concentration (Lb/Ton Process Weight)	***0.329***

Signature of Reviewer: Fred H. Quentin

3.0 FACILITY DESCRIPTION

Steel Dynamics, Inc. owns and operates a steel processing mill which has the capacity to produce 400 tons of hot rolled coil steel per hour. Tons of iron, scrap steel and various metals are charged into electric arc furnaces (EAF) and transformed to molten steel which is then transferred to a ladle metallurgical station (LMS) for refining.

SDI is located at Dekalb County Roads 44 & 59 near Butler, Indiana.

The SDI steel processing mill consists basically of two (2) twin shell EAF and a LMS system, which were the sources tested for compliance purposes, two (2) water cooled molds, two (2) tunnel furnaces with natural gas-fired burners, four (4) tundish preheaters with natural gas-fired burners, two (2) tundish dryers with natural gas-fired burners, two (2) ladle dry-outs with natural gas-fired burners, six (6) ladle preheaters with natural gas-fired burners; slag processing operations incorporating grizzly/feeders, covered conveyors, material sizing screens and storage piles; carbon, lime and flux additive handling systems with pneumatic conveyors, storage bins and enclosed conveyors to the blending areas at the EAF; and one (1) baghouse dust silo, an emissions side draft evacuation collection system and collection canopies which exhaust to two (2) pulse jet, fabric filter baghouses with 99.85% particulate removal efficiencies and 125' high exhaust stacks. The particulate and gaseous emissions testing was performed on these stacks. See Figures 1 and 2.

The LMS system is composed of two (2) small capacity electric arc heating stations and a central argon stir station. The LMS is capable of handling up to 400 tons of molten steel received from the EAF. Alloys such as ferromanganese, ferrovanadium and ferromagnesium are used to refine the steel to the desired specifications. The steel from the EAF is transferred to the heating stations where alloys are added for melting as the temperature is maintained at approximately 3,000 °F. The ladle is then transferred to the argon stir station where the mixture is stirred magnetically and charged with an argon lance. Calcium-silicon wire is added at this stage to remove remaining impurities. If necessary, the process is repeated until the required specifications are achieved.

During the emissions testing on February 2 and 3, 1999, the process tap rates averaged 470.8 and 481.0 tons of steel per hour, respectively.

Process operating data recorded during the emissions testing can be found in Appendix B of this report.

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

OFFICE OF AIR QUALITY

OFFICE MEMORANDUM

To: Dave Lawrence
Date: 8/24/01
From: Dave Cline
Thru: Ed Surla
Subject: Steel Dynamics EAF/LMF SO2, NOx Testing
Source I.D. 033-00043
Permit No. 9187

The subject company has submitted a report concerning SO2 and NOx testing on the Electric Arc Furnace (EAF), and the Ladle Metallurgical Station (LMF) baghouse outlet stacks. The testing was conducted by Guenther/Shackelford and Associates (GSA) using EPA reference methods 1-4, 6c, and 7e. The test protocol was reviewed by Quentin Flory who also observed the testing program. I have reviewed this report and found the sampling procedures used and results obtained to be acceptable to this office. A copy of the test report is filed in the Compliance Data Section. The following is a summary of the test results.

Date of Test: July 26, 2001
Unit Tested: EAF and LMF
Type of Fuel: N/A
Pollution Control Equipment: None

Pollutant:	SO2/NOx
Test Method:	1-4, 6c, 7e
Permit Condition:	#7
Limits:	
SO2: (EAF/LMF combined limit)	80 Lbs/hr and .20 Lbs/Ton steel
NOx: (EAF Only)	204 Lbs/hr and .51 Lbs/Ton steel
Maximum Operating Rate:	400 Tons Per Hr
Average Rate During Test:	418 Tons Per Hr
Average Measured Emissions:	
SO2:	53.13 Lbs/hr (EAF/LMF combined) .127 Lbs/Ton steel
NOx:	159.31 Lbs/hr (EAF only) .38 Lbs/Ton steel

Status: IN COMPLIANCE (with permitted limits at 104% of maximum rated capacity).

cc: D. Cline
WPS/General File Dekalb County

G/SA

GUENTHER / SHACKELFORD ASSOCIATES

ENVIRONMENTAL CONSULTANTS & TESTING CONTRACTORS

SOURCE EMISSIONS TEST REPORT

PERFORMED FOR
STEEL DYNAMICS, INC.
BUTLER, INDIANA

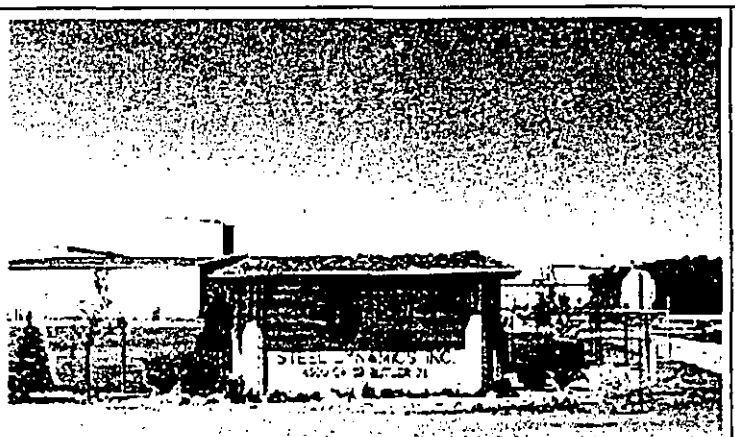
TWIN SHELL ELECTRIC ARC FURNACE
LADLE METALLURGICAL STATION
BAGHOUSE OUTLETS

EPA METHODS 1, 2, 3A, 4, 6C AND 7E

JULY 26, 2001
G/SA PROJECT NO. 01-T-136

Prepared for:

Mr. Barry Smith
Environmental Engineer
Steel Dynamics, Inc.
4500 County Road 59
Butler, IN 46271



SDI™

COMPLIANCE TEST REPORT

STEEL PROCESSING MILL
EAF/LMS
BAGHOUSE OUTLETS
TEST DATA AND RESULTS

SOURCE EMISSIONS COMPLIANCE TESTING
EPA Methods 1, 2, 3A, 4, 6C, and 7E
Performed on the
Twin Shell Electric Arc Furnaces
Baghouse Outlet
and
EPA Methods 1, 2, 3A, 4 and 6C
Performed on the
Ladle Metallurgical Station System
Baghouse Outlet
at
Steel Dynamics, Inc.
Steel Processing Mill
Butler, Indiana

July 26, 2001

Project No. 01-T-136

1.0 INTRODUCTION

This report presents the results of the source emissions compliance testing conducted by Guenther/Shackelford Associates (G/SA) for Steel Dynamics, Inc. (SDI), near Butler, Indiana.

The primary purpose of this testing program was to determine through continuous emissions monitoring (CEM) sulfur dioxide (SO_2) and nitrogen oxides (NO_X) concentrations from the effluent gas stream of the baghouse serving the Twin Shell Electric Arc Furnaces (EAF), and to determine SO_2 concentrations of the exhaust gas from the baghouse serving the Ladle Metallurgical Station (LMS) System, and associated equipment at SDI's Steel Processing Mill, to establish outlet emission rates, and to

determine if the emissions discharged into the atmosphere from the EAF and the LMS meet the Indiana Department of Environmental Management (IDEM) source emission limits.

G/SA's responsibility was to conduct instrument monitoring for SO_2 and NO_X ,and perform data reduction for emission concentrations evaluation. SDI's responsibility was to maintain process operating parameters and to provide process operating data per compliance test requirements.

The following report provides information pertaining to the SDI Steel Processing Mill's operations, emissions testing and analytical results.

The emissions testing conducted on the EAF and LMS Baghouse Outlets was performed on Tuesday, July 26, 2001.

The following requirements were specific for the testing program:

1. Pertinent equipment calibrations performed and calibration data provided.
2. Three (3), consecutive two (2) hour, minimum, SO_2 and NO_X emissions test runs performed at the EAF Baghouse Outlet (exhaust stack), and, simultaneously, three (3), consecutive two (2) hour, minimum, SO_2 emissions test runs performed at the LMS Baghouse Outlet (exhaust stack) per IDEM Rule 326 IAC 3-2.1.

3. Process manufacturing capacities and control devices maintained at required operating conditions, and production rates recorded during the emissions testing periods.

4. All testing, monitoring and analyses performed in accordance with current United States Environmental Protection Agency (USEPA) test methodologies and analytical procedures for SO_2 and NO_X emissions determinations.

5. SO_2 emissions from the EAF and LMS shall not exceed a combined average rate of 80 pounds per hour (lb/hr), and a combined average concentration of 0.20 pounds per ton of steel process weight (lb/tpw) pursuant to IDEM Rule 326 IAC 12-1-1.

6. NO_X emissions from the EAF shall not exceed an average rate of 204 lb/hr and an average concentration of 0.51 lb/tpw pursuant to IDEM Rule 326 IAC 12-1-1.

The emissions testing program was supervised by G/SA, whose headquarters is in Crown Point, Indiana. G/SA also performed stack gas flow rates and moisture content determinations at the EAF Baghouse Outlet sampling location, and in part at the LMS Baghouse Outlet sampling location. G/SA performed the preliminary data reduction and prepared in part the final report. The stack gas flow rates and moisture content determinations at the LMS Baghouse Outlet sampling location were performed in part by G/SA's affiliate, Source Assessment Technologies, LLC (S.A.T.), whose headquarters

is in Wheatland, Missouri. S.A.T. also performed the final SO_2 and NO_X data reduction, and in part the final report preparation. The CEM emissions testing for SO_2 and NO_X concentrations, and carbon dioxide (CO_2) and oxygen (O_2) content conducted at the EAF and LMS Baghouse Outlet sampling locations were performed by G/SA's subcontractor, Grace Consulting, Inc. (GCI), whose headquarters is in Wellington, Ohio.

The emissions testing was performed in accordance with USEPA Reference Methods 1, 2, 3A, 4, 6C (SO_2) and 7E (NO_X), Title 40, Part 60, Appendix A of the U.S. Code of Federal Regulations and IDEM Rule 326 IAC 3-2.1.

The testing program was approved by and/or coordinated with the following personnel:

Barry Smith, Environmental Engineer, SDI

The emissions testing was performed by the following personnel:

Fred Guenther, Test Supervisor, G/SA

Terry Shackelford, Senior Test Engineer, G/SA (S.A.T.)

Brandon Peyton, Test Engineer, G/SA

Gerry Gonzales, Test Technician, G/SA

Tim Hagg, Test Technician, G/SA

Tim Moody, Test Engineer, GCI

Kurt Kinter, Test Engineer, GCI

The emissions testing was observed by the following personnel:

Quintan Flory, Environmental Scientist, Air Compliance Section, IDEM

2.0 TEST RESULTS SUMMARY

The source emissions testing was performed utilizing USEPA Methods 1, 2, 3A, 4, 6C and 7E at the EAF Baghouse Outlet sampling location, and USEPA Methods 1, 2, 3A, 4 and 6C at the LMS Baghouse Outlet sampling location. A summary of the test results is given below:

SAMPLING LOCATION(S)	RUN NO.	COMBINED SO_2, *Lb/Hr*	COMBINED SO_2, *Lb/TPW*
EAF & LMS Baghouse Outlets	1	53.4	0.128
	2	42.9	0.101
	3	63.5	0.153
		Avg. 53.3 (Combined Limit: 80 Lb/Hr)	Avg. 0.127 (Combined Limit: 0.20 Lb/TPW)

SAMPLING LOCATION(S)	RUN NO.	NO_x, *Lb/Hr*	NO_x, *Lb/TPW*
EAF Baghouse Outlet	1	173.0	0.413
	2	155.7	0.367
	3	150.1	0.361
		Avg. 159.6 (Limit: 204 Lb/Hr)	Avg. 0.380 (Limit: 0.51 Lb/TPW)

A complete list of test parameters for each Method 6C and 7E emissions test run performed at the EAF sampling location, and each Method 6C emissions test run performed at the LMS sampling location can be found in Tables 1 and 2, and Table 3, respectively.

Sample calculations and examples of the equations used to generate the test results can be found in Appendix E.

TABLES

EAF BAGHOUSE OUTLET

G/SA ..... ENVIRONMENTAL TESTING CONSULTANTS
P.O. Box 807, Crown Point, IN 46307 TEL (219) 663-5394 / FAX (219) 662-7037

TABLE 1
EPA METHOD 6C
SULFUR DIOXIDE EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. PROJECT NO.: 01-T-136
SOURCE TESTED: TWIN SHELL EAF - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	26-Jul-01	26-Jul-01	26-Jul-01
Sampling Location	**Exhaust Stack**	**Exhaust Stack**	**Exhaust Stack**
Test Time, Start-Stop (24 Hour)	0700-0914	1015-1220	1258-1510
Sampling Time (Minutes)	120	120	120
Average Process Tap Rate (TPH)	**419.0**	**424.0**	**415.5**
Stack Area (Ft^2)	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	0.993	0.993	0.993
Barometric Pressure (In. Hg)	29.21	29.24	29.24
Static Pressure (In. H2O)	-1.00	-1.00	-1.00
Dry Gas Meter Sample Volume (DCF)	93.655	93.242	93.142
Average Dry Gas Meter Temperature (°F)	81.9	83.4	84.5
Average Orifice Meter Delta H (In. H2O)	1.728	1.728	1.728
Volume Condensate Collected (Ml)	44.3	48.1	46.7
Average CO2 Concentration (%)	1.3	1.3	1.2
Average O2 Concentration (%)	19.9	20.0	20.0
Average Square Root of Delta P (In. H2O½)	1.354	1.351	1.378
Average Stack Gas Temperature (°F)	187.7	188.5	192.0
Average Corrected SO2 Concentration (PPMV)	**3.31**	**1.93**	**3.45**

CALCULATED DATA

Absolute Pressure (In. Hg)	29.14	29.17	29.17
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	88.867	88.321	88.038
Water Vapor Volume at Standard Conditions (SCF)	2.085	2.264	2.198
Moisture Fraction (Dimensionless)	0.023	0.025	0.024
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	29.00	29.01	28.99
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.75	28.73	28.72
Stack Gas Velocity (FPS)	85.5	85.3	87.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,611,636	1,607,866	1,645,565
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,250,322	1,244,588	1,268,231
SO2 Emission Concentration (Gr/DSCF)	0.0039	0.0022	0.0040
SO2 Emission Concentration (Lb/DSCF)	5.50E-07	3.21E-07	5.74E-07
SO2 Emission Rate (Lb/Hr)	41.3	24.0	43.7
SO2 Emission Concentration (Lb/TPW)	0.099	0.057	0.105

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**1,457,070**
Average Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	**1,254,380**
Average SO2 Emission Concentration (Gr/DSCF)	**0.0034**
Average SO2 Emission Concentration (Lb/DSCF)	**4.82E-07**
Average SO2 Emission Rate (Lb/Hr)	**36.3**
Average SO2 Emission Concentration (Lb/TPW)	**0.087**

Signature of Reviewer: Fred H. Sulfaro

G/SA ..... ENVIRONMENTAL TESTING CONSULTANTS
P.O. Box 807, Crown Point, IN 46307 TEL (219) 663-5394 / FAX (219) 662-7037

TABLE 2
EPA METHOD 7E
NITROGEN OXIDES EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. PROJECT NO.: 01-T-136
SOURCE TESTED: TWIN SHELL EAF - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

	1	2	3
Run Number			
Date	26-Jul-01	26-Jul-01	26-Jul-01
Sampling Location	**Exhaust Stack**	**Exhaust Stack**	**Exhaust Stack**
Test Time, Start-Stop (24 Hour)	0700-0914	1015-1220	1258-1510
Sampling Time (Minutes)	120	120	120
Average Process Tap Rate (TPH)	**419.0**	**424.0**	**415.5**
Stack Area (Ft^2)	314.159	314.159	314.159
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	0.993	0.993	0.993
Barometric Pressure (In. Hg)	29.21	29.24	29.24
Static Pressure (In. H2O)	-1.00	-1.00	-1.00
Dry Gas Meter Sample Volume (DCF)	93.655	93.242	93.142
Average Dry Gas Meter Temperature (°F)	81.9	83.4	84.5
Average Orifice Meter Delta H (In. H2O)	1.728	1.728	1.728
Volume Condensate Collected (Ml)	44.3	48.1	46.7
Average CO2 Concentration (%)	1.3	1.3	1.2
Average O2 Concentration (%)	19.9	20.0	20.0
Average Square Root of Delta P (In. H2O½)	1.354	1.351	1.378
Average Stack Gas Temperature (°F)	187.7	188.5	192.0
Average Corrected NOx Concentration as NO2 (PPMV)	**19.31**	**17.46**	**16.52**

CALCULATED DATA

Absolute Pressure (In. Hg)	29.14	29.17	29.17
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	88.867	88.321	88.038
Water Vapor Volume at Standard Conditions (SCF)	2.085	2.264	2.198
Moisture Fraction (Dimensionless)	0.023	0.025	0.024
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	29.00	29.01	28.99
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.75	28.73	28.72
Stack Gas Velocity (FPS)	85.5	85.3	87.3
Stack Gas Flow Rate at Actual Conditions (ACFM)	1,611,636	1,607,866	1,645,565
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	1,250,322	1,244,588	1,268,231
NOx Emission Concentration (Gr/DSCF)	0.0161	0.0146	0.0138
NOx Emission Concentration (Lb/DSCF)	2.31E-06	2.08E-06	1.97E-06
NOx Emission Rate (Lb/Hr)	173.0	155.7	150.1
NOx Emission Concentration (Lb/TPW)	0.413	0.367	0.361

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**1,457,070**
Average Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	**1,254,380**
Average NOx Emission Concentration (Gr/DSCF)	**0.0148**
Average NOx Emission Concentration (Lb/DSCF)	**2.12E-06**
Average NOx Emission Rate (Lb/Hr)	**159.6**
Average NOx Emission Concentration (Lb/TPW)	**0.380**

Signature of Reviewer:

LMS BAGHOUSE OUTLET

G/SA ..... ENVIRONMENTAL TESTING CONSULTANTS
P.O. Box 807, Crown Point, IN 46307 TEL (219) 663-5394 / FAX (219) 662-7037

TABLE 3
EPA METHOD 6C
SULFUR DIOXIDE EMISSIONS TEST RESULTS

CLIENT: STEEL DYNAMICS, INC. PROJECT NO.: 01-T-136
SOURCE TESTED: LMS SYSTEM - BAGHOUSE OUTLET DATA INPUT BY: TLS

INPUT DATA

Run Number	1	2	3
Date	26-Jul-01	26-Jul-01	26-Jul-01
Sampling Location	**Exhaust Stack**	**Exhaust Stack**	**Exhaust Stack**
Test Time, Start-Stop (24 Hour)	0700-0912	1015-1218	1258-1502
Sampling Time (Minutes)	120	120	120
Average Process Tap Rate (TPH)	**419.0**	**424.0**	**415.5**
Stack Area (Ft^2)	56.745	56.745	56.745
Pitot Tube Coefficient (Dimensionless)	0.840	0.840	0.840
Dry Gas Meter Correction Factor (Dimensionless)	1.001	1.001	1.001
Barometric Pressure (In. Hg)	29.21	29.24	29.24
Static Pressure (In. H2O)	-0.51	-0.48	-0.49
Dry Gas Meter Sample Volume (DCF)	90.030	90.695	90.275
Average Dry Gas Meter Temperature (°F)	79.3	94.3	94.1
Average Orifice Meter Delta H (In. H2O)	1.960	1.960	1.960
Volume Condensate Collected (Ml)	33.3	33.0	34.1
Average CO2 Concentration (%)	0.0	0.1	0.1
Average O2 Concentration (%)	20.8	20.8	20.9
Average Square Root of Delta P (In. H2O½)	1.030	1.014	1.046
Average Stack Gas Temperature (°F)	159.8	164.5	158.3
Average Corrected SO2 Concentration (PPMV)	**6.83**	**10.89**	**11.04**

CALCULATED DATA

Absolute Pressure (In. Hg)	29.17	29.20	29.20
Dry Gas Meter Sample Volume at Standard Conditions (DSCF)	86.572	84.938	84.583
Water Vapor Volume at Standard Conditions (SCF)	1.567	1.553	1.605
Moisture Fraction (Dimensionless)	0.018	0.018	0.019
Dry Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.83	28.85	28.85
Wet Molecular Weight of Stack Gas (Lb/Lb-Mole)	28.64	28.65	28.65
Stack Gas Velocity (FPS)	63.7	62.9	64.6
Stack Gas Flow Rate at Actual Conditions (ACFM)	216,879	214,156	219,944
Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	176,913	173,555	179,849
SO2 Emission Concentration (Gr/DSCF)	0.0080	0.0127	0.0129
SO2 Emission Concentration (Lb/DSCF)	1.14E-06	1.81E-06	1.84E-06
SO2 Emission Rate (Lb/Hr)	12.1	18.9	19.8
SO2 Emission Concentration (Lb/TPW)	0.029	0.044	0.048

Average Stack Gas Flow Rate at Actual Conditions (ACFM)	**216,993**
Average Stack Gas Flow Rate at Dry Standard Conditions (DSCFM)	**176,772**
Average SO2 Emission Concentration (Gr/DSCF)	**0.0103**
Average SO2 Emission Concentration (Lb/DSCF)	**1.59E-06**
Average SO2 Emission Rate (Lb/Hr)	**16.9**
Average SO2 Emission Concentration (Lb/TPW)	**0.040**

Signature of Reviewer:

3.0 FACILITY DESCRIPTION

Steel Dynamics, Inc. owns and operates a steel processing mill which has the capacity to produce 400 tons of hot rolled coil steel per hour. Tons of iron, scrap steel and various metals are charged into electric arc furnaces (EAF) and transformed to molten steel which is then transferred to a ladle metallurgical station (LMS) for refining.

SDI is located at Dekalb County Roads 44 & 59 near Butler, Indiana.

The SDI steel processing mill consists basically of two (2) twin shell EAF and a LMS system, which were the sources tested for compliance purposes, two (2) water cooled molds, two (2) tunnel furnaces with natural gas-fired burners, four (4) tundish preheaters with natural gas-fired burners, two (2) tundish dryers with natural gas-fired burners, two (2) ladle dry-outs with natural gas-fired burners, six (6) ladle preheaters with natural gas-fired burners; slag processing operations incorporating grizzly/feeders, covered conveyors, material sizing screens and storage piles; carbon, lime and flux additive handling systems with pneumatic conveyors, storage bins and enclosed conveyors to the blending areas at the EAF; and one (1) baghouse dust silo, an emissions side draft evacuation collection system and collection canopies which exhaust to two (2) pulse jet, fabric filter baghouses with 99.85% particulate removal efficiencies and 125' high exhaust stacks. The gaseous emissions testing was performed on these stacks. See Figures 1 and 2.

The LMS system is composed of two (2) small capacity electric arc heating stations and a central argon stir station. The LMS is capable of handling up to 400 tons of molten steel received from the EAF. Alloys such as ferromanganese, ferrovanadium and ferromagnesium are used to refine the steel to the desired specifications. The steel from the EAF is transferred to the heating stations where alloys are added for melting as the temperature is maintained at approximately 3,000 °F. The ladle is then transferred to the argon stir station where the mixture is stirred magnetically and charged with an argon lance. Calcium-silicon wire is added at this stage to remove remaining impurities. If necessary, the process is repeated until the required specifications are achieved.

During the emissions testing on July 26, 2001, the process tap rates averaged 419.5 tons of steel per hour.

Process operating data recorded during the emissions testing can be found in Appendix B of this report.

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
We make Indiana a cleaner, healthier place to live

Frank O'Bannon
Governor

John M. Hamilton
Commissioner

100 North Senate Avenue
P.O. Box 6015
Indianapolis, Indiana 46206-6015
Telephone 317-232-8603
Environmental Helpline 1-800-451-6027

Construction Permit
Office of Air Management

Steel Dynamics, Inc.
4500 County Road 59
Butler, Indiana 46721

is hereby authorized to construct

The Office of Air Management (OAM) has reviewed an application from Steel Dynamics, Inc. relating to the construction, modification, and operation of the equipment listed in the Page 2 of this permit.

This permit is issued to the above mentioned company (herein known as the Permittee) under the provisions of 326 IAC 2-1, 40 CFR 52.780, and 40 CFR 52.21 with conditions listed on the attached pages.

Construction Permit No.: CP-033-8091-00043	
Issued by: Paul Dubenetzky Paul Dubenetzky, Branch Chief Office of Air Management	Issuance Date: June 25, 1997

a) a second two hundred (200) tons per hour electric arc furnace (EAF) with a direct shell evacuation (DSE) control to increase the total plant capacity of steel production to four hundred (400) tons per hour. The existing EAF capacity will be reduced to two hundred (200) tons per hour. The two (2) furnaces and ladle metallurgy stations will have a combined throughput of four hundred (400) tons per hour. The existing EAF baghouse air flow will be increase from 1.05 million dscf to 1.3 million dscf.

b) a tunnel furnace No. 2 with a ninety-two (92) MMBtu per hour low NOx natural gas-fired burners in the heating zone and twenty-five and nine tenths (25.9) MMBtu per hour low NOx natural gas-fired burners in the holding zone. The emissions from the heating zone will be emitted through stack (14) one hundred twenty-five (125) feet above the ground at an air flow of fifty thousand (50,000) acfm and the holding zone through stack (15) one hundred fifteen (115) feet above the ground at an air flow of twenty-four thousand one hundred (24,100) acfm.

c) a two hundred twenty-five (225) tons per hour continuous caster with emissions ducted to the EAF baghouse.

d) a direct reduction plant containing a two hundred ninety six (296) MMBtu/hr rotary hearth furnace (RHF) to process iron ore and coal to produce ninety-six (96) tons per hour of direct reduced iron. The following pollutant controls will be: an afterburner for CO and VOC, lime injection into the gas stream for SO_2, selective non catalytic reduction for NOx, a baghouse with pulse jet fiberglass filter for PM/PM_{10} and calcium sulfate (results of lime and SO_2 reaction). All the emissions will be exhausted through a stack one hundred (100) feet above ground level at an air flow of three hundred forty two thousand (342,000) acfm.

e) coal and iron ore handling will consist of: a receiving shed with plastic covers on the rail car openings, water spray in the dump area, baghouse to control shed particulate emissions, outdoor storage of coal and iron ore with berms to reduce wind erosion; a coal and ore stacker conveyor with a maximum capacity of two thousand five hundred (2,500) tons per hour with water sprayers at the discharge points; closed conveyors to move coal and ore to storage silos or coal crusher with a maximum capacity of one thousand one hundred (1100) tons per hour; and an enclosed coal crusher with a portion of the air recirculated with the remaining air directed to the RHF furnace baghouse.

f) Eleven (11) storage silos with particulate matter in the exhaust air controlled by fabric filter to store four (4) coal bins, four (4) iron ore bins, one (1) lime bin, one (1) bentonite bin, and one (1) bin for the RHF dust.

Construction Conditions

1. That the data and information supplied with the application shall be considered part of this permit. Prior to <u>any</u> proposed change in construction which may affect allowable emissions, the change must be approved by the Office of Air Management (OAM).

9. That pursuant to 326 IAC 2-6 (Emission Reporting), the owner/operator of Steel Dynamics, Inc. must annually submit an emission statement for the facility. This statement must be received by July 1 of each year and must comply with the minimum requirements specified in 326 IAC 2-6-4. A copy of this rule is enclosed. The annual statement must be submitted to:

Data Support Section, Office of Air Management
100 North Senate Avenue, P. O. Box 6015
Indianapolis, Indiana 46206-6015

The annual emission statement covers the twelve (12) consecutive month time period starting January 1 and ending December 31.

10. That pursuant to 326 IAC 2-2-3, the two shell electric arc furnaces (EAFs), PM/PM10 emissions shall be controlled by a direct shell evacuation system and canopy hood with 100 percent overall capture exhausted to a baghouse with 99.85 control efficiency, at an air flow rate of 1.3 million dscfm, discharging through a stack (S01) at a height of 125 feet above the ground. A slight negative pressures shall be maintained to draw particulate matter through the DSE duct. This air flow rate shall replace the flow rate limit in condition No. 7 in permit CP 033-3692 issued October 7, 1994.

11. That pursuant to 326 IAC 2-2-3 (BACT), the PM/PM10 emissions from the EAF baghouse stack (S01) shall not exceed 0.0032 grains per dscf, an air flow rate of 1.3 million dscfm (1.62 million acfm), and a maximum emission per hour of 35.7 pounds. This limit shall replace operation condition No. 5 lbs./hr limit in permit CP 033-3692 issued October 7, 1994.

12. That pursuant to 326 IAC 2-2-3 (BACT), the EAF baghouse stack (S01) opacity shall not exceed three percent (3%) determined by a six (6) minute average (24 readings taken in accordance with EPA Method 9, Appendix A) pursuant to 326 IAC 6-1-10.1 subsection (e). This condition will satisfy NSPS 40 CFR Part 60, Subpart AAa, 40 CFR 60.272a.

13. That pursuant to 326 IAC 2-2-3 (BACT), the fugitive emissions generated at the EAF shall not exceed three (3%) percent opacity from any building opening as determined by a six (6) minute average (24 readings taken in accordance with EPA Method 9, Appendix A). Three (3%) percent opacity is reflective of 100 percent capture.

14. That pursuant to 326 IAC 2-2-3 (BACT), the nitrogen oxide(s) emissions from EAFs using low-NOX natural gas-fired burners shall not exceed 0.51 pounds per ton of steel produced. The total emissions per hour shall not exceed 204.0 pounds.

15. That pursuant to 326 IAC 2-2-3 (BACT), the carbon monoxide emissions from the EAFs shall be controlled by an adjustment gap between the EAF direct shell evacuation system (DSE) and the remaining water cooled duct to the common baghouse. The CO emissions shall not exceed 2.0 pounds per ton of hot steel produced. The total emissions per hour shall not exceed 800 pounds. A slight negative pressure shall be maintained at the gap to ensure further combustion of the CO.

Steel Dynamics, Inc. CP 033-8091
Butler, IN Plt ID 033-00043

16. That pursuant to 326 IAC 2-2-3 (BACT), the volatile organic compound emissions from the EAFs shall be controlled through an extensive scrap management program filed with the OAM. All grades of scrap shall be free of non-ferrous metals, non-metallic, excessive dirt, oil, grease, and tin plate. Heavily oiled scrap such as used engine blocks and machine shop bodings shall not be used. The furnace shall be limited to 0.13 pounds of volatile organic emissions per ton of steel produced. The total emissions per hour shall not exceed 52.0 pounds.

17. That pursuant to 326 IAC 2-2-3 (BACT), the sulfur dioxide emissions from EAFs shall be controlled by the use of high quality scrap and monitoring the sulfur content of the coke. Emissions shall be not exceed 0.20 pounds per ton of steel produced. The total emissions per hour shall not exceed 80 pounds.

18. That pursuant to 326 IAC 2-2-3 (BACT), the lead emissions from the EAF baghouse shall not exceed 0.19 lbs/hr.

19. That pursuant to 326 IAC 2-2-3 (BACT), the PM/PM10 emissions from the new two hundred twenty-five (225) tons per hour continuous caster shall be controlled by a canopy hood positioned over the caster vented to the EAFs baghouse (SO1). Fugitive emissions emitted from any roof monitor or building opening shall not exceed three percent (3%) opacity determined by a six (6) minute average (24 readings taken in accordance with EPA Method 9, Appendix A) pursuant to 326 IAC 5-1-4.

20. That pursuant to 326 IAC 2-2-3 (BACT), the tunnel furnace No.2 heating zone shall be equipped with Low NOX natural gas-fired burners not exceeding ninety-two (92) million BTU per hour heat input and oxides of nitrogen emissions shall not exceed 0.10 lbs/MMBtu. The total emissions per hour shall not exceed 9.2 pounds.

21. That pursuant to 326 IAC 2-2-3 (BACT), the tunnel furnace No.2 holding zone shall be equipped with Low NOx natural gas-fired burners not exceeding twenty-five and nine tenths (25.9) million BTU per hour heat input and nitrogen oxide(s) emissions shall not exceed 0.10 lbs/MMBtu. The total emissions per hour shall not exceed 2.6 pounds.

22. That pursuant to 326 IAC 2-2-3 (BACT), the PM/PM10 emissions from the rotary hearth furnace baghouse shall not exceed an air flow rate design of 300,000 dscfm (342,000 acfm)and 0.0052 grains per dscf through stack 16 one hundred (100) feet above ground level. The total per hour emissions shall not exceed 13.4 pounds.

23. That pursuant to 326 IAC 2-2-3 (BACT), opacity from the rotary hearth furnace baghouse shall not exceed three (3%) percent determined by a six (6) minute average (24 readings taken in accordance with EPA Method 9, Appendix A) pursuant to 326 IAC 5-1-4.

24. That pursuant to 326 IAC 2-2-3 (BACT), the nitrogen oxide(s) emissions from rotary hearth furnace shall be controlled by the use of low-NOX natural gas-fired burners plus a selective non-catalytic reduction unit. Continuous emission monitoring (CEM), pursuant to 326 IAC3-1.1, shall be conducted and a record maintained. The total emissions per hour shall not exceed 120 pounds.

Steel Dynamics, Inc. CP 033-8091
Butler, IN Plt ID 033-00043

25. That pursuant to 326 IAC 2-2-3 (BACT), the carbon monoxide emissions from the rotary hearth furnace shall be controlled by an afterburner and operated at a temperature exceeding two thousand six hundred (2,600) ^{o}F and emissions shall not exceed 100 ppm, 114,519ug /M^{3}. Continuous emission monitoring (CEM), pursuant to 326 IAC 3-1.1, shall be conducted and a records maintained. The total emissions per hour shall not exceed 146.8 pounds.

26. That pursuant to 326 IAC 2-2-3 (BACT), the volatile organic compound emissions from the rotary hearth furnace shall be controlled by an afterburner and operated at a temperature exceeding two thousand six hundred (2,600) ^{o}F and emissions shall not exceed 0.06 pounds per ton of material charged into the furnace. The total emissions shall not exceed 6.23 lbs/hr.

27. That pursuant to 326 IAC 2-2-3 (BACT), the sulfur dioxide emissions from the rotary hearth furnace shall be controlled by lime injection and shall not exceed 0.75 pounds per ton of material charged into the furnace. Continuous emission monitoring (CEM), pursuant to 326 IAC 3-1.1, shall be conducted and a record maintained. The total emissions per hour shall not exceed 78 pounds.

28. That pursuant to 326 IAC 2-2-3 (BACT), lead emissions from the rotary hearth furnace shall not exceed 0.0021 pounds per hour.

29. That pursuant to 326 IAC 2-2-3 (BACT), the visible emissions discharged into the atmosphere from the silos storing coal, iron ore, lime, and rotary hearth furnace dust shall be limited to three (3%) percent opacity determined by a six (6) minute average (24 readings taken in accordance with EPA Method 9, Appendix A) pursuant to 326 IAC 5-1-4.

30. That pursuant to 326 IAC 2-2-3 (BACT), the fugitive particulate matter emissions into the atmosphere from the coal, iron ore,and rotary hearth furnace dust handling system shall be limited to three (3%) percent opacity determined by a six (6) minute average (24 readings taken in accordance with EPA Method 9, Appendix A) pursuant to 326 IAC 5-1-4.

31. That pursuant to 326 IAC 2-2-3 (BACT), coal and iron ore receiving shall be conducted in a shed. Water shall be sprayed on the material as the car is rotated to dump. The shed shall have closure material over the door openings. The air pressure in the shed shall be maintained at a level to ensure that material shall not escape through the doors. Emissions from the baghouse shall not exceed 0.01 gr/dscf of PM and an air flow of five thousand (5,000) scfm. The total emissions from the baghouse shall not exceed 0.46 lbs/hr. Visible emissions from the opening shall be limited to three percent (3%) opacity determined by a six (6) minute average (24 readings taken in accordance with EPA Method 9, Appendix A during actual dumping) pursuant to 326 IAC 5-1-4.

32. That pursuant to 326 IAC 2-2-3 (BACT), water shall be applied at each transfer and discharge point of the coal and iron ore stacker. The sprayer shall be operated at all times when the stacker is in operation and shall be used to control fugitive dust from the piles. The material dropping distance shall be maintained at less than three (3) feet.

33. That pursuant to 326 IAC 2-2-3 (BACT), the material shall be removed to hoppers located below ground level by front loaders The discharge dropping distance shall be less than three (3) feet.

34. That pursuant to 326 IAC 2-2-3 (BACT), the coal and iron conveyors shall be covered and the transfer point enclosed. The visible emissions at the discharged and transfer point shall be limited to three (3%) percent opacity determined by a six (6) minute average (24 readings taken in accordance with EPA Method 9, Appendix A) pursuant to 316 IAC 6-1-10.1 subsection (e).

35. That pursuant to 326 IAC 2-2-3 (BACT), the coal double cone classifier (grinder) shall be totally enclosed. The air from the product collectors that is not recirculated shall be emitted through the rotary hearth furnace baghouse.

36. That pursuant to 326 IAC 2-2-3 (BACT), visible emissions from vents, stacks, and building roof monitors, unless otherwise specified, shall not exceed three (3%) percent opacity, Visible emissions shall be determined by a six (6) minute average (24 readings taken in accordance with EPA Method 9, Appendix A) pursuant to 326 IAC 5-1-4.

37. That visible emission readings shall be:

a) recorded and maintained for three (3) years,

b) made available for review upon request of OAM staff, and

c) reported to the OAM on a quarterly basis of readings in excess of the limits specified in operation conditions.

38. That pursuant to 326 IAC 3-1.1 and NSPS 40 CFR 60.273a, Emission Monitoring, a continuous monitoring system for the measurement of the opacity of emissions discharged into the atmosphere from the control device on the EAF stack shall be installed, calibrated, maintained, and operated by the owner or operator.

39. That pursuant to 40 CFR 60.274a, Monitoring of operations.

(a) The owner or operator subject to the provisions of this Subpart shall maintain records of the following information:

(1) All data obtained under paragraph (b) of this section; and

(2) All monthly operational status inspections performed under paragraph (c) of this section.

(b) Except as provided under paragraph (d) of this section, the owner or operator subject to the provisions of this Subpart, shall check and record on a once-per-shift basis, the furnace static pressure on the DEC system and either; (1) check and record the control system fan motor amperes and damper position on a once-per-shift basis; or (2) install, calibrate, and maintain a monitoring device that continuously records the volumetric flow rate through each separately

ducted hood. The monitoring device(s) may be installed in any appropriate location in the exhaust duct such that reproducible flow rate monitoring will result. The flow rate monitoring device(s) shall have an accuracy of ±10 percent over its normal operating range and shall be calibrated according to the manufacturer's instructions. The Administrator may require the owner or operator to demonstrate the accuracy of the monitoring device(s) relative to Methods 1 and 2 of appendix A of this part.

(c) When the owner or operator of an affected facility is required to demonstrate compliance with the standards under § 60.272a(a)(3) and at any other time the Administrator may require that (under section 114 of the Act, as amended) either the control system fan motor amperes and all damper positions or the volumetric flow rate through each separately ducted hood shall be determined during all periods in which a hood is operated for the purpose of capturing emissions from the affected facility subject to paragraph (b)(1) or (b)(2) of this section. The owner or operator may petition the Administrator for reestablishment of these parameters whenever the owner or operator can demonstrate to the Administrator's satisfaction that the affected facility operating conditions upon which the parameters were previously established are no longer applicable. The values of these parameters as determined during the most recent demonstration of compliance shall be maintained at the appropriate level for each applicable period. Operation at other than baseline values may be subject to the requirements of paragraph 276a(c).

(d) The owner or operator shall perform monthly operational status inspections of the equipment that is important to the performance of the total capture system (i.e., pressure sensors, dampers, and damper switches). This inspection shall include observations of the physical appearance of the equipment (e.g., presence of holes in ductwork or hoods, flow constrictions caused by dents or accumulated dust in ductwork, and fan erosion). Any deficiencies shall be noted and proper maintenance performed.

(e) The owner or operator may petition the Administrator to approve any alternative to monthly operational status inspections that will provide a continuous record of the operation of each emission capture system.

(f) If emissions during any phase of the heat time are controlled by the use of a DEC system, the owner or operator shall install, calibrate, and maintain a monitoring device that allows the pressure in the free space inside the EAF to be monitored. The monitoring device may be installed in any appropriate location in the EAF or DEC duct prior to the introduction of ambient air such that reproducible results will be obtained. The pressure monitoring device shall have an accuracy of ±5 mm of water gauge over its normal operating range and shall be calibrated according to the manufacturer's instructions.

(g) When the owner or operator of an EAF controlled by a DEC is required to demonstrate compliance with the standard under § 60.272a(a)(3) of this Subpart, and at any other time the Administrator may require (under section 114 of the Clean Air Act, as amended), the pressure in the free space inside the furnace shall be determined during the melting and refining period(s) using the monitoring device required under paragraph (f) of this section. The owner or

operator may petition the Administrator for reestablishment of the 15-minute integrated average of the pressure whenever the owner or operator can demonstrate to the Administrator's satisfaction that the EAF operating conditions upon which the pressures were previously established are no longer applicable. The pressure determined during the most recent demonstration of compliance shall be maintained at all times when the EAF is operating in a meltdown and refining period. Operation at higher pressures may be considered by the Administrator to be an unacceptable operation and maintenance of the affected facility.

(h) During any performance test required under § 60.8, and for any report there of required by § 60.275a(d) of this Subpart, or to determine compliance with § 60.272a(a)(3) of this Subpart, the owner or operator shall monitor the following information for all heats covered by the test:

(1) Charge weights and materials, and tap weights and materials;

(2) Heat times, including start and stop times, and a log of process operation, including periods of no operation during testing and the pressure inside an EAF when direct-shell evacuation control systems are used;

(3) Control device operation log; and

(4) Continuous monitor or Reference Method 9 data.

40. That pursuant to 326 IAC 12 and 40 CFR Part 60, Subpart AAa, Standards of Performance for Steel Plants: Electric Arc Furnaces and Argon-Oxygen Decarburization Vessels Constructed After August 7, 1983, the EAF shall comply with New Source Performance Standards requirements of 40 CFR 60.276a, Recordkeeping and reporting requirements.

41. That the baghouse controlling emissions from the EAF, rotary hearth furnace, coal/iron ore receiving, and coal crusher facilities shall be operated at all times when units are in operation. The pressure drops from the baghouses shall be maintained within the range of 6 to 8 inches of water. If the inches of water from these baghouses fall outside their ranges, corrective action shall be taken in accordance with Steel Dynamics, Inc. The "Operation, Maintenance and Fugitive Dust Plan" on record with the IDEM. The company shall document the cause of the out of range reading and take immediate action to correct any problem. Failure or partial failure of control devices shall be reported to IDEM according to the procedure specified for malfunctions in 326 IAC 1-6-2, in which case the provisions of 326 IAC 1-6-5 may apply at the discretion of IDEM. Records shall be maintained at the source for a minimum period of three (3) years and be made available upon request of the Office of Air Management (OAM). In the event that the pressure is outside the stated limits, the permittee shall comply with the requirements of operation condition No. 39.

42. That the permittee shall implement the following procedures when parameters for the baghouses are not operating in the required operation permit conditions:

a) implement the inspection of the system and the baghouse in accordance with the operation and maintenance plan submitted to the IDEM OAM,

b) maintain documentation on the cause of the out of range readings,

c) implement immediate corrective action for any problems discovered, corrective action shall be taken in accordance with Operation, and Maintenance submitted to the OAM prior to the start of operation,

d) report to IDEM failure or partial failure of control devices according to the procedure specified for malfunctions in 326 IAC 1-6-2, in which case the provisions of 326 IAC 1-6-5 may apply at the discretion of IDEM. OAM reserves the right to request stack tests pursuant to 326 IAC 2-1-4 (Operating Permits).

43. That an accedence of an allowable opacity limit specified for each emission unit or piece of equipment shall be considered as a violation of the permit condition and shall not be refuted by a stack test conducted by the source demonstrating compliance with the mass limit.

44. The ambient monitoring site required in construction permit CP 033-3692 for PM10, lead, and meteorological permameters shall be operated at the present locations for an additional minimum period of two years after the modification has been completed. After this period the owner may petition for the removal of the monitoring requirements, if it is established to the satisfaction of the Commissioner, that ambient particulate levels shall continue to comply with the NAAQS. Data from the monitors shall be submitted on a quarterly basis in a format approved by the Commissioner.

45. That visible emission notations of all exhaust to the atmosphere from the baghouses and roof vents shall be performed once per working shift. A trained employee shall record whether emissions are normal or abnormal.

a) For processes operated continuously, "normal" means those conditions prevailing, or expected to prevail, 80% of the time the process is in operation, not counting start up or shut down time.

(b) In the case of batch or discontinuous operation, readings shall be taken during that part of the operation specified in the facility's specific condition prescribing visible emissions.

(c) A trained employee is an employee who has worked at the plant at least one (1) month and has been trained in the appearance and characteristics of normal and abnormal visible emissions for that specific process.

(d) The Preventive Maintenance Plan for this facility shall contain trouble shooting contingency and corrective actions for when an abnormal emission is observed.

46. That pursuant to 326 IAC 6-4 (Fugitive Dust Emissions), the permittee shall be in violation of 326 IAC 6-4 (Fugitive Dust Emissions) if any of the criteria specified in 326 IAC 6-4-2(1) through (4) are

violated. Observations of visible emissions crossing the property line of the source at or near ground level must be made by a qualified representative of IDEM. [326 IAC 6-4-5(c)].

47. Pursuant to 326 IAC 1-5-2 (Emergency Reduction Plans; Submission):

a) The Permittee shall prepare written emergency reduction plans (ERPs) consistent with safe operating procedures.

(b) These ERPs shall be submitted for approval to:

Indiana Department of Environmental Management
Compliance Branch, Office of Air Management
100 North Senate Avenue, P.O. Box 6015
Indianapolis, Indiana 46206-6015

within ninety (90) calendar days from the date on which this source commences operation.

(c) If the ERP is disapproved by IDEM, OAM, the Permittee shall have an additional thirty (30) days to resolve the differences and submit an approvable ERP. If after this time, the Permittee does not submit an approvalable ERP, IDEM, OAM (and local agency), shall supply such a plan.

(d) These ERPs shall state those actions that will be taken, when each episode level is declared, to reduce or eliminate emissions of the appropriate air pollutants.

(e) Said ERPs shall also identify the sources of air pollutants, the approximate amount of reduction of the pollutants, and a brief description of the manner in which the reduction will be achieved.

(g) Upon direct notification by IDEM, OAM (and local agency), that a specific air pollution episode level is in effect, the Permittee shall immediately put into effect the actions stipulated in the approved ERP for the appropriate level. [326 IAC 1-5-3]

48. That a log of information necessary to document compliance with production limitations, process emission limits, heater capacities, visible emission exceedances, ambient monitoring results, and NSPS requirements shall be maintained. These records shall be kept for at least the past 36 months and made available upon request to the Office of Air Management. A quarterly summary shall be submitted to:

Compliance Data Section
Office of Air Management
100 North Senate Avenue
P.O. Box 6015
Indianapolis, Indiana 46206-6015

Steel Dynamics, Inc.
Butler, IN

CP 033-8091
Plt ID 033-00043

Within 30 days after the end of the quarter being reported in the format attached. These reports shall include the required NSPS requirements, and operation permit requirements.

Indiana Department of Environmental Management
Office of Air Management

Technical Support Document (TSD) for New Construction and Operation

Source Background and Description

Source Name: **Steel Dynamics, Inc**
Source Location: **4500 DeKalb County Road 59, Butler, Indiana**
County: **DeKalb**
Construction Permit No.: **CP 033-8091**
SIC Code: **3312**
Permit Reviewer: **RWO**

The Office of Air Management (OAM) has reviewed an application from Steel Dynamics, Inc. relating to the construction, modification, and operation of:

a) a second two hundred (200) tons per hour(T/hr) electric arc furnace (EAF) with a direct shell evacuation (DSE) system will be added to increase the plants total capacity of steel production from two hundred twenty-five (225) T/hr to four hundred (400) T/hr. The existing EAF baghouse with air flow will be increased from 1.05 million dscf to 1.3 million dscf. The particulate emissions will continue to be limited to 0.0032 gr/dscf.

b) a tunnel furnace Id No. 2 with a ninety-two (92) Million Btu per hour low NOx natural gas-fired burners in the heating zone and twenty-five and nine tenths (25.9) Million Btu per hour low NOx natural gas-fired burners in the holding zone. The emissions from the heating zone will be emitted through stack No. 14 and the holding zone through stack No. 15.

c) a two hundred twenty-five (225) T/hr continuous caster with emissions ducted to the EAF baghouse.

d) a direct reduction plant containing a rotary hearth furnace (RHF) to blend coal and iron ore into ninety-six (96) tons per hour (T/hr) of direct reduced iron to be added to the EAF. The RHF will be equipped with the following pollutant controls: lime injection for SO_2, selective non catalytic reduction for NOx, pulse jet fiber filter for PM/PM_{10} from the furnace and the calcium sulfate (results of lime and SO_2 reaction), and an afterburner for CO and VOC. All emissions will exhaust through stack No. 16.

e) coal and iron ore handling twenty-five thousand (25,000) tons of coal and seventy-five thousand (75,000) tons of iron ore per month. The receiving will consisting of: an enclosed receiving shed with plastic covers on the entrance and exit, water spray over the receiving area, and baghouse to control PM/PM10 in the shed. A boom will be used to deliver material to the outdoor storage piles. Water will be sprayed at the discharge and transfer points and to maintain moisture content of the material. A berm will be constructed for fugitive dust control. The material will be moved in closed conveyors to coal crusher storage silos. The coal crusher will be totally enclosed with air exhausted to the RHF furnace baghouse.

f) Eleven (11) storage silos with particulate matter in the exhaust air controlled by fabric filter to store four (4) coal bins, four (4) iron ore bins, one (1) lime bin, one (1) bentonite bin, and one (1) bin for the RHF dust.

Source Definition

The company will be employing a new process to make a scrap substitute to supplement the scrap for the electric arc furnace. The scrap substitute will be produced from coal and iron ore processed in a rotary hearth furnace (RHF). The coal and ore mixture will be fed into the RHF where the oxygen in the ore will combine with the carbon in the combustion gasses reducing the ore to a scrap substitute. The required coal and iron ore will be received in a shed. A baghouse will collect emissions during tipping of the rail car shed that are not trapped by the water sprayed on the material as it is unloaded from the rail car. The material will be conveyed to storage. The sprayer on the boom will be used during piling and to maintain the moisture content of the pile to control wind generated fugitive emissions. The coal and ore will be carried or pushed into a conveyor hopper for transfer to the coal crusher or storage silos. The crushers will be totally enclosed and a portion of the air from product collectors will be recycled to the crusher and the remaining air exhausted to the RHF baghouse. The crushed material will be stored in silos before being fed into the RHF. The PM/PM_{10}, SO2 and NOx emissions from the RHF will be controlled as detailed under the BACT analysis section. The product from the RHF will be transferred to the EAF in a sealed system to prevent the scrap substitute from re-oxidizing.

Stack Summary

Stack ID	Operation	Height (feet)	Diameter (feet)	Flow Rate (ACFM)	Temperature (f)
14	tunnel furnace #2 heating zone	125	6	50,000	1235
15	tunnel furnace #2 holding zone	115	4	24,100	1600
16	rotary furnace	100	11	342,000	350
1	existing EAF baghouse	125	20	1,620,000	200

Recommendation

The staff recommends to the Commissioner that the construction and operation be approved. This recommendation is based on the following facts and conditions:

Information, unless otherwise stated, used in this review was derived from the application and additional information submitted by the applicant.

An application for the purposes of this review was received on January 16, 1997, with additional information received on February 12, 1997 and March 21, 1997.

Emissions Calculations

The emissions supplied with the application were reviewed and found to be acceptable except for the carbon monoxide emissions of 4.7 lbs/ton from electric arc furnaces (EAFs) and the nitrogen oxides emission of 0.17 lbs/ million Btu from the No. 2 tunnel furnace. The EAF, CO allowable emissions will be the limit established in construction permit CP 033-3692, issued October 7, 1994, of 2.0 lbs/ton of steel produced. The permitted NOx will be 0.10 lbs/million Btu from the tunnel furnace. See Appendix "B" Proposed Modified Section, pages B-21 -B-35, in the application for calculations and attached modified summary sheet of the emissions. The modeling was conducted with CO emissions of 2.0 lbs/ton and the tunnel furnace at the level in the application.

Total Potential and Allowable Emissions

- Indiana Permit Allowable Emissions Definition (after compliance with applicable rules, based on 8,760 hours of operation per year at rated capacity):

Pollutant	Allowable Emissions (tons/year)
Particulate Matter (PM)	135.9
Particulate Matter (PM10)	120.8
Sulfur Dioxide (SO_2)	495.2
Volatile Organic Compounds (VOC)	128.4
Carbon Monoxide (CO)	2194
Nitrogen Oxides (NO_x)	975.4
Single Hazardous Air Pollutant (HAP)	2.7
Combination of HAPs	4.5

(a) Allowable emissions are determined from the applicability of rule 326 IAC (i.e. 5-1, 6-3, and 6-4). See application in Appendix B, pages B-20 through B-36 for detailed calculations and spreadsheets for modification of CO emissions and summary of emissions comparing existing with the permitted allowable.

(c) Allowable emissions (as defined in the Indiana Rule) of PM, SO2, VOC, CO, and NOx are greater than 25 tons per year. Therefore, pursuant to 326 IAC 2-1, Sections 1 and 3, a construction permit is required.

(d) Allowable emissions (as defined in the Indiana Rule) of a single hazardous air pollutant (HAP) is not greater than 10 tons per year and/or the allowable emissions of any combination of the HAPs are not greater than 25 tons per year.

County Attainment Status

(a) Volatile organic compounds (VOC) and oxides of nitrogen are precursors for the formation of ozone. Therefore, VOC and NOx emissions are considered when evaluating the rule applicability relating to the ozone standards. DeKalb County has been designated as attainment or unclassifiable for ozone. Therefore, VOC and NOx emissions were reviewed pursuant to the

requirements for Prevention of Significant Deterioration (PSD), 326 IAC 2-2 and 40 CFR 52.21.

(b) DeKalb County has been classified as attainment or unclassifiable for total suspended particulate, sulfur dioxide, carbon monoxide, and oxides of nitrogen. Therefore, these emissions were reviewed pursuant to the requirements for Prevention of Significant Deterioration (PSD), 326 IAC 2-2 and 40 CFR 52.21.

Source Status

Existing Source PSD, Part 70 or FESOP Definition (emissions after controls, based on 8,760 hours of operation per year at rated capacity and/ or as otherwise limited):

Pollutant	Emissions (ton/yr)
PM	233
PM10	225
SO_2	198
VOC	135
CO	2031
NO_x	819

This existing source is a major stationary source because it is in one of the 28 listed source categories and at least one regulated pollutant is emitted at a rate of 100 tons per year or more.

These emissions were based on maximum potential emissions from the existing sources as approved in previously issued construction permits.

Proposed Modification

PSD potential emissions from the proposed modification (after compliance with applicable rules, based on 8,760 hours of operation per year at rated capacity and/or as limited by operation conditions):

Pollutant	PM (ton/yr)	PM10 (ton/yr)	SO_2 (ton/yr)	VOC (ton/yr)	CO (ton/yr)	NO_x (ton/yr)
Proposed Modification	135.9	120.8	495.2	128.4	2194	975.4
Contemporaneous Increases	0	0	0	0	0	0
Contemporaneous Decreases	0	0	0	0	0	0
Net Emissions	135.9	120.8	495.2	128.4	2194	975.4
PSD or Offset Significant Level	25	15	40	40	100	40

This modification to the existing major stationary source is major because the emissions increase are greater than the PSD significant levels. Therefore, pursuant to 326 IAC 2-2, and 40 CFR 52.21, PSD requirements do apply.

Federal Rule Applicability

The electric arc furnace is subject to the New Source Performance Standard, 326 IAC 12, (40 CFR Part 60.270, Subpart AAa). This rule requires the following:

(a) The particulate matter emissions are limited to 0.0052 grains per dry standard cubic foot, and three (3%) percent opacity from the controls and limits shop emissions to six (6%) percent opacity (40 CFR 60.272a, Standard for particulate matter).

(b) Install, calibrate, and maintain a continuous monitoring system or conduct three (3), six (6) minute visible emission observations in accordance with EPA method 9 at least once a day (40 CFR 60.273a, Emission monitoring).

(c). Check and record on a once-per-shift basis, the furnace static pressure (40 CFR 60.274a, Monitoring of operations).

(d). Conduct performance tests 40 CFR 60.275a, (Test methods and procedures).

(e). Maintain records for at least two (2) years and supply the OAM semi-annual reports (40 CFR 60.276a, Recordkeeping and reporting requirements).

This PSD source is subject to 40 CFR 52.780, "Review of New Sources and Modifications"

State Rule Applicability

326 IAC 1-6-2 (Malfunctions: Notice)
Pursuant to 326 IAC 1-6-2 (Records; Notice of Malfunction):

(a) A record of all malfunctions, including startups or shutdowns of any facility or emission control equipment, which result in violations of applicable air pollution control regulations or applicable emission limitations shall be kept and retained for a period of three (3) years and shall be made available to the Indiana Department of Environmental Management (IDEM), Office of Air Management (OAM) or appointed representative upon request.

(b) When a malfunction of any facility or emission control equipment occurs which lasts more than one (1) hour, said condition shall be reported to OAM, using the Malfunction Report Forms (2 pages). Notification shall be made by telephone or facsimile, as soon as practicable, but in no event later than four (4) daytime business hours after the beginning of said occurrence.

(c) Failure to report a malfunction of any emission control equipment shall constitute a violation of 326 IAC 1-6, and any other applicable rules. Information of the scope and expected duration of the malfunction shall be provided, including the items specified in 326 IAC 1-6-2(a)(1) through (6).

(d) Malfunction is defined as any sudden, unavoidable failure of any air pollution control equipment, process, or combustion or process equipment to operate in a normal and usual manner. [326 IAC 1-2-39].

326 IAC 2-2 (Prevention of Significant Deterioration Requirements)

The quantity of the regulated pollutants is great enough to subject the facility to a PSD review to determine the impact on ambient air quality standards in the area. The review was extended to determine the impact on the areas of DeKalb County that are currently classified as not meeting ambient air quality standards for SO2, Pb, and CO.

326 IAC 2-6 (Emission Reporting)

This facility is subject to 326 IAC 2-6 (Emission Reporting), because it emits more than 100 tons/yr of particulate matter, sulfur dioxide, carbon monoxide, oxides of nitrogen, and VOC. Pursuant to this rule, the owner/operator of this facility must annually submit an emission statement of the facility. The annual statement must be received by July 1 of each year and must contain the minimum requirements as specified in 326 IAC 2-6-4. A copy of the applicable rule will be enclosed with the permit.

326 IAC 5-1(Opacity Limitations)

This facility is subject to opacity limits as specified in 326 IAC 5-1-2 and the specific opacity limitations established by operation conditions.

326 IAC 6-3 (Process Operations)

326 IAC 6-3, Particulate Emission Limitations for Process Operations, limits PM/PM-10 emissions from the following operations integral to the Steel Dynamics, Inc. steel making. For purposes of determining the Indiana 326 IAC 6-3 limit for each process, the following equation was used:

$E=55.0\ P^{0.11} - 40$
where
E = allowable limit, pounds per hour, and
P = process weight rate, T/hr (EAF = 400 tons/hour)
$E = 55.0 * P^{0.11} - 40$
$E = 55.0 * 400.0^{0.11} - 40$
E = 66.3 lbs/hour

Projected emissions after modification based on 400 tons per hour production 233.3 tons per year. (233.3 Tons / year * 2000 lbs. / ton) / 8760 hours per year = 53.3 lbs. / hour

This facility will achieve compliance with PM/ PM_{10} by the use of BACT controls and operating conditions limiting emissions.

326 IAC 6-5 (Fugitive Particulate Matter Emission Limitations)

This facility is subject to opacity limits as specified in 326 IAC 6-4 and the fugitive dust plan submitted by the facility.

326 IAC 7-1.1-2, (Sulfur Dioxide Emission Limitations)

A limit on the amount of SO2 emissions will be controlled by the scrap plan and controls on the rotary hearth furnace.

New Electric Arc Furnace (EAF) BACT

PM/PM_{10}

Scrap metal, scrap substitute, pebbled lime, and carbon (coke) are charged into the existing EAF and the second EAF being added. The EAFs will have oxygen/fuel/auxiliary natural gas-fired burners to aid in the melting and to control CO emissions generated during melting under the hood. The charging and melting cycles are staggered between the two (2) electric arc furnaces. The melting period emissions will be captured by the direct shell evacuation (DSE) system. Fugitive emissions generated during charging when the DSE is removed will be collected by an overhead canopy. The collected particulate matter emissions from the canopy and DSE will be controlled by the existing baghouse containing polyester bags. The air flow in the baghouse will be increased from the air flow current 1.3 million cubic feet per minute to 1.6 million cubic feet per minute.

The existing canopy over the furnaces shown in the drawing submitted and approved in the original application will control emissions from both furnaces.. This approaches total enclosure of the EAF area for the purpose of calculating fugitive emissions by:

(a) the absence of roof monitors in the furnace bays,

(b) the continuation of sheeting between the furnace and casting bays will cause any fugitive dust laden air to cool and fall to the ground within the furnace bay, and

(c) the addition of roll-up truck doors on the openings in the furnace area for wind minimization.,

Fugitive emissions generated at each shell in the EAF during each complete cycle from tap to tap shall not exceed three (3) percent opacity when emitted from any building opening. Three (3) percent opacity will be reflective of one hundred (100%) percent capture. Since the emissions inventory did not account for any emissions from the dust handling system, the three (3) percent opacity is appropriate. NSPS, 40 CFR Part 60.272(a) states that affected electric arc furnace limits are 0.0052 gr/dscf for particulate matter, three percent (3%) opacity at the control device, and six percent (6%) opacity from the shop due solely to the operation of the EAF.

Particulate matter BACT will be a DSE system on the furnaces, furnace bay canopy, building configuration, a maximum air of 1,300,000 million cubic per dscf (dry standard cubic feet per minute), and an emission limit of 0.0032 gr/dscf.

SO_2

Charging methods and three (3) flue gas desulfurization options, wet scrubbing, a dry scrubber absorption, and dry sorbent injection, were evaluated to control SO_2 emissions from the EAF.

Carbon with low sulfur content will continue to injection into the furnace. The current permitted level ranges from 0.8-1.00% to 0.2-0.5% sulfur.

A wet scrubber that is designed to inject a wet slurry of lime or limestone into the exhaust gas stream was rejected because: the cost of installation equals two to three times the cost of a dry scrubber, treating the sludge, and the disposal of the sludge, possible water pollution, and relatively low SO_2 rate in the exhaust stream.

The reaction of SO_2 with the fine droplet of a spray dry absorption utilizing sodium carbonate or slaked lime was evaluated. Sulfites and sulfates will be produced by the reaction. The heat in the exhaust will dry the droplets producing dry powder that would be collected in the baghouse. The baghouse would require the use of Teflon-coated bags due to possible corrosion and to collect the fine particulate. The control was rejected as BACT because of the high flow rate and the relatively low SO2 concentrations.

The application of dry sorbent injection is mainly in furnaces or utility boilers where the dry powder can be injected directly into the furnace or post-furnace region. The control was rejected as BACT because: the required mixing cannot be obtained by injection of the powder into the exhaust gas steam, the low concentration of SO2 in the high exhaust flow rate, and low collection efficiency estimated at fifty percent (50%).

BACT shall be use of high quality steel, maintaining the sulfur content of the coke to less than one percent (1%) and an operation condition stating emissions shall not exceed 0.2 lb/ton.

NOx

Seven combustion controls: low excess air (LEA), overfired air burners (OFA) out of service (BOOS), reduced combustion air temperature (RCAT), flue gas recirculation (FGR), and oxyfuel burners, were evaluated for NOx emissions. In addition, selective catalytic reduction (SCR) and three (3) non-catalytic reductions, (NSCR) systems Exxon Thermal DeNOx®, and Nalco Fuel Tech's NoxOUT®, were evaluated for NOx emissions reduction.

The LEA option is not very effective for an EAF because the reduction of excess air to less than normal will result in increased CO emissions.

The OFA option reduces NOx emissions by conducting combustion in a full rich combustion zone and lower temperature air fuel-lean zone. The OFA is used in large utility boilers. The design of the OFA does not adapt to an EAFdue to inadequate resdence time and incomplete combustion.

The BOOS option requires sections of burners to be taken out of service, but air is required to continue to be supplied. The EAF design does not allow enough residence time to adequately reduce NOx, and the required uniform heating for even melting of the charge from tap to tap.

The RCAT option requires a combustion system which preheats the incoming air. The preheating is an inherent component of the EAF and will be incorporated in a portion of the EAF.

The FGR option requires the recycling of cooled flue gas back into the combustion zone and introduction of inert products into the combustion zone. The results will be cold spots requiring additional burners which will actually increase NOx emissions. Therefore, FGR is not practical to be added to the EAF, due to design, required added burners, and the lowering of the melting efficiency.

The Exxon Thermal DeNOx® option to reduce emissions must have a relatively stable exhaust gas stream and NOx concentration. The system has not been utilized for EAF because the temperature will vary widely over the melt cycle and will not remain in the desired temperature window.

The Nalco Fuel Tech's NoxOUT® option requires a relatively stable gas flow, consistent NOx concentrations, proper residence time, and proper temperature to be effective. The Exxon

Thermal DeNOx® system has not been utilized for EAF because of these limitations.

BACT will be low-NOx natural gas-fired oxyfuel burners, and an operation permit condition stating that NOx emission shall not exceed 0.51 lbs/ton of steel produced.

CO

Seven (7) methods of controlling CO were evaluated in addition to operation practices modifications. Operation practices will be the incorporation of improves to the foamy slag process. The chemical energy of the operation practices reduces electric usage and will extend the life of the equipment. The seven options reviewed were: flaring, CO oxidation catalyst, post combustion reaction chamber, catalytic incineration, oxygen injection and direct shell evacuation (DSE) controls.

Flaring was reviewed and rejected because of the added fuel required to increase the exhaust gas temperature from 200°F to 1,300°F for the 1.6 million ACM air flow for adequate temperature and residence time for CO destruction. The added fuel will also increase NOx emissions from the natural gas-fire heaters.

CO oxidation catalyst was reviewed and rejected because the control would need to be installed after the baghouse. The concentration of particulate in the gas stream would foul the catalyst. The temperature exiting from the baghouse will be far below that required for CO destruction. This would require reheating of the exhaust gas and increase NOx emissions.

The post combustion reaction chamber option was reviewed and rejected. The post combustion requires placing duct burners or thermal incinerators prior to the baghouse. The high particulate concentration in the exhaust gas would plug the burners making it difficult to maintain burner efficiency. Locating the burners or thermal incinerators after the baghouse would require reheating the exhaust gas which were cooled to meet baghouse requirements.

Catalytic incineration was reviewed and rejected. Placing the unit before the baghouse to take advantage of the higher temperature would subject the catalysts to plugging, cause severe maintenance problems, and will reduce the reliability of the control. Locating the system after the baghouse would require additional heat to reheat the exhaust gas that were cooled to meet baghouse requirements.

The oxygen injection option was reviewed and rejected because the direct injection of oxygen into furnace has not been demonstrated to reduce CO. Oxygen lances and oxyfuel burners will be used to reduce CO emissions.

The direct shell evacuation, fourth hole furnace control system, was selected because of the lower air flow rate and its acceptance as the primary control technology for controlling CO. An adjustable gap in the duct work between the furnace and the EAF. The baghouse is kept under negative pressure and will draw air into the gap. The oxygen in the air entering through the gap allows for continued combustion of the CO.

BACT will be the direct shell evacuation (DSE) and an operation condition that states CO emissions shall not exceed 2.0 lbs / ton of steel produced.

VOC

Three (3) methods of control, catalytic or thermal oxidation, degreasing of scrap before processing, and scrap management plan, were evaluated again as possible VOC controls. BACT will be the current scrap management plan on file which eliminates the purchase of oily scrap steel or scrap items containing oil.

Added Tunnel Furnaces BACT Analysis

PM , PM_{10} SO2 & VOC

Due to the low amount of emissions generated from low-NOx natural gas-fired burners, add on controls were impractical.

NOx

Combustion control systems composed of: low excesses air (LEA), overfire air (OFA) , burners out of service (BOOS), reduced combustion air temperature (RCAT), Load reduction (LR), flue gas recirculation (FGR), and Low NOx Burners (LNBs) were reviewed.

The LEA was eliminated from further consideration because of the increased production of carbon monoxide and is not effective for this type of furnace.

The OFA was eliminated from further consideration because it may not heat the steel slab from the caster uniform enough to provide for an adequately rolling temperature and the added equipment required for the furnaces.

The BOOS was eliminated from further consideration because of the extra burners needed, increasing emissions from the combustion of the gas, and residual time to properly heat the slab to accomplish an adequate rolling temperature.

The RCAT is already incorporated into the overall furnace design.

The FGR was eliminated from further consideration because of the poor heat distribution, reduces efficiency of the furnace resulting in inadequate rolling of the slab producing a poor quality product.

The use of add on controls was evaluated. These controls consisted of: one (1) catalytic reduction and three (3) non-catalytic reduction systems were evaluated.

The selective catalytic reduction (SCR) was eliminated due to a variable gas flow rate, the NOx concentrations, the difficulty of maintaining optimum temperature range for destruction and controlling ammonia loss along with materials in the gasses that can coat catalyst (catalytic poisoning).

The non-selective catalytic reduction was rejected because these units currently are limited to internal combustion engines.

The selective catalytic reduction, Exxon's Thermal DeNOx®, was eliminated because a lack of a stable air flow rate to ensure adequate residence time, the maintaining a sufficient temperature to destroy the NOx, possible ammonia escaping, and the low destruction efficiency.

The selective catalytic reduction, Nalco Fuel Tech's NoxOUT® was eliminated because of the lack of a stable air flow rate to ensure adequate residence time, maintaining a sufficient temperature for the added urea to react, and low efficiency.

BACT shall be low-NOx natural gas-fired burners because of the ability to adjust to caster speed, caster slab temperature, slab width, steel grades, width of product, and different gauges require different rolling temperatures.

CO

A check of the federal BLIS database control base verified the company statement that no application of alternative for CO. The cost of possible use of oxidation catalyst (see table 2-7 in the application) was conducted and the cost was determined to be $355,000 per ton of VOC removed. BACT shall be low-NOx natural gas-fired burners.

The Added Caster Analysis

PM & PM_{10}

The new caster will employ the same control technology as the existing caster. BACT for control of the PM/PM_{10} emissions from the water cooling of the hot metal will be captured by a hood over the caster connected to the EAF baghouse.

Rotary Hearth Furnace BACT Analysis

The rotary heart furnace (RHF) will be charged with coal and iron ore at a rate of approximately one hundred four (104) tons per hour. The RHF contains eight (8) heating zones fired by natural gas burners to ignite the coal and continue the combustion of coal. The total heat input is designed to produce two hundred ninety-six million (296,000,000) Btu per hour. The coal and ore will be blanketed by carbon monoxide which will react with the oxygen in the ore to form sixty-nine (69) tons per hour of scrap substitute. The reduction of the mixture from one hundred four (104) tons to (69) tons per hour is the result of the coal combustion and oxygen in the iron ore reduction, and moisture loss. The scrap substitute will be moved from the RHF to the EAF in a blanket of nitrogen to prevent oxidation.

PM & PM_{10}

A baghouse will be the control employed as the BACT control. The baghouse will utilize fiberglass bags due to the temperature of 350°F in the unit. The baghouse will be under negative pressure, air will be pulled through the baghouse. The PM and PM_{10} emission this baghouse will be limited to 0.0052 gr/dscf rather than the 0.0032 gr/dscf for the EAF due to the lower volume of air flow and the higher exhaust temperatures.

SO2

The main source of the SO_2 will be from the coal in the process. Hydrated lime will be injected into the waste gas before the baghouse to form calcium sulfate $CaSO_4$. The $CaSO_4$ will be collected in the baghouse.

NOX

A selective non catalytic reduction (SNCR) control can be used to reduce the NOX because the gas temperature of the flue gas is cooled from two thousand six hundred (2600)°F to one thousand eight hundred (1800)°F. The temperature difference provides sufficient residence time

to achieve at least fifty percent (50%) reduction. The SNCR will utilize the injection of urea into the gas stream. The reaction of urea with NOX produces carbon, nitrogen, and water along with some urea slip. The urea slip will be less than twenty (20) ppm.

CO & VOC

The RHF combustion exhaust gasses will pass through an afterburner which is designed to destroy ninety-nine percent (99%) of CO and VOC emissions. The hot gasses will be blended with cold auxiliary air in the combustion chamber. Temperature in the chamber will be two thousand six hundred (2600)°F. The afterburner will be considered BACT for CO and VOC.

Coal and Iron Ore Receiving BACT Analysis

PM & PM_{10}

The coal and iron ore receiving will be conducted in a shed. A rotary car dump in the shed will be used to empty the cars. Water will be sprayed on the material as the car is rotated. The shed will have plastic strips over the door openings to contain the material dust that may not be captured by the spray. The shed air will be exhausted to a baghouse. Emissions from the baghouse will be limited to 0.01 gr/dscf. Visible emissions from the shed opening determined by reading taken in accordance with 326 IAC 5 (twenty four (24) consecutive reading taken at fifteen (15) second intervals during the actual dumping time) will be limited to three percent (3%).

Coal and Iron Ore Handling And Storage BACT Analysis

PM & PM_{10}

Three options were considered for the storage of the coal and ore: inside a building, in silos, and outside piles with wind breaks and water spray.

(a) The use of enclosed buildings for storage was rejected by the engineers and contractor for the following reasons: the explosion and fire hazard, the large amount of material inventory, associated problems filling the buildings, difficulty of removing material from the building, and the estimated cost in excess of thirty percent (30%) of the budgeted amount.

(b) The use of silo storage was rejected due again to the cost, size of the silos, the difficulty of moving the material to and from the silos, and the fire hazard.

(c) The use of outside piles with wind breaks and water spray was selected. The coal and iron ore will be conveyed to a sacker boom to form the storage piles. Water sprayers will be located at the sacker boom discharge and boom transfer points. The material dropping distance will be maintained at a minimum, less than three (3) feet, by the stacking procedure after the original pile has been established. In addition, compacting and spraying to maintain piles moist to prevent fugitive dust emissions will be used. The material will be removed from the pile by front end loaders into hoppers located below ground level. The dropping distance from the loader to the hopper will be less than three (3) feet. The conveyors to the silos and coal grinder will be covered and transfer point enclosed.

BACT will be the use of water spray, wind breaks, fugitive emission losses limits and operating procedures

Coal crushing BACT Analysis

PM & PM_{10}

The coal double cone classifier (grinder) will be totally enclosed. The crushed coal will be pulled through the collectors. Some of the exhaust air from the collectors will be recycled to convey coal to the crusher. The remaining exhaust air from the collectors will be directed to the rotary hearth furnace baghouse. BACT will be enclosed conveyors to the storage silos.

Storage Silo BACT Analysis

PM & PM_{10}

The total storage silo after the modification will be twelve (12) storage silo: four (4) for coal, four (4) for iron ore, one (1) for lime, one (1) for bentonite, one (1) for the EAF, and one (1) for rotary hearth furnace baghouse dust.

The baghouse emissions from the electric arc furnaces DSE control and EAF area are emptied into hoppers beneath each compartment. Screw feeders transport the dust to gathering screw conveyors to the storage silo. Each storage silo will be equipped with an air bin vent filter to vent the displaced air. The dust filter will have at least a ninety percent (90%) collection efficiency. The material collected in the filter will drop back into the bin when filling is stopped.

BACT will be limiting visible emissions to not exceed three percent (3%) determined by reading taken in accordance with 326 IAC 5 (twenty four (24) consecutive reading taken at fifteen (15) second intervals during filling of the silos).

Air Toxic Emissions

Indiana presently requests applicants to provide information on emissions of the 189 hazardous air pollutants set out in the Clean Air Act Amendments of 1990. These pollutants are either carcinogenic or otherwise considered toxic and are commonly used by industries. They are listed as air toxicities on the Office of Air Management (OAM) Construction Permit Application Form Y.

This modification will emit levels of air toxics less than those which constitute a major source according to Section 112 of the 1990 Amendments to the Clean Air Act.

See attached spreadsheets for detailed air toxic calculations.

Conclusion

The construction of the two hundred (200) tons per hour electric arc furnace with direct shell evacuation control, a natural gas-fired tunnel furnace with a holding zone, a two hundred twenty-five (225) tons per hour continuous caster a ninety-six (96) tons per hour direct reduction rotary hearth furnace, coal/iron ore receiving, coal /iron ore storage pile, coal/iron ore conveyors, and coal/iron ore storage silos will be subject to the conditions of the attached proposed **Construction Permit No. CP-033-8091, Plt ID No. 033-00043.**