Minnesota Pollution Control Agency

June 20, 1996

AP-42 Section 11.23
Reference 41
Report Sect. 4
Reference 53

Mr. Ronald E. Myers
Emission Factor and Inventory Group
Emissions, Monitoring and
Analysis Division
U.S. Environmental Protection Agency
Research Triangle Park, North Carolina 27711

Dear Mr. Myers:

We received your revised Draft AP-42 Section 11.23, Taconite Ore Processing, on March 13, 1996. Seven out of the nine active taconite plants are in Minnesota. We have finished our review of the emission factors for this important industry in Minnesota and we have the following comments.

Page 11.23-5:
We would include language in the 5th paragraph that clarifies that the incipient infusion temperature for acid pellet falls in the lower region of the specified temperature range and flux pellet incipient infusion temperature falls in the upper end of the specified temperature range of 2350 - 2550 degrees Fahrenheit.

Page 11.23-6:
We disagree with your statement that indurating furnaces generate low levels of Sulfur Dioxide (SO_2) emissions in the 4th paragraph of section 11.23.3. We also disagree with the 0.10 lb/ton emission factor for SO_2. During our review of a Title V application for one of the taconite plants in Minnesota we found that SO_2 emissions were 0.187 lb/Ton of SO_2 when firing with natural gas and 0.339 lb/ton when firing with fuel oil. While the lb/ton figure may seem low, when you take note that some large induration furnaces like those in Minnesota with a production rate of 700+ tons per hour have actual emissions ranging from 450 to 830 Tons Per Year (TPY) of SO_2 per furnace. We suggest the paragraph be rewritten as follows.

"Induration furnaces generate Sulfur Dioxide (SO_2). SO_2 emissions have a fuel component and a raw material component (concentrate, binder, limestone). Induration furnaces also emit combustion products such as Nitrogen Oxides (NO_x) and Carbon Monoxide (CO). Because of the additional heating requirements, emissions of NO_x and SO_2 generally are higher when flux pellets are produced than when acid pellets are produced."

We would also change the 6th paragraph of section 11.23.3 in the following manner.

"Annular coolers normally operate in stages. The exhaust of the first stage is vented to the Induration furnaces as preheated combustion gas. The second and third stages are generally left uncontrolled"

520 Lafayette Rd. N.; St. Paul, MN 55155-4194; (612) 296-6300 (voice); (612) 282-5332 (TTY)
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We would stay away from stating the emissions are small. While reviewing a Title V permit for a taconite plant in Minnesota the uncontrolled emission rate was determined to be 0.09 lb/ton.

Table 11.23-2
Emission Factors for Taconite Ore Induration Furnaces - Acid Pellet Production

1. Natural Gas Fired Grate/Kiln Uncontrolled

For this source type you reference three test reports. Reference 4 is for an U.S. Environmental Protection Agency (EPA) test of Eveleth Mines in Minnesota from November 1975. We could not find a copy of this report in our files. Which pelletizing plant was tested during this test? There are two pelletizing plants at the Eveleth facility. The original plant simply identified as pelletizing plant No. 2 that has only one waste gas stack. The expansion plant has two waste gas stacks and they are identified as waste gas stacks 2A and 2B.

It is important that if the expansion plant was the one tested in reference 4 that both stacks were tested. In order to come up with a valid lb/ton emission factor the emissions from both stacks must be taken into account. If only one of the two stacks was tested then the tested emission rate should be doubled to approximate the emissions from the other stack and the emission factor rating should be reduced one grade due to this approximation.

Reference 36 is sited for this unit. However on page 4-1 of the final draft report it states that References 32 to 44 were not used to develop the emission factor due to the lack of process data. We contacted the plant where the testing was done in reference 36 and obtained the process data. Attachment 1 contains the missing process data and our spread sheet calculations of the following average emission factors from this furnace.

	PM	PM_{10}
Average emission	Filterable	Filterable
Lb/Ton Fired Pellets	5.11	0.63

The above values should be included in the average emission factor along with the values obtained from References 4 and 5. Section 4 should be updated to summarize reference 36 to make it consistent with the table that will be included in the final AP-42 section..

2. Natural Gas Fired Grate/Kiln with Multiclone

√ Reference 35 was used to develop the Particulate Matter (PM) and Particulate Matterless than 10 um in size (PM_{10}) emission factors for this source category. The plant tested in Reference 35 is located in Minnesota. The pelletizing furnace that was tested in this reference has two waste gas stacks. The testing was only conducted on one of the two stacks. The test results should be doubled to account for all of the emissions from the untested stack. The PM_{10} emission factor of 0.14 lb/tons of fired pellets appears to account for both stacks.

√ The testing involved in this reference used methods 201A and 202 for PM_{10}. The testing done in this reference did not include method 5 for PM. The taconite plant that the testing was done at in reference 35 has conducted PM compliance testing each year for one of the two stacks on an alternating basis Included in Attachment 2 to this letter are the copies of the summaries of stack testing using method 5. Using these test results we come up with an emission factor of 0.59 lb of PM/ton of fired pellets. The spreadsheet containing our calculations are also included in Attachment 2. The emission factor for this source type should be changed to 0.59 lb of PM/ton of fired pellets.

3. Natural Gas & Oil Fired Grate Kiln with ESP

This emission factor seems rather low. We would like a copy of this test report to review.

4. Coal Fired Grate/Kiln with Wet Scrubber

√ The fuel used in Reference 29 during the subject stack test was Pet Coke not Coal. Appendix J of Reference 29 contains the proximate analysis of the fuel used and it is listed as Pet Coke. Pet Coke is a coal by-product and as such may have different emission characteristics. This may warrant assigning an emission factor rating of E. Attachment 3 to this letter contains our review of Reference 29. We calculated an emission rate of 0.10 lb/ton based only on the information from Reference 29. We recommend the average filterable PM emission rate be kept at 0.15 lb/ton.

√ We were unable to locate Reference 18. Page 4-14 and 4-15 of the Emission Factor Documentation for this section appears to have accounted for all of the emissions from both stacks.

5. Grate/Kiln Unspecified Fuel Type

√ Reference 35 and 36 are cited in footnote (j) for this source type. Neither of these references are contained in Section 4 of the draft final report. Section 4 should contain a summary of all the references footnoted in this table. We suggest EPA either eliminate this source category or revise it to include data from Attachment 1 and 2 of this letter and conduct a sensitivity analysis to see if the condensable PM is independent of fuel type.

6. Gas Fired Vertical Shaft

References 12-14 and 24 are used for this type of furnace. We no longer have copies of these reports in our files. We were unable to verify if emissions from both the bottom gas and top gas stacks were used to develop the emission factor. In order to find the total emissions from these furnaces you need to add the emissions from the top gas and bottom gas stacks together.

7. Gas Fired Vertical Shaft with Multiclone

References 12-13 and 24 are used for this type of furnace. We no longer have copies of this report in our files. We were unable to verify if emissions from both the bottom gas and top gas stacks were used to develop the emission factor. In order to find the total emissions from these furnaces you need to add the emissions from the top gas and bottom gas stacks together. Please see our comments in the following section on how EPA should change the way it classifies vertical shaft furnaces.

8. Gas Fired Vertical Shaft with Multiclone and Wet scrubber

Reference 14 is used for this type of furnace. We no longer have copies of this report in our files. We do have two stack tests for vertical shaft furnaces in Minnesota that are more recent. Copies of summaries and operating conditions are included in Attachment 4 to this letter. It is important to remember that the furnaces tested in Attachment 4 have two stacks. In order to find the total emissions from these furnaces you need to add the emissions from the top gas and bottom gas stacks together. Also take note that the bottom gas emissions are controlled by a wet scrubber (roto-clone) and the top gas emissions are controlled by a heat recuperation unit and centrifugal precleaner.

The heat recuperation units act as a wet scrubber since the slurry comes into contact with the air stream. There are vertical shaft furnaces that have multiclone collectors on the top gas stack but do not have the heat recuperation units and as such have higher emissions. EPA should make a distinction for the vertical shaft furnace on the type of control equipment used on both the top gas and bottom gas stacks. Attachment 4 also contains our spreadsheet calculations which indicate that a vertical shaft furnace firing natural gas with a rotoclone wet scrubber on the bottom stack and centrifugal precleaners and heat recuperation units on the top gas stack have the following average PM emission rates in lb/ton fired pellets

Filterable PM	0.12
Filterable + Condensable PM	0.17
Condensable PM	0.05

9. Straight Grate, Unspecified Fuel with Wet Scrubber.

After reviewing Reference 30 we come up with a 0.12 lb/ton of Filterable PM from this source. The fuel type used was natural gas and petroleum coke. The fuel input information was contained in Appendix G of the stack test report along with the production estimates. In Attachment 5 you will find our spreadsheet calculations and a copy of Appendix G of Reference 30. This category should be split into two categories as defined below.

There are four stacks for the induration furnace at this source and they are labeled A to D. In reference 30, stack D had a filterable PM emission rate of 6.23 lb/hr. Another test on stack D was conducted in May 1985, and the filterable PM emission rate was 11.2 lb/hr. The fuel input information was contained in Appendix I of the stack test report and the fuel type was natural gas only. In the May 1985, stack test only stack D was tested. However, if fuel type played an important role in determining the emissions of filterable PM the you would expect the emissions from burning natural gas and Pet coke to be greater than that from only burning natural gas. It appears the May 1985, test report is contradictory to the test performed in Reference 30.

It also appears that other process parameters relating to the pellet feed (green balls) such as compression strength may play a more important role in determining the emissions of filterable PM than the fuel type. I will not be possible to determine this until further testing is done. Also looking at the flux pellet table it appears that the testing done so far does not indicate a significant variation in PM or PM_{10} based on the type of pellet being made. The values for the flux pellet PM and PM_{10} emissions are well within the average values obtained for the acid pellets. This may not be surprising when you look at how an induration furnace works. Large quantities of hot combustion gas and excess air (200,000 to 400,000 acfm) pass through the bed of pellets as they move through the induration furnace. As the green balls dry some of the fines are entrained in the air stream and are emitted. In time more tests will be conducted that will allow us to do more statistically significant comparisons.

We also looked at Reference 31 that covers stack tests at Hibbing Taconite. Two complete sets of test were conducted at Hibbing Taconite. One set of tests was conducted when the furnace burned only natural gas and another set of tests was conducted when the furnace burned at least 80% pet coke with the remainder natural gas. On page 6 of Reference 31 the average filterable PM emissions from the furnace was 41.2 lb/hr on natural gas and 46 lb/hr on pet coke. In Attachment 6 to this letter you will find our spreadsheet calculations for each of the cases.

We recommend that EPA delete the source type "Straight Grate, unspecified fuel with wet scrubber" and replace it with two source types as listed below

	Average Emission Factor (lb/ton)	References
Straight Grate - Pet Coke/ Natural Gas With Wet Scrubber	0.12	30, 31
Straight Grate - Natural Gas With Wet Scrubber	0.10	31

Table 11.23-3
Emission Factors for Taconite Ore Induration Furnaces - Flux Pellet Production

We recommend the elimination of the Grate/Kiln unspecified fuel category. Based on our review of the available tests PM and PM_{10} emissions are less sensitive to fuel types and the type of pellet made than variations in the feed material quality. The Bulk of the emissions comes from the pellets as they are dried by updraft and down draft air currents in the furnaces. It would be worthwhile endeavor to investigate PM and PM_{10} emissions as a function of pellet quality parameters such as pellet compression strength. It may be best to eliminate Table 11.23-3 and average the data with that in Table 11.2-2 and have only one table for PM and PM_{10} emissions from the furnaces that would be used for all pellet types.

Table 11.23-4
Emission Factors for Taconite Ore Processing - Other Sources

We have no comment on this table.

Table 11.23-5
Emission Factors for Taconite Ore Indurating Furnaces - Acid Pellet Production

In acid pellet production the primary sources of sulfur are the concentrate and the fuel (Coal, Fuel Oil, Pet Coke). As can be seen by the following emission factors for natural gas combustion the SO_2 emissions from the concentrate is significant. We strongly agree with footnote (b) of this table and in fact SO_2 sulfur mass balances may be the best method of determining emissions from furnaces with multiple stacks instead of non simultaneous stack testing of all stacks at the furnace.

1. Natural Gas Fired Grate/Kiln

The SO_2 emission factor was derived from References 4,35 and 36. However on Page 4.1 of the emission factor documentation it states that References 35 and 36 were not used to develop the emission factor due to the lack of process data. The Minnesota Pollution Control Agency obtained the process data for Reference 36 and it is located in Attachment 1 of this letter. Using the process information we obtain the following:

(193 lb/hr)/(270 tons/hr of fired pellets) = 0.71 lb/ton of fired pellets

AGAIN, WE USED WRONG PROCESS RATE NEED TO REVISE

The average SO_2 emission factor should be recalculated with the above value used in the average.

The NO_x emission factor was derived from References 19 and 35. Looking at Table 2 from Reference 35 the NO_x average emission factor is 1.92 lb/ton of fired pellets taking into account the fact that the tests in Reference 35 were for only one of the two stacks at the subject furnace. The 1.92 lb/ton emission factor was obtained by multiplying the data for one stack by two to account for the other stack. When making approximation such as this a low emission factor rating should be assigned.

In order to obtain a NO_x emission factor of 1.4 lb/ton of fired pellets contained in this table, the average emission factor derived from Reference 19 would have to be approximately 1.0 lb/ton that is extremely low and we have not seen such a low emission rate in any recent testing. We do not have Reference 19 in our files. The furnace in Reference 19 has two stacks. EPA should verify that the NO_x emissions from both stacks were added together to get the total NO_x emissions from the furnace.

2. Natural Gas Fired Grate/Kiln with Wet scrubber

We do not have a copy of Reference 4 in our files so we can not comment on this entry.

3. Coal/coke fired Grate/Kiln

The references given in footnote (h) for this category are references for units with wet scrubbers. References 15 and 29 should not be used to support an emission factor for this source type. We are unable to verify the 2.0 lb/hr emission rate for SO_2 since we do not know which references were actually used to develop this emission factor.

4. Coal/Coke-fired Grate/Kiln with Wet Scrubber

From Reference 29 we calculate the SO_2 emission rate to be a total of 719 lb/hr from both stacks of the subject furnace. From Appendix I of Reference 29 we calculate the average production rate to be 492 long tons/hour that equals 551.2 tons/hour. We come up with an average SO_2 emission factor of 1.30 lb/ton of fired pellets.

The test contained in Reference 15 was on only one of the two stacks for the subject furnace. We calculated the SO_2 emission rate to be 425.5 lb/hr for one stack based on the two valid test runs. The production rate average was 477.4 long tons/hour that corresponds to 534.6 tons/hr. Multiplying the SO_2 emission rate by two to account for the stack that was not tested we come up with the average SO_2 emission rate of 1.59 lb/ton of fired pellets.

We come up with an average SO_2 emission rate of 1.45 lb/ton of fired pellets that is slightly higher than the 1.4 lb/hr value found in table 11.23-5. We believe the value should be corrected

5. Gas Fired Straight Grate with Wet Scrubber

√ Reference 31 does support the SO_2 emission factor. Reference 31 also has information on NO_x from this type of unit. In Reference 31 Line No. 1 was fired with natural gas only and Line No. 2 was fired with natural gas and Pet Coke. Reference 31 does contain information on NO_x emissions from Line No. 1. Using this information we come up with an NO_x emission factor of 0.60 lb/ton although we would assign an emission factor rating of E.

6. Coke Fired Straight Grate with Wet Scrubber

√ Reference 31 also has information on NO_x from this type of unit. In Reference 31 Line No. 2 was fired with natural gas and Pet Coke. Reference 31 does contain information on NO_x emissions from Line No. 2. Using this information we come up with an NO_x emission factor of 0.28 lb/ton although we would assign an emission factor rating of E.

7. Straight Grate, Unspecified Fuel with Wet Scrubber

√ An emission factor of 0.44 lb/ton of NO_x is given for this unit and the emission factor was developed from Reference 31. As noted in items 5 and 6 above Reference 31 contains two complete tests. One test on Line No. 1 with only natural gas being fired and the other test on Line No. 2 when a combination of natural gas and Pet Coke was fired. This information is contained in Appendix I of Reference 31. This category, Straight Grate, Unspecified Fuel with Wet Scrubber, should be deleted and the NO_x values in items 5 and 6 above should be added.

√ The CO and Carbon Dioxide (CO_2) values should be recalculated for Line No. 1 in Reference 31 and those should be inserted in the Gas Fired Straight Grate with Wet Scrubber category. The CO and CO_2 values should be recalculated for Line No. 2 in Reference 31 and should be inserted into the Coke fired straight grate with wet scrubber category.

Table 11.23-6
Emission Factors for Taconite Ore Indurating Furnaces - Flux Pellet Production

1. Natural Gas Fired Grate/Kiln

√ Reference 27 and 35 was used to develop the emission factors for this category. The test in Reference 35 was for what the company calls a semi-flux pellet. The semi-flux pellet contains only about 1% limestone. The typical flux pellet contains about 10% limestone. At the 10% limestone content the SO_2 emissions are higher due to the sulfur in the limestone and the increase in fuel consumption needed per ton of pellets. The higher the

- limestone content the more fuel and higher temperatures are needed to calcine the limestone. Reference 35 should be averaged with the acid pellet values and included in Table 11.23-5 for acid pellets. A foot note that the acid pellet table includes semi-flux pellets with 1% or less limestone content should then be added to Table 11.23-5.

- Reference 27 only should be used for the NO_x emission factor for flux pellets. The total NO_x emissions from the four stacks was 487 lb/hr with an average green ball feed rate of 423.5 LT/hr. Applying conversion factor of 1.12 standard ton per long ton and 0.75 long ton of fired pellets per long ton of green balls the Average NO_x emission factor is 1.37 lb/ton of fired pellets.

Our review of the revised AP-42 Section 11.23 has been completed. We agree with the approach of segregating emission factors based on fuel type and furnace type for PM and PM_{10}. For the time being it may also be reasonable to segregate PM and PM_{10} emissions by pellet type until further testing can be done to verify our hypothesis that other factors related to the feed material quality are more dominant in the determination of PM and PM_{10} emissions. It has been our experience with our seven taconite plants that there are significant variations in emission of SO_2, NO_x and CO between fuel types, furnace types and pellet types. We appreciate the cooperation EPA has shown in allowing us the needed time to complete our review of the important industry in Minnesota.. Please feel free to contact me if you have any questions about our recommended changes at (612)297-4518.

Sincerely,

Patrick O'Neill

Patrick O'Neill
Staff Engineer
Permit Section
Air Quality Division

PFO:lao

Enclosure

cc: Carolina Schutt, Air Quality Division
Hongming Jiang, Air Quality Division

KEY TO REFERENCES FOR TACONITE ORE AP-42

Background report	AP-42
2-1	1
2-2	2
2-3	3
2-4	5
2-5	not used
4-1	4
4-2	5
4-3	6
4-4	2
4-5, 4-6	not used
4-7	7
4-8	8
4-9	9
4-10	10
4-11	11
4-12	12
4-13	13
4-14	14
4-15	15
4-16	16
4-17	17
4-18	18
4-19	19
4-20	20
4-21	21
4-22	22
4-23	23
4-24	24
4-25	25
4-26	26
4-27	27
4-28	28
4-29	29
4-30	30
4-31	31
4-32 to 4-45	not used.
4-46	32
4-47	33
4-48	34
4-49	35
4-50 to 4-51	not used.
4-52	36

FILENAME: TAC_REFS.WQ1
DATE: 02/19/96

Attachment #1

US Steel Minntac
Stack Testing Of Natural Gas Fired Grate/Kiln

- Average PM Emission Factor Calculation Spreadsheet
- Summary Pages From Stack Test March 1994

Attachment #1

Average Filterable PM Emission Factor for Grate/Kiln firing natural gas (SCC 3-03-023-t)					
	Top Gas	Long Tons	Emissions		
July, 1995	(lb/hr)	Fired Pellets	Lb/ton fired pellets		
Run 1	1563.00	270.00	5.79		
Run 2	1346.00	270.00	4.99		
Run 3	1232.00	270.00	4.56		
Average Filterable PM Emission Factor =			**5.11**		

Attachment #1

~~Sheet1~~

Average Filterable PM-10 Emission Factor for Grate/Kiln firing natural gas (SCC 3-03-023-t)					
	Top Gas	Long Tons	Emissions		
July, 1995	(lb/hr)	Fired Pellets	Lb/ton fired pellets		
Run 1	181.70	270.00	0.67		
Run 2	153.60	270.00	0.57		
Run 3	173.00	270.00	0.64		
Average Filterable PM-10 Emission Factor =			**0.63**		

Reference 36

FACSIMILE MESSAGE

USX CORPORATION - U.S. STEEL GROUP, INC.
MINNTAC PLANT - ENVIRONMENTAL CONTROL
P.O. Box 417 County Highway 102
Mountain Iron, Minnesota 55768

FAX Number (218) 749-7360
For any problems with FAX messages from/to this number, please call Joanie at (218) 749-7394. Minntac's Steelcom prefix is 453.

DATE: 15 MAY 96 FROM: Larry Salmela (Voice phone -7569)

TO: Mr. Patrick O'Neill
MPCA - AQD
FAX speed dial #29

TOTAL PAGES: 8

RE: AQD File 28A, March 25, 1994 Engineering Test at Agglomerator Line 3

The next pages of this FAX have most of the information that your message on my answering machine asks for. I did not realize until this morning that Interpoll omitted the process parameters. I need to dig for that data to make the report complete, but let me know if the process data is critical to your analysis. If so, I'll get to it sooner rather than later.

I put your survey request at the bottom of one of the piles on my desk. Please FAX me another one, and I'll do it right away.

Please let me know if you need anything further.

APPENDIX E

PROCESS DATA

(Not available at time of report publication)

Table 3. Summary of the Results of the March 25, 1994 Sulfur Dioxide Emission Test on the No. 3 Waste Gas Stack at the US Steel Minntac Plant in Mountain Iron, Minnesota.

Test/Run	Date	Time (HRS)	Concentration (ppm,d)	Emission Rate (LB/HR)
1/1	3-25-94	1030-1142	63	185
1/2	3-25-94	1224-1332	60	190
1/3	3-25-94	1358-1503	67	203
Avg			63	193

Table 2b Summary of the Results of the March 25, 1994 PM-10 Emission Test on the No. 3 Waste Gas Stack (Source 8.03) at the US Steel Minntac Plant Located in Mountain Iron, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		03-25-94	03-25-94	03-25-94
Time runs were done	(HRS)	1054/1220	1348/1526	1555/1726
Volumetric flow				
actual	(ACFM)	463074	453264	452825
standard	(DSCFM)	323362	303314	324473
Gas temperature	(DEG-F)	195	189	174
Moisture content	(%V/V)	9.09	13.66	9.72
Gas composition	(%V/V,dry)			
carbon dioxide		1.60	1.60	1.60
oxygen		17.80	17.80	17.70
nitrogen		80.60	80.60	80.70
Isokinetic variation	(%)	87.1	94.6	85.7
PM-10 Concentration				
actual	(GR/ACF)	.0458	.0395	.0446
standard	(GR/DSCF)	.0656	.0591	.0622
PM-10 Emission Rate	(LB/HR)	181.7	153.6	173.0

Note: Dry Catch Only

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Table 2a Summary of the Results of the March 25, 1994 PM-10 Emission Test on the No. 3 Waste Gas Stack (Source 8.03) at the US Steel Minntac Plant Located in Mountain Iron, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		03-25-94	03-25-94	03-25-94
Time runs were done	(HRS)	1054/1220	1348/1526	1555/1726
Volumetric flow				
actual	(ACFM)	463074	453264	452825
standard	(DSCFM)	323362	303314	324473
Gas temperature	(DEG-F)	195	189	174
Moisture content	(%V/V)	9.09	13.66	9.72
Gas composition	(%V/V,dry)			
carbon dioxide		1.60	1.60	1.60
oxygen		17.80	17.80	17.70
nitrogen		80.60	80.60	80.70
Isokinetic variation	(%)	87.1	94.6	85.7
PM-10 Concentration				
actual	(GR/ACF)	.0516	.0514	.0514
standard	(GR/DSCF)	.0740	.0769	.0718
PM-10 Emission Rate	(LB/HR)	205.0	199.9	199.6

Note: Dry + Method 202 Condensible Particulate Material

Table 1b Summary of the Results of the March 25, 1994 Particulate Emission Test on the No. 3 Waste Gas Stack (Source 8.03) at the US Steel Minntac Plant Located in Mountain Iron, Minnesota.

ITEM	Run 1	Run 2	Run 3
Date of test	03-25-94	03-25-94	03-25-94
Time runs were done (HRS)	1030/1142	1224/1332	1358/1503
Volumetric flow			
actual (ACFM)	428684	448140	431420
standard (DSCFM)	295837	315600	302731
Gas temperature (DEG-F)	194	192	187
Moisture content (%V/V)	10.35	8.74	9.79
Gas composition (%V/V,dry)			
carbon dioxide	1.60	1.60	1.60
oxygen	17.90	17.90	17.80
nitrogen	80.50	80.50	80.60
Isokinetic variation (%)	98.1	98.4	100.8
Particulate concentration			
actual (GR/ACF)	0.425	0.350	0.333
standard (GR/DSCF)	0.617	0.498	0.475
Part. emission rate (LB/HR)	1563	1346	1232

Note: Dry Catch Only

Table 1a Summary of the Results of the March 25, 1994 Particulate Emission Test on the No. 3 Waste Gas Stack (Source 8.03) at the US Steel Minntac Plant Located in Mountain Iron, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		03-25-94	03-25-94	03-25-94
Time runs were done	(HRS)	1030/1142	1224/1332	1358/1503
Volumetric flow				
actual	(ACFM)	428684	448140	431420
standard	(DSCFM)	295837	315600	302731
Gas temperature	(DEG-F)	194	192	187
Moisture content	(%V/V)	10.35	8.74	9.79
Gas composition	(%V/V,dry)			
carbon dioxide		1.60	1.60	1.60
oxygen		17.90	17.90	17.80
nitrogen		80.50	80.50	80.60
Isokinetic variation	(%)	98.1	98.4	100.8
Particulate concentration				
actual	(GR/ACF)	0.426	0.351	0.334
standard	(GR/DSCF)	0.518	0.499	0.476
Part. emission rate	(LB/HR)	1567	1350	1234

Note: Dry + Organic Wet Catch

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2 SUMMARY AND DISCUSSION

The results of the particulate emission engineering test are summarized in Tables 1a and 1b. As will be noted, the particulate concentration averaged 0.531 GR/DSCF (dry + organic wet catch) and 0.530 GR/DSCF (dry catch only). The corresponding emission rates averaged 1384 and 1380 LB/HR.

The PM-10 results are summzrized in Table 2. The PM-10 concentration averaged 0.074 GR/DSCF (Dry + Method 202 Wet Catch) and 0.062 GR/DSCF (Dry Catch Only). The corresponding PM-10 emission rate averaged 202 and 169 LB/HR.

The sulfur dioxide results are summarized in Table 3. The sulfur dioxide concentration averaged 63 ppm,d and the emission rate averaged 193 LB/HR.

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

A-10

Reference 36
process data

FACSIMILE MESSAGE

USX CORPORATION - U.S.STEEL GROUP, INC.
MINNTAC PLANT - ENVIRONMENTAL CONTROL
P.O. Box 417 County Highway 102
Mountain Iron, Minnesota 55768

FAX Number (218) 749-7360
For any problems with FAX messages from/to this number, please call Joanie at (218) 749-7394. Minntac's Steelcom prefix is 453.

DATE: 21 MAY 96 **FROM:** Larry Salmela

TO: Patrick O'Neill
MPCA - AQD
FAX Speed dial #29

TOTAL PAGES: 2

RE: 1. Taconite Survey 2. Line 3 Process Data for 3-25-94

1. The next page of this FAX is the survey response from Minntac. My humble apologies the tardy response.

2. Our records show that our production rate was 270 tons of pellets per hour at Line 3 on March 25, 1994. To avoid confusion about the units, the "ton" used here is the standard 2,000 lb ton.

270 tons of fired pellets per hour

A-11

Attachment #2

National Steel Pellet Company (NSPC)
Stack Testing Of Natural Gas Fired Grate/Kiln
With Multiclone Collector

- Average PM Emission Factor Calculation Spreadsheet
- Summary Pages From Stack Tests from 1989 to 1995

Average Filterable PM Emission Factor for Natural Gas Fired Grate Kiln (SCC 3-03-023-t)						
		with multiclone control				
	Stack test Results	Total Emissions	Long Tons	Conversion	Conversion	Emissions
Date	(lb/hr)	(lb/hr)	green balls	Green Balls to Fired Pellets	Long to Short tons	Lb/ton fired pellets
June, 1989	227.62	455.24	715.00	529.10	592.59	0.77
May,1990	311.90	623.8	710.00	525.40	588.45	1.06
June, 1991	127.83	255.66	740.00	547.60	613.31	0.42
June, 1992	102.93	205.86	810.00	599.40	671.33	0.31
June, 1993	155.60	311.2	870.00	643.80	721.06	0.43
November, 1994	115.69	231.38	855.00	632.70	708.62	0.33
July, 1995	305.00	610	875.00	647.50	725.20	0.84
				Average Filterable PM emission rate =		**0.59**
1. Total emissions are obtained by multiplying the stack test result by 2 to reflect the stack that was not tested						
This furnace has two waste gas stacks of equivalent size and emissions.						
2. The green ball feed rate is given in the stack test reports in long tons. To convert the long tons of green balls to						
long tons of fired pellets was obtained by multiplying the green ball feed rate by 0.74, this conversion factor is contained in reference 35						
3. To convert long tons of fired pellets to a short ton (2000 lb) the long tons of fired pellets was multiplied by 1.12						

DK

Attachment #3

Eveleth Mines
Stack Testing Of Grate/Kiln using Pet Coke as Fuel
With Wet Scrubber

- Average PM Emission Factor Calculation Spreadsheet

Attachment #3

	Average Filterable PM Emission Factor for Coal Fired Grate Kiln with Wet Scrubber (SCC 3-03-023-x)						
	Stack A test Results	Stack B test Results	Total Emissions	Long Tons	Conversion	Emissions	
	(lb/hr)	(lb/hr)	(lb/hr)	Fired Pellets	Long to Short tons	Lb/ton fired pellets	
Run 1	35.40	22.21	57.61	493.80	553.06	0.10	
Run 2	37.50	20.29	57.79	491.10	550.03	0.11	
Run 3	36.02	18.39	54.41	492.80	551.94	0.10	
			Average Filterable PM emission rate =			**0.10**	
1. Total emissions are obtained by adding the stack test results for stacks A & B. This Furnace has two stacks.							
2. The Process rate is given in the stack test reports in long tons of Fired Pellets.							
3. To convert long tons of fired pellets to a short ton (2000 lb) the long tons of fired pellets was multiplied by 1.12							
4. Appendix J of the Stack Test Report indicates the fuel type was Pet Coke not Coal.							
5 This spreadsheet is based on results of the stack test report listed as Reference 29							

Attachment #4

LTV Steel
Stack Testing Of Gas fired vertical shaft furnace with wet scrubber (roto-clone) on bottom gas stack and centrifugal precleaners and heat recuperation on top gas stack

- Stack Test Summary Pages August, 1994 & July, 1995
- Average PM Emission Factor Calculation Spreadsheet

	Average Filterable PM Emission Factor for vertical shaft furnace firing natural gas (SCC 3-03-023-dd)					
	Top Gas	Bottom Gas	Total Emissions	Long Tons	Conversion	Emissions
July, 1995	(lb/hr)	(lb/hr)	(lb/hr)	Fired Pellets	Long to Short tons	Lb/ton fired pellets
Run 1	5.99	2.14	8.13	52.03	58.27	0.14
Run 2	3.43	1.66	5.09	51.76	57.97	0.09
Run 3	6.61	1.65	8.26	52.03	58.27	0.14
					Average Filterable PM emission rate =	**0.12**
1. Total emissions are obtained by adding the stack test results for top gas and bottom gas stacks. This Furnace has two stacks.						
2. The Process rate is given in the stack test reports in long tons of Fired Pellets.						
3. To convert long tons of fired pellets to a short ton (2000 lb) the long tons of fired pellets was multiplied by 1.12						
4. Top gas stacks controlled by centrifugal precleaners and heat recuperation units						
5. Bottom gas stacks controlled by wet scrubbers (roto-clones)						

Average PM (Filterable+Condensible) emission factor for vertical shaft furnace firing natural gas (SCC 3-03-023-dd)						
	Top Gas	Bottom Gas	Total Emissions	Long Tons	Conversion	Emissions
July, 1995	(lb/hr)	(lb/hr)	(lb/hr)	Fired Pellets	Long to Short tons	Lb/ton fired pellets
Run 1	9.05	2.29	11.34	52.03	58.27	0.19
Run 2	6.74	2.93	9.67	51.76	57.97	0.17
Run 3	9.06	1.72	10.78	52.03	58.27	0.18
August, 1994						
Run 1	6.05	1.16	7.21	52.19	58.45	0.12
Run 2	6.69	1.62	8.31	51.56	57.75	0.14
Run 3	12.16	1.15	13.31	51.14	57.28	0.23
		Average PM (Filterable+Condensible) emission rate =				**0.17**
1. Total emissions are obtained by adding the stack test results for top gas and bottom gas stacks. This Furnace has two stacks.						
2. The Process rate is given in the stack test reports in long tons of Fired Pellets.						
3. To convert long tons of fired pellets to a short ton (2000 lb) the long tons of fired pellets was multiplied by 1.12						
4. Top gas stacks controlled by centrifugal precleaners and heat recuperation units						
5. Bottom gas stacks controlled by wet scrubbers (roto-clones)						
Production rate fired Pellets in LT for August 1994 Test						
	Top Gas	Bottom Gas	Avg.,(Used in column E			
Run 1	51.46	52.92	52.19			
Run 2	51.02	52.10	51.56			
Run 3	51.11	51.16	51.14			
Production rate for July 1995 test did not specify which test the data was for , so it was assumed it was						
valid for both top and bottom gas stack tests. Available operating data indicates a fairly steady production rate						

OIL

Attachment #6

Hibbing Taconite
Average Filterable PM Emission Factors for Straight Grate

- Average PM Emission Factor Calculation Spreadsheets
  1. Natural Gas Only
  2. Natural Gas/Pet Coke

Average Filterable PM Emission Factor for Natural Gas Fired Straight Grate (SCC 3-023023-hh)					
			with wet scrubber		
	Stack test Results	Long Tons	Conversion	Emissions	
Stack 4	(lb/hr)	Pellets	Long to Short tons	Lb/ton fired pellets	
Run 1	10.33	376.00	421.12	0.02	
Run 2	19.08	371.00	415.52	0.05	
Run 3	12.97	359.00	402.08	0.03	
Stack 3					
Run 1	10.86	402.00	450.24	0.02	
Run 2	4.39	347.00	388.64	0.01	
Run 3	7.06	394.00	441.28	0.02	
Stack 2					
Run 1	11.00	354.00	396.48	0.03	
Run 2	8.59	394.00	441.28	0.02	
Run 3	9.92	369.00	413.28	0.02	
Stack 1					
Run 1	9.58	387.00	433.44	0.02	
Run 2	10.45	399.00	446.88	0.02	
Run 3	9.86	341.00	381.92	0.03	
Average Filterable PM (lb/ton per furnace) emission rate =				**0.10**	
1. This furnace has 4 stacks.					
2. To convert long tons of fired pellets to a short ton (2000 lb) the long tons of fired pellets was multiplied by 1.12					
3. Stack test performed May 1985, Hibbing Taconite					
4. Emissions and process data found on pages 23-30 of Reference 31					

Average Filterable PM Emission Factor for Natural Gas/Pet Coke Fired Straight Grate (SCC 3-023023-hh)					
			with wet scrubber		
	Stack test Results	Long Tons	Conversion	Emissions	
Stack 4	(lb/hr)	Pellets	Long to Short tons	Lb/ton fired pellets	
Run 1	11.53	381.00	426.72	0.03	
Run 2	11.62	384.00	430.08	0.03	
Run 3	12.24	384.00	430.08	0.03	
Stack 3					
Run 1	10.49	411.00	460.32	0.02	
Run 2	10.38	356.00	398.72	0.03	
Run 3	13.60	405.00	453.60	0.03	
Stack 2					
Run 1	12.62	357.00	399.84	0.03	
Run 2	11.52	401.00	449.12	0.03	
Run 3	11.97	371.00	415.52	0.03	
Stack 1					
Run 1	11.14	394.00	441.28	0.03	
Run 2	11.18	405.00	453.60	0.02	
Run 3	9.89	346.00	387.52	0.03	
Average Filterable PM (lb/ton per furnace) emission rate =				**0.11**	
1. This furnace has 4 stacks.					
2. To convert long tons of fired pellets to a short ton (2000 lb) the long tons of fired pellets was multiplied by 1.12					
3. Stack test performed May 1985, Hibbing Taconite					
4. Emissions and process data found on pages 31-38 of Reference 31					

Attachment #5

Inland Steel
Average Filterable PM Emission Factor Data for Simultaneous Natural gas and Pet Coke Fired Straight Great

- Appendix G of Reference 30
- Average PM Emission Factor Calculation Spreadsheet
- May 1985 Stack Test for Stack D

Average Filterable PM Emission Factor for Natural Gas/Pet Coke Fired Straight Grate (SCC 3-023023-hh)						
			with wet scrubber			
	Stack test Results	Long Tons	Conversion	Emissions		
Stack	(lb/hr)	Pellets	Long to Short tons	Lb/ton fired pellets		
A	14.96	344.00	385.28	0.04		
B	13.05	344.00	385.28	0.03		
C	10.66	342.00	383.04	0.03		
D	6.23	347.00	388.64	0.02		
	Average Filterable PM emission rate =			**0.12**		
1. The green ball feed rate is given in the stack test reports in long tons. To convert the long tons of green balls to						
long tons of fired pellets was obtained by multiplying the green ball feed rate by 0.8, this conversion factor is contained in reference 30						
2. To convert long tons of fired pellets to a short ton (2000 lb) the long tons of fired pellets was multiplied by 1.12						

APPENDIX G

PROCESS DATA

PROCESS FUEL DISTRIBUTION

Distribution during 'A' and 'B' scrubber testing:

Natural Gas - 'A' combustion chamber:

530,872
530,798
74 mcf

'B' combustion chamber:

262,700
262,321
379 mcf

Total plant gas = 453 mcf
= 453 MMBTU

Petroleum Coke - 'A' combustion chamber:

2,239,700
2,236,687
3,013

= 30,130 lbs.

$30{,}130 \text{ lbs.} \times \frac{14{,}100 \text{ BTU}}{\text{lb.}} \times \frac{1 \text{ MMBTU}}{10^6}$

Total plant petroleum coke 425 MMBTU

Percent plant natural gas $\frac{453}{878}$ = 52%

Percent plant PetCoke $\frac{425}{878}$ = 48%

PRODUCTION ESTIMATE

* Shift 2 - 7:00 a.m. to 3:00 p.m.

* 'A' and 'B' scrubber testing - 8:00 a.m. to 4:00 p.m.

* Conveyor GP2 scale reading = 3,442 L.T.

* Conversion factor green balls to pellets = 3,442 * 0.8 = 2,754 L.T. pellets

$$\frac{2754 \text{ L.T. Pellets}}{8 \text{ hours}} = \underline{\underline{344}} \text{ L.T. per hour}$$

* Percent of design rate $= \frac{344 \text{ LTPH actual}}{328 \text{ LTPH design}} = \underline{\underline{105\%}}$

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PROCESS FUEL DISTRIBUTION

Distribution during 'C' scrubber testing:

NATURAL GAS

'A' Combustion Chamber		531,065
		531,026
		39 MCF
'B' Combustion Chamber		263,697
		263,498
		199 MCF
Total Plant Natural Gas	=	238 MCF
		238 MMBTU

PETROLEUM COKE

'A' Combustion Chamber	=	2,247,457
		2,245,896
		1,561 x 10
	=	15,610 lbs.

$$15{,}610 \text{ lbs.} * \frac{14{,}100 \text{ BTU}}{\text{lb.}} * \frac{1 \text{ MMBTU}}{10^6 \text{ BTU}} =$$

Total Plant Petroleum Coke	=	220 MMBTU
Percent Plant Natural Gas	=	52%
Percent Plant Petroleum Coke	=	48%

DPB:djs
8/19/86

AS

PROCESS FUEL DISTRIBUTION

Distribution during 'D' scrubber testing:

NATURAL GAS

'A' Combustion Chamber 531,507

531,470

37 MCF

'B' Combustion Chamber 264,996

264,792

204 MCF

Total Plant Natural Gas = 241 MCF

241 MMBTU

PETROLEUM COKE

'A' Combustion Chamber = 2,255,251

2,253,753

1,498 x 10

= 14,980 lbs.

$$14{,}980 \text{ lbs.} * \frac{14{,}100 \text{ BTU}}{\text{lb.}} * \frac{1 \text{ MMBTU}}{10^6 \text{ BTU}} =$$

Total Plant Petroleum Coke = 211 MMBTU

Percent Plant Natural Gas = 53%

Percent Plant Petroleum Coke = 47%

DPB:djs
8/19/86

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PRODUCTION ESTIMATE

* 'C' Scrubber Testing:

Shift 2 8/7/86 - 7:00 a.m. to 3:00 p.m.

Conveyor GP2 scale reading = 3,424

Conversion factor green balls to pellets

3424 * 0.8 = 2,739 L.T.

$\frac{2,739 \text{ L.T. Pellets}}{8 \text{ Hours}}$ = 342 L.T. per hour

* 'D' Scrubber Testing:

Shift 2 8/8/86 - 7:00 a.m. to 3:00 p.m.

Conveyor GP2 scale reading = 3,465

Conversion factor green balls to pellets

3465 * 0.8 = 2,772

$\frac{2,772 \text{ L.T. Pellets}}{8 \text{ Hours}}$ = 347 L.T. per hour

DPB:djs
8/19/86

A5

Interpoll Inc.
4500 Ball Road N.E.
Circle Pines, Minnesota 55014

Telephone (612)786-6020

RESULTS OF THE MAY 21, 22 AND 23, 1985, PARTICULATE EMISSION COMPLIANCE TESTS ON THE HEARTH LAYER SCREEN, PRODUCT SPLITTER, INDURATING GAS SCRUBBER D AND HEIL SCRUBBER EXHAUST AT THE INLAND STEEL MINORCA TACONITE PLANT LOCATED NEAR VIRGINIA, MINNESOTA

Submitted to:

INLAND STEEL MINING COMPANY
P. O. Box 1
Virginia, Minnesota 55792

Attention: Michael Ricciardi

Approved by:

Perry Lonnes, Ph.D.
President

Report Number 5-2006
June 3, 1985

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ABBREVIATIONS

ACFM	actual cubic feet per minute
cc (ml)	cubic centimeter (milliliter)
DSCFM	standard cubic foot of dry gas per minute
DSML	dry standard milliliter
DEG-F (^{O}F)	degrees Fahrenheit
DIA.	diameter
FT/SEC	feet per second
GPM	gallons per minute
GR/ACF	grains per actual cubic foot
GR/DSCF	grains per dry standard cubic foot
g	gram
HP	horsepower
HRS	hours
IN.	inches
IN. HG.	inches of mercury
IN. WC.	inches of water
LB	pound
LB/DSCF	pounds per dry standard cubic foot
LB/HR	pounds per hour
LB/10^{6}BTU	pounds per million British Thermal Units heat input
LB/MMBTU	pounds per million British Thermal Units heat input
MW	megawatt
mg/DSCM	milligrams per dry standard cubic meter
microns (µm)	micrometer
MIN.	minutes
ohm-cm	ohm-centimeter
PPH	pounds per hour
PPM	parts per million
PSI	pounds per square inch
SQ. FT.	square feet
v/v	percent by volume
w/w	percent by weight

Standard conditions are defined as 68 ^{O}F (20 ^{O}C) and 29.92 IN. of mercury pressure.

2 SUMMARY AND DISCUSSION

The results of the particulate and visible emission test on the four sources are summarized below (a more detailed summary on a source by source basis may be found in Tables 1-4):

	Average Values			
Source	Volume (DSCFM)	Concentration (GR/DSCF)	Emission Rate (LB/HR)	Opacity (%)
Hearth Layer Screen	23,100	.017	3.31	6
Product Splitter	16,100	.066	9.17	15.2
Induration Furnace Scrubber D	124,000	.011	11.2	0
Heil Scrubber	27,300	.011	2.63	0

No difficulties were encountered in the field or in the laboratory evaluation of the flue gas and particulate samples. On the basis of this fact and a complete review of the entire data and results, it is our opinion that the emission rates and emission factors reported herein are accurate and closely reflect the actual values which existed at the time the tests were performed.

TABLE 3. SUMMARY OF THE RESULTS OF THE 5-22-85 PARTICULATE EMISSION TEST ON THE INDURATING GAS-SCRUBBER D STACK AT THE INLAND STEEL MINING COMPANY PLANT IN VIRGINIA, MINNESOTA

ITEM	RUN 1	RUN 2	RUN 3
DATE OF TEST	5-22-85	5-22-85	5-22-85
TIME OF TEST (HRS)	916/1032	1050/1200	1247/1350
VOLUMETRIC FLOW			
ACTUAL (ACFM)	175000	165000	167000
STANDARD (DSCFM)	125000	123000	125000
GAS TEMPERATURE (DEG-F)	132	121	121
GAS MOISTURE CONTENT (% V/V)	15.97	13.81	13.32
GAS COMPOSITION (% V/V, DRY)			
CARBON DIOXIDE	.40	.60	.80
OXYGEN	19.40	19.40	19.00
NITROGEN	80.20	80.00	80.20
ISOKINETIC VARIATION (%)	98.9	101.4	101.3
PARTICULATE CONCENTRATION			
ACTUAL (GR/ACF)	.0086	.0074	.0071
STANDARD (GR/DSCF)	.012	.010	.0095
PARTICULATE EMISSION RATE (LB/HR)	12.84	10.60	10.22

AS

TEST LOG

PERTINENT INFORMATION - MUST INCLUDE FREQUENCY AND DURATION OF SOOT BLOWING AND ASH PULLING.

Job Name INLAND STEEL

Date 5-[illegible]-85

Unit No. _____ Location INDURATING GAS SCRUBBER D STACK

RUN 1 440 LT/HR PROCESS RATE

RUN 2 440 LT/HR PROCESS RATE

RUN 3 440 LT/HR PROCESS RATE

- ☐ NSPT
- ☑ COMPLIANCE TEST
- ☐ ENGINEERING TEST
- ☐ EQUIPMENT PERFORMANCE TEST

PROBE:

Length 10 feet effective

☐ Glass liner ☑ Stainless-steel liner ☐ Inconel liner ☐ Other _____

☐ Impinger assembly

☐ Condenser

WET CATCH ANALYSIS:

☐ "organic" ☐ "inorganic"

☑ To comply with (State) or Federal Regulations

OR

☐ As requested by _____ of _____

Nozzle Calibration:

.249

.250

.248

_____

_____

.249

Temperature Measurement:

☑ Digital

☑ Bimetalic

☑ Thermometer wet/DRY

☐ Other _____

Orsat data:

1 number per run

☑ integrated bag

☐ bulb

☑ O_2 Analyzer

AS

Tech's Initials

PLANT OPERATING SUMMARY
3/ 23/ 85

	S1	S2	S3	TOTALS
COARSE ORE CRUSHED	9227	10375	11500	31099
C. ORE - TONS/HR.				1787
COIL MAG IRON-%	20.09	22.16	20.00	20.75
PRIMARY HOURS RUN				17.4
FINE ORE CRUSHED	11000	10000	10700	31700
F.ORE - TONS/HR.				489
MAG IRON %	29.08	24.17	23.74	25.66
F.O. SIZE % + 5/8	15.0	16.6	13.9	15.2
SEC. CRUSHER I HRS. RUN				21.6
SEC. CRUSHER II HRS. RUN				21.9
SEC. CRUSHER III HRS. RUN				21.3
ROD MILL FEED				27218
RMD MAG IRON-%	20.00	19.57	20.30	19.96
RMD SIZE % + 10M	18.28	25.09	26.87	23.41
MOISTURE CONTENT				2.48
RMF LINE 1	9001		375.0	24.0
RMF LINE 2	9394		393.0	23.9
RMF LINE 3	8823		369.2	23.9
RODS	0	10	13	23
BALLS	0	1	0	1
CONCENTRATE PRODUCED				8328
SILICA COMBINED	4.26	4.30	4.26	4.27
GRIND COMBINED	86.32	83.95	79.43	83.24
FILTER CAKE MOISTURE	9.07	9.20	9.10	9.12
DRY WEIGHT RECOVERY				28.51
L1 MAG FE	2.44	2.66	2.66	2.59
L2 MAG FE	2.44	2.51	2.81	2.59
L3 MAG FE	3.10	2.51	2.58	2.73
FT MAG FE	2.22	2.81	2.14	2.39
TURBIDITY	290	280	260	277
CONCENTRATE TO STOCKPILE				120
CONCENTRATE FROM STOCKPILE				0
SST TONNAGE CHANGE				60
CONCENTRATE TO PELLETS				8148
TOTAL PELLETS PRODUCED				7717
@ INDEX	93.50	93.10	94.07	93.56
PELLET SIZE % + 1/2	6.22	10.72	5.80	7.58
PELLET SIZE % - 1/4	1.25	2.02	1.07	1.44
COMPRESSION STRENGTH	476.50	449.40	473.30	466.40
GR FD HRS.				24.0
PELLETS TONS/HR.				321.53
MBTU/TON				363.62
MCF USED	A=1500		B=1306	2806
TRAIN SHIPMENTS-DRY (P-3 SCALE)				7491
TRAIN MOISTURE				1.82
TONS PER CAR				69.8

CC, DHP, BAM, RHN, GEM, FMP, CWP
FLS, GNA, PIT ENGR., ARB, GJB JHW

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REQUIRED DATA
for
COMBUSTION SOURCES

Process exhaust
Incinerating gas scrubber

C. Fuel Input

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

FUEL DESCRIPTION Coal:State, Cty, Mine Oil: Specify Grade	INPUT (LBS/HR) (GAL/HR)	& MOISTURE As Rec'd	As Rec'd (BTU/LB) (BTU/GAL)	HEAT INPUT (BTU/HR)
No. 1				
Natural Gas	1.88 X10³ MCFM		1,014 BTU/CF	114,379,200
No. 2				
No. 3				
			TOTAL	

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

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

4. Describe any changes anticipated for procurement of fuels within the next twelve (12) months. None.

D. Equipment & Operating Data

1. Furnace No. Area 108 Traveling grate.

2. Furnace Mfg. Dravo Corporation.

3. Type of Firing external two chamber.

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