



JENNIFER M. GRANHOLM
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING



STEVEN E. CHESTER
DIRECTOR

EdL
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April 5, 2004

Mr. Paul A. Korpi, General Manager
Empire Iron Mining Partnership
P.O. Box 38
Palmer, Michigan 49871-0038

Dear Mr. Korpi:

By this letter, the Michigan Department of Environmental Quality (DEQ), Air Quality Division (AQD) accepts your proposed demonstration plan to burn only coal during the ozone season for control of the oxides of nitrogen for the Rule 801 subject units at your facility. This demonstration, as submitted on March 30, 2001, is required pursuant to Rule 801(4)(g).

Rule 801(4)(g) states, in part, "An owner or operator of an emission unit which is not subject to the provisions of subdivision (a) to (f) of this subrule shall submit a proposal for oxides of nitrogen control..." Rule 801(4)(g) also states that "the owner or operator shall implement the control program by May 31, 2004."

For more information on the implementation of this control program, please refer to the Schedule of Compliance, Appendix 2, of your Renewable Operating (RO) Permit Number 199600365. Please note that your units will still be subject to all other applicable requirements and limitations within your RO Permit.

If you have any questions, please call Ms. Teresa Walker, AQD, at 517-335-2247 or Mr. R. Thomas Maki, AQD, at 906-346-8503.

Sincerely,

G. Vinson Hellwig, Chief
Air Quality Division

GVH:TW:LH

cc: Mr. Robert Irvine, DEQ
Mr. R. Thomas Maki, Upper Peninsula District Office, DEQ

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DEQ - Air Quality Division

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Empire Iron Mining Partnership

The Cleveland-Cliffs Iron Company, Manager

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APR 02 2001

March 30, 2001.

R. Thomas Maki
DEQ Air Quality Division
1990 US-41 South
Marquette, MI 49855

DEQ - Air Quality Division

Subject: NOx Control Plan
Empire Iron Mining Partnership

Dear Mr. Maki:

The Empire Mine submits the enclosed NOx Control Plan as required by Michigan Air Pollution Control Rule 801(4)(g) and the Empire Mine Air Renewable Operating Permit No. 199600365, Table E-4, II. Unit 4 Furnace is the only applicable emission unit at Empire that exceeds the 250 MMBtu/HR limitation.

The Plan proposes burning coal during the ozone season as the main control technology, even though the future availability and cost of coal is difficult to predict. Other technology is either not practical or feasible for the grate/kiln pelletizing process. It should also be noted that SO2 emissions increase 2.5X while burning coal. The Empire Mine is a large consumer of electric power and in addition to our NOx reduction program costs, will incur approximately \$1 million per year increased costs due to NOx reduction efforts at Wisconsin Electric Power Company.

Empire Mine requests an exemption from inclusion in the Michigan NOx Control Plan due to our northern location and its severe economic impact.

If additional information is required, please contact me or Donald Ahola at 906-475-3724.

Sincerely,

Paul A. Korpi
General Manager
906-475-3643

EMPIRE IRON MINING PARTNERSHIP
NO_x CONTROL PLAN

**Plan to Control NO_x Emissions from Unit 4 Pellet Indurating Furnace
During the Ozone Season (April 1 – September 30)**

Michigan Air Pollution Control Rule 801(4)(g) and the Empire Mine air Renewable Operating Permit (ROP) requires that the Empire Iron Mining Partnership (Empire Mine) submit a NO_x control plan to the Michigan Department of Environmental Quality (MDEQ) for all applicable units by April 1, 2001. The plan as outlined below is for Unit 4, the only applicable grate-kiln-cooler machine, that produces pellets during the ozone season. It should also be noted that because the Empire Mine is a large consumer of electric power, it will incur approximately \$1 million per year increased costs due to NO_x reduction efforts at Wisconsin Electric Power Company.

1. Listing of Reasonably Available NO_x Control Technologies:

- One pollution prevention technology is that of low-NO_x burners, which lower the flame temperature to reduce the amount of NO_x formed. However, low NO_x burners are much larger in physical size than the existing burners. A low-NO_x burner for this application would have a diameter of approximately 40 feet and could not be physically accommodated at the existing facilities. Therefore, the use of a low-NO_x burner is not an option.
- Another pollution prevention technology is oscillating combustion burners. This technology uses oscillation of the fuel flow above and below the stoichiometric value to create fuel-rich and fuel-lean zones that improve heat transfer and reduce NO_x. The amount of NO_x reduction that can be expected at the Empire Mine is speculative, and the technology is experimental. The initial start-up cost for replacing the burner on Empire Units 4 with oscillating burners is estimated at \$500,000. In addition, an annual fee must be paid for the right to use the patented technology if NO_x emissions are reduced by 15% or more. For reduction of 15 – 29% of NO_x, the annual fee is \$50,000. For 30% or greater reduction of NO_x, the annual fee is \$100,000. At this time, the Empire Mine does not plan to spend the money on this experimental technology.
- A proposed technique for reducing NO_x with existing burners is to inject water into the flame using an atomizing spray nozzle, to reduce flame temperature. This method was tested at the Empire Mine, and the water increased fuel consumption without any reduction in NO_x emissions.
- Plant testing at Empire while producing standard pellets with 100% natural gas firing, and maximizing the primary air, resulted in NO_x reductions approaching 30% from normal gas firing with low primary air (baseline). The additional energy required to heat the extra primary air would cost around \$200,000 during the ozone season based on a typical fuel cost of \$2.70/MMBtu. Total ozone season NO_x reduction would be about 865 tons at a cost of \$233 per ton of NO_x reduction.

- Plant testing at Empire while producing standard pellets, either burning 100% eastern coal or a normal combination of western coal and natural gas in the kiln, resulted in NOx reductions approaching 70%, compared to normal gas firing with low primary air (baseline). Additional ozone season energy costs required to heat the extra primary air associated with coal firing and based on a typical fuel cost of \$2.70/MMBtu, total about \$380,000 for 2,178 tons of NOx reduction. This equates to \$174 per ton of NOx reduction.
- Plant testing at Empire while producing Royal fluxed pellets with 100% natural gas firing, resulted in NOx emissions about 8% less than standard pellet baseline NOx levels. No further reduction in NOx was realized by maximizing the primary air to the kiln burner.
- Plant testing at Empire while producing Royal fluxed pellets with 100% eastern coal firing in the kiln and normal natural gas firing in preheat, resulted in NOx reductions approaching 58% from the standard pellet baseline. For about 1,744 tons of NOx reduction during the ozone season, the total additional energy cost would be about \$192,000 based on a typical fuel cost of \$2.70/MMBtu. This equates to \$111 per ton of NOx reduction.

2. Empire Mine Selected Technology for Controlling NOx Emissions:

- Although natural gas is normally the fuel of choice, the Empire Mine proposes burning coal on Unit 4 during the ozone season to help achieve a net NOx emissions reduction of 25%. When possible, Empire also plans to schedule repairs and summer shutdowns on any one of the pelletizing units during the ozone season to help attain the proposed total plant NOx emissions reduction.
- Empire Mine reserves its option to burn natural gas if it is economically advantageous to do so or pellet quality cannot be maintained while burning coal.
- Kiln burner flame characteristics (shape, temperature, consistency, etc.) are important factors for an efficient operation and production of quality pellets. Gas and coal have very different flame characteristics, with the gas flame exhibiting superior characteristics.
- Burning coal adds delivery and operational problems. Coal delivery to the kilns can be curtailed for any number of reasons: boat and trucking delays, freezing, and coal conveying and milling problems. Coal firing operational problems includes: increased buildup in the kiln, requiring additional maintenance, production shutdowns, and costs. Coal ash contributes to kiln buildup and chokes down the kiln and pre-heat areas, with buildup removal required by mechanical means or unit shutdown. Increase operational costs are incurred while removing buildup by either method.
- Burning coal reduces NOx emissions, but increases SO2 emissions by 2.5 times compared to gas firing.
- Empire Mine reserves the option to amend this plan, should economic and technical conditions change in the future.

3. Empire Mine Proposal for Testing, Monitoring and Reporting NOx Emissions:

- Empire will measure and record the amount of coal and natural gas burned through computer control, throughout the ozone season on Unit 4 Indurating Furnace. Empire will report any testing, monitoring, and calculations to show compliance with the proposed NOx reduction, using the emission units shown below for baseline natural gas and coal burning.

4. Empire Mine Proposed NOx Emission Units:

- Natural Gas Firing, (Low Stoichiometric) - 2.79 lbs NOx per Long Ton of Pellets Produced
- Natural Gas Firing (Maximum Primary Air) - 1.95 lbs NOx per Long Ton of Pellets Produced
- Coal Firing - 0.91 lbs NOx per Long Ton of Pellets Produced

5. Empire Mine Annual Summary Report

- An annual summary report shall be submitted to the MDEQ and shall include the following information: 1) quantity of NOx emissions and emission rates while burning natural gas and coal; 2) amount of NOx reduction from baseline during the ozone season; and 3) total operating time of the emission unit during the ozone season.

Respectfully submitted:

Paul A. Korpi

Paul A. Korpi
General Manager, Empire Mine

Date: March 30, 2001