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# RESULTS OF JUNE 12, 1975 OXIDES OF NITROGEN DETERMINATIONS AT THE FAIRLANE PLANT PELLET FURNACE WET SCRUBBER INLET AND OUTLET

Submitted to:

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## SYMBOLS AND ABBREVIATIONS

| | |
|---|---|
| ACFM | actual cubic feet per minute |
| DEF-F | degrees Fahrenheit |
| FT/SEC | feet per second |
| GR/ACF | grains per actual cubic foot |
| GR/SCF | grains per dry standard cubic foot |
| g | gram |
| HRS | hours |
| IN. | inches |
| IN. HG. | inches of mercury |
| IN. WC. | inches of water |
| LB | pound |
| LB/HR | pounds per hour |
| LB/SCF | pounds per dry standard cubic foot of gas |
| MIN | minutes |
| SCFM | standard cubic feet of dry gas per minute |
| SQ. FT. | square feet |
| V/V | percent by volume |

Standard conditions are defined as $70^{\circ}F$ and 29.92 inches of mercury pressure.

# 1 INTRODUCTION

On June 12, 1975, Interpoll Inc. conducted a series of oxides of nitrogen ($NO_x$) determinations on the gas stream entering and exiting the pellet furnace wet scrubber. The $NO_x$ determinations were carried out in accordance with EPA Method 7. Three 2-liter grab samples were collected at the inlet and outlet and the average inlet and outlet-concentrations determined. The actual volumetric flow, temperature and absolute gas pressure were also measured. The mass flow of oxides of nitrogen entering and exiting the scrubber were then calculated together with the scubber "oxides of nitrogen" removal efficiency. At the time of the determinations, the kiln temperature was 2380°F., the air pressure -1 in. WC. and the feed rate 385 long tons per hour (wet).

The results of all field and laboratory measurements and determinations are reported in Section 2. Field data sheets are presented in the Appendix.

# 2 RESULTS

The results of the inlet and outlet oxides of nitrogen concentration determinations are presented in Table 1. The average inlet and outlet concentrations were 402 and 317 PPM (dry basis), respectively. The average mass flow of $NO_x$ at the inlet and outlet were 638.4 and 504.0 LB/HR (reported as $NO_2$) which corresponds to a scrubber removal efficiency of 21.05%. The mass flows were calculated from the average dry standard concentrations and the dry standard flow measured at the outlet. This calculation assumes no leakage

into the duct system between the inlet and outlet sampling locations. The influence of water vapor introduced by the scrubber is eliminated when dry concentrations and flow rates are utilized.

The results of the volumetric flow determination at the scrubber outlet are summarized in Table 2. A Type S pitot was used to measure the velocity pressures. The moisture content was determined psychrometrically.

Table 1. Results of $NO_x$ Concentration Determinations Conducted on June 12, 1975 on the Inlet and Outlet of the Pellet Furnace Wet Scrubber at the Fairlane Plant.

| SAMPLE | Concentration | |
|---|---|---|
| | LB/SCF | PPM |
| Inlet | $3.97 \times 10^{-5}$ | 336 = 541 lb/hr |
| Inlet | $5.45 \times 10^{-5}$ | 461 = 742 |
| Inlet | $4.83 \times 10^{-5}$ | 408 = 656 |
| Outlet | $3.75 \times 10^{-5}$ | 317 = 510 lb/hr |
| Outlet | $3.59 \times 10^{-5}$ | 303 = 487 |
| Outlet | $3.92 \times 10^{-5}$ | 331 = 532 |

$\frac{336}{1,036,000}$

Table 2. Results of Flow Determination at Scrubber Outlet

| | |
|---|---|
| TIME AND DATE | 1450,6/12/75 |
| BAROMETRIC PRESSURE (UNCOMPENSATED IN.HG.) | 28.24 |
| PITOT TUBE COEFFICIENT | 0.84 |
| NUMBER OF SAMPLING PORTS | 2 |
| TOTAL NUMBER OF POINTS TRAVERSED | 24 |
| STACK DIAMETER (IN.) | 120 |
| CROSS SECTIONAL AREA (SQ.FT) | 78.54 |
| DIRECTION OF FLOW | VERTICAL,UP |
| STATIC PRESSURE (IN.WC) | -1.1 |
| AVERAGE GAS TEMPERATURE (DEG-F) | 132 |
| ABSOLUTE GAS PRESSURE (IN.HG.) | 28.24 |
| AVERAGE MOISTURE CONTENT (V/V) | 16.45 |
| AVERAGE LINEAR VELOCITY | 67.4 |
| VOLUMETRIC FLOW | |
| ACTUAL (ACFM) | 317,800 |
| STANDARD DRY (SCFM) | 224,400 |

Source category: Taconite Ore Processing
Plant name : Eveleth Taconite Company
Process : Induration

Filename: TAC4-19.WQ1
Location: Eveleth, MN
Test date: 6/12/75

Date: 10/24/96
Ref. No.: 4-19
Process rate basis: Feed/estimated production

| Source | Type of control | Pollutant | Run No. | Test Method | Isokinetic, % | Gas volume, DSCF | Volum. flow rate, DSCFM | Mass, g | Concen., PPM | Emission rate, lb/hr | Process rate, ton/hr | Emission factor kg/Mg | Emission factor lb/ton | Rat. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gas-fired grate/kiln (nat. gas-fired) | None | NOx | 1 | EPA 7 | | | 224,400 | | 336 | 541 | 324 | 0.84 | 1.7 | |
| | | NOx | 2 | | | | 224,400 | | 461 | 742 | 324 | 1.1 | 2.3 | |
| | | NOx | 3 | | | | 224,400 | | 408 | 657 | 324 | 1.0 | 2.0 | |
| | | | | | | | | | PPM | Average | | 1.0 | 2.0 | C |
| | Wet scrubber | NOx | 1 | | | | 224,400 | | 317 | 510 | 324 | 0.79 | 1.6 | |
| | | NOx | 2 | | | | 224,400 | | 303 | 488 | 324 | 0.75 | 1.5 | |
| | | NOx | 3 | | | | 224,400 | | 331 | 533 | 324 | 0.82 | 1.6 | |
| | | | | | | | | | % | Average | | 0.79 | 1.6 | C |

Basis for rating: Incomplete documentation; production rates estimated from feed rates.
Problems noted: Feed rates only reported; production rates estimated using feed-to-production ratio of 1.19 as indicated in Ref. 29 for this source.
Other notes: May be for one of two stacks, but cannot determine from the reference.