AP32 Section:	12.5.1
Background Chapter	3
Reference:	13
Title:	Source Sampling for NOx Emissions, Annealing Furnace Outlet Stack. Nucor Steel, Crawfordsville, IN. May 23 and 24, 1995.

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

OFFICE OF AIR MANAGEMENT

OFFICE MEMORANDUM

To: Phil Perry
From: Dave Cline DC
Subject: Nucor Steel Annealing Furnace NOx Testing
Crawfordsville IN, Montgomery County
Source ID No. 107-00038

Date: 10/23/95
Thru: E. Surla 11/3
F.George

The subject company has submitted a report concerning NOx testing of their annealing furnaces. These furnaces combust natural gas and are used to relax the memory of coiled steel. The testing was conducted on May 23 and 24, 1995 by Ramcon Evironmental Corporation. The test protocol was reviewed by Steve Friend, Dave Cline observed the field testing. The purpose of the test was to determine compliance with operating permit requirements. I have reviewed this report and found the sampling procedures used and the 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 report:

Maximum Permitted Rate:	4.75 MMBTU/Hr
Average Rate During Test:	3.4 MMBtu/Hr
Average Measured Emissions: (measured on 1 furnace)	.872 Lbs/Hr NOx
Allowable Emissions: (all 24 furnaces combined)	2.3 Lbs/Hr NOx
Highest Six Minute Opacity:	N/A
Average Opacity:	N/A
Allowable Opacity:	N/A
Type of Fuel:	Natural Gas

STATUS: OUT OF COMPLIANCE
***NOTE: The Air Compliance Section recommends no enforcement action as per the attached letter.**

cc: W. Stanfield
D. Cline
General File Montgomery County

RAMCON
ENVIRONMENTAL CORPORATION

Source Sampling for NOx Emissions

Annealing Furnace Outlet Stack

NUCOR STEEL
CRAWFORDSVILLE, INDIANA
May 23 and 24, 1995

Dave Sulc
Nucor Steel

William Joseph Sewell, II
Vice President
RAMCON Environmental Corporation

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I. INTRODUCTION

On May 23 and 24, 1995 personnel from RAMCON Environmental Corporation conducted air emissions testing at Nucor Steel located in Crawfordsville, Indiana. The testing was performed for nitrogen oxides, carbon dioxide and oxygen. The outlet stack located on the annealing furnace was the emission source for the testing.

In conjunction with the gaseous analysis for pollutant concentration, a velocity traverse was conducted to determine the volumetric flow rate of gases that were being emitted from the process. A velocity determination was conducted before and after the gaseous analysis determination(s). This determination provided data that would support the conversion of pollutant concentration in parts per million (ppm) to emission values in pounds per hour (lb/hr).

The gaseous compounds of interest were collected and analyzed by test methods that utilize "real-time" continuous emission monitor (CEM) instrumentation. This technology provides data with a high degree of reliability on-site. Reference Methods 3A and 7E were employed for the analysis of oxygen, carbon dioxide, and nitrogen oxides, respectively.

These testing procedures set forth a sampling strategy to continuously extract sample gas from the source. This sample stream is routed to individual CEMs for analysis of the various targeted pollutants and diluent gases. The test results are based on the average value of one-minute averages generated by the CEM instrument data acquisition during the test periods. Three (3) sampling periods were performed in which the gaseous concentrations were continuously monitored for the listed target compounds.

The purpose of the performance test was to determine if the emissions of the targeted gaseous pollutants from this source are equal to or below the allowable emission limitation established by the appropriate regulatory authorities. The calculations of these test results are provided in a later section.

II. TEST RESULTS

The test results are summarized in the Table below. The gaseous analysis results for the target pollutants are shown in parts per million (ppm), dry basis. The NOx values are reported as nitrogen dioxide. The emission values of pollutants are tabulated in pounds per hour (lb/hr).

Annealing Line Test Summary
May 23 and 24, 1995

Run	Time	O_2, %	CO_2, %	NOx, ppm	NOx, lb/hr
* 1	13:03 - 14:04	2.62	10.32	147.08	0.665
2	15:35 - 16:36	2.73	10.34	245.55	0.988
3	17:04 - 18:05	2.76	10.29	264.43	1.007
4	17:45 - 18:45	3.70	9.76	131.22	0.654
	Average:	3.06	10.13	213.73	0.88

*Run 1 void due to high scale usage on NOx analyzer.

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OFFICE OF AIR MANAGEMENT
TEST OBSERVATION REPORT

Agency: IDEM (OAM)

Date of Test: 5/23/95

Company Name: Nucor Steel

Plant ID. 107-00038

Plant Location: RR2

Major/Minor: Min

City: Crawfordsville

Reported By: DAC

County: Montgomery

Test Reason: Permit Requirement

Facility Tested: Annealing Furnaces

Persons Interviewed: Dave Sulc(Nucor)

Test Observer: Dave Cline (IDEM)

Process Description: Coils of steel are placed in the annealing furnaces where they are heated to a constant temperature to relax them. When the furnaces are first fired they continue to heat up until they reach a set temperature. Once this is reached, the furnaces are set to begin "pulsing" this is simply a brief period where the burners fire from 15 seconds to several minutes and then shut off. The purpose of this is maintain a steady temperature inside the furnace, allowing the coil heat to stabilize throughout it's area. The furnaces are then gradually backed off allowing the coils to cool at a constant speed as well.

Pollutants Tested: NOx, CO2.

Test Method/s: 7E, 3A.

Test Summary: I arrived on site the first day and met with Dave Sulc. We headed out to the test site and I checked over Ramcon's equipment. Everything was standard so I calibrated their meter box and found it to be acceptable. While I was doing this I discussed the test plan with Ramcon and found they had no deviations from standard practices planned. During the box cal I also checked on all protocol gases, observed leak checks on the pitot lines, and checked the pretest linearity and bias calibrations. Once I was satisfied that everything was OK we began testing. Since the stacks were so small I had Ramcon do their flows immediately before we inserted the 7E probe. The first run went well with no problems encountered. After the run I observed all posttest cals with everything being acceptable. As soon as we got the first test done we began doing flows for the second. We then started the second 7E run. We hit a snag though since the NOx climbed out of the acceptable calibration range of the analyzer. Because of this we had to do this run over again after we had recalibrated the instrument with gases in the acceptable concentration range. After we got this run over with the pulse phase of the furnace was getting ready to start so we couldn't get another run in. Because of this I departed site and headed home with the understanding that we would finish the test the next day as well as do the information tests on some of the other furnaces. Before I left I obtained copies of the prior runs, calibrations, and flow tests.

On the second day I arrived on site and found we had a problem. Ramcon had left their sample manifold on internal cal all night long and it had depleted the mid range calibration gas. Because of this there was no way to calibrate the instrument so Ramcon had to order another cylinder of gas. This bottle was not scheduled to arrive until 3:30pm so I departed the site and