Emission Study of the Cement Kiln 20 Baghouse Collector at Alpena Plant, Great Lakes Division Lafarge Corporation Alpena, Michigan

Clayton Project No. 22105.00

Clayton Environmental Consultants, Inc.

22345 Roethel Drive • Novi, Michigan 48050 • (313) 344-1770

1.0 INTRODUCTION

Mr. Walter W. Dowd, Environmental Engineer of the Alpena Plant, Great Lakes Division, Lafarge Corporation, retained Clayton Environmental Consultants, Inc. to sample the cement Kiln 20 process baghouse exhausts for particulate and gas pollutants concentrations at the Alpena, Michigan, plant.

The purpose of the study was to quantify the particulate, particle size nitrogen oxides, volatile organic compound, and sulfur dioxide concentrations of the cement kiln process baghouse outlet breeching to the stack during the process audits performed on the day of tests.

Messrs., Donald B. Miller, Tim J. Ogonowski, and Victor W. Hanson, Environmental Consultants of Clayton, conducted the sampling program on March 8, 1989. Mr. Dowd provided coordination and technical assisstance.

2.0 CONCLUSIONS

The particulate emission concentration from the Kiln 20 baghouse averaged 0.0087 grains per dry standard cubic foot (gr/dscf). The particulate emission rate averaged 7.6 pounds per hour (lbs/hr). Complete particulate data are provided in Table 1.

The Kiln 20 nitrogen oxides emission rate averaged 169.9 lbs/hr at an average concentration of 232 parts per million-volume per volume (ppm-v/v) and 443 milligrams per dry standard cubic meter (mg/dscm). Table 2 shows the individual test results.

The sulfur dioxide stack emission concentrations averaged 265 ppm (v/v) and 706 mg/dscm and the emission rate averaged 261 lbs/hr. Table 3 shows the individual sulfur dioxide test results.

The United States Environmental Protection Agency (USEPA) Method 25 (Determination of Total Gaseous Non Methane Organics (TGNMO) emissions as Carbon) was followed to determine VOC emission concentration of the Kiln 20 baghouse. The VOC emission concentration averaged 71 ppm (v/v) and 35 mg/dscm as carbon and the emission rate averaged 12.9 lbs/hr as carbon.

Based on USEPA Method 25, the VOC emission concentrations averaged 70.5 ppm (v/v) and 46.9 mg/dscm as methane and an emission rate of 18.0 lbs/hr, as methane. Table 4 shows the individual test results.

Using USEPA Method 25 A (Determination of Total Gaseous Organics Using a Flame Ionization Analyzer (FID)" the Kiln 20 VOC emission concentrations averaged 7.6ppm (v/v) and 5.0 mg/dscm as methane and the emission rate averaged 1.9 lbs/hr as methane. Table 5 shows the individual test results.

The particle size data shows the cumulative percentage of particles less than 10 micron in size to be 64 percent. Table 6 shows the complete size distribution.

3.0 PROCESS INFORMATION

Limestone and shale from drying operations are blended, ground to a powder, and air-fluid bed homogenized to a uniform feed material which is fed into the kiln. Kilns are longcylinders in which heat is applied to the feed to cause it to chemically break down and reform into new compounds. Kiln 20 is 500 feet long and changes in diameter from 13 feet at the firing end to 15 feet at the feed end. As the kiln rotates, the feed flows toward the fire because the kiln is installed at a slope of 3/8 of an inch per foot. Various chemical reactions occur until at the hottest point , about 2700°F, the final reaction within the kiln occurs. As the material exits the discharge end of the kiln, it has been transformed from kiln feed to a new material referred to as clinker.

4.0 SAMPLING AND ANALYTICAL PROCEDURES

Baghouse outlet gas sampling was conducted in accordance with procedures outlined in the U.S. EPA Standards of Performance for New Stationary Sources, Reference Methods 1 through 4 (Federal Register, 40 CFR 60, December 23, 1971, as amended through December 16, 1987), where applicable.

The Michigan Department of Natural Resources (MDNR) Method 5B, Instack Filtration, was used for particulate sampling. The impinger solution used was a 25 % ethlylene glycol solution to prevent freezing due to ambient temperatures below 20 °F.

The sulfur dioxide and nitrogen oxides were measured by a Pace Model 302 continuous analyzer.

The FID VOC's were measured by a Ratfisch Model 55 A continuous analyzer.

Particle size distribution was determined by sampling with an Andersen 8-stage, instack cascade impactor.

Appendix A contains the field data sheets, analyzer strip charts, and calculation data for the complete testing program.

U.S. EPA Methods 1 and 2 were used for stack air velocity and volume determinations. A copy of these methods are provided in Appendix B.

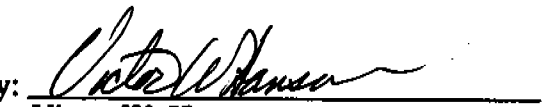
A copy of MDNR Method 5B is provided in Appendix C.

Information on the TGNMO VOC and FID VOC procedures are provided in Appendicies D and E.

Appendix F describes the particle sizing technique.

DISCLAIMER

The information and opinions rendered in this report are exclusively for your use and we respectfully request that they not be distributed or published without our consent. The information in this report is given in response to your limited assignment and should be evaluated and implemented only in light of that assignment. We accept responsibility for the competent performance of our duties in executing the assignment and preparing this report in accordance with normal standards of our profession but disclaim any responsibilty for consequential damages.

This report prepared by: 

Victor W. Hanson
Environmental Consultant
Environmental Engineering Services
April 13, 1989

Table 2

Nitrogen Oxides Emission Results
of the
Cement Kiln 20 Baghouse Discharge
at
Lafarge Corporation
Alpena, Michigan

Clayton Project No. 22105.00

March 8, 1989

Test Number	Time	Stack Gas Air Flow (dscfm)	Stack Gas Temperature (°F)	NOx as Nitrogen Dioxide Emissions: Parts per million (v/v)	Milligrams per cubic meter	Pounds per hour
1	0812-0915 (63 minutes)	102,685	331	195	373	143.5
2	1524-1624 (60 minutes)	102,154	332	185	354	135.5
3	1624-1724 (60 minutes)	102,154	332	315	603	230.7
Average		102,280	332	232	443	169.9

(dscfm) = dry standard cubic feet per minute, 68°F, 29.92 inches of mercury
(v/v) = volume per volume

EACH KILN PRODUCES ~ 40 TONS/HOUR; TOTAL CLINKER PRODUCTION IS ON P1 OF MY WRITE UP

40 TONS/HR @ 170 LB/HR = 4 1/4 LB/TON OF CLINKER

Lafarge Corporation
Great Lakes Region

THOMAS T. WHEELER
Director of Governmental and Public Affairs

P.O. Box 887
4000 Town Center, Suite 2000
Southfield, Michigan 48037
(313) 354-9050
FAX: (313) 354-0039

Table 3

Sulfur Dioxides Emission Results
of the
Cement Kiln 20 Baghouse Discharge
at
Lafarge Corporation
Alpena, Michigan

Clayton Project No. 22105.00

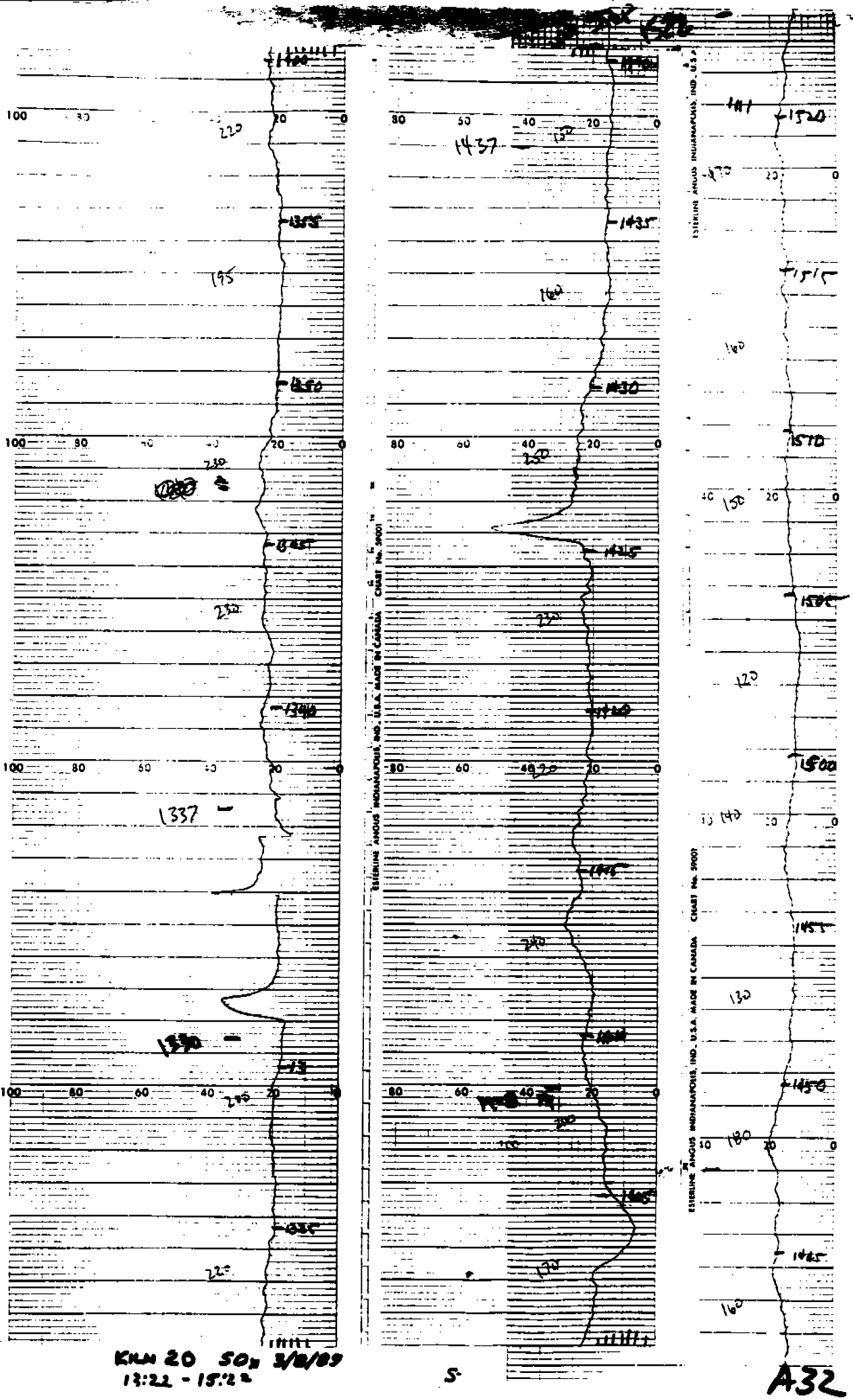
March 8, 1989

Test Number	Time	Stack Gas Air Flow (dscfm)	Stack Gas Temperature (°F)	SOx as Sulfur Dioxide Emissions: Parts per million (v/v)	Milligrams per cubic meter	Pounds per hour
1	0937-1037 60	102,685	331	350	932	358.4
2	1037-1137 60	102,685	331	170	453	174.1
3	1137-1237 60	101,029	328	410	1,092	413.1
4	1237-1337 60	101,029	328	300	799	302.3
5	1337-1437 60	102,154	332	210	559	214.0
6	1437-1537 60	102,154	332	150	399	152.8
Average		101,956	330	265	706	269.1

(dscfm) = dry standard cubic feet per minute, 68°F, 29.92 inches of mercury
(v/v) = volume per volume

FEED LB/HR 81.2
SO_2 LB/HR 269.1

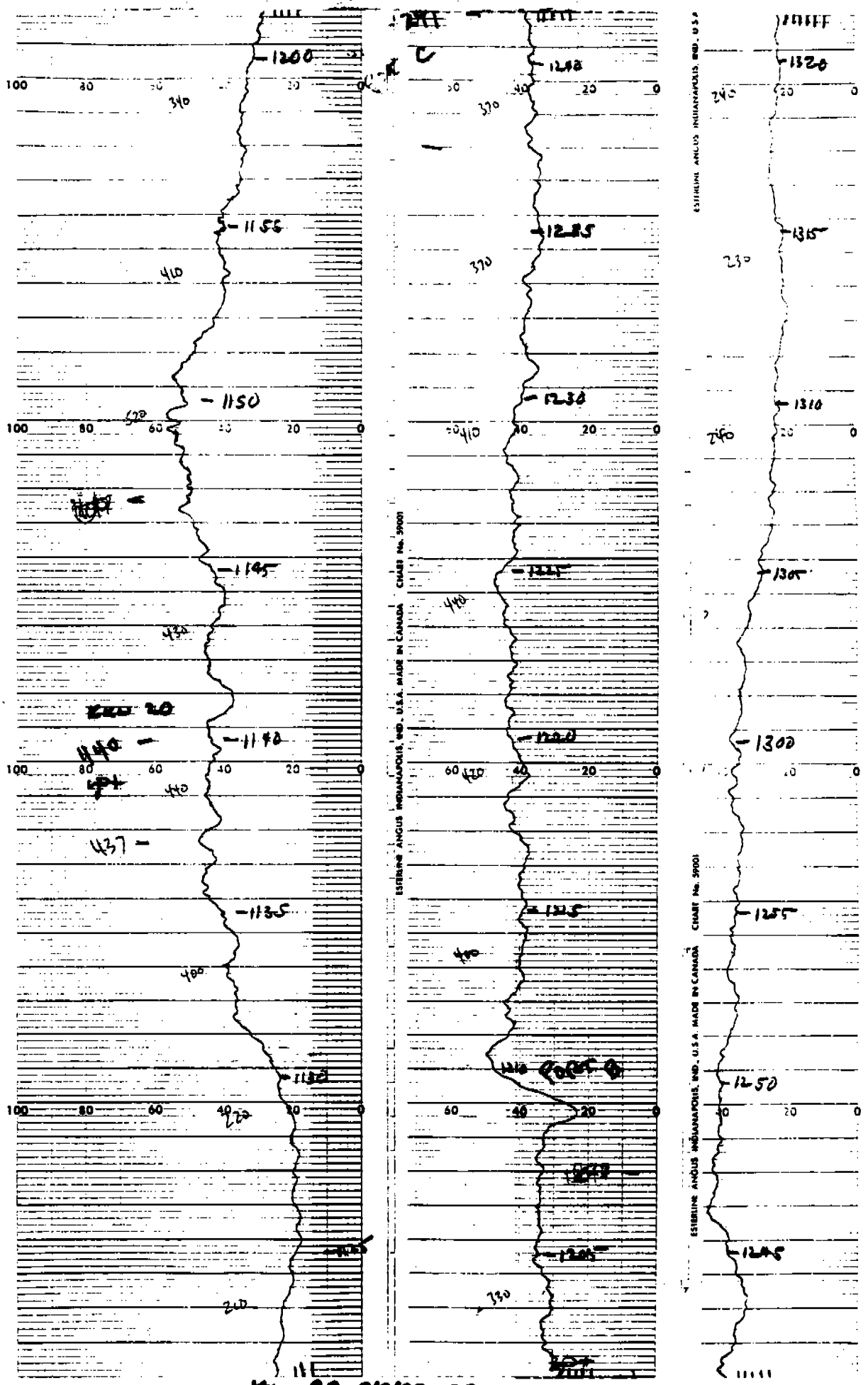
SO_2 / FEED TON 3.31



KNH 20 SO2 3/18/09
13:22 - 15:22

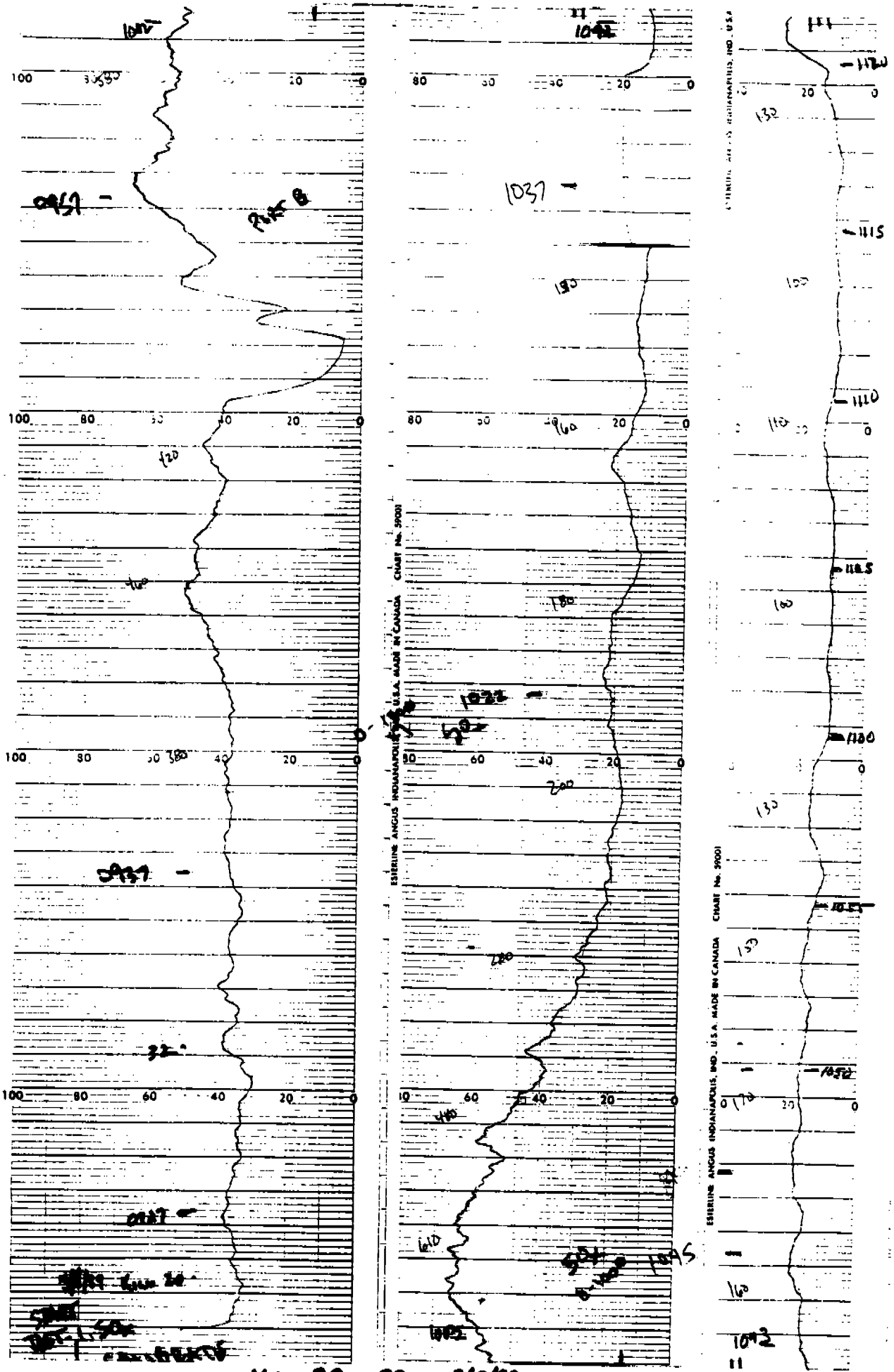
5

A32



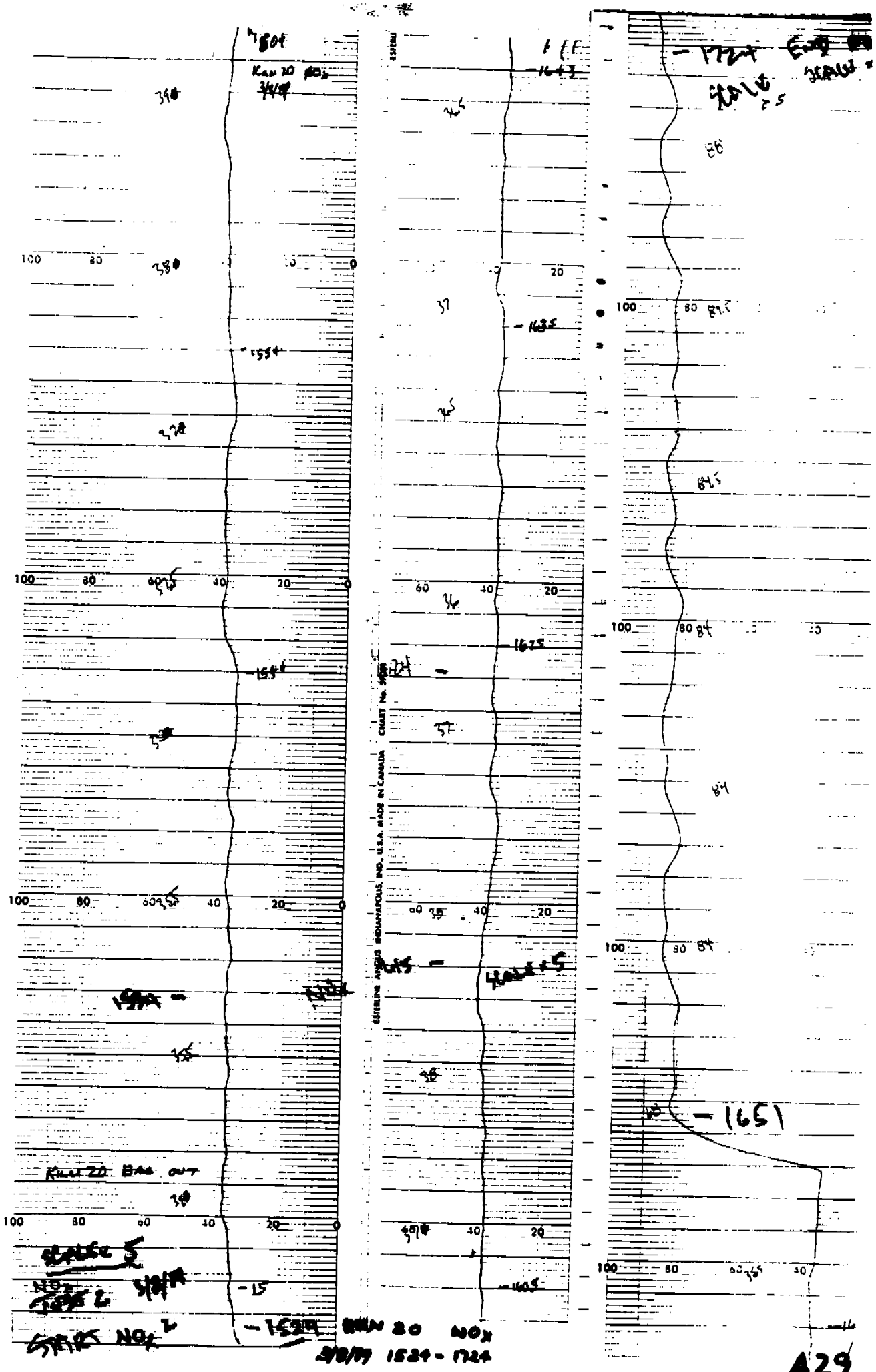
KILN 20 2/8/89. 50x
11:21 – 12:26

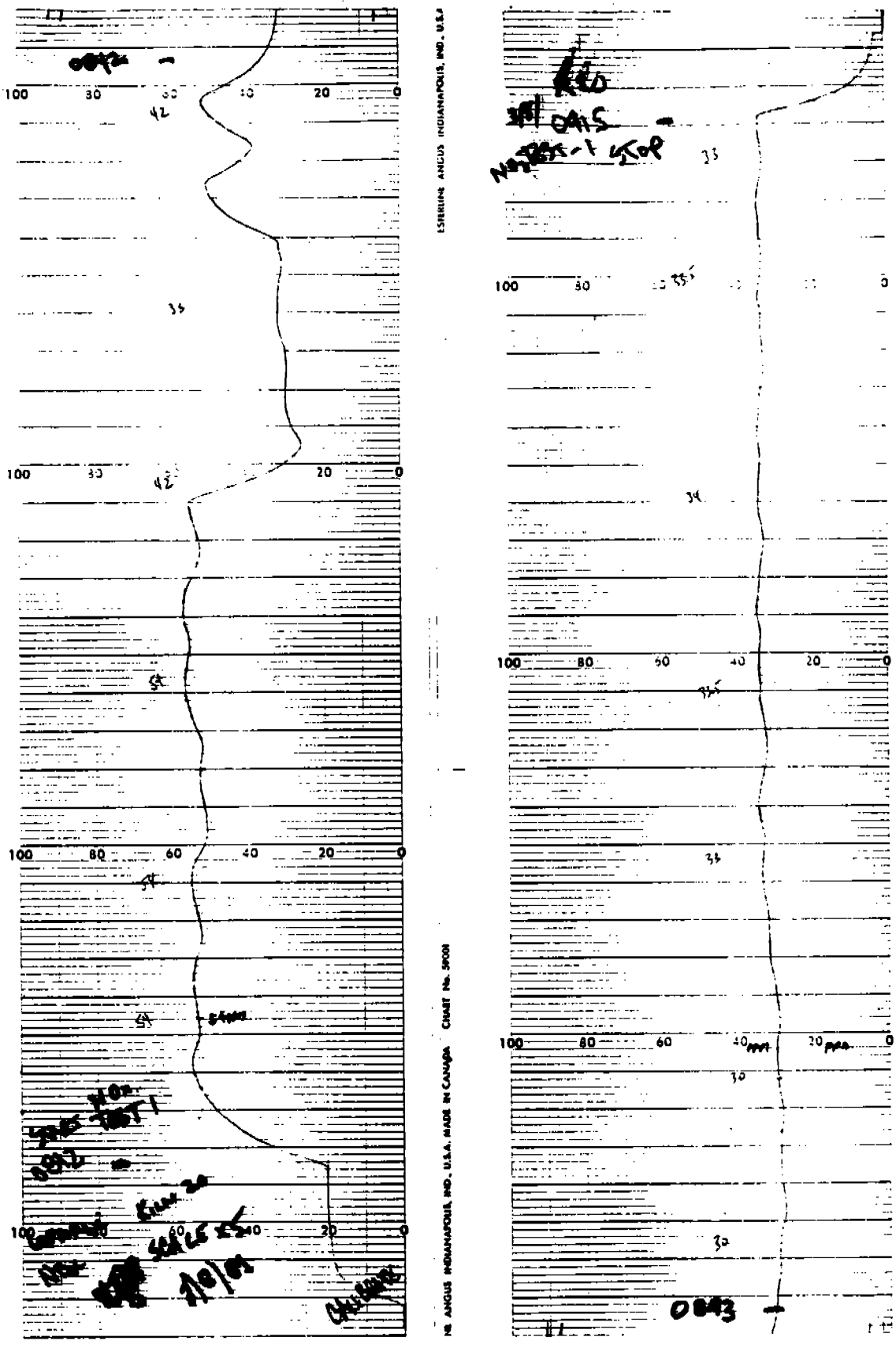
A31



KILN 20 SO_2 3/8/89
0924 - 1121

A30


RUN 20 NOx
3/4/19
1524 - 1724
A29



KILN 20 NOx
3/8/89 0812-0915