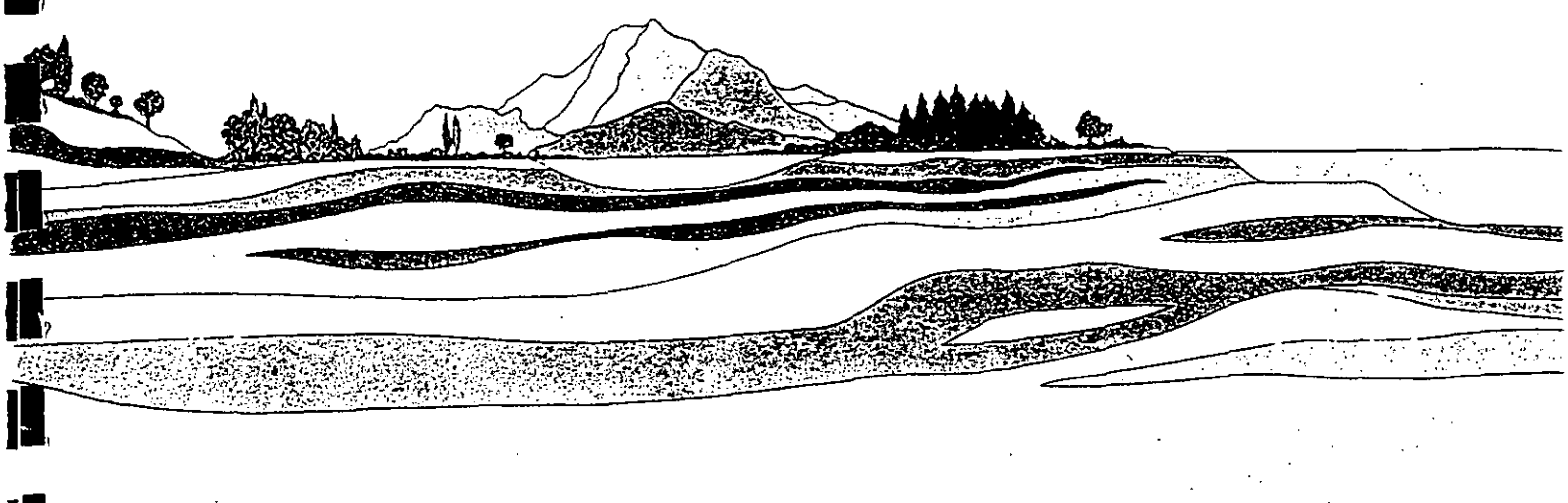
AP42 Section:	11.3
Reference:	37
Title:	*Source Emissions Testing, Marseilles Brick, Marseilles, Illinois*, Fugro Midwest, Inc., St. Ann, MO, July 1, 1994.

FUGRO MIDWEST, INC.

FUGRO McClelland

SOURCE EMISSIONS TESTING
MARSEILLES BRICK
MARSEILLES, ILLINOIS

MARSEILLES BRICK VENTURE, LTD.



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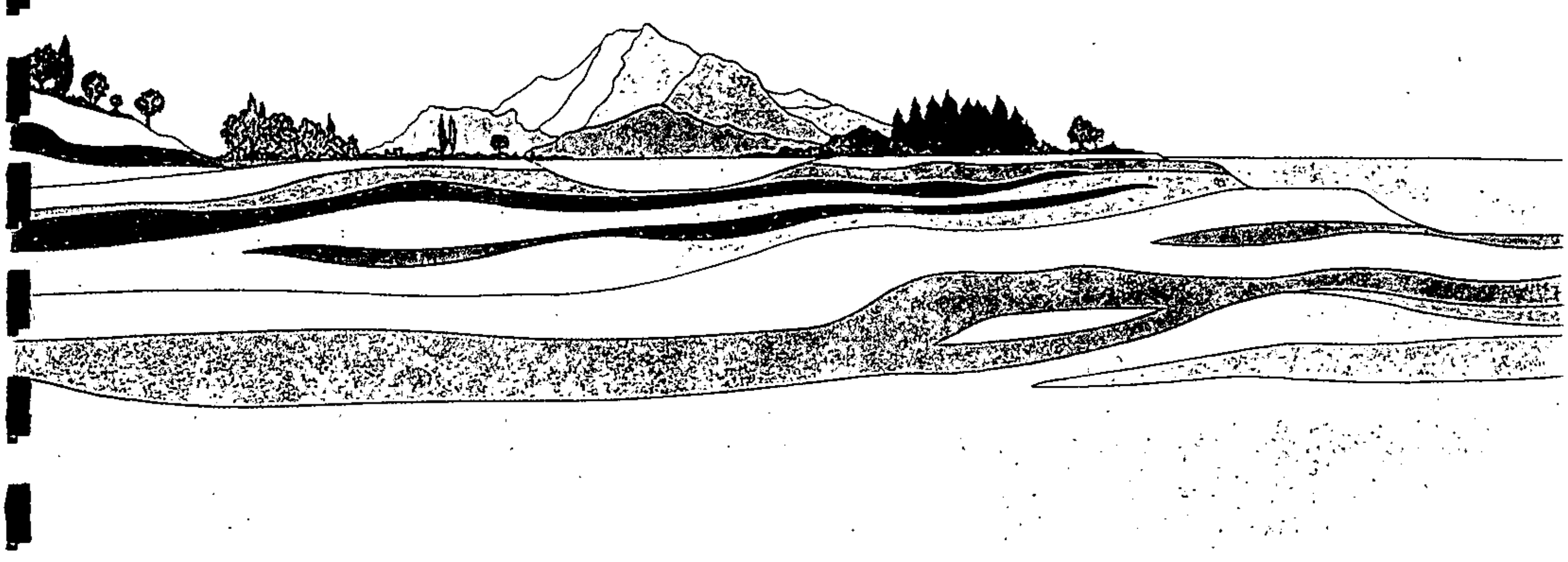

FUGRO MIDWEST, INC.

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July 1, 1994
Report 0894-8885

Mr. Charles Laird
Marseilles Brick Venture, Ltd.
P.O. Box 306
1401 Broadway
Marseilles, Illinois 61341

Source Emissions Testing
Marseilles Brick
Marseilles, Illinois

Dear Mr. Laird:

Fugro Midwest, Inc. (Fugro) is pleased to provide you with this report on the results of the air emissions tests conducted at the Marseilles Brick facility located in Marseilles, Illinois. Testing was conducted on May 10, 1994 at the outlet of the number one dryer, and on May 11, 1994 at the outlet of the number two dryer and kiln.

This report describes the testing methodologies and summarizes the results of the emissions testing.

Fugro appreciates this opportunity to provide service to Marseilles Brick, and we look forward to working with you on future projects. Please call us if you have any questions concerning this report.

Sincerely,

FUGRO MIDWEST, INC.

Anna C. Nabb
Air Quality Scientist

Christopher N. Dawdy
Vice President
Manager, Air Quality Group

ACN:CND:ab

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1.0 INTRODUCTION

Fugro Midwest, Inc. (Fugro) was contracted by Marseilles Brick Venture, Ltd. to conduct source emissions testing at their facility located in Marseilles, Illinois. Marseilles Brick has two independent Dryer tunnels approximately 200 ft. in length that hold 14 kiln cars each. Waste heat from the cooling section of the kiln is supplied to each dryer by a fan through a duct/plenum system. The heat to each dryer is boosted to 325°F by two natural gas burners, 442M BTU/hr. and 432M BTU/hr. respectively, located in the air supply duct. Moist warm air is exhausted to the atmosphere by a fan at the entrance end of each dryer tunnel. Dryer #1 and Dryer #2 are independent of each other except for the common waste heat supply from the kiln.

The tunnel kiln used by Marseilles Brick to fire its brick is a 498 ft. metal jacketed natural gas fired kiln designed by Ceric. The kiln holds a total of 36 kiln cars with 20 in the pre-heat and furnace section and 16 in the cooling section. The pre-heat section is divided into 6 zones with a total of 32 gas fired side burners. The furnace section is divided into 7 zones with 19 natural gas fired top burners in each zone for a total of 133 top fired burners. The cooling section has a rapid cool zone (2 car lengths long) where the brick is cooled from 1930°F to approximately 1300°F by injecting ambient air directly on the brick. The balance of the cooling section is used to cool the brick to approximately 100°F before existing the kiln.

Waste heat is removed from the cooling section close to the exit to supply heated air to the dryers. The kiln exhaust fan is located near the entrance end of the pre-heat and exhausts the products of combustion to the atmosphere through a 40 ft high brick chimney.

Source emissions testing was conducted to determine mass emission rates of particulate, sulfur trioxide, sulfur dioxide, carbon monoxide, nitrogen oxide, and volatile organics. Three 1-hour test runs were conducted on each of the two dryer units and the kiln while firing bricks with an 80% shale/20% fireclay composition.

The emissions testing was conducted following the procedures outlined in 40 CFR Part 60, Appendix A, using USEPA Methods 1, 2, 3, 4, 5, and 6 to determine sampling point locations, volumetric flow rates, molecular weight, moisture concentrations, total particulate matter, and sulfur dioxide/sulfur trioxide, respectively. Additionally, USEPA Method 7E was used to determine nitrogen oxide (NO_x) emissions, USEPA Method 10 was used to determine carbon monoxide emissions, and USEPA Method 25A was used to determine total volatile organic emissions.

This report presents the results of the emissions testing conducted at the Marseilles Brick facility. Copies of the field data sheets, laboratory analysis, equipment calibration records, calibration gas certifications, and example calculations are included in the appendices of this report.

2.0 SUMMARY OF TEST RESULTS

Fugro conducted source emissions testing at the Marseilles Brick facility located in Marseilles, Illinois, on May 10 and May 11, 1994 to quantify emission rates from three processes. An air emissions summary is presented in Table 2-1. The emissions were determined by averaging the results of three 1-hour test runs conducted on the exhaust of each unit. The testing was conducted during the use of 80% shale/20% clay mixture. Appendix A contains related process operations data.

3.0 PURPOSE OF TESTING

Fugro conducted air emissions testing at the facility located in Marseilles, Illinois for the purpose of determining mass emission rates of particulate matter, sulfur trioxide, sulfur dioxide, carbon monoxide, nitrogen oxide and volatile organics. These emissions rates will be used to evaluate the potential emissions associated with the brick manufacturing operation. The testing was conducted as required by 35 Ill. Adm. Code 201.282(a) in association with Permit #89010009.

4.0 ACTIVITIES DURING THE TESTING

Messrs. Robert Folle, Todd Staley, and Dan Cusac of Fugro conducted the emissions testing. Mr. Charles Laird of Marseilles Brick scheduled the testing and coordinated the testing effort. Resumes of the test crew are presented in Appendix B.

5.0 TEST METHODS AND PROCEDURES

Fugro utilized USEPA Test Methods 1, 2, 3, 4, 5, and 6 as outlined in 40 CFR Part 60, Appendix A, to determine traverse point locations, stack gas velocity, volumetric flow rates, molecular weight, moisture, total particulate matter emissions and sulfur emissions, respectively. Additionally, Methods 7E, 10, and 25A when used to determine nitrogen oxide, carbon monoxide, and total hydrocarbon emissions.

Table 2-1 Emissions Summary Marseilles Brick Venture Ltd. Marseilles, Illinois								
Source	Run		Parameter					
			Particulate	SO_2	SO_3	NO_X	CO	THC
Dryer #1	1	gr/dscf	0.0074	0	0.0005	-	-	-
		lb/hr.	0.9765	0	0.0632	1.29	0.53	0.39
		ppm	-	ND	0.35	11.9	8.0	3.7
	2	gr/dscf	0.0023	0	0.0001	-	-	-
		lb/hr.	0.3741	0	0.0216	0.47	1.52	0.78
		ppm	-	ND	0.10	3.5	18.7	6.1
	3	gr/dscf	0.0041	0	0.0004	-	-	-
		lb/hr	0.6398	0	0.0625	0.26	1.86	0.88
		ppm	-	ND	0.30	2.0	24.0	7.3
	Avg.	gr/dscf	0.0046	0	0.0003	-	-	-
		lb/hr.	0.6635	0	0.0491	0.67	1.30	0.68
		ppm	-	ND	0.25	5.8	16.9	5.7
Dryer #2	1	gr/dscf	0.0057	0	0	-	-	-
		lb/hr.	0.7770	0	0	0.17	1.04	0.33
		ppm	-	ND	ND	1.5	14.9	3
	2	gr/dscf	0.0008	0	0	-	-	-
		lb/hr.	0.1199	0	0	0.29	1.50	0.32
		ppm	-	ND	ND	2.2	19.0	2.6
	3	gr/dscf	0.0008	0	0.0004	-	-	-
		lb/hr.	0.1206	0	0.0529	0.35	1.43	0.55
		ppm	-	ND	0.27	3.0	20.0	4.9
	Avg.	gr/dscf	0.0024	0	0.0001	-	-	-
		lb/hr.	0.3391	0	0.0176	0.27	1.32	0.40
		ppm	-	ND	0.09	2.2	18.0	3.5
Kiln	1	gr/dscf	0.0376	0.3800	0.0249	-	-	-
		lb/hr.	4.2421	42.9170	2.3903	2.36	6.98	0.80
		ppm	-	338.1	18.6	25.9	125.8	9.2
	2	gr/dscf	0.0381	0.3496	0.0197	-	-	-
		lb/hr.	4.6234	42.3965	2.8082	2.67	7.23	0.81
		ppm	-	314.5	14.95	27.6	122.8	8.8
	3	gr/dscf	0.0347	0.3458	0.0163	-	-	-
		lb/hr.	3.8788	38.5965	1.8228	2.50	6.81	0.67
		ppm	-	310.8	12.4	28.0	125.5	7.8
	Avg.	gr/dscf	0.0368	0.3585	0.0203	-	-	-
		lb/hr.	4.2481	41.3033	2.3404	2.51	7.01	0.76
		ppm	-	321.1	15.3	27.2	124.7	8.6

5.1 Field Procedures and Equipment (EPA Method 5 and 6)

5.1.1 Sampling Equipment and Procedures

The sampling equipment consists of the following:

1. Pitot Assembly
   a. Nozzle – Glass with a sharp, tapered leading edge.
   b. Probe – Stainless steel sheath with a 5/8-in. OD glass liner wrapped with nichrome wire; rheostat controlled and capable of maintaining a temperature of 248 degrees F +/- 25 degrees F.
   c. Pitot – Type "S" constructed and attached to probe according to specifications outlined in the "code of Federal Regulations, Chapter I, Title 40 Part 60, Appendix A, Method 2."
   d. Fyrite probe – Stainless steel 1/4-in. tubing attached to pitot tube in an interference-free arrangement.
   e. Thermocouple – Type "K" attached to the pitot tube such that the tip has no contact with the metal and does not interfere with the pitot tube face openings.

2. Filter Holder – Borosilicate glass with a glass fritted filter support and silicone rubber sealing gasket.

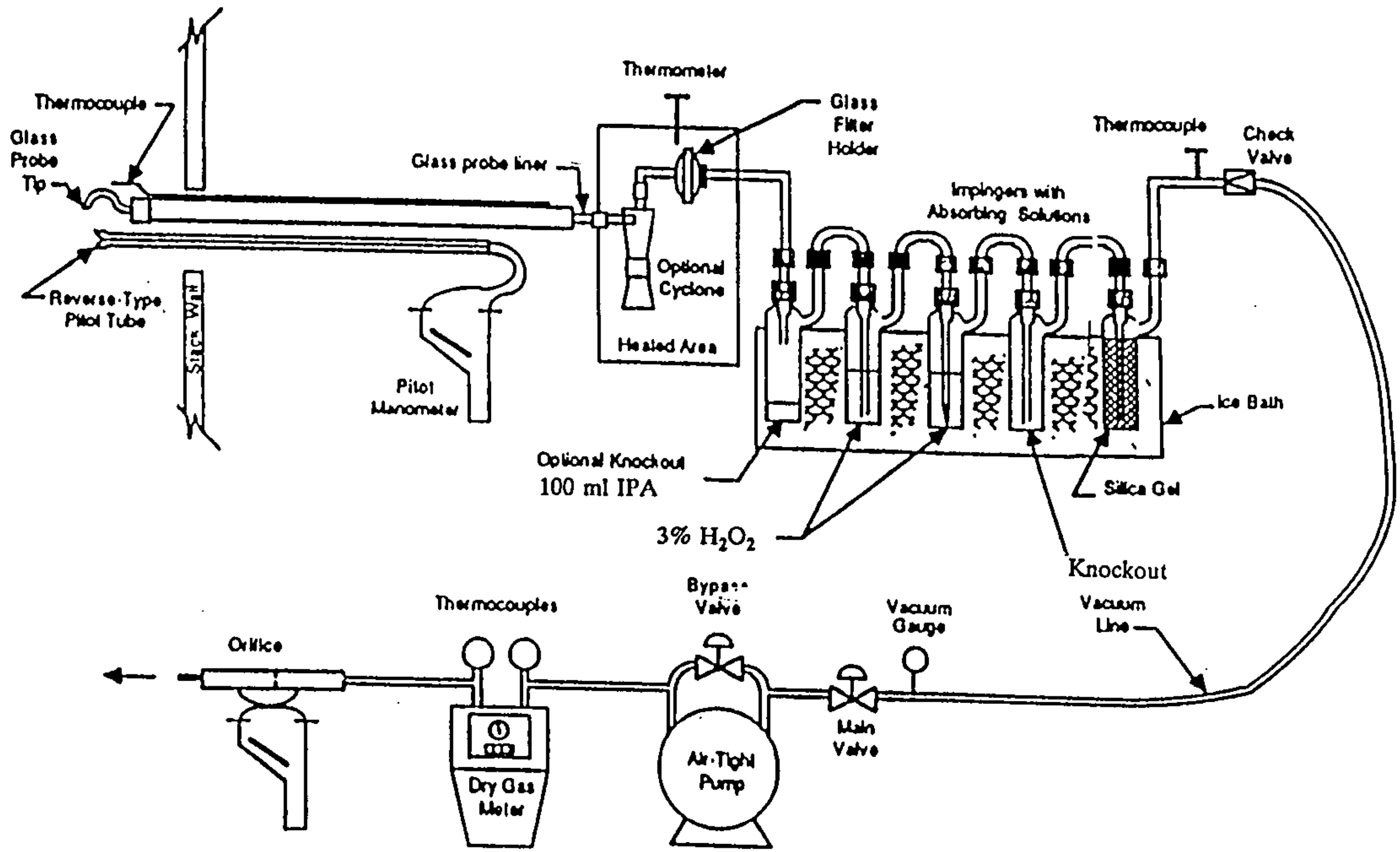
3. Filter Heating Assembly – Controlled heating element in aluminum module attached to end of probe; capable of maintaining 248 degrees F +/- 25 degrees F.

4. Impingers – Four glass impingers connected in series with glass ball joint fittings and placed in an ice bath. The first, third, and fourth impingers were of the modified Greenburg-Smith design. The second impinger was of the Greenburg-Smith design with a standard tip. Final gas exit temperature was measured to within +/- 5 degrees F with a thermometer immersed in the gas stream.

5. Control Box – Module containing the vacuum gauge, leak-free pump, thermometer capable of measuring temperature to within +/- 5 degrees F, dry gas meter with a minimum of 2% accuracy, valves and related equipment as required to maintain an isokinetic sampling rate and to determine sample volume.

6. Nomograph – To determine isokinetic sampling rate.

A schematic of the particulate sampling train is shown in Figure 5-1.



SOURCE: ENVIRONMENT REPORTER

FIGURE 5-1

Particulate Matter and Sulfur Dioxide Sampling Train

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Prior to leaving the laboratory, glass fiber filters were numbered for identification purposes, heated for 2 hours at 250 degrees F, desiccated for 2 hours, and preweighed to the nearest 0.1 mg.

Upon arrival at the sampling site, the control box was leak-checked from the pump to the orifice at 5 to 7 in. of water.

The sampling train was prepared in the following manner: 100 ml of 80% isopropanol in the first impinger, 100 ml of 3% hydrogen peroxide water was added to each of the next two impingers. The fourth impinger was left empty and the fifth impinger contained 250 grams of silica gel.

After assembling the train with the pitot tube, as shown on the schematic, the system was leak-checked by plugging the inlet to the probe nozzle and pulling a 15-in. mercury vacuum. A leakage rate not to exceed 0.02 cfm is considered acceptable. The pitot tube system was also leak-checked at 2 to 3 in. of water, and any leaks found were corrected.

The probe nozzle size and moisture content was derived from a preliminary velocity and temperature traverse measurement. Sampling points within the duct were selected in accordance with EPA Method 1 (40 CFR 60, Appendix A). The sampling probe was attached and the heater was adjusted to provide a gas temperature of approximately 248 degrees F, +/- 25 degrees F.

The filter heating system was turned on, and ice was placed around the impingers. After a suitable warmup period, the nozzle was placed at the first traverse point with the flow adjusted to isokinetic conditions. Using calculated sampling points and sampling times, the probe was repositioned to the next traverse point, and isokinetic sampling was re-established. This was accomplished for each point along the traverse until the run was completed. Readings were taken at each traverse point and at the calculated time interval. At the conclusion of each run, the pump was turned off and the final readings were recorded. A final leak check of the sampling system was performed, as previously described at the highest vacuum encountered during the test run. A leak check of the pitot system was also repeated.

5.1.2 Sample Recovery

The volume of liquid in the first four impingers was measured and recorded on the field data sheet. The probe nozzle, and all sample-exposed surfaces were washed with reagent-grade acetone and put into a clean sample bottle marked "prefilter." A brush was used to loosen any adhering particulate matter, and subsequent washings were put into the "prefilter" container. The filter was carefully removed from the fritted teflon support and placed in its original container. Any filter material that adhered to the filter support surfaces was carefully removed and added to the filter container. The silica gel was removed from the fifth impinger and transferred to its original container. A sample of the acetone used in washing the probe was saved as a blank for laboratory analysis. The liquid from the first four impingers was collected and labeled for shipment to the laboratory.

5.1.3 Analytical Procedures

The filter and any loose particulate matter was transferred from the filter container to a clean, tared glass weighing dish. The filter was placed in a desiccator for 24 hours and weighed to a constant weight. The original weight of the filter was deducted, and the weight gain recorded to the nearest 0.1 mg.

The "prefilter" wash and blank acetone solutions were transferred to individual clean, tared beakers, then evaporated to dryness and desiccated to a constant weight. The weight gain of the "prefilter" was adjusted for the blank and recorded to the nearest 0.1 mg. The silica gel was weighed, and the weight gain was recorded to the nearest 0.1 gram.

The impinger catch was shipped to IT Analytical of Cincinnati, Ohio, for sulfur titrations. The analytical data sheets for particulate and SO_2/SO_3 analyses are presented in Appendix C.

5.2 Oxygen (O_2) and Carbon Dioxide (CO_2) Sampling

As required by EPA Method 3 (40 CFR 60, Appendix A), oxygen and carbon dioxide samples were collected by an integrated bag system for Orsat analysis. The Orsat sampling system consists of a stainless steel probe, flexible sample line from the probe to a condenser, a small vacuum pump with a critical orifice, and a tedlar bag. The collected sample was then analyzed using an Orsat gas analyzer. Oxygen and carbon dioxide concentrations were determined in percent of stack gas and stack gas molecular weight was then calculated.

The Orsat sampling procedure consists of the following leak check and sampling techniques. Prior to sampling, the base was leak-checked to 2 to 4 in. of water. The inlet to the condenser was plugged, and a vacuum of 10 in. of Hg was created. The outlet of the pump was then plugged and the pump was turned off. The vacuum was observed for 30 seconds to determine any leakage. The vacuum must hold steady for at least 30 seconds for the leak test to be acceptable. The sample line was then purged with stack gas and the bag was connected. Sampling was conducted at an appropriate constant rate at the same traverse points and for the same length of time as the other testing parameters were tested. At the conclusion of the run, the pump was turned off and the bag sealed.

After leak-checking, the Orsat gas analyzer, an average value for each gas was determined. The gas was analyzed until two values were obtained that fell within the specified variance of the gas tested. Data were recorded on the field data sheets, and the bag was evacuated for the next sample run.

Appendix D contains copies of all field data and sample custody sheets. Equipment calibration records are presented as Appendix E.

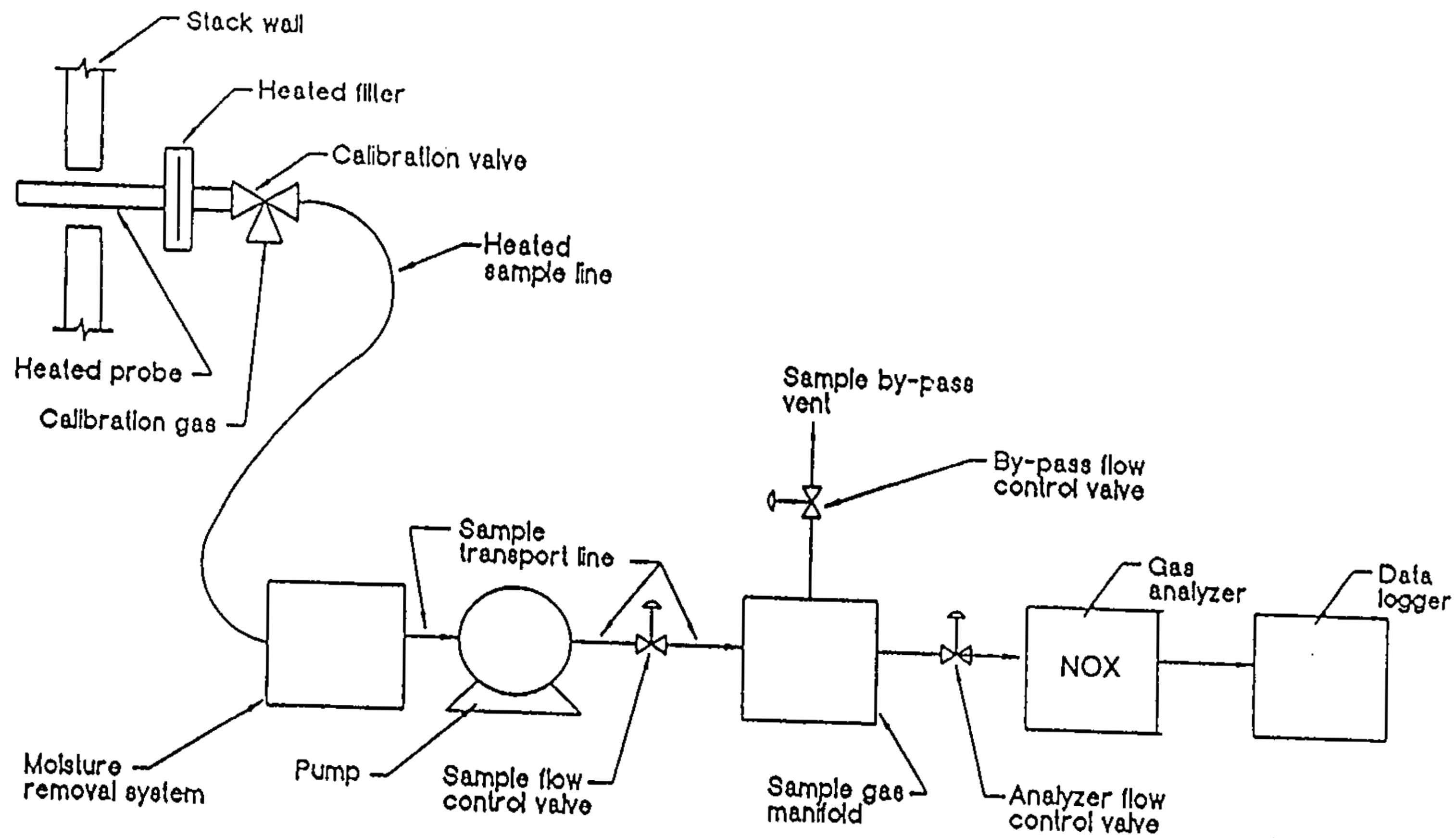
5.3 Oxides of Nitrogen Sampling - EPA Method 7E

Nitrogen oxide (NO_x) was measured following the procedures set forth in Method 7E of 40 CFR 60, Appendix A. The NO_x analysis was performed with a TECO, Model 10AR, chemiluminescent NO_x analyzer manufactured by Thermo Environmental Instruments, Inc. The TECO 10AR blends the gas sample with O_3 in a reaction chamber. The resulting chemiluminescence is monitored through an optical filter by a high-sensitivity photomultiplier positioned at one end of the chamber. The filter/photomultiplier combination responds to light in a narrow-wave length band unique to the reaction of NO and O_3. The output from the photomultiplier is linearly proportional to the NO concentration. To measure NO_x concentrations, the NO_x in the sample gas is converted to NO through a converter. The chemiluminescent response in the reaction chamber to the converter effluent is linearly proportional to the NO_x concentration entering the converter.

The electrical responses from the TECO 10AR were recorded on an Omega 5500 data logger. This data was digitized into 60-minute averages. The gas sample in the stack was drawn from the stack port with a Thomas Industries Model 107 diaphragm pump. The sample gas flow from the stack flowed through Teflon tubing to a glass condenser (ice bath) where the water vapor was removed. From the condenser, the gas flow was reduced by a valve before entering the pump. The gas sample was then pumped through the analyzer at a constant flow rate and pressure (Figure 5-2).

The nitrogen oxide analyzer was calibrated using a three-point calibration consisting of a zero gas, and two additional test concentrations of nitrogen oxide (NO) consisting of 86.7 parts per million (ppm) and 356 ppm of NO. The NO_x analyzer was calibrated before and after the NO_x tests. The certifications for the calibration gases used during the test are presented in Appendix E.

An initial analyzer calibration error test was performed for zero and upscale span calibrations on the analyzer to determine the difference between the gas concentrations exhibited by the gas analyzer and the known concentrations of the calibration gas, when the calibration gas is introduced directly to the analyzer's input (+/- 2% of span for each concentration is acceptable).



SOURCE: ENVIRONMENT REPORTER

FIGURE 5-2

Nitrogen Oxide (NO_x) Sampling System

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A sampling system bias test was performed on the analyzer system. Zero and calibration gases were introduced to the outlet of the sampling probe, and the difference between the bias readings and the initial analyzer calibration error readings (known gas concentrations introduced directly into the analyzer's input) were recorded (bias). Bias system limits for each concentration is +/- 5% of span. Sampling was performed simultaneously. Sampling was started at the first measurement point, as determined by Method 1, after twice the system response time (time it takes for calibration gas to travel up to the probe and back down to the analyzers input) had elapsed. System response time was 2 minutes and 36 seconds. Zero and calibration drift (span) tests were performed immediately preceding and following the test run before any adjustments to the measurement system (+/- 3% of span). All test runs were found to be within the system specifications and all zero and upscale calibrations were within the sampling system bias specifications.

5.4 Sampling Equipment and Procedures for Carbon Monoxide (CO) Sampling

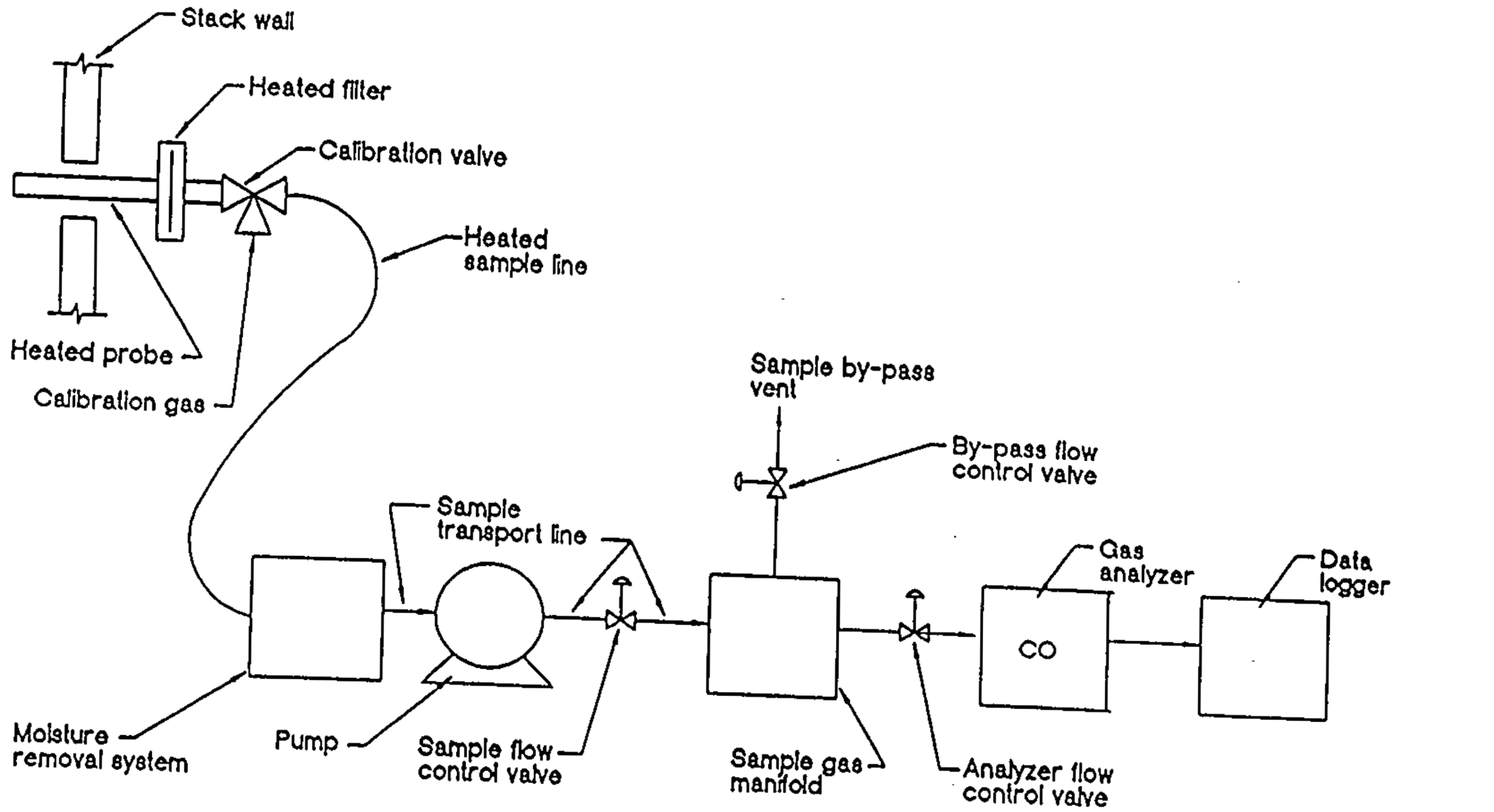
Carbon Monoxide (CO) Sampling — EPA Method 10.

CO concentrations in the stack gas were monitored with a Horiba 331 CO Analyzer. This instrument utilizes gas filter correlation for CO measurement.

The gas sample was continuously drawn from the stack with a Thomas Industries Model 107 diaphragm pump. The gas flowed from the stack through Teflon tubing to a glass condenser where the majority of the water vapor was removed. From the condenser, the gas flow rate was reduced by a valve before entering the pump. The gas was then pumped through the analyzer at a constant flow rate and pressure (Figure 5-3). The CO analyzer was calibrated with known concentrations of certified N_2 for zero span and certified concentrations of CO for upscale span calibrations. The analyzer was calibrated before and after each test run. Protocol-1 calibration gas certificates are presented in Appendix E. Photocopies of the actual CO concentration readings recorded on a data logger/chart recorder are presented in Appendix F.

5.5 Sampling Equipment and Procedures for Total Hydrocarbon (THC) Determination (EPA Method 25A)

Total hydrocarbon concentrations (as propane) in the stack gas were continuously extracted and analyzed with a J.U.M. Model VE-7 heated total hydrocarbon analyzer. The analyzer utilizes a hydrogen flame ionization detector (FID) in a heated oven (190°C) to prevent the loss of high molecular weight hydrocarbons.



SOURCE: ENVIRONMENT REPORTER

FIGURE 5-3
Carbon Monoxide (CO) Sampling Train
EPA Method 10

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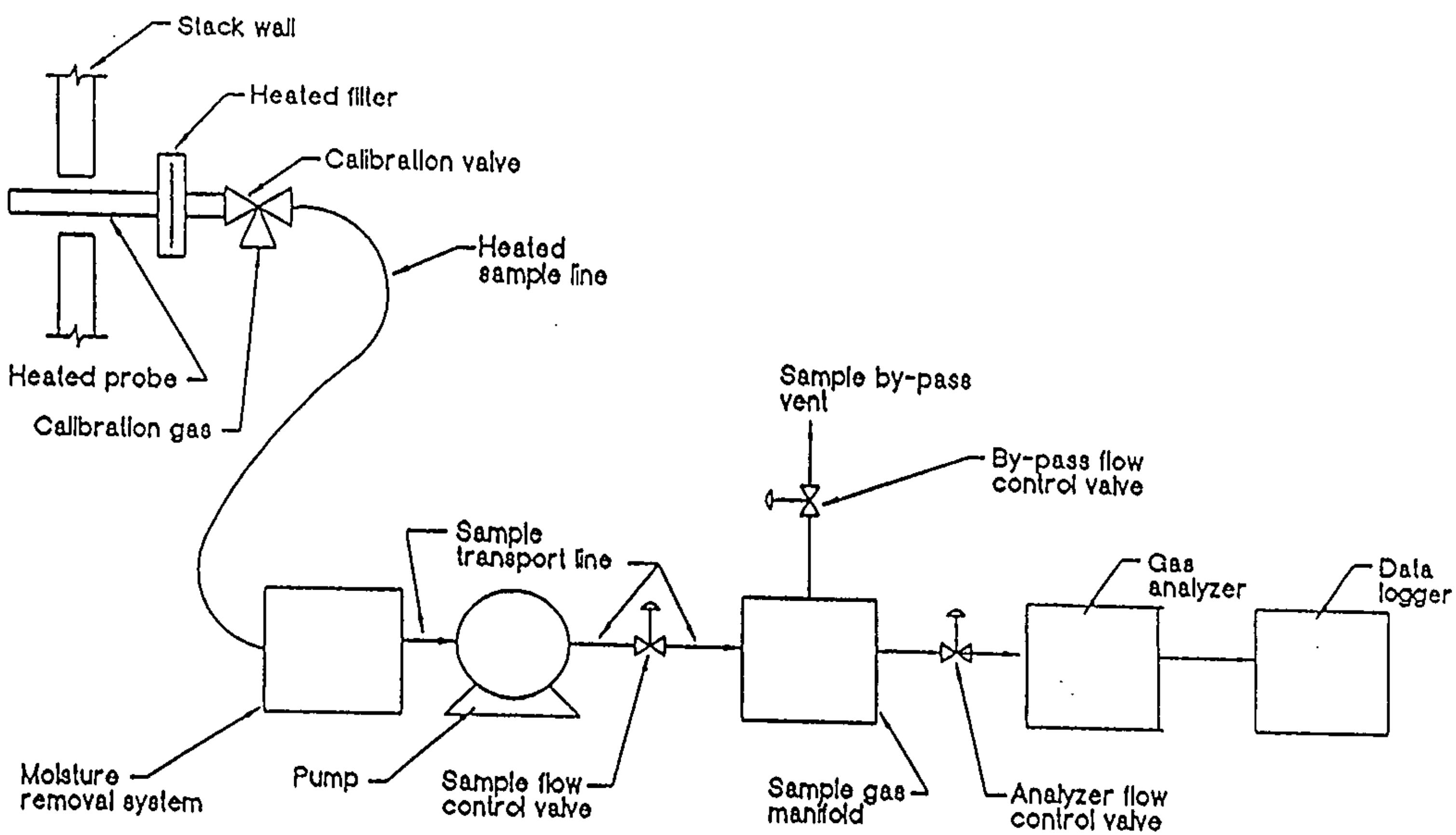
Stack gas was continuously extracted from the source through heated teflon sample lines (250°F) connected to suitable stainless steel sampling probes. The stack gas was introduced directly into the heated total hydrocarbon analyzer at a constant flow rate and pressure. The total hydrocarbon analyzer was calibrated before and after each of the tests with known concentrations of USEPA Protocol-1 propane calibration gases for upscale span calibrations and drift checks and zero gas for zero calibrations.

The total hydrocarbon analyzer's responses (as propane) were continuously recorded on an Omega Model 5500 data logger. Figure 5-4 illustrates a schematic diagram of the total hydrocarbon sampling train. Calibration gas certifications for the USEPA Protocol-1 calibration gases are presented in Appendix E. Copies of the data logger records are presented in Appendix F.

6.0 EMISSION RESULTS

The emissions results of the testing are presented in Tables 6-1 through 6-9. Example calculations for test run number 1, conducted on the #1 dryer outlet on May 10, 1994, are presented in Appendix F.



SOURCE: ENVIRONMENT REPORTER

FIGURE 5-4

Total Hydrocarbon Sampling Train

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TABLE 6-1. PARTICULATE MATTER EMISSION SUMMARY

PLANT: MARSEILLES BRICK
CITY, STATE: MARSEILLES, ILL.
STACK: KILN STACK

PARTICULATE MATTER SUMMARY

Run Number	1	2	3	AVERAGE
Date of Run		MAY 11, 1994		
Starting Time (hours)	1515	1700	1840	
Ending Time (hours)	1615	1800	1943	
Net Time of Run (minutes)	60	60	60	
Number of Points	21	21	21	
Barometric Pressure (in. Hg)	29.85	29.85	29.85	
Static Pressure (in. H2O)	-0.11	-0.11	-0.11	
Stack Pressure (in. Hg)	29.84	29.84	29.84	29.84
Average Delta H (in. H2O)	2.4143	2.5619	2.1667	2.38
Average Delta P (in,H2o)	0.2129	0.2400	0.2038	0.22
Meter Pressure (in. Hg)	30.03	30.04	30.01	30.03
Pitot Tube Coefficient	0.84	0.84	0.84	0.84
Meter Box Number (STL#)	2	2	2	
Y-Factor	1.001	1.001	1.001	
Stack Length (in.)	41	41	41	
Stack Width (in.)	41	41	41	
Stack Cross Sectional Area (ft2)	11.673611	11.673611	11.673611	11.67361111
Nozzle Diameter (inches)	0.370	0.370	0.370	
Nozzle Area (ft2)	0.00074667	0.0007467	0.000746674	0.000746674
Meter Temperature (F)	88.952	95.238	94.381	92.857
Stack Temperature (F)	481.571	480.143	473.524	478.413
Ending DGM Volume (ACF)	923.715	986.317	1036.52	
Beginning DGM Volume (ACF)	872.15	935.121	991.447	
Volume of Dry Gas Sample (acf)	51.5650	51.1960	45.0730	49.2780
Dry, Std. Gas Sample Volume (dscf)	49.8247	48.926	43.099	47.2832
Condensate Collected (mL)	74.50	73.60	63.60	70.57
Moisture Concentration (%)	6.58	6.61	6.49	6.56
Carbon Dioxide Concentration (%)	1.800	1.800	1.800	1.800
Oxygen Concentration (%)	17.800	17.800	17.800	17.800
Carbon Monoxide Concentration (%)	0.000	0.000	0.000	0.000
Nitrogen Conc. Dry (gas balance)	80.400	80.400	80.400	80.400
Molecular Weight, Dry (lb/lb-mole)	29.0000	29.0000	29.0000	29.0000
Molecular Weight, Wet (lb/lb-mole)	28.2767	28.2726	28.2856	28.2783
SQRT Delta P Avg., Pitot (in. H2O)	0.458527	0.486638	0.446180	0.463782
Avg. Velocity, Stack Gas (ft/sec)	34.7823	36.8894	33.6955	35.1224
Actual Flow Rate (acfm)	24362.113	25837.945	23600.892	24600.317
Dry, Std. Vol. Flow Rate (dscfm)	12729.777	13516.055	12449.049	12898.294
% Isokinetic	102.05	94.38	90.26	95.56
Total Filter Catch (mg)	20.90	25.10	15.80	20.60
Total Wash Catch (mg)	104.60	101.40	85.70	97.23
Total Catch (mg)	125.50	126.50	101.50	117.83
Particulate Conc. (grams/dscf)	0.0024	0.0025	0.0023	0.0024
Particulate Conc. (grains/dscf)	0.0376	0.0381	0.0347	0.0368
Particulate Concentration (lb/dscf)	5.55E-06	5.70E-06	5.19E-06	5.48E-06
Particulate Emission Rate (lb/hr)	4.2421	4.6234	3.8788	4.2481

TABLE 6-2. SULFUR TRIOXIDE EMISSION SUMMARY

PLANT: MARSEILLES BRICK
CITY, STATE: MARSEILLES, ILL.
STACK: KILN STACK

SULFUR TRIOXIDE SUMMARY

Run Number	1	2	3	AVERAGE
Date of Run		MAY 11, 1994		
Starting Time (hours)	1515	1700	1840	
Ending Time (hours)	1615	1800	1943	
Net Time of Run (minutes)	60	60	60	
Number of Points	21	21	21	
Barometric Pressure (in. Hg)	29.85	29.85	29.85	
Static Pressure (in. H2O)	-0.11	-0.11	-0.11	
Stack Pressure (in. Hg)	29.84	29.84	29.84	29.84
Average Delta H (in. H2O)	2.4143	2.5619	2.1667	2.38
Average Delta P (in,H2o)	0.2129	0.2400	0.2038	0.22
Meter Pressure (in. Hg)	30.03	30.04	30.01	30.03
Pitot Tube Coefficient	0.84	0.84	0.84	0.84
Meter Box Number (STL#)	2	2	2	
Y-Factor	1.001	1.001	1.001	
Stack Length (in.)	41	41	41	
Stack Width (in.)	41	41	41	
Stack Cross Sectional Area (ft2)	11.673611	11.673611	11.673611	11.67361111
Nozzle Diameter (inches)	0.370	0.370	0.370	
Nozzle Area (ft2)	0.00074667	0.0007467	0.000746674	0.000746674
Meter Temperature (F)	88.952	95.238	94.381	92.857
Stack Temperature (F)	482.048	480.143	473.524	478.571
Ending DGM Volume(ACF)	923.715	986.317	1036.52	
Beginning DGM Volume (ACF)	872.15	935.121	991.447	
Volume of Dry Gas Sample (acf)	51.5650	51.1960	45.0730	49.2780
Dry, Std. Gas Sample Volume (dscf)	49.8247	48.926	43.099	47.2832
Condensate Collected (mL)	74.50	73.60	63.60	70.57
Moisture Concentration (%)	6.58	6.61	6.49	6.56
Carbon Dioxide Concentration (%)	1.800	1.800	1.800	1.800
Oxygen Concentration (%)	17.800	17.800	17.800	17.800
Carbon Monoxide Concentration (%)	0.000	0.000	0.000	0.000
Nitrogen Conc. Dry (gas balance)	80.400	80.400	80.400	80.400
Molecular Weight, Dry (lb/lb-mole)	29.0000	29.0000	29.0000	29.0000
Molecular Weight, Wet (lb/lb-mole)	28.2767	28.2726	28.2856	28.2783
SQRT Delta P Avg., Pitot (in. H2O)	0.458527	0.486638	0.446180	0.463782
Avg. Velocity, Stack Gas (ft/sec)	34.7911	36.8894	33.6955	35.1253
Actual Flow Rate (acfm)	24368.272	25837.945	23600.892	24602.370
Dry, Std. Vol. Flow Rate (dscfm)	12726.559	13516.055	12449.049	12897.221
% Isokinetic	102.07	94.38	90.26	95.57
Total Catch (mg)	83.10	65.40	47.70	65.4000
SO3 Conc. (grams/dscf)	0.0016	0.0013	0.0011	0.0013
SO3 Conc. (grains/dscf)	0.0249	0.0197	0.0163	0.0203
SO3 Concentration (lb/dscf)	3.68E-06	2.95E-06	2.44E-06	3.02E-06
SO3 Emission Rate (lb/hr)	2.8082	2.3903	1.8228	2.3404

TABLE 6-3. SULFUR DIOXIDE EMISSION SUMMARY

PLANT: MARSEILLES BRICK
CITY, STATE: MARSEILLES, ILL.
STACK: KILN STACK

SULFUR DIOXIDE SUMMARY

Run Number	1	2	3	AVERAGE
Date of Run	MAY 11, 1994			
Starting Time (hours)	1515	1700	1840	
Ending Time (hours)	1615	1800	1943	
Net Time of Run (minutes)	60	60	60	
Number of Points	21	21	21	
Barometric Pressure (in. Hg)	29.85	29.85	29.85	
Static Pressure (in. H2O)	-0.11	-0.11	-0.11	
Stack Pressure (in. Hg)	29.84	29.84	29.84	29.84
Average Delta H (in. H2O)	2.4143	2.5619	2.1667	2.38
Average Delta P (in,H2o)	0.2129	0.2400	0.2038	0.22
Meter Pressure (in. Hg)	30.03	30.04	30.01	30.03
Pitot Tube Coefficient	0.84	0.84	0.84	0.84
Meter Box Number (STL#)	2	2	2	
Y-Factor	1.001	1.001	1.001	
Stack Length (in.)	41	41	41	
Stack Width (in.)	41	41	41	
Stack Cross Sectional Area (ft2)	11.673611	11.673611	11.673611	11.67361111
Nozzle Diameter (inches)	0.370	0.370	0.370	
Nozzle Area (ft2)	0.00074667	0.0007467	0.000746674	0.000746674
Meter Temperature (F)	88.952	95.238	94.381	92.857
Stack Temperature (F)	482.048	480.143	473.524	478.571
Ending DGM Volume (ACF)	923.715	986.317	1036.52	
Beginning DGM Volume (ACF)	872.15	935.121	991.447	
Volume of Dry Gas Sample (acf)	51.5650	51.1960	45.0730	49.2780
Dry, Std. Gas Sample Volume (dscf)	49.8247	48.926	43.099	47.2832
Condensate Collected (mL)	74.50	73.60	63.60	70.57
Moisture Concentration (%)	6.58	6.61	6.49	6.56
Carbon Dioxide Concentration (%)	1.800	1.800	1.800	1.800
Oxygen Concentration (%)	17.800	17.800	17.800	17.800
Carbon Monoxide Concentration (%)	0.000	0.000	0.000	0.000
Nitrogen Conc. Dry (gas balance)	80.400	80.400	80.400	80.400
Molecular Weight, Dry (lb/lb-mole)	29.0000	29.0000	29.0000	29.0000
Molecular Weight, Wet (lb/lb-mole)	28.2767	28.2726	28.2856	28.2783
SQRT Delta P Avg., Pitot (in. H2O)	0.458527	0.486638	0.446180	0.463782
Avg. Velocity, Stack Gas (ft/sec)	34.7911	36.8894	33.6955	35.1253
Actual Flow Rate (acfm)	24368.272	25837.945	23600.892	24602.370
Dry, Std. Vol. Flow Rate (dscfm)	12726.559	13516.055	12449.049	12897.221
% Isokinetic	102.07	94.38	90.26	95.57
Total Catch (mg)	1270.00	1160.00	1010.00	1146.6667
SO2 Conc. (grams/dscf)	0.0246	0.0227	0.0224	0.0232
SO2 Conc. (grains/dscf)	0.3800	0.3496	0.3458	0.3585
SO2 Concentration (lb/dscf)	5.62E-05	5.23E-05	5.17E-05	5.34E-05
SO2 Emission Rate (lb/hr)	42.9170	42.3965	38.5965	41.3033

TABLE 6-4. PARTICULATE MATTER EMISSION SUMMARY

PLANT: MARSEILLES BRICK
CITY, STATE: MARSEILLES, ILL.
STACK: DRYER STACK #1

PARTICULATE MATTER SUMMARY

Run Number	1	2	3	AVERAGE
Date of Run	MAY 10, 1994			
Starting Time (hours)	1253	1448	1630	
Ending Time (hours)	1353	1548	1730	
Net Time of Run (minutes)	60	60	60	
Number of Points	24	24	24	
Barometric Pressure (in. Hg)	30.26	30.26	30.26	
Static Pressure (in. H2O)	-0.21	-0.21	-0.21	
Stack Pressure (in. Hg)	30.24	30.24	30.24	30.24
Average Delta H (in. H2O)	1.7917	2.3938	2.2138	2.13
Average Delta P (in,H2o)	0.2204	0.3075	0.2817	0.27
Meter Pressure (in. Hg)	30.39	30.44	30.42	30.42
Pitot Tube Coefficient	0.84	0.84	0.84	0.84
Meter Box Number (STL#)	2	2	2	
Y-Factor	1.001	1.001	1.001	
Stack Diameter (in.)	45	45	45	
Stack Cross Sectional Area (ft2)	11.0447	11.0447	11.0447	11.0447
Nozzle Diameter (inches)	0.300	0.300	0.300	
Nozzle Area (ft2)	0.00049087	0.0004909	0.000490874	0.000490874
Meter Temperature (F)	84.667	96.625	96.958	92.750
Stack Temperature (F)	92.333	94.292	94.125	93.583
Ending DGM Volume (ACF)	580.614	639.95	701.52	
Beginning DGM Volume (ACF)	540.3	591.384	653.16	
Volume of Dry Gas Sample (acf)	40.3140	48.5660	48.3600	45.7467
Dry, Std. Gas Sample Volume (dscf)	39.7361	46.910	46.662	44.4361
Condensate Collected (mL)	90.40	84.30	85.20	86.63
Moisture Concentration (%)	9.67	7.80	7.91	8.46
Carbon Dioxide Concentration (%)	0.300	0.300	0.300	0.300
Oxygen Concentration (%)	20.400	20.400	20.400	20.400
Carbon Monoxide Concentration (%)	0.000	0.000	0.000	0.000
Nitrogen Conc. Dry (gas balance)	79.300	79.300	79.300	79.300
Molecular Weight, Dry (lb/lb-mole)	28.8640	28.8640	28.8640	28.8640
Molecular Weight, Wet (lb/lb-mole)	27.8132	28.0167	28.0042	27.9447
SQRT Delta P Avg., Pitot (in. H2O)	0.451493	0.546681	0.520479	0.506218
Avg. Velocity, Stack Gas (ft/sec)	26.2723	31.7516	30.2320	29.4186
Actual Flow Rate (acfm)	17410.091	21041.132	20034.131	19495.118
Dry, Std. Vol. Flow Rate (dscfm)	15196.275	18680.309	17769.427	17215.337
% Isokinetic	98.11	94.22	98.53	96.96
Total Filter Catch (mg)	0.00	0.20	0.10	0.10
Total Wash Catch (mg)	19.30	6.90	12.60	12.93
Total Catch (mg)	19.30	7.10	12.70	13.03
Particulate Conc. (grams/dscf)	0.0005	0.0001	0.0003	0.0003
Particulate Conc. (grains/dscf)	0.0074	0.0023	0.0041	0.0046
Particulate Concentration (lb/dscf)	1.07E-06	3.34E-07	6.00E-07	6.68E-07
Particulate Emission Rate (lb/hr)	0.9765	0.3741	0.6398	0.6635

TABLE 6-1

TABLE 6-5. SULFUR TRIOXIDE EMISSION SUMMARY

PLANT: MARSEILLES BRICK
CITY, STATE: MARSEILLES, ILL.
STACK: DRYER STACK #1

SULFUR TRIOXIDE EMISSIONS SUMMARY

Run Number	1	2	3	AVERAGE
Date of Run		MAY 10, 1994		
Starting Time (hours)	1253	1448	1630	
Ending Time (hours)	1353	1548	1730	
Net Time of Run (minutes)	60	60	60	
Number of Points	24	24	24	
Barometric Pressure (in. Hg)	30.26	30.26	30.26	
Static Pressure (in. H2O)	-0.21	-0.21	-0.21	
Stack Pressure (in. Hg)	30.24	30.24	30.24	30.24
Average Delta H (in. H2O)	1.7917	2.3938	2.2138	2.13
Average Delta P (in.H2o)	0.2204	0.3075	0.2817	0.27
Meter Pressure (in. Hg)	30.39	30.44	30.42	30.42
Pitot Tube Coefficient	0.84	0.84	0.84	0.84
Meter Box Number (STL#)	2	2	2	
Y-Factor	1.001	1.001	1.001	
Stack Diameter (in.)	45	45	45	
Stack Cross Sectional Area (ft2)	11.0447	11.0447	11.0447	11.04466167
Nozzle Diameter (inches)	0.300	0.300	0.300	
Nozzle Area (ft2)	0.00049087	0.0004909	0.000490874	0.000490874
Meter Temperature (F)	84.667	96.625	96.958	92.750
Stack Temperature (F)	92.333	94.292	94.125	93.583
Ending DGM Volume (ACF)	580.614	639.95	701.52	
Beginning DGM Volume (ACF)	540.3	591.384	653.16	
Volume of Dry Gas Sample (acf)	40.3140	48.5660	48.3600	45.7467
Dry, Std. Gas Sample Volume (dscf)	39.7361	46.910	46.662	44.4361
Condensate Collected (mL)	90.40	84.30	85.20	86.63
Moisture Concentration (%)	9.67	7.80	7.91	8.46
Carbon Dioxide Concentration (%)	0.300	0.300	0.300	0.300
Oxygen Concentration (%)	20.400	20.400	20.400	20.400
Carbon Monoxide Concentration (%)	0.000	0.000	0.000	0.000
Nitrogen Conc. Dry (gas balance)	79.300	79.300	79.300	79.300
Molecular Weight, Dry (lb/lb-mole)	28.8640	28.8640	28.8640	28.8640
Molecular Weight, Wet (lb/lb-mole)	27.8132	28.0167	28.0042	27.9447
SQRT Delta P Avg., Pitot (in. H2O)	0.451493	0.546681	0.520479	0.506218
Avg. Velocity, Stack Gas (ft/sec)	26.2723	31.7516	30.2320	29.4186
Actual Flow Rate (acfm)	17410.091	21041.132	20034.131	19495.118
Dry, Std. Vol. Flow Rate (dscfm)	15196.275	18680.309	17769.427	17215.337
% Isokinetic	98.11	94.22	98.53	96.96
Total Catch (mg)	1.25	0.41	1.24	0.97
SO3 Conc. (grams/dscf)	0.0000	0.0000	0.0000	0.0000
SO3 Conc. (grains/dscf)	0.0005	0.0001	0.0004	0.0003
SO3 Concentration (lb/dscf)	6.94E-08	1.93E-08	5.86E-08	4.91E-08
SO3 Emission Rate (lb/hr)	0.0632	0.0216	0.0625	0.0491

TABLE 6-6. SULFUR DIOXIDE EMISSION SUMMARY

PLANT: MARSEILLES BRICK
CITY, STATE: MARSEILLES, ILL.
STACK: DRYER STACK #1

SULFUR DIOXIDE EMISSIONS SUMMARY

Run Number	1	2	3	AVERAGE
Date of Run	MAY 10, 1994			
Starting Time (hours)	1253	1448	1630	
Ending Time (hours)	1353	1548	1730	
Net Time of Run (minutes)	60	60	60	
Number of Points	24	24	24	
Barometric Pressure (in. Hg)	30.26	30.26	30.26	
Static Pressure (in. H2O)	-0.21	-0.21	-0.21	
Stack Pressure (in. Hg)	30.24	30.24	30.24	30.24
Average Delta H (in. H2O)	1.7917	2.3938	2.2138	2.13
Average Delta P (in,H2o)	0.2204	0.3075	0.2817	0.27
Meter Pressure (in. Hg)	30.39	30.44	30.42	30.42
Pitot Tube Coefficient	0.84	0.84	0.84	0.84
Meter Box Number (STL#)	2	2	2	
Y-Factor	1.001	1.001	1.001	
Stack Diameter (in.)	45	45	45	
Stack Cross Sectional Area (ft2)	11.0447	11.0447	11.0447	11.04466167
Nozzle Diameter (inches)	0.300	0.300	0.300	
Nozzle Area (ft2)	0.00049087	0.0004909	0.000490874	0.000490874
Meter Temperature (F)	84.667	96.625	96.958	92.750
Stack Temperature (F)	92.333	94.292	94.125	93.583
Ending DGM Volume(ACF)	580.614	639.95	701.52	
Beginning DGM Volume (ACF)	540.3	591.384	653.16	
Volume of Dry Gas Sample (acf)	40.3140	48.5660	48.3600	45.7467
Dry, Std. Gas Sample Volume (dscf)	39.7361	46.910	46.662	44.4361
Condensate Collected (mL)	90.40	84.30	85.20	86.63
Moisture Concentration (%)	9.67	7.80	7.91	8.46
Carbon Dioxide Concentration (%)	0.300	0.300	0.300	0.300
Oxygen Concentration (%)	20.400	20.400	20.400	20.400
Carbon Monoxide Concentration (%)	0.000	0.000	0.000	0.000
Nitrogen Conc. Dry (gas balance)	79.300	79.300	79.300	79.300
Molecular Weight, Dry (lb/lb-mole)	28.8640	28.8640	28.8640	28.8640
Molecular Weight, Wet (lb/lb-mole)	27.8132	28.0167	28.0042	27.9447
SQRT Delta P Avg., Pitot (in. H2O)	0.451493	0.546681	0.520479	0.506218
Avg. Velocity, Stack Gas (ft/sec)	26.2723	31.7516	30.2320	29.4186
Actual Flow Rate (acfm)	17410.091	21041.132	20034.131	19495.118
Dry, Std. Vol. Flow Rate (dscfm)	15196.275	18680.309	17769.427	17215.337
% Isokinetic	98.11	94.22	98.53	96.96
Total Catch (mg)	ND	ND	ND	ND
SO2 Conc. (grams/dscf)	0.0000	0.0000	0.0000	0.0000
SO2 Conc. (grains/dscf)	0.0000	0.0000	0.0000	0.0000
SO2 Concentration (lb/dscf)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SO2 Emission Rate (lb/hr)	0.0000	0.0000	0.0000	0.0000

ND = Not detected above the detection limit, 0.6 mg.

TABLE 6-7. PARTICULATE MATTER EMISSION SUMMARY

PLANT: MARSELLES BRICK
CITY, STATE: MARSELLES, LL.
STACK: DRYER STACK #2

PARTICULATE MATTER SUMMARY				
Run Number	1	2	3	AVERAGE
Date of Run	MAY 11, 1994			
Starting Time (hours)	750	930	1106	
Ending Time (hours)	850	1030	1206	
Net Time of Run (minutes)	60	60	60	
Number of Points	24	24	24	
Barometric Pressure (in. Hg)	30.09	30.09	30.09	
Static Pressure (in. H2O)	-0.21	-0.21	-0.21	
Stack Pressure (in. Hg)	30.07	30.07	30.07	30.07
Average Delta H (in. H2O)	1.7142	2.1388	1.8067	1.89
Average Delta P (in,H2o)	0.2354	0.2858	0.2417	0.25
Meter Pressure (in. Hg)	30.22	30.25	30.22	30.23
Pitot Tube Coefficient	0.84	0.84	0.84	0.84
Meter Box Number (STL#)	2	2	2	
Y-Factor	1.001	1.001	1.001	
Stack Diameter (in.)	45	45	45	
Stack Cross Sectional Area (ft2)	11.044662	11.044662	11.044662	11.04466167
Nozzle Diameter (inches)	0.300	0.300	0.300	
Nozzle Area (ft2)	0.00049087	0.0004909	0.000490874	0.000490874
Meter Temperature (F)	70.708	83.083	86.500	80.097
Stack Temperature (F)	94.375	94.750	98.208	95.778
Ending DGM Volume (ACF)	750	809.014	862.16	
Beginning DGM Volume (ACF)	708.421	762.5	819.654	
Volume of Dry Gas Sample (acf)	41.5790	46.5140	42.5060	43.5330
Dry, Std. Gas Sample Volume (dscf)	41.8178	45.762	41.524	43.0347
Condensate Collected (mL)	82.80	71.40	69.50	74.57
Moisture Concentration (%)	8.53	6.84	7.30	7.56
Carbon Dioxide Concentration (%)	0.300	0.300	0.300	0.300
Oxygen Concentration (%)	20.400	20.400	20.400	20.400
Carbon Monoxide Concentration (%)	0.000	0.000	0.000	0.000
Nitrogen Conc. Dry (gas balance)	79.300	79.300	79.300	79.300
Molecular Weight, Dry (lb/lb-mole)	28.8640	28.8640	28.8640	28.8640
Molecular Weight, Wet (lb/lb-mole)	27.9378	28.1207	28.0706	28.0430
SQRT Delta P Avg., Pitot (in. H2O)	0.474180	0.524860	0.482470	0.493837
Avg. Velocity, Stack Gas (ft/sec)	27.6595	30.5263	28.1733	28.7864
Actual Flow Rate (acfm)	18329.380	20229.150	18669.877	19076.136
Dry, Std. Vol. Flow Rate (dscfm)	16051.471	18029.040	16454.378	16844.963
% Isokinetic	97.75	95.24	94.69	95.89
Total Filter Catch (mg)	0.50	0.30	2.10	0.97
Total Wash Catch (mg)	14.80	2.00	0.20	5.67
Total Catch (mg)	15.30	2.30	2.30	6.63
Particulate Conc. (grams/dscf)	0.0004	0.0000	0.0001	0.0002
Particulate Conc. (grains/dscf)	0.0057	0.0008	0.0008	0.0024
Particulate Concentration (lb/dscf)	8.07E-07	1.11E-07	1.22E-07	3.47E-07
Particulate Emission Rate (lb/hr)	0.7770	0.1199	0.1206	0.3391

TABLE 6-6. SULFUR TRIOXIDE EMISSION SUMMARY

PLANT: MARSEILLES BRICK
CITY, STATE: MARSEILLES, ILL
STACK: DRYER STACK #2

SULFUR TRIOXIDE SUMMARY

Run Number	1	2	3	AVERAGE
Date of Run	MAY 11, 1994			
Starting Time (hours)	750	930	1106	
Ending Time (hours)	850	1030	1206	
Net Time of Run (minutes)	60	60	60	
Number of Points	24	24	24	
Barometric Pressure (in. Hg)	30.09	30.09	30.09	
Static Pressure (in. H2O)	-0.21	-0.21	-0.21	
Stack Pressure (in. Hg)	30.07	30.07	30.07	30.07
Average Delta H (in. H2O)	1.7142	2.1388	1.8067	1.89
Average Delta P (in,H2o)	0.2354	0.2858	0.2417	0.25
Meter Pressure (in. Hg)	30.22	30.25	30.22	30.23
Pitot Tube Coefficient	0.84	0.84	0.84	0.84
Meter Box Number (STL#)	2	2	2	
Y-Factor	1.001	1.001	1.001	
Stack Diameter (in.)	45	45	45	
Stack Cross Sectional Area (ft2)	11.044662	11.044662	11.044662	11.04466167
Nozzle Diameter (inches)	0.300	0.300	0.300	
Nozzle Area (ft2)	0.00049087	0.0004909	0.000490874	0.000490874
Meter Temperature (F)	70.708	83.083	86.500	80.097
Stack Temperature (F)	94.375	94.750	98.208	95.778
Ending DGM Volume(ACF)	750	809.014	862.16	
Beginning DGM Volume (ACF)	708.421	762.5	819.654	
Volume of Dry Gas Sample (acf)	41.5790	46.5140	42.5060	43.5330
Dry, Std. Gas Sample Volume (dscf)	41.8178	45.762	41.524	43.0347
Condensate Collected (mL)	82.80	71.40	69.50	74.57
Moisture Concentration (%)	8.53	6.84	7.30	7.56
Carbon Dioxide Concentration (%)	0.300	0.300	0.300	0.300
Oxygen Concentration (%)	20.400	20.400	20.400	20.400
Carbon Monoxide Concentration (%)	0.000	0.000	0.000	0.000
Nitrogen Conc. Dry (gas balance)	79.300	79.300	79.300	79.300
Molecular Weight, Dry (lb/lb-mole)	28.8640	28.8640	28.8640	28.8640
Molecular Weight, Wet (lb/lb-mole)	27.9378	28.1207	28.0706	28.0430
SQRT Delta P Avg., Pitot (in. H2O)	0.474180	0.524860	0.482470	0.493837
Avg. Velocity, Stack Gas (ft/sec)	27.6595	30.5263	28.1733	28.7864
Actual Flow Rate (acfm)	18329.380	20229.150	18669.877	19076.136
Dry, Std. Vol. Flow Rate (dscfm)	16051.471	18029.040	16454.378	16844.963
% Isokinetic	97.75	95.24	94.69	95.89
Total Catch (mg)	ND	ND	1.01	ERR
SO3 Conc. (grams/dscf)	0.0000	0.0000	0.0000	0.0000
SO3 Conc. (grains/dscf)	0.0000	0.0000	0.0004	0.0001
SO3 Concentration (lb/dscf)	0.00E+00	0.00E+00	5.36E-08	1.79E-08
SO3 Emission Rate (lb/hr)	0.0000	0.0000	0.0529	0.0176

ND = Not detected above detection limit.

TABLE 6-9. SULFUR DIOXIDE EMISSION SUMMARY

PLANT: MARSEILLES BRICK
CITY, STATE: MARSEILLES, ILL
STACK: DRYER STACK #2

SULFUR DIOXIDE SUMMARY

Run Number	1	2	3	AVERAGE
Date of Run	MAY 11, 1994			
Starting Time (hours)	750	930	1106	
Ending Time (hours)	850	1030	1206	
Net Time of Run (minutes)	60	60	60	
Number of Points	24	24	24	
Barometric Pressure (in. Hg)	30.09	30.09	30.09	
Static Pressure (in. H2O)	-0.21	-0.21	-0.21	
Stack Pressure (in. Hg)	30.07	30.07	30.07	30.07
Average Delta H (in. H2O)	1.7142	2.1388	1.8067	1.89
Average Delta P (In,H2o)	0.2354	0.2858	0.2417	0.25
Meter Pressure (in. Hg)	30.22	30.25	30.22	30.23
Pitot Tube Coefficient	0.84	0.84	0.84	0.84
Meter Box Number (STL#)	2	2	2	
Y-Factor	1.001	1.001	1.001	
Stack Diameter (in.)	45	45	45	
Stack Cross Sectional Area (ft2)	11.044662	11.044662	11.044662	11.04466167
Nozzle Diameter (inches)	0.300	0.300	0.300	
Nozzle Area (ft2)	0.00049087	0.0004909	0.000490874	0.000490874
Meter Temperature (F)	70.708	83.083	86.500	80.097
Stack Temperature (F)	94.375	94.750	98.208	95.778
Ending DGM Volume(ACF)	750	809.014	862.16	
Beginning DGM Volume (ACF)	708.421	762.5	819.654	
Volume of Dry Gas Sample (acf)	41.5790	46.5140	42.5060	43.5330
Dry, Std. Gas Sample Volume (dscf)	41.8178	45.762	41.524	43.0347
Condensate Collected (mL)	82.80	71.40	69.50	74.57
Moisture Concentration (%)	8.53	6.84	7.30	7.56
Carbon Dioxide Concentration (%)	0.300	0.300	0.300	0.300
Oxygen Concentration (%)	20.400	20.400	20.400	20.400
Carbon Monoxide Concentration (%)	0.000	0.000	0.000	0.000
Nitrogen Conc. Dry (gas balance)	79.300	79.300	79.300	79.300
Molecular Weight, Dry (lb/lb-mole)	28.8640	28.8640	28.8640	28.8640
Molecular Weight, Wet (lb/lb-mole)	27.9378	28.1207	28.0706	28.0430
SQRT Delta P Avg., Pitot (in. H2O)	0.474180	0.524860	0.482470	0.493837
Avg. Velocity, Stack Gas (ft/sec)	27.6595	30.5263	28.1733	28.7864
Actual Flow Rate (acfm)	18329.380	20229.150	18669.877	19076.136
Dry, Std. Vol. Flow Rate (dscfm)	16051.471	18029.040	16454.378	16844.963
% Isokinetic	97.75	95.24	94.69	95.89
Total Catch (mg)	ND	ND	ND	ND
SO2 Conc. (grams/dscf)	0.0000	0.0000	0.0000	0.0000
SO2 Conc. (grains/dscf)	0.0000	0.0000	0.0000	0.0000
SO2 Concentration (lb/dscf)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SO2 Emission Rate (lb/hr)	0.0000	0.0000	0.0000	0.0000

ND = Not detected above detection limit.

APPENDIX A

Process Operations Data

MARSEILLES BRICK

VENTURE LIMITED PARTNERSHIP

************FAX COVER SHEET************

DATE: 5/25/94

TO: Robt Felle
Fugro McClelland

FROM: Jock Laird

TOTAL # OF PAGES, INCLUDING COVER: 3

MESSAGE: Dear Bob
Following is a Brief description of our Drying & Firing Process. The test were set up for a 80% shale 20% Fireclay Mix. If you have any questions about this information please give me a call.

Regards
Jock

MAIN OFFICE 1401 Broadway, P.O. Box 306 • Marseilles, IL 61341 • 815/795-6922 • [redacted]

Description of Drying & Firing Procedure

Marseilles Brick has two independent Dryer tunnels approximately 200 ft. in length that hold 14 kiln cars each. Waste heat from the cooling section of the kiln is supplied to each dryer by a fan through a duct/plenum system. The heat to each dryer is boosted to 325°F by two natural gas burners, 442M BTU/hr and 432M BTU/hv respectively, located in the air supply duct. Moist warm air is exhausted to the atmosphere by a fan at the entrance end of each dryer tunnel. Dryer #1 and Dryer #2 are independent of each other except for the common waste heat supply from the kiln.

The tunnel kiln used by Marseilles Brick to fire its brick is a 498 ft. metal jacketed natural gas fired kiln designed by Ceric. The kiln holds a total of 36 kiln cars with 20 in the pre-heat and furnace section and 16 in the cooling section. The pre-heat section is divided into 6 zones with a total of 32 gas fired side burners. The furnace section is divided into 7 zones with 19 natural gas fired top burners in each zone for a total of 133 top fired burners. The cooling section has a rapid cool zone (2 car lengths long) where the brick are cooled from 1930°F to approximately 1300°F by injecting ambient air directly on the brick. The balance of the cooling section is used to cool the brick to approximately 100°F before exiting the kiln.

Waste heat is removed from the cooling section close to the exit to supply heated air to the dryers. The kiln exhaust fan is located near the entrance end of the pre-heat and exhausts the products of combustion to the atmosphere through a 40' high brick chimney.

MATERIAL BEING TESTED

80% Shale, 20% Fireclay
Size: Modular
Weight: Wet - 4.6 lbs., Dry - 4.1 lbs., Fired - 3.8 lbs.
Units per car: 10,080
Production rate 12 cars per day

Date: May 10, Time 12:00 p.m.
Position of cars in kiln
16 cars 80% Shale, 20% Fireclay in pre-heat & furnace section
20 cars 10% Shale, 90% Fireclay 4 in furnace & 16 in cooling

Position of cars in Dryers
Dryer #1
14 cars 80% Shale, 20% Fireclay
Dryer #2
14 cars 80% Shale, 20% Fireclay

Date: May 11, Time 7:00 a.m.
Position of cars in kiln
23 cars 80% Shale, 20% Fireclay in pre-heat, furnace & cooling
13 cars 10% Shale, 90% Fireclay in cooling section

Position of cars in Dryers
Dryer #1
14 cars 80% Shale, 20% Fireclay
Dryer #2
14 cars 80% Shale, 20% Fireclay

Date: May 11, Time 12:00 p.m.
Position of cars in kiln
25 cars 80% Shale, 20% Fireclay in pre-heat, furnace & cooling
11 cars 10% Shale, 90% Fireclay in cooling section

Position of cars in Dryers
Dryer #1
14 cars 80% Shale, 20% Fireclay
Dryer #2
14 cars 80% Shale, 20% Fireclay

Total fuel consumption during Test #1 (Dryer #1 exhaust)

May 10 - 14,200 cubic feet per hour

Total fuel consumption during Test #2 (Dryer #2 exhaust)

May 11 - 13,100 cubic feet per hour

Total fuel consumption during Test #3 (kiln exhaust)

May 11 - 13,100 cubic feet per hour

APPENDIX B

Resumes

RESUME

Robert F. Folle
Air Quality Scientist

EDUCATION:	MBA, Business Management, Golden Gate University, San Francisco, California, 1979 BA, Business Administration, St. Leo College, St. Leo, Florida, 1977
QUALIFICATIONS:	Certified EPA Method 9 visual opacity observer, 40 CFR, Part 52, Appendix F, Air Pollution Control Board, St. Louis, MO, April 1993; Certified AHERA Asbestos Inspector #7ME0409920031R; Certified AHERA Asbestos Mgr. Planner #7ME040992003MPR; Certification of Completion, 40 Hr. Course in Hazardous Materials/Waste Site Investigation, 1989; Certification of Completion, Supervisors Course in Hazardous Materials/Waste Site Operations, 1990; Certification of Completion, Air Dispersion Modeling, 1990; Certification of Completion, Air Dispersion Modeling Laboratory, 1990.
EXPERIENCE:	Over 4 years experience in the performance and management of a diversified range of air quality projects. Performed as field team leader, project manager or group leader on over 200 source emissions projects involving the collection and analysis of air quality data for engineering design, permitting and compliance. Project manager for numerous air dispersion modeling projects involving the use of the USEPA industrial source complex (ISC) short-term (ISCST) and long-term (ISCLT), complex-1 and screen models. Extensive experience as field team leader and project manager for continuous emission monitoring system (CEMS) performance specification certification testing including CEMS relative accuracy (RA) certifications. Participated and managed numerous projects involving asbestos sampling and asbestos air monitoring for facility and transactional environmental audits.
PROFESSIONAL AFFILIATIONS:	Member of the Air and Waste Management Association Source Evaluation Society

RESUME

J. Todd Staley
Senior Environmental Technician

EDUCATION:

Community College of the Air Force
1983 - 1992 - Management and Construction Technology

QUALIFICATIONS:

Certified EPA Method 9 visual opacity observer
OSHA Hazardous Waste Operations and Emergency Response
RCRA Compliance & Hazardous Waste Management

EXPERIENCE:

Over nine years experience as an environmental technician. Responsible for ensuring compliance and providing technical assistance on waste disposal, UST remediation and air quality projects. Currently assigned to the Air Quality Group engaged in all technical aspects of Source Emissions testing. Participated in several source tests including projects at petroleum refineries, hazardous waste incinerators, chemical production facilities, explosive manufacturers and chemical transfer facilities.

Mr. Staley has served as an Air Quality Technician on several source emission testing projects and Continuous Emission Monitoring System (CEM) specification certifications.

He has provided technical support on several USEPA Method 5 projects including collection and analysis of Air Quality data for a major explosives plant in Missouri.

At a chemical production facility in West Virginia, he assisted in a USEPA Boiler and Industrial Furnace (BIF) project, providing Continuous Emission Monitoring (CEM) specification certifications on two CO and O_2 systems. Certifications included span drift and CEMS relative accuracy tests. (RA)

Mr. Staley is presently providing on-going monitoring services for two benzene transfer facilities in Illinois and Missouri. He is responsible for leak detection monitoring of all components at both facilities on a routine basis.

PROFESSIONAL AFFILIATIONS:

Air and Waste Management Association
Source Evaluation Society

RESUME

Daniel M. Cusac
Air Quality Technician

EDUCATION: Illinois Central College, 1989-1993, Metals Technology

QUALIFICATIONS: Certified EPA Method 9-Visual Plume Observer
OSHA Hazardous Waste Operations and Emergency Response

EXPERIENCE:

Assigned to the Air Quality Division serving as a technician on several Source Emissions Testing projects. Provided technical support for Air Quality projects at petroleum refineries, waste incinerators, chemical production facilities and chemical transfer facilities.

While assigned to the Air Quality Group, Mr. Cusac has provided technical support on several source emission testing projects and Continuous Emission Monitoring (CEM) system certifications.

He has served as an Air Quality Technician on a wide variety of tests utilizing USEPA Methods 1, 2, 3, 4, 5, 9, and 12 for the collection and analysis of total particulate matter, visible opacity and lead.

Mr. Cusac has also performed multi-metals emission testing utilizing USEPA (Draft) Method 0012 at major industrial facilities. He has been involved in the collection and recovery of samples utilizing the procedures outlined in the draft method.

He has participated in conducting Continuous Emission Monitoring (CEM) system performance specification and relative accuracy testing following the guidelines published in the Boilers and Industrial Furnace (BIF) regulation.

PROFESSIONAL AFFILIATIONS:

Air and Waste Management Association
Source Evaluation Society

APPENDIX C

Laboratory Analysis

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

Fugro McClelland
9921 St. Charles Rock Road
St. Ann, MO 63074

Date: June 2, 1994

Attn: Todd Staley

Project Number 415

This is the Certificate of Analysis for the following samples:

Client Project ID:	Fugro McClelland
Date Received:	May 17, 1994
Work Order:	4448
Number of Samples:	20
Sample Type:	Liquid

I. Introduction

Twenty samples arrived at ITAS Cincinnati on May 17, 1994. The samples were collected on May 10, 1994 and May 11, 1994 and are labeled in Table I.

II. Analytical Results/Methodology

The analytical results for this report are presented by analytical test. The data will include sample identification information, the analytical results, and the appropriate detection limits.

The analysis requested was Sulfur Dioxide and Trioxide including Sulfuric Acid Mist by EPA Method 8.

Reviewed and Approved by:

Kenneth H. Mueller

Kenneth Mueller, C.H.M.M.
Project Manager

I. *Introduction (cont.)*

Client Sample ID	Lab Sample ID
DRIER 1 RUN 1A	AD5859
DRIER 1 RUN 2A	AD5860
DRIER 1 RUN 3A	AD5861
DRIER 1 RUN 1B	AD5862
DRIER 1 RUN 2B	AD5863
DRIER 1 RUN 3B	AD5864
DRIER 2 RUN 1A	AD5865
DRIER 2 RUN 2A	AD5866
DRIER 2 RUN 3A	AD5867
DRIER 2 RUN 1B	AD5868
DRIER 2 RUN 2B	AD5869
DRIER 2 RUN 3B	AD5870
KILN EXHAST RUN 1A	AD5871
KILN EXHAST RUN 2A	AD5872
KILN EXHAST RUN 3A	AD5873
KILN EXHAST RUN 1B	AD5874
KILN EXHAST RUN 2B	AD5875
KILN EXHAST RUN 3B	AD5876
BLANK 80% IPA	AD5877
BLANK 3% H2O2	AD5878

III. Quality Control

Immediately following the analytical data for the samples can be found the QA/QC information that pertains to these samples. The purpose of this information is to demonstrate that the data enclosed is scientifically valid and defensible. This QA/QC data is used to assess the laboratory's performance during the analysis of the samples it accompanies. All quantitations were performed within the calibrated range of the analytical instrument.

Client: Fugro McClelland
Work Order: 4448
05444802

INTERNATIONAL TECHNOLOGY CORPORATION

Analytical Results, mg

Client Sample ID	Lab Sample ID	Sulfur Trioxide including Sulfuric Acid 1ST	2ND	Average	Detection Limit
DRIER 1 RUN 1A	AD5859	1.13	1.37	1.25	0.4
DRIER 1 RUN 2A	AD5860	ND	0.41	ND	0.3
DRIER 1 RUN 3A	AD5861	1.15	1.34	1.24	0.3
DRIER 2 RUN 1A	AD5865	ND	ND	ND	0.5
DRIER 2 RUN 2A	AD5866	ND	ND	ND	0.5
DRIER 2 RUN 3A	AD5867	1.01	1.01	1.01	0.4
KILN EXHAST RUN 1A	AD5871	84.6	81.5	83.1	0.4
KILN EXHAST RUN 2A	AD5872	65.9	64.9	65.4	0.4
KILN EXHAST RUN 3A	AD5873	47.8	47.6	47.7	0.5
BLANK 80% IPA	AD5877	ND	ND	ND	1.0

Client Sample ID	Lab Sample ID	Sulfur Dioxide 1ST	2ND	Average	Detection Limit
DRIER 1 RUN 1B	AD5862	ND	ND	ND	0.5
DRIER 1 RUN 2B	AD5863	ND	ND	ND	0.6
DRIER 1 RUN 3B	AD5864	ND	ND	ND	0.6
DRIER 2 RUN 1B	AD5868	ND	ND	ND	0.6
DRIER 2 RUN 2B	AD5869	ND	ND	ND	0.6
DRIER 2 RUN 3B	AD5870	ND	ND	ND	0.6
KILN EXHAST RUN 1B	AD5874	1270	1270	1270	4
KILN EXHAST RUN 2B	AD5875	1160	1160	1160	3
KILN EXHAST RUN 3B	AD5876	1010	1010	1010	3
BLANK 3% H2O2	AD5878	ND	ND	ND	3

ND = Not detected above the reported detection limit

Client: Fugro McClelland
Work Order: 4448
05444803

Quality Assurance Data

Quality Control
Standard Reference Solutions

Analyte	Theoretical Value	Percent Recovery
Sulfur Dioxide	114.4 mg/DSCM	
	111.23	97.2
	113.52	99.2

CHAIN OF CUSTODY RECORD

FUGRO McClelland
9921 St Charles Rock Rd.
St Ann, MO 63074
Phone: 314-428-8880
Fax: 314-428-8719

PROJECT NO. 0894-8885 | PROJECT NAME Marseilles Brick | LOCATION Marseilles IL

SAMPLE IDENTIFICATION	DATE	TIME	ANALYSES REQUESTED A	B	C	D	E	F	SAMPLE TYPE (Water, Soil, etc.)	CONTAINERS/ PRESERVATIVES G	H	I	J	K	L	COMMENTS
Drier 1 Run 1 A	5-10-94	1400	X						Aqueous	X						A: 80% IPA Reagent; DI Rinse
Run 2 A	5-10-94	1600	X													B: 3% H_2O_2 Reagent; DI Rinse
Run 3 A	5-10-94	1730	X													
Drier 1 Run 1 B	5-10-94	1400		X												
Run 2 B	5-10-94	1600		X												
Run 3 B	5-10-94	1730		X												
Drier 2 Run 1 A	5-11-94	0900	X													
Run 2 A	5-11-94	1030	X													
Run 3 A	5-11-94	1200	X													
Drier 2 Run 1 B	5-11-94	0900		X												
Run 2 B	5-11-94	1030		X												Sample recd @ 18°C,
Run 3 B	5-11-94	1200		X												No COC Seals present
Kiln Exaust Run 1 A	5-11-94	1630	X													
Run 2 A	5-11-94	1800	X													
Run 3 A	5-11-94	1450	X													
(cont)																

SAMPLES SUBMITTED TO: (LABORATORY) T

Relinquished By (signature)	Date	Time	Received By (signature)
[signature]	5-13-94	1600	UPS
	5-17-94	1515	Julie Moore HAF

Analyses Requested
A SO3
B SO2
C
D
E
F

Containers/ Preservatives
G 500ml Poly
H
I
J
K
L

CHCUSTFM.SYD

CHAIN OF CUSTODY RECORD

FUGRO McClelland
9921 St Charles Rock Rd.
St Ann, MO 63074
Phone: 314-428-8880
Fax: 314-428-8719

PROJECT NO. 0884-8885 | PROJECT NAME Marseilles Brick | LOCATION Marseilles IL

SAMPLE IDENTIFICATION	DATE	TIME	A	B	C	D	E	F	SAMPLE TYPE (Water,Soil,etc.)	G	H	I	J	K	L	COMMENTS
Kiln Exhaust Run 1B	5-11-94	1630		X					Aqueous	X						
Run 2B	5-11-94	1800		X												
Run 3B	5-11-94	1850		X												
Blank 806 IPA	5-11-94	1200	-													
Blank 38 H2Oe	5-11-94	1205		-												

ANALYSES REQUESTED: A–F. CONTAINERS/PRESERVATIVES: G–L.

Comments: Samples recv'd in good condition at 18°C w/ no COC seals present.. Julie Noal 5/17/94

SAMPLES SUBMITTED TO: (LABORATORY) IT

Relinquished By (signature)	Date	Time	Received By (signature)
[signature]	5-13-94	1600	UPS
	5-17-94	~~1500~~	Julie Noal IT Co.
	5-17-94	1515	

Analyses Requested	Containers/Preservatives
A	G 500ml Poly
B	H
C	I
D	J
E	K
F	L

PARTICULATE LABORATORY ANALYSIS

Project Name: Marseilles Brick | Date Sampled: 5-11-94

Project Number: 0894-8885 | Date Analyzed: 5-17-94

Source: Kiln Exhaust | Analyzed By: CND

Run No.	1	2	3	94-22
Beaker No.	94-24	94-27	94-28	Blank
Beaker Vol (ml)	300	300	300	300
Final Wt (g)	51.9076	51.7349	51.8320	51.5721
Tare Wt (g)	51.8030	51.6335	51.7463	51.5721
Wt Gain (mg)	104.6	101.4	85.7	0
Blk Corr (mg)	0	0	0	
Net Wt (mg)	104.6	101.4	85.7	
Filter No.	940017	940018	940019	
Final Wt (g)	0.3578	0.3617	0.3558	
Tare Wt (g)	0.3369	0.3366	0.3400	
Wt Gain (mg)	20.9	25.1	15.8	
Blk Gain (mg)	0	0	0	
Net Wt (mg)	20.9	25.1	15.8	
TOTAL PARTICULATE WTS				
Filter (mg)	20.9	25.1	15.8	
Wash (mg)	104.6	101.4	85.7	
Total (mg)	125.5	126.5	101.5	

Fugro McClelland

PARTICULATE LABORATORY ANALYSIS

Project Name: Marseilles Brick

Project Number: 0894-8885

Source: Dryer #1

Date Sampled: 5-10-94

Date Analyzed: 5-17-94

Analyzed By: CND

Run No.	1	2	3		
Beaker No.	94-23	94-24	94-25		
Beaker Vol	300	300	300		ml
Final Wt	51.9817	52.6761	52.3703		g
Tare Wt	51.9624	52.6692	52.3577		g
Wt Gain	19.3	6.9	12.6		mg
Blk Corr	0	0			mg
Net Wt		6.9			mg
Filter No.	940013	940012	94001~~8~~3 ALN		
Final Wt	0.3352	0.3382	0.3385		g
Tare Wt	0.3353	0.3380	0.3384		g
Wt Gain	0	0.2	0.1		mg
Blk Gain	0	0	0		mg
Net Wt	0	0.2	0.1		mg
TOTAL PARTICULATE WTS					
Filter	0	0.2	0.1		mg
Wash	19.3	6.9	12.6		mg
Total	19.3	7.1	12.7		mg

Fugro McClelland

PARTICULATE LABORATORY ANALYSIS

Project Name: Marseilles Brick

Project Number: 0894-8885

Source: Dryer #2

Date Sampled: 5-10-94

Date Analyzed: 5-17-94

Analyzed By: CND

Run No.	1		Run No.	2		Run No.	3		Run No.		
Beaker No.	94-19		Beaker No.	94-20		Beaker No.	94-21		Beaker No.		
Beaker Vol	300	ml	Beaker Vol	300	ml	Beaker Vol	30	ml	Beaker Vol		ml
Final Wt	52.3604	g	Final Wt	51.8132	g	Final Wt	52.0157	g	Final Wt		g
Tare Wt	52.3456	g	Tare Wt	51.8103	g	Tare Wt	52.0136	g	Tare Wt		g
Wt Gain	14.8	mg	Wt Gain	2.0	mg	Wt Gain	2.1	mg	Wt Gain		mg
Blk Corr	0	mg	Blk Corr	0	mg	Blk Corr	0	mg	Blk Corr		mg
Net Wt	14.8	mg	Net Wt	2.0	mg	Net Wt	2.1	mg	Net Wt		mg
Filter No.	940014		Filter No.	940015		Filter No.	940016		Filter No.		
Final Wt	0.3371	g	Final Wt	0.3381	g	Final Wt	0.3368	g	Final Wt		g
Tare Wt	0.3366	g	Tare Wt	0.3378	g	Tare Wt	0.3366	g	Tare Wt		g
Wt Gain	0.5	mg	Wt Gain	0.3	mg	Wt Gain	0.2	mg	Wt Gain		mg
Blk Gain	0	mg	Blk Gain	0	mg	Blk Gain	0	mg	Blk Gain		mg
Net Wt	0.5	mg	Net Wt	0.3	mg	Net Wt	0.2	mg	Net Wt		mg
TOTAL PARTICULATE WTS			TOTAL PARTICULATE WTS			TOTAL PARTICULATE WTS			TOTAL PARTICULATE WTS		
Filter	0.5	mg	Filter	0.3	mg	Filter	2.1	mg	Filter		mg
Wash	14.8	mg	Wash	2.0	mg	Wash	0.2	mg	Wash		mg
Total	15.3	mg	Total	2.3	mg	Total	2.3	mg	Total		mg

APPENDIX D

Field Data Sheets

FUGRO McClelland

Company Marseilles Brick Project ________

Test Location N Date 5-10-94

Traverse Point Determination — Circular Stacks

Stack Inside Diameter 45 feet

Is diameter greater than 12 inches? Yes / No

Distance Upstream from Disturbance ____ ft 1 diameters

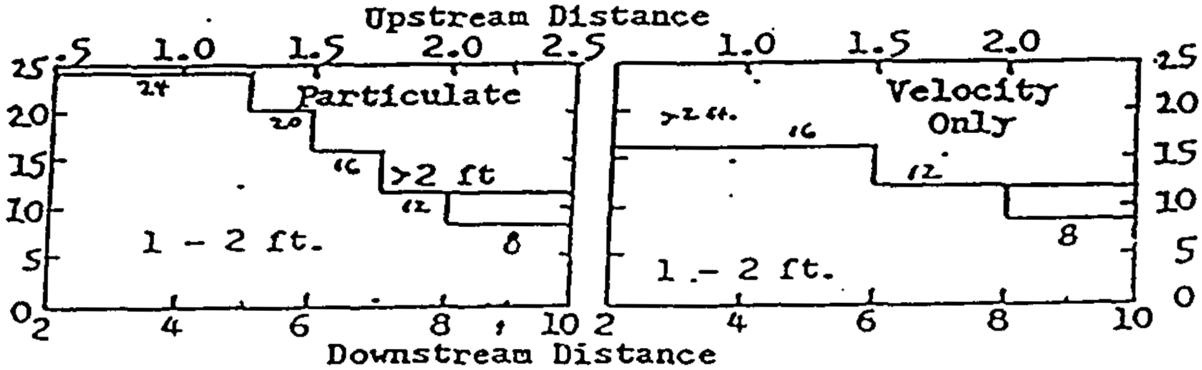
Distance Downstream from Disturbance ____ ft 5 diameters

Are the ports greater than two diameters downstream and one-half diameter upstream from disturbances? Yes / No

Number of Traverse Points Required (as shown in 40CFR60, Appendix A, Method 1) 24 points

Number of Traverse Points per Diameter 12

Minimum Number of Traverse Points



Port Extension Length 4.75 inches

Point No.	% of ID From Wall	Distance To Inside Wall	Distance To Outside Port Edge
1	2.1	.945	5.69
2	6.7	3.01	7.76
3	11.8	5.31	10.06
4	17.7	7.96	12.71
5	25.0	11.25	16.0
6	35.6	16.0	20.75
7	64.4	28.98	33.73
8	75.0	33.75	38.5
9	82.3	37.035	41.78
10	88.2	39.69	44.44
11	93.3	41.98	46.73
12	97.9	44.05	48.75

PLANT Marseilles Brick
CITY, STATE Marseilles IL
STACK N

PROJECT
TEST SERIES NO.
DATE 5-10-94

VELOCITY TRAVERSE DATA

Run No. ____
Page ____ of ____

	~~Clock Time~~ Cyclone	Port # and Point	Stack Temp. °F	Δp in. H_2O	$\sqrt{\Delta p}$
1	0	A 1	92	.49	
2	0	2	93	.40	
3	10°	3	93	.41	
4	0	4	93	.29	
5	0	5	94	.25	
6	0	6	93	.21	
7	0	B 1	93	.32	
8	0	2	93	.27	
9	0	3	93	.26	
10	0	4	93	.11	
11	0	5	93	.14	
12	0	6	94	.17	
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
AVERAGES			93	.276	0.5253

PITOT TUBE
Number
Coefficient (C_p) .84
Calibration Date

PRESSURES
Barometric 30.26 in. Hg
Static -.21 in. H_2O
Stack (P_s) ____ in. Hg

CALCULATIONS
Stack Area (A) 49.75 ft²
Water Vapor Conc. ____ %
Dry Gas Fraction (DGF)
DGF = 1 − (%H_2O/100) = ____
Carbon Dioxide Conc. 0.3 %
Oxygen Concentration 20.4 %
Molecular Weight, Wet (M_s) 28.2797
RMS $p = (\overline{\sqrt{\Delta p}})^2$ ____ $\overline{\sqrt{\Delta p}}$ = ____
Stack Temp. ____ °F + 460 = (T_s) ____ °R
Stack Gas Velocity (V_s)
$V_s = (\sqrt{(T_s/(P_s M_s))})(\overline{\sqrt{\Delta p}})\ C_p\ 85.49$
V_s = ____ feet/second
Actual Volumetric Flowrate (Q_a)
$Q_a = 3600\ V_s\ A$
Q_a = ____ acf/hour
$Q_a/60$ = ____ acf/min.
Dry, Standard Volumetric Flowrate (Q_s)
$Q_s = 17.64\ Q_a\ DGF\ P_s\ /\ T_s$
Q_s = ____ dscf/hour
$Q_s/60$ = ____ dscf/min.
Signature

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44.03

Client:	Marseilles Brick	Hot Box No.:	STC 2	Barometric Pressure:	30.09
Location:	Marseilles IL	Cold Box No.:	STC 2	Stack Diameter, in:	45
Source I.D.:	Drier No. 2	Console No.:	STC 2	Nozzle Diameter, in:	.30
Project No.:	0894-8885	Pitot No.:		Filter No.:	940014
Date:	5-11-94	Pitot Coefficient:	.84	Ambient Temp.:	63
Run Number:	1	DGMC Factor:	1.001	Static Pressure:	-.21
Operator:	JTS	Meter ΔH@:	1.928	K Factor:	7.35

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H_2O) ΔP	Velocity Head (H_2O) √ΔP	Orifice Pressure Differential (H_2O) Calc	Orifice Pressure Differential (H_2O) Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Sample Train Temperatures (°F) Filter Box	Sample Train Temperatures (°F) Last Impinger	Sample Train Temperatures (°F) Dry Gas Meter	Vacuum ("Hg)
1	0	708.421	.41	.6403	3.0135	3.0	92	250	250	50	63	4
2	2.5	710.825	.39	.6245	2.8665	2.7	95	250	250	50	64	4
3	5.0	713.040	.31	.5568	2.2785	2.3	95	250	250	50	64	4
4	7.5	714.900	.22	.4690	1.6170	1.6	94	250	250	50	64	4
5	10.0	716.640	.19	.4359	1.3965	1.4	95	250	250	51	66	2
6	12.5	718.240	.13	.3605	0.9555	.95	92	250	250	51	66	2
7	15.0	719.620	.10	.3162	0.7350	.73	92	250	251	51	67	2
8	17.5	720.151	.14	.3742	1.0290	1.0	95	249	250	52	67	2
9	20.0	722.035	.14	.3742	1.0290	1.0	95	249	248	52	68	2
10	22.5	723.150	.09	.3000	0.6615	.66	95	250	250	53	69	2
11	25.0	724.700	.18	.4243	1.3230	1.3	95	250	250	53	70	2
12	27.5	726.260	.20	.4472	1.4700	1.5	96	250	250	53	71	2
13 B	30.0	727.966	.42	.6481	3.0870	3.1	92	250	250	55	68	2
14	32.5	730.200	.38	.6164	2.7930	2.8	95	250	250	55	69	2
15	35.0	732.600	.26	.5099	1.9110	1.9	95	250	250	55	69	2
16	37.5	734.495	.24	.4899	1.764	1.8	95	250	250	55	69	2
Total/Avg.												

	Final Weights	Initial Weights	Weight Gained
First Impinger	130	100	30
Second Impinger	125	100	25
Third Impinger	100	100	0
Silica Gel	277.8	250	27.8
		Total Condensate	

Flue Gas Analysis

Trial	O_2	CO_2	CO	N_2
1	20.4	.3	0	
2	20.4	.3	0	
3	20.4	.3	0	
AVG				

COMMENTS:
Start 0750
Stop

Pretest Leak Check @ 10 "Hg for 0.000 CFM

Postest Leak Check @ 10 "Hg for 0.000 CFM

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H_2O) ΔP	Velocity Head (H_2O) √ΔP	Orifice Pressure Differential (H_2O) Calc.	Orifice Pressure Differential (H_2O) Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Sample Train Temperatures (°F) Filter Box	Sample Train Temperatures (°F) Last Impinger	Sample Train Temperatures (°F) Dry Gas Meter	Vacuum (Hg)
17	40.0	736.199	.19	.4359	1.3965	1.4	95	250	250	56	75	2
18	42.5	737.700	.11	.3317	.8035	.80	95	250	250	57	76	2
19	45.0	739.300	.15	.3873	1.1025	1.1	95	250	250	57	77	2
20	47.5	740.800	.21	.4582	1.5435	1.5	95	250	249	58	78	2
21	50.0	742.501	.26	.5099	1.9110	1.9	95	251	250	58	78	2
22	52.5	744.010	.29	.5385	2.1315	2.1	95	251	251	59	79	2
23	55.0	746.300	.32	.5657	2.3520	2.3	94	250	251	59	80	2
24	57.5	747.950	.32	.5657	2.3520	2.3	94	250	250	61	80	2
	60.0	750.000										
Total/Avg			.235			1.714					70.7	

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FUGRO McClelland

Client:	Marseilles Brick
Location:	Marseilles IL
Source I.D.:	Drier 2
Project No.:	
Date:	5-11-94
Run Number:	2
Operator:	JTS
Hot Box No.:	STC2
Cold Box No.:	STC2
Console No.:	STC2
Pitot No.:	
Pitot Coefficient:	.84
DGMC Factor:	1.001
Meter Δ H@:	1.928
Barometric Pressure:	30.09
Stack Diameter, in:	45
Nozzle Diameter, in:	.30
Filter No.:	940015
Ambient Temp.:	67
Static Pressure:	-.21
K Factor:	7.52

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H_2O) ΔP	Velocity Head (H_2O) √ΔP	Orifice Pressure Differential (H_2O) Calc	Orifice Pressure Differential (H_2O) Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum ("Hg)
1 A	0	762.500	.45	.6708	3.384	3.4	95	250	250	50	77	4
2	2.5	764.751	.41	.6403	3.0832	3.1	95	250	250	50	78	2
3	5.0	767.250	.35	.5916	2.6320	2.6	94	249	250	50	79	2
4	7.5	769.375	.27	.5196	2.0304	2.0	95	249	250	50	80	2
5	10.0	771.290	.18	.4243	1.3536	1.3	95	250	250	51	80	2
6	12.5	772.910	.13	.3605	.9776	.98	95	249	250	52	81	2
7	15.0	774.300	.10	.3162	.7520	.75	94	250	250	52	81	2
8	17.5	775.525	.24	.4899	1.8048	1.8	94	251	250	52	81	2
9	20.0	777.400	.29	.5385	2.1808	2.2	94	250	250	52	82	2
10	22.5	779.290	.26	.5099	1.9552	1.9	95	250	250	52	82	2
11	25.0	781.351	.18	.4243	1.3536	1.3	95	249	250	53	83	2
12	27.5	782.540	.35	.5916	2.632	2.6	95	250	250	54	83	2
13 B *	30.0	784.660	.50	.7071	3.8000	3.8	94	250	250	51	83	2
14	32.5	787.285	.50	.7071	3.8000	3.8	94	250	251	50	84	2
15	35.0	789.990	.42	.6481	3.1920	3.2	95	250	251	50	84	2
16	37.5	792.340	.31	.5660	2.3560	2.3	95	250	250	51	85	2
Total/Avg.												

	Final Weights	Initial Weights	Weight Gained
First Impinger	132	100	32
Second Impinger	124	100	24
Third Impinger	0	100	0
Silica Gel	265.4	250	15.4
		Total Condensate	[illegible]

Flue Gas Analysis

Trial	O_2	CO_2	CO	N_2
1	20.4	.30	0	
2	20.4	.30	0	
3	20.4	.30	0	
AVG				

COMMENTS:
Start 0930
Stop 1033
* Change K-factor - 7.60

Pretest Leak Check @ 10 "Hg for 0.000 CFM
Posttest Leak Check @ 10 "Hg for 0.000 CFM

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H₂O)		Orifice Pressure Differential (H₂O)		Stack Gas Temperature (°F)	Sample Train Temperatures (°F)				Vacuum (Hg)
			ΔP	√ΔP	Calc.	Actual		Probe	Filter Box	Last Impinger	Dry Gas Meter	
17	40.0	794.420	.24	.4899	1.824	1.8	95	250	250	51	85	2
18	42.5	796.470	.18	.4243	1.368	1.4	95	251	250	52	85	2
19	45.0	798.100	.18	.4243	1.368	1.1	95	251	251	53	86	2
20	47.5	799.730	.21	.4582	1.596	1.6	95	251	251	54	87	2
21	50.0	801.400	.24	.4899	1.824	1.8	95	251	251	54	87	2
22	52.5	803.200	.30	.5477	2.280	2.3	95	251	251	55	87	2
23	55.0	804.490	.25	.5000	1.900	1.9	95	250	250	56	87	2
24	57.5	807.200	.32	.5657	2.432	2.4	95	250	250	56	87	2
2	60.0	809.014										
Total/Avg.												

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Client: Morseilles Brick	Hot Box No.: STL 2	Barometric Pressure: 30.09
Location: Morseilles IL	Cold Box No.: STL 2	Stack Diameter, In: 45
Source I.D.: Drier 2	Console No.: STL 2	Nozzle Diameter, In: .30
Project No.:	Pitot No.:	Filter No.: 940016
Date: 5-11-94	Pitot Coefficient: .84	Ambient Temp.: 68
Run Number: 3	DGMC Factor: 1.001	Static Pressure: -.21
Operator: JTS	Meter Δ H@: 1.928	K Factor: 7.52

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H_2O) ΔP	√ΔP	Orifice Pressure Differential (H_2O) Calc	Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum (Hg)
1 A	0	819.654	.47	.6856	3.5344	3.5						
2	2.5	822.200	.45	.6708	3.3810	3.4	98	250	250	49	80	3
3	5.0	825.341	.35	.5916	2.6320	2.6	97	250	250	49	80	3
4	7.5	827.120	.32	.5657	2.4064	2.4	97	250	250	49	81	2
5	10.0	828.900	.21	.4582	1.5792	1.6	97	250	250	49	81	2
6	12.5	830.875	.13	.3605	0.9776	.98	97	251	250	50	82	2
7	15.0	832.190	.16	.4000	1.2032	1.2	98	250	251	50	83	2
8	17.5	833.751	.18	.4243	1.3536	1.3	97	251	250	50	83	2
9	20.0	835.130	.18	.4243	1.3536	1.3	100	251	250	51	83	2
10	22.5	836.830	.20	.4472	1.5040	1.5	100	251	250	52	84	2
11	25.0	838.275	.25	.5000	1.8800	1.9	100	250	251	53	86	2
12	27.5	840.415	.25	.5000	1.8800	1.9	99	250	251	54	87	2
13 B	30.0	842.605	.39	.6245	2.9328	2.9	98	250	250	54	88	2
14	32.5	844.900	.35	.5916	2.6320	2.6	93	250	251	56	86	2
15	35.0	847.000	.25	.5000	1.8800	1.9	94	250	250	58	89	2
16	37.5	848.400	.25	.5000	1.8800	1.9	94	250	250	58	89	2
Total/Avg.							94	250	248	59	89	2

	Final Weights	Initial Weights	Weight Gained
First Impinger	130	100	30
Second Impinger	122	100	22
Third Impinger	100	100	0
Silica Gel	267.5	250	17.5
		Total Condensate	

Flue Gas Analysis

Trial	O_2	CO_2	CO	N_2
1	20.1	.3	0	
2	20.1	.3	0	
3	20.1	.3	0	
AVG				

COMMENTS:
Start 1100
Stop 1212

Pretest Leak Check @ 10 "Hg for 0.000 CFM
Postest Leak Check @ 20 "Hg for 0.000 CFM

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H_2O) ΔP	Velocity Head (H_2O) $\sqrt{\Delta P}$	Orifice Pressure Differential (H_2O) Calc.	Orifice Pressure Differential (H_2O) Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Sample Train Temperatures (°F) Filter Box	Sample Train Temperatures (°F) Last Impinger	Sample Train Temperatures (°F) Dry Gas Meter	Vacuum ("Hg)
17	40.0	849.820	.20	.4472	1.504	1.5	100	250	251	61	90	2
18	42.5	851.499	.09	.3000	0.6768	.68	101	250	250	61	90	2
19	45.0	852.700	.16	.4000	1.2032	1.2	101	250	250	62	90	2
20	47.5	854.270	.16	.4000	1.2032	1.2	100	250	250	63	91	2
21	50.0	855.705	.20	.4472	1.504	1.5	100	250	250	63	91	2
22	52.5	857.472	.22	.4690	1.6544	1.6	101	250	250	64	91	2
23	55.0	859.400	.20	.4472	1.504	1.5	100	250	250	64	91	2
24	57.5	860.610	.18	.4243	1.3536	1.3	101	251	250	65	91	2
	60.0	862.160										
Total/Avg												

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Company Marseilles Brick Project ____________

Test Location Drier #2 Date 5-11-94

Traverse Point Determination — Circular Stacks

Stack Inside Diameter 45" feet

Is diameter greater than 12 inches? Yes / No

Distance Upstream from Disturbance ____ ft 1 diameters

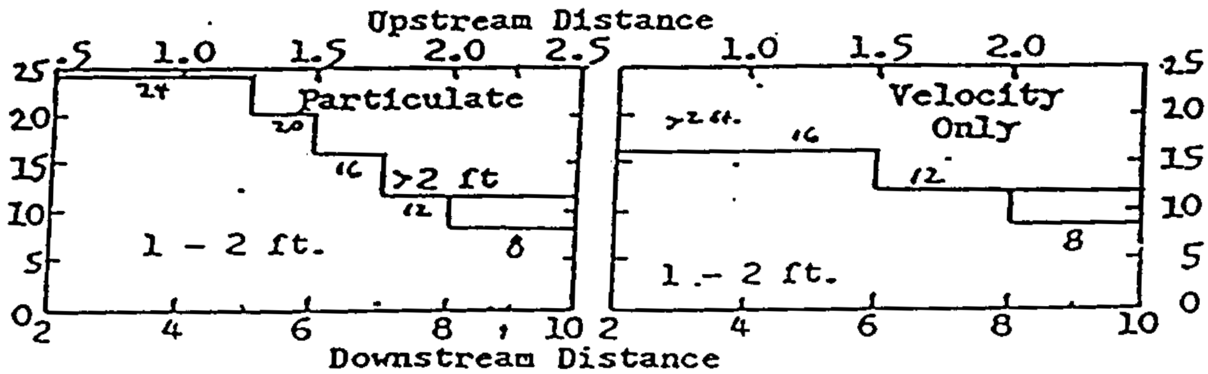
Distance Downstream from Disturbance ____ ft 5 diameters

Are the ports greater than two diameters downstream and one-half diameter upstream from disturbances? Yes / No

Number of Traverse Points Required (as shown in 40CFR60, Appendix A, Method 1) 24 points

Number of Traverse Points per Diameter 12

Minimum Number of Traverse Points



Port Extension Length 5 inches

Point No.	% of ID From Wall	Distance To Inside Wall	Distance To Outside Port Edge
1	2.1	.945	5.94
2	6.7	3.015	8.01
3	11.8	5.31	10.31
4	17.7	7.96	12.96
5	25.0	11.25	16.25
6	35.6	16.02	21.02
7	64.4	28.98	33.98
8	75.0	33.75	38.75
9	82.3	37035	42.03
10	88.2	39.69	44.69
11	93.3	41.98	46.98
12	97.9	44.05	49.05

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Client: Marseilles Brick	Hot Box No.: STLZ	Barometric Pressure: 29.85
Location: Marseilles IL	Cold Box No.: STLZ	Stack Diameter, in: 41'
Source I.D.: Kiln Exaust	Console No.: STLZ	Nozzle Diameter, in: .37
Project No.:	Pitot No.:	Filter No.: 940017
Date: 5-11-94	Pitot Coefficient: .84	Ambient Temp.: 69
Run Number: 1	DGMC Factor: 1.001	Static Pressure: -.11
Operator: JTB	Meter Δ H@: 1.928	K Factor: 11.28

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H_2O) ΔP	Velocity Head (H_2O) √ΔP	Orifice Pressure Differential (H_2O) Calc.	Orifice Pressure Differential (H_2O) Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum (" Hg)
1	0	872.150	.17	.4123	1.9176	1.9	468	250	250	49	82	2
2	2.8	874.010	.20	.4472	2.256	2.2	480	250	250	50	82	2
3	5.6	876.125	.20	.4472	2.256	2.2	483	251	250	50	82	2
4	8.4	878.130	.20	.4472	2.256	2.2	487	250	250	50	83	2
5	11.2	880.520	.18	.4243	2.0304	2.0	488	249	250	51	86	2
6	14.0	882.950	.15	.3873	1.6920	1.7	491	250	250	51	87	2
7	16.8	884.620	.14	.3741	1.5792	1.6	490	250	250	51	87	2
8 B	19.6	886.570	.14	.3741	1.5792	1.6	485	250	250	52	89	2
9	22.4	888.300	.18	.4243	2.0304	2.0	455	250	250	52	89	2
10	25.2	890.410	.16	.4000	1.8048	1.8	462	250	250	52	89	2
11	28.0	892.440	.17	.4123	1.9176	1.9	466	250	251	53	89	2
12	30.8	894.515	.26	.5099	2.9328	2.9	467	250	251	52	90	2
13	33.6	896.890	.27	.5196	3.0456	3.0	476	251	250	54	90	2
14 *	36.4	899.600	.27	.5196	3.0888	3.1	480	251	250	54	91	2
15 C	39.2	901.420	.27	.5196		3.1	486	251	251	56	92	2
16	42.0	905.900	.25	.5000	2.860	2.9	486	251	250	57	92	2
Total/Avg.												

	Final Weights	Initial Weights	Weight Gained
First Impinger	120	100	20
Second Impinger	115	100	15
Third Impinger		100	0
Silica Gel	284.5	250	39.5
		Total Condensate	

Flue Gas Analysis

Trial	O_2	CO_2	CO	N_2
1	17.8	1.8	0	
2	17.8	1.8	0	
3	17.8	1.8	0	
AVG				

COMMENTS:

Start 1515

Stop 1623

* Change K-factor 11.44

Pretest Leak Check @ 10 "Hg for 0.000 CFM

Posttest Leak Check @ "Hg for CFM

RUN 1

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H_2O) ΔP	Velocity Head (H_2O) √ΔP	Orifice Pressure Differential (H_2O) Calc.	Orifice Pressure Differential (H_2O) Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Sample Train Temperatures (°F) Filter Box	Sample Train Temperatures (°F) Last Impinger	Sample Train Temperatures (°F) Dry Gas Meter	Vacuum ("Hg)
17	44.8	909.600	.25	.5000	2.860	2.9	488	250	250	60	93	2
18	47.6	912.651	.25	.5000	2.860	2.9	490	251	249	60	93	2
19	50.1	915.300	.25	.5000	2.860	2.9	493	250	250	61	94	2
20	53.2	917.570	.26	.5099	2.9744	3.0	495	250	250	62	94	2
21	56.0	920.195	.25	.5000	2.860	2.9	497	250	250	62	94	2
	58.8	922.832										
	(60.0)	923.715										
Total/Avg												

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Client: Marseilles Brick	Hot Box No.: STL 2	Barometric Pressure: 29.85
Location: Marseilles IL	Cold Box No.: STL2	Stack Diameter, in: 41.
Source I.D.: Kiln Exhaust	Console No.: STL2	Nozzle Diameter, in: .37
Project No.:	Pitot No.:	Filter No.: 940018
Date: 5-11-94	Pitot Coefficient: .84	Ambient Temp.: 69
Run Number: 2	DGMC Factor: 1.001	Static Pressure: -.1
Operator: JTS	Meter Δ H@: 1.928	K Factor: 10.70

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H_2O) ΔP	Velocity Head (H_2O) √ΔP	Orifice Pressure Differential (H_2O) Calc	Orifice Pressure Differential (H_2O) Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum ("Hg)
1	0	935.121	.28	.5291	2.9960	3.0	486	250	250	50	90	2
2	2.8	937.990	.28	.5291	2.9960	3.0	487	250	250	50	91	2
3	5.6	940.120	.28	.5291	2.9960	3.0	488	250	250	51	91	2
4	8.4	943.210	.30	.5477	3.2100	3.2	491	250	250	51	92	2
5	11.2	946.100	.25	.5000	2.6750	2.7	495	250	250	52	92	2
6	14.0	948.230	.27	.5196	2.8890	2.9	496	250	250	52	93	2
7	16.8	950.920	.27	.5196	2.8890	2.9	498	250	250	53	94	2
8 B	19.6	953.100	.24	.4899	2.568	2.6	493	250	250	54	94	2
9	22.4	955.890	.28	.5291	2.9960	3.0	440	250	250	54	94	2
10	25.2	958.190	.26	.5099	2.7820	2.8	463	247	249	55	95	2
11	28.0	961.200	.28	.5291	2.9960	3.0	468	248	250	56	97	2
12	30.8	963.420	.31	.5568	3.317	3.3	471	250	250	57	97	2
13	33.6	965.900	.32	.5657	3.421	3.4	472	250	250	60	98	2
14	36.4	968.857	.15	.3873	1.605	1.6	445	250	250	60	96	2
15 C	39.2	971.000	.17	.4123	1.819	1.8	477	250	251	60	96	2
16	42.0	972.620	.20	.4472	2.1400	2.1	481	250	251	60	97	2
Total/Avg.												

	Final Weights	Initial Weights	Weight Gained
First Impinger	129	100	29
Second Impinger	117	100	14
Third Impinger	0	100	0
Silica Gel	280.6	250	30.6
Total Condensate			

Flue Gas Analysis

Trial	O_2	CO_2	CO	N_2
1	17.8	1.8		
2	17.8	1.8		
3	17.8	1.8		
AVG				

COMMENTS:

Start - 1700

Stop - 1804

Pretest Leak Check @ 10 "Hg for 0.00 CFM

Posttest Leak Check @

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H_2O) ΔP	Velocity Head (H_2O) √ΔP	Orifice Pressure Differential (H_2O) Calc.	Orifice Pressure Differential (H_2O) Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Sample Train Temperatures (°F) Filter Box	Sample Train Temperatures (°F) Last Impinger	Sample Train Temperatures (°F) Dry Gas Meter	Vacuum (Hg)
17	44.8	974.310	.20	.4472	2.2400	2.1	480	250	250	61	98	2
18	47.6	977.200	.20	.4472	2.1400	2.1	485	250	250	61	98	2
19	50.4	979.800	.19	.4359	2.0330	2.0	487	251	250	62	99	2
20	53.2	981.610	.16	.4000	1.7120	1.7	490	247	253	64	99	2
21	56.0	983.515	.15	.3873	1.6050	1.6	490	250	250	65	99	2
	58.8	985.530										
	(60.0)	986.317										
Total/Avg.			.240			2.5	480				95	

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FUGRO McClelland

Client: Marseilles Brick	Hot Box No.: STL 2	Barometric Pressure: 29.85	
Location: Marseilles IL	Cold Box No.: STL 2	Stack Diameter, in: 41'	
Source I.D.: Kiln Exaust	Console No.: STL 2	Nozzle Diameter, in: .37	
Project No.:	Pitot No.:	Filter No.: 940019	
Date: 5-11-94	Pitot Coefficient: .84	Ambient Temp.: 69	
Run Number: 3	DGMC Factor: 1.001	Static Pressure: -.11	
Operator: JTS	Meter Δ H@: 1.928	K Factor: 10.65	

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H₂O) ΔP	Velocity Head (H₂O) √ΔP	Orifice Pressure Differential (H₂O) Calc	Orifice Pressure Differential (H₂O) Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum ("Hg)
1 A	0	991.447	.15	.3873	1.5975	1.6	477	250	250	50	92	2
2	2.8	993.200	.15	.3873	1.5975	1.6	482	249	249	50	93	2
3	5.6	995.101	.15	.3873	1.5975	1.6	486	250	250	51	94	2
4	8.4	996.875	.16	.4000	1.7040	1.7	488	251	250	53	95	2
5	11.2	999.010	.15	.3873	1.5975	1.6	490	250	250	54	93	2
6	14.0	1000.610	.14	.3742	1.491	1.5	493	250	250	55	93	2
7	16.8	1002.411	.15	.3873	1.5975	1.6	477	251	250	56	94	2
8 B	19.6	1004.150	.14	.3742	1.491	1.5	440	252	251	57	94	2
9	22.4	1005.990	.14	.3742	1.491	1.5	456	250	250	57	95	2
10	25.2	1007.921	.20	.4472	2.13	2.1	459	250	250	59	93	2
11	28.0	1009.851	.15	.3873	1.5975	1.6	461	250	247	60	93	2
12	30.8	1011.401	.16	.4000	1.7040	1.7	463	250	250	60	94	2
13	33.6	1013.500	.20	.4472	2.13	2.0	464	250	250	62	94	2
14	36.4	1015.862	.25	.5000	2.6625	2.7	465	250	250	63	95	2
15 C	39.2	1018.320	.30	.5477	3.1950	3.2	471	250	250	60	95	2
16	42.0	1021.150	.30	.5477	3.1950	3.2	473	250	250	60	95	2
Total/Avg.												

	Final Weights	Initial Weights	Weight Gained
First Impinger	121	100	21
Second Impinger	118	100	18
Third Impinger	100	100	0
Silica Gel	274.6	250	24.6
		Total Condensate	

Flue Gas Analysis

Trial	O_2	CO_2	CO	N_2
1	17.8	1.8	0	
2	17.8	1.8	0	
3	17.8	1.8	0	
AVG				

COMMENTS:

START - 1840

STOP 1943

Pretest Leak Check @ 10 "Hg for 0.000 CFM

Posttest Leak Check @

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H_2O)		Orifice Pressure Differential (H_2O)		Stack Gas Temperature (°F)	Sample Train Temperatures (°F)				Vacuum (Hg)
			ΔP	$\sqrt{\Delta P}$	Calc.	Actual		Probe	Filter Box	Last Impinger	Dry Gas Meter	
17	44.8	1024.610	.30	.5477	3.1950	3.2	476	250	251	60	96	2
18	47.6	1026.610	.31	.5568	3.3015	3.3	478	251	250	61	96	2
19	50.4	1028.930	.27	.5196	2.8755	2.9	480	251	250	61	96	2
20	53.2	1031.875	.27	.5196	2.8755	2.8	482	250	250	61	96	2
21	56.0	1034.521	.24	.4899	2.556	2.5	483	250	250	61	96	2
	58.8	1036.520										
	(60.0)											
Total/Avg												

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Company ______________________ Project ______________

Test Location Kiln Exhaust Date 5.11.94

Traverse Point Determination -- Circular Stacks

Stack Inside Diameter 41" feet

Is diameter greater than 12 inches? Yes / No

Distance Upstream from Disturbance 7 ft 2 diameters

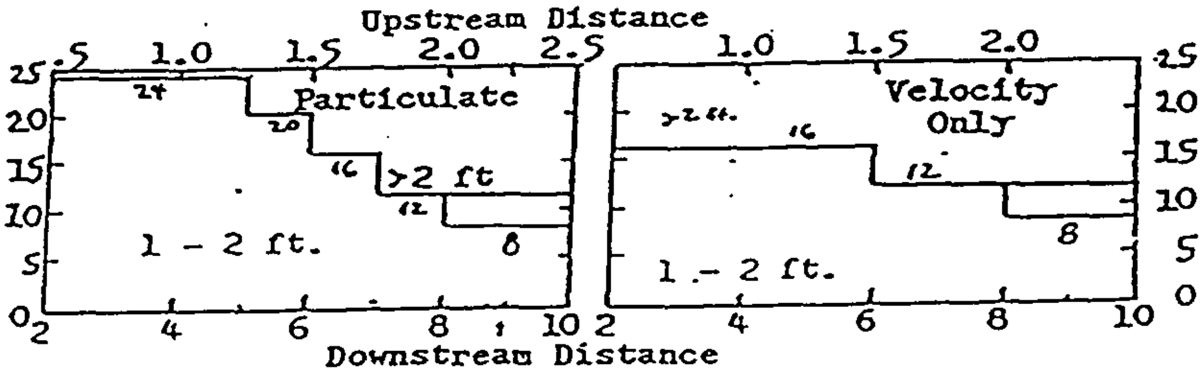
Distance Downstream from Disturbance 20 ft 5 diameters

Are the ports greater than two diameters downstream and one-half diameter upstream from disturbances? Yes / No

Number of Traverse Points Required (as shown in 40CFR60, Appendix A, Method 1) ________ points

Number of Traverse Points per Diameter ________

Minimum Number of Traverse Points



Port Extension Length 20 inches

Point No.	% of ID From Wall	Distance To Inside Wall	Distance To Outside Port Edge
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

5.8

PLANT Marseilles Brick
CITY, STATE Marseilles IL
STACK Kiln Exaust

PROJECT
TEST SERIES NO.
DATE

VELOCITY TRAVERSE DATA

Run No.
Page of

	Clock Time Cyclone	Port & and Point	Stack Temp. °F	Δp in. H_2O	$\sqrt{\Delta p}$
1	0		472	.22	
2	0		474	.25	
3	0		475	.25	
4	0		477	.24	
5	0		479	.25	
6	0		480	.23	
7	0		480	.24	
8	0		470	.15	
9	0		472	.15	
10	0		477	.16	
11	0		479	.15	
12	0		481	.13	
13	0		481	.10	
14	0		482	.10	
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
AVERAGES			477	.18	0.4243

PITOT TUBE
Number
Coefficient (C_p) .84
Calibration Date

PRESSURES
Barometric 29.85 in. Hg
Static -.11 in. H_2O
Stack (P_s) 41" in. Hg

CALCULATIONS
Stack Area (A) ft²
Water Vapor Conc. 5 %
Dry Gas Fraction (DGF)
DGF = 1 − (%H_2O/100) =
Carbon Dioxide Conc. 1.8 %
Oxygen Concentration 17.8 %
Molecular Weight, Wet (M_s) 28.4500
RMS p = $(\sqrt{\Delta p})^2$ $\sqrt{\Delta p}$ =
Stack Temp. °F + 460 = (T_s) °R
Stack Gas Velocity (V_s)
$V_s = (\sqrt{T_s/(P_s M_s)})(\sqrt{\Delta p})\ C_p\ 85.49$
V_s = feet/second
Actual Volumetric Flowrate (Q_a)
$Q_a = 3600\ V_s\ A$
Q_a = acf/hour
$Q_a/60$ = acf/min.
Dry, Standard Volumetric Flowrate (Q_s)
$Q_s = 17.64\ Q_a\ DGF\ P_s\ /\ T_s$
Q_s = dscf/hour
$Q_s/60$ = dscf/min.
Signature

FUGRO McClelland

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FUGRO McClelland

93.09

Client:	Marseilles Brick
Location:	Marseilles IL
Source I.D.:	N
Project No.:	
Date:	5-10-94
Run Number:	1
Operator:	JTS
Hot Box No.:	STLZ
Cold Box No.:	STLZ
Console No.:	STLZ
Pitot No.:	
Pitot Coefficient:	.84
DGMC Factor:	1.001
Meter ΔH@:	1.928
Barometric Pressure:	30.26
Stack Diameter, In:	49.75
Nozzle Diameter, In:	.30
Filter No.:	940011
Ambient Temp.:	74
Static Pressure:	-.21
K Factor:	8.15

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H_2O) ΔP	√ΔP	Orifice Pressure Differential (H_2O) Calc	Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum ("Hg)
1 A	0	540.300	.42	.6481	3.423	3.4	90	250	250	54	72	3
2	2.5	542.930	.35	.5916	2.852	2.8	91	250	250	55	73	2
3	5.0	545.500	.27	.5196	2.200	2.2	91	250	250	56	76	2
4	7.5	547.000	.17	.4123	1.385	1.4	91	250	250	56	76	2
5	10.0	548.52	.10	.3162	.815	.8	91	250	250	56	77	2
6	12.5	549.610	.07	.2646	.570	.5	91	250	250	57	78	2
7	15.0	550.620	.07	.2646	.570	.5	91	250	250	57	79	2
8	17.5	551.691	.08	.2828	.652	.6	91	250	250	58	79	2
9 *	20.0	553.100	.32	.2657	2.6368	2.6	93	250	250	59	80	2
10	22.5	554.500	.21	.4582	1.730	1.7	93	250	250	59	81	2
11	25.0	555.880	.16	.4000	1.318	1.3	93	250	250	59	81	2
12	27.5	557.300	.16	.4000	1.318	1.3	93	249	250	59	84	2
13 B	30.0	558.800	.11	.3317	.9064	.90	93	250	250	60	84	2
14	32.5	560.020	.45	.6708	3.708	3.7	93	251	250	60	86	2
15	35.0	562.750	.47	.6856	3.873	3.9	93	249	249	61	88	4
16	37.5	564.990	.41		3.378	3.4	93	250	251	62	89	4
Total/Avg												

	Final Weights	Initial Weights	Weight Gained
First Impinger	130	100	30
Second Impinger	130	100	30
Third Impinger	105	100	5
Silica Gel	275.4	250	25.4
Total Condensate			

Flue Gas Analysis

Trial	O_2	CO_2	CO	N_2
1	20.4	.03		
2	20.4	.03		
3	20.4	.03		
AVG				

COMMENTS:
Start 1253
Stop 1400
* Change K to 8.24

Pretest Leak Check @ 10 "Hg for 0.000 CFM

Posttest Leak Check @ 10 "Hg for 0.000 CFM

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H_2O)		Orifice Pressure Differential (H_2O)		Stack Gas Temperature (°F)	Sample Train Temperatures (°F)				Vacuum (Hg)
			ΔP	√ΔP	Calc	Actual		Probe	Filter Box	Last Impinger	Dry Gas Meter	
	40.0	567.486	.31	0.5568	2.554	2.5	92	251	250	62	91	4
	42.5	569.790	.14	0.3742	1.154	1.1	93	250	249	63	94	4
	45.0	571.550	.10	0.3162	.824	.8	93	251	252	61	95	4
	47.5	572.500	.14	0.3742	1.154	1.1	95	250	250	61	93	2
	50.0	573 900	.17	0.4123	1.400	1.4	93	251	251	62	92	2
	52.5	575.495	.18	0.4243	1.483	1.5	93	250	250	63	94	2
	55.0	577.028	.24	0.4899	1.978	2.0	93	251	250	64	95	2
	57.5	578.900	.19		1.566	1.6	93	250	250	65	95	2
	60.0	580.614										
Total/Avg			.220			1.7916					85	

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93.48

Client: Marseilles Brick	Hot Box No.: STL 2	Barometric Pressure: 30.26
Location: Marseilles IL	Cold Box No.: STL2	Stack Diameter, in: 45
Source I.D.: Drier 1	Console No.: STL2	Nozzle Diameter, in: .30
Project No.:	Pitot No.:	Filter No.: 940012
Date: 5-10-94	Pitot Coefficient: .84	Ambient Temp.: 75
Run Number: 2	DGMC Factor: 1.~~00~~001	Static Pressure: -.21
Operator: JTS	Meter ΔH@: 1.928	K Factor: 7.69

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H2O) ΔP	Velocity Head (H2O) √ΔP	Orifice Pressure Differential (H2O) Calc	Orifice Pressure Differential (H2O) Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum (Hg)
1 A	0	591.384	.45	.6708	3.4605	3.5	94					
2	2.5	593.300	.50	.7071	3.845	3.8	95	250	250	58	90	2
3	5.0	595.920	.48	.6928	3.691	3.7	95	250	250	58	93	4
4	7.5	598.700	.44	.6633	3.384	3.4	95	250	250	54	94	4
5	10.0	601.200	.34	.5831	2.614	2.6	95	250	251	58	95	4
6	12.5	603.400	.21	.4582	1.615	1.615	95	250	250	60	95	4
7	15.0	605.151	.22	.4690	1.692	1.7	95	250	250	60	95	4
8	17.5	606.510	.30	.5477	2.307	2.3	94	251	250	61	95	2
9	20.0	608.800	.27	.5196	2.076	2.0	94	250	250	62	96	2
10	22.5	610.800	.20	.4472	1.538	1.5	94	250	250	63	97	2
11 *	25.0	612.270	.25	.5000	1.9425	1.9	95	250	249	63	98	2
12	27.5	613.950	.25	.5000	1.9425	1.9	94	250	250	63	98	2
13 B	30.0	615.828	.31	.5568	2.4087	2.4	94	250	250	60	98	2
14	32.5	617.510	.35	.5916	2.719	2.7	94	250	250	60	98	2
15	35.0	620.201	.26	.5099	2.020	2.0	94	251	250	61	97	2
16	37.5	622.100	.22	.4690	1.709	1.7	94	251	250	61	97	2
Total/Avg.							94	250	249	62	97	2

	Final Weights	Initial Weights	Weight Gained
First Impinger	130	100	30
Second Impinger	127	100	27
Third Impinger	5	100	5
Silica Gel	272.3	250	22.3
Total Condensate			

Flue Gas Analysis

Trial	O_2	CO_2	CO	N_2
1	20.4	.03	0	
2	20.4	.03	0	
3	20.4	.03	0	
AVG				

COMMENTS:
Start 1448
Stop 1553
* Change K Factor 7.77

Pretest Leak Check @ 10 "Hg for 0.000 CFM
Posttest Leak Check @ "Hg for CFM

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H_2O) P	Velocity Head (H_2O) √ΔP	Orifice Pressure Differential (H_2O) Calc	Orifice Pressure Differential (H_2O) Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Sample Train Temperatures (°F) Filter Box	Sample Train Temperatures (°F) Last Impinger	Sample Train Temperatures (°F) Dry Gas Meter	Vacuum ("Hg)
17	40.0	623.400	.19	.4359	1.4763	1.5	94	250	250	62	98	2
18	42.5	625.800	.11	.3317	.8547	.85	95	250	250	63	98	2
19	45.0	627.150	.27	0.5196	2.098	2.1	94	250	251	63	98	2
20	47.5	628.870	.39	.6245	3.2329	3.2	94	250	250	64	98	2
21	50.0	631.851	.27	0.5196	2.098	2.1	94	250	250	64	98	2
22	52.5	633.400	.27	0.5196	2.098	2.1	94	249	250	60	98	2
23	55.0	635.310	.49	.7000	4.0619	4.1	94	250	250	61	99	2
24	57.5	637.800	.34	.5831	2.8185	2.8	94	250	251	61	99	2
	60.0	639.950										
Total/Avg			.307			2.4	94				96.6	

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Client: Marseilles Brick	Hot Box No.: STC 2	Barometric Pressure: 30.26
Location: Marseilles IL	Cold Box No.: STC 2	Stack Diameter, In: 45
Source I.D.: Drier #1	Console No.: STC 2	Nozzle Diameter, In: .30
Project No.:	Pitot No.: C	Filter No.: 940013
Date: 5-10-94	Pitot Coefficient: .84	Ambient Temp.: 75
Run Number: 3	DGMC Factor: 1.0001	Static Pressure: -.21
Operator: JTS	Meter ΔH@: 1.828	K Factor: 7.79

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H_2O) ΔP	Velocity Head (H_2O) √ΔP	Orifice Pressure Differential (H_2O) Calc.	Orifice Pressure Differential (H_2O) Actual	Stack Gas Temperature (°F)	Sample Train Temperatures (°F) Probe	Filter Box	Last Impinger	Dry Gas Meter	Vacuum ("Hg)
A 1	0	653.160	.45	.6708	3.505	3.5	94	250	251	50	92	4
2	2.5	655.529	.41	.6403	3.193	3.2	94	250	250	51	92	4
3	5.0	658.010	.31	.5568	2.4149	2.4	94	251	249	50	93	4
4	7.5	660.105	.22	.4690	1.7138	1.7	94	251	250	51	95	2
5	10.0	662.050	.15	.3873	1.1685	1.7	94	251	251	52	95	2
6	12.5	663.957	.14	.3742	1.0906	1.1	94	250	251	52	95	2
7	15.0	665.420	.17	.4123	1.324	1.3	94	250	250	53	95	2
8	17.5	666.950	.23	.4796	1.791	1.8	95	250	250	53	96	2
9	20.0	668.686	.22	.4690	1.7138	1.7	95	250	250	54	96	2
10	22.5	670.400	.34	.5831	2.648	2.6	95	250	251	54	97	2
11	25.0	672.500	.31	.5568	2.4149	2.4	94	250	250	55	98	2
12	27.5	674.590	.22	.4690	1.7791	1.8	94	250	250	55	99	2
B 13	30.0	676.700	.43	.6557	3.3497	3.3	94	250	250	55	99	2
14	32.5	679.010	.39	.6245	3.038	3.0	94	248	251	57	100	2
15	35.0	681.160	.37	.6083	2.882	2.9	94	250	250	58	100	2
16	37.5	682.951	.22	.4690	1.7138	1.7	94	250	250	59	100	2
Total/Avg.												

	Final Weights	Initial Weights	Weight Gained
First Impinger	132	100	32
Second Impinger	130	100	30
Third Impinger	105	100	5
Silica Gel	268.2	250	18.2
Total Condensate			

Flue Gas Analysis

Trial	O_2	CO_2	CO	N_2
1	20.4	.03	0	
2	20.4	.03	0	
3	20.4	.03	0	
AVG				

COMMENTS:
Start 1630
Stop 1633

Pretest Leak Check @ 10 "Hg for 0.000 CFM

Postest Leak Check @ 10 "Hg for 0.000 CFM

Port and Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head (H_2O)		Orifice Pressure Differential (H_2O)		Stack Gas Temperature (°F)	Sample Train Temperatures (°F)				Vacuum ("Hg)
			ΔP	$\sqrt{\Delta P}$	Calc	Actual		Probe	Filter Box	Last Impinger	Dry Gas Meter	
17	40.0	685.520	.14	.3742	1.0906	1.1	94	250	250	59	100	2
18	42.5	687.060	.12	.3464	.9348	.93	94	250	251	59	100	2
19	46.0	688.451	.15	.3873	1.1685	1.2	94	250	250	59	100	2
20	47.5	689.990	.24	.4899	1.8696	1.9	94	249	250	60	97	2
21	50.0	691.600	.31	.5568	2.414	2.4	94	250	250	61	97	2
22	52.5	693.650	.36	.6000	2.8044	2.8	94	250	250	62	97	2
23	55.0	695.737	.41	.6403	3.1939	3.2	94	250	250	63	97	2
24	57.5	698.010	.45	.6708	3.5056	3.5	94	250	250	64	97	2
~~25~~	60.0	701.520										
Total/Avg			.281			2.21					97	

APPENDIX E

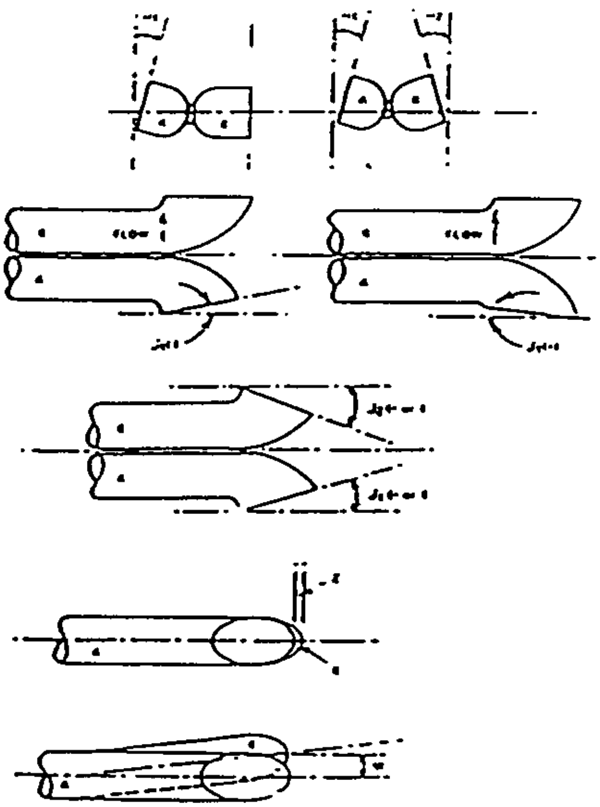
Equipment Calibration Records

FUGRO McClelland

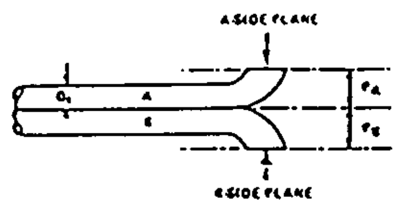
TYPE S PITOT TUBE CALIBRATION

PITOT TUBE 5-1SS

DATE 4-11-94



Are a_1 and a_2 < 10°?	Yes	No
Are B_1 and B_2 < 5°?	Yes	No
Is Z < 1/8 inch?	Yes	No
Is W < 1/32 inch?	Yes	No



External tube diameter (D_t) .3705

Is D_t between 3/16 and 3/8 in.? Yes No

Base-to-opening plane distances:

P_A .401

P_B .401

Does $P_A = P_b$?	Yes	No
Is $1.05\ D_t \leq P \leq 1.50\ D_t$?		
.397 ≤ .401 ≤ .568	Yes	No

When pitot tube is part of an assembly:

Is the thermocouple 2 inches behind the pitot tube opening?	Yes	No
Does the pitot tube extend 3 inches beyond the compression fitting on the nozzle?	Yes	No
Is the distance between the nozzle and the pitot tube more than 3/4 inch when a ½ inch nozzle is in place?	Yes	No

If any answer is no, the pitot tube must be calibrated in a wind tunnel against a standard type pitot tube.

If all answers are yes, the pitot tube may be assigned a baseline coefficient of 0.84.

Assigned Baseline Coefficient 0.84

Signature

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 1-6-94 Thermocouple number 5-1

Ambient temperature 23.0 °C Barometric pressure 29.74 in. Hg

Calibrator D.M.C Reference: mercury-in-glass Fisher Scientific #15-041A

other ______________

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[b] %
100°C	Water	100°C	97.78	0.006
0°C	Ice Water	0.000°C	0.000°C	0.000
—	Oil	219.44°C	219.44°C	0.000

[a] Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \leq 1.5\%.$

FUGRO

Dry Gas Meter and Orifice Calibration

Dry Gas Meter or Console Number STZ 2 Date 5-4-94

Barometric Pressure(not corrected to sea level pressure), P_b = 30.09 in. Hg

ΔH	Dry Gas Meter						Wet Test Meter						Time		Y	$\Delta H_@$
	Volume, cu.ft.			Temp.		Press	Volume, cu.ft.			Temp.						
	Final	Init.	Δ	°F	°R	in.Hg	Final	Init.	Δ	°C	°F	°R	' & "	min.		
			V_d		T_d	P_m			V_w			T_w		θ		
.5	490.000	480.000	10.000	78	538	30.127	48.237	38.107	10.13		68	528		25.4	1.031	1.716
1.0	500.000	490.000	10.000	83	543	30.164	58.141	48.237	9.904		68	528		18.3	1.016	1.847
1.5	510.010	500.000	10.010	84	544	30.200	67.900	58.141	9.759		68	528		15.2	1.001	1.965
2.0	520.013	510.010	10.003	89	549	30.237	77.518	67.900	9.618		68	528		13.1	0.995	1.985
2.5	530.016	520.013	10.003	91	551	30.274	87.016	77.518	9.498		68	528		11.6	0.985	1.988
3.0	540.018	530.016	10.002	95	555	30.311	96.394	87.016	9.378		68	[illegible]		10.7	0.978	2.067
														Average	1.001	1.928

Signature [signature]

$P_m = (\Delta H \div 13.6) + P_b$

$°F = (°C \times 9 \div 5) + 32$

$°R = °F + 460$

$$Y = \frac{V_w P_b T_d}{V_d P_m T_w}$$

$$\Delta H_@ = \left(\frac{T_w \theta}{V_w}\right)^2 \frac{0.0317 \Delta H}{P_b T_d}$$

Y is the ratio of accuracy of the wet test meter to the dry gas meter and its tolerance limits are ± 0.02 from 1.00.

$\Delta H_@$ is the orifice differential pressure which gives an air flow rate of 0.75 cfm at 70°F and 29.92 inches of mercury. It had tolerance limits of ± 0.20 in. H_2O from 1.84.

213-585-2154
FAX= 213-585-0582

LIQUID CARBONIC

CYLINDER GAS PRODUCTS

5700 SOUTH ALAMEDA STREET • LOS ANGELES, CALIFORNIA 90058

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

CUSTOMER ENV. & INDUST. DIST. P.O NUMBER 031694-2

REFERENCE STANDARD

COMPONENT		NIST SRM NO.	CYLINDER NO.	CONCENTRATION
PROPANE	GMIS	vs 2645a	SA 5908	497 ppm

ANALYZER READINGS

R=REFERENCE STANDARD Z=ZERO GAS C=GAS CANDIDATE

1. COMPONENT PROPANE GMIS ANALYZER MAKE-MODEL-S/N HP 5890 SERIES II S/N 3310A48533

ANALYTICAL PRINCIPLE GC/ FLAME IONIZATION LAST CALIBRATION DATE 03/11/94

FIRST ANALYSIS DATE 04/08/94 SECOND ANALYSIS DATE

Z 0	R 519884	C 526732	CONC.	497 ppm	Z	R	C	CONC.	
R 521351	Z 0	C 526817	CONC.	496 ppm	R	Z	C	CONC.	
Z 0	C 527344	R 520672	CONC.	497 ppm	Z	C	R	CONC.	
U/M uV			MEAN TEST ASSAY	497 ppm	U/M uV			MEAN TEST ASSAY	

THIS CYLINDER NO. SA 5143
HAS BEEN CERTIFIED ACCORDING TO SECTION 3.0.4
OF TRACEABILITY PROTOCOL NO. 1
PROCEDURE G1
CERTIFIED ACCURACY ± 1 % NIST TRACEABLE
CYLINDER PRESSURE 2000 PSIG
CERTIFICATION DATE 04/08/94
EXPIRATION DATE 04/08/97 TERM 36 MONTHS

CERTIFIED CONCENTRATION

PROPANE	497 ppm
ZERO AIR	BALANCE

ANALYZED BY MARIA E. ROCHON CERTIFIED BY TY TRIPLETT

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET, TROY, MI 48083 (313) 589-2950 FAX: (313) 589-2134

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
FURGO MCCLELLAND
CHRIS DAWDY
9921 ST CHARLES ROCK RD
ST ANN MO 63074

Assay Laboratory
Scott Specialty Gases, Inc.
1290 Combermere
Troy, MI 48083

Purchase Order H145-2
Scott Project # 547552

ANALYTICAL INFORMATION

Certified to exceed the minimum specifications of EPA Protocol 1 Procedure #G1, Section Number 3.0.4

Cylinder Number ALM030957 **Certification Date** 2-18-93 **Expiration Date** 8-18-94
Cylinder Pressure 1900 psig **Previous Certification Dates** None

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Propane	30.68 ppm	±1% NIST Directly Traceable

Balance Gas: Nitrogen

*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
SRM 2643A	10-14-95	SX-20305	99.12 ppm Propane in N_2

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
Prop: Beckman/400/1002059	1-25-93	Flame Ionization Detector

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
Propane	Date: 2-18-93 Response Units: mv Z1=0.00 R1=99.10 T1=30.70 R2=99.10 Z2=0.00 T2=30.70 Z3=0.00 T3=30.70 R3=99.10 Avg. Conc. of Cust. Cyl. 30.68 ppm		Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=0.99999 SRM 2643A Constants: A=-0.03442105 B=1.000549 C=0 D=0 E=0
			Concentration=A+Bx+Cx^2+Dx^3+Ex^4
			Concentration=A+Bx+Cx^2+Dx^3+Ex^4

Special Notes

Analyst Tim S .derson

213-585-2154
FAX# 213-585-0582

LIQUID CARBONIC

CYLINDER GAS PRODUCTS

5700 SOUTH ALAMEDA STREET • LOS ANGELES, CALIFORNIA 90058

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

CUSTOMER ENV. & INDUST. DIST. P.O NUMBER 092393-2

REFERENCE STANDARD

COMPONENT	NIST SRM NO.	CYLINDER NO.	CONCENTRATION
NITRIC OXIDE GMIS	vs. 1687b	CC56971	485 ppm

ANALYZER READINGS

R=REFERENCE STANDARD *Z=ZERO GAS* *C=GAS CANDIDATE*

1. COMPONENT NITRIC OXIDE GMIS ANALYZER MAKE-MODEL-S/N Beckman 951A S/N 0101354

ANALYTICAL PRINCIPLE Chemiluminescence LAST CALIBRATION DATE 08/27/93

FIRST ANALYSIS DATE 10/04/93 SECOND ANALYSIS DATE 10/11/93

Z 0	R 485	C 356	CONC. 356 ppm	Z 0	R 487	C 354	CONC. 353 ppm
R 485	Z 0	C 356	CONC. 356 ppm	R 487	Z 0	C 356	CONC. 355 ppm
Z 0	C 356	R 485	CONC. 356 ppm	Z 0	C 358	R 488	CONC. 356 ppm
U/M mV		MEAN TEST ASSAY	356 ppm	U/M mV		MEAN TEST ASSAY	355 ppm

THIS CYLINDER NO. SA 8379
HAS BEEN CERTIFIED ACCORDING TO SECTION 3.0.4
OF TRACEABILITY PROTOCOL NO. 1
PROCEDURE G1
CERTIFIED ACCURACY ± 1 % NIST TRACEABLE
CYLINDER PRESSURE 2000 PSIG
CERTIFICATION DATE 10/11/93
EXPIRATION DATE 10/11/95 TERM 24 MONTHS

CERTIFIED CONCENTRATION	
NITRIC OXIDE	356 ppm
NITROGEN	BALANCE
NOx	362 ppm

ANALYZED BY MARIA E. ROCHON

CERTIFIED BY DOUG GRANT

213-585-2154
FAX# 213-585-0582

LIQUID CARBONIC

CYLINDER GAS PRODUCTS

5700 SOUTH ALEMEDA STREET • LOS ANGELES, CALIFORNIA 90058

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

CUSTOMER ENV. & INDUST. DIST. P.O NUMBER 031993-4

REFERENCE STANDARD

COMPONENT		NIST SRM NO.	CYLINDER NO.	CONCENTRATION
NITRIC OXIDE	GMIS	vs 1684b	SA 1395	85.2 ppm

ANALYZER READINGS

R=REFERENCE STANDARD *Z=ZERO GAS* *C=GAS CANDIDATE*

1. COMPONENT NITRIC OXIDE GMIS ANALYZER MAKE-MODEL-S/N Beckman 951A S/N 0101354

ANALYTICAL PRINCIPLE Chemiluminescence LAST CALIBRATION DATE 03/03/93

FIRST ANALYSIS DATE 01/21/93 SECOND ANALYSIS DATE 03/24/93

Z 0	R 967	C 822	CONC. 86.7 ppm	Z 0	R 862	C 870	CONC. 86.0 ppm
R 967	Z 0	C 822	CONC. 86.7 ppm	R 860	Z 0	C 869	CONC. 86.1 ppm
Z 0	C 822	R 967	CONC. 86.7 ppm	Z 0	C 869	R 860	CONC. 86.1 ppm
U/M mV		MEAN TEST ASSAY	86.7 ppm	U/M mV		MEAN TEST ASSAY	86.1 ppm

CHRONOLOGY: First Analysis vs GMIS SA 3057, 102 ppm NO/N2

THIS CYLINDER NO.	SGAL 1074	CERTIFIED CONCENTRATION	
HAS BEEN CERTIFIED ACCORDING TO SECTION	3.0.4	NITRIC OXIDE	86.4 ppm
OF TRACEABILITY PROTOCOL NO.	1	NITROGEN	BALANCE
PROCEDURE	G1	NOx	88.7 ppm
CERTIFIED ACCURACY	± 1 % NIST TRACEABLE		
CYLINDER PRESSURE	2000 PSIG		
CERTIFICATION DATE	03/24/93		
EXPIRATION DATE	09/24/94		

ANALYZED BY MARIA E. ROCHON

CERTIFIED BY KWAN T. YOUNG

213-585-2154
FAX# 213-585-0582

LIQUID CARBONIC

CYLINDER GAS PRODUCTS

5700 SOUTH ALAMEDA STREET • LOS ANGELES, CALIFORNIA 90058

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

CUSTOMER ENV. & INDUST. DIST. P.O NUMBER 102293-1

REFERENCE STANDARD

COMPONENT	NIST SRM NO.	CYLINDER NO.	CONCENTRATION
CARBON DIOXIDE GMIS	vs 1675b	438008	14.04 %

ANALYZER READINGS

R=REFERENCE STANDARD *Z=ZERO GAS* *C=GAS CANDIDATE*

1. COMPONENT CARBON DIOXIDE GMIS ANALYZER MAKE-MODEL-S/N Siemens Ultramat 5E S/N A12-730

ANALYTICAL PRINCIPLE NDIR LAST CALIBRATION DATE 09/03/93

FIRST ANALYSIS DATE 11/10/93 SECOND ANALYSIS DATE

Z 0.00	R 14.00	C 10.06	CONC.	10.09 %	Z	R	C	CONC.
R 14.02	Z 0.00	C 10.06	CONC.	10.07 %	R	Z	C	CONC.
Z 0.00	C 10.06	R 14.04	CONC.	10.06 %	Z	C	R	CONC.
U/M %		MEAN TEST ASSAY		10.07 %	U/M %		MEAN TEST ASSAY	

THIS CYLINDER NO. SA 3236
HAS BEEN CERTIFIED ACCORDING TO SECTION 3.0.4
OF TRACEABILITY PROTOCOL NO. 1
PROCEDURE G1
CERTIFIED ACCURACY ± 1 % NIST TRACEABLE
CYLINDER PRESSURE 2000 PSIG
CERTIFICATION DATE 11/10/93
EXPIRATION DATE 11/10/96 TERM 36 MONTHS

CERTIFIED CONCENTRATION

CARBON DIOXIDE	10.07 %
NITROGEN	BALANCE

ANALYZED BY MARIA ROCHON

CERTIFIED BY DAVID LEON

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET, TROY, MI 48083 (313) 589-2950 FAX: (313) 589-2134

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer

FUGRO MCCLELLAND
MR. TODD SATLEY
9921 ST CHARLES ROCK RD
ST ANN MO 63074

Assay Laboratory
Scott Specialty Gases, Inc.
1290 Combermere
Troy, MI 48083

Purchase Order H145
Scott Project # 549824

ANALYTICAL INFORMATION

Certified to exceed the minimum specifications of EPA Protocol 1 Procedure # G1, Section Number 3.0.4

Cylinder Number ALM022588 **Certification Date** 4-19-93 **General Exp. Date** 4-19-96
Cylinder Pressure 1900 psig **Previous Certification Dates** None **Acid Rain Exp. Date** 10-19-94

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Carbon Monoxide	60.08 ppm	±1% NIST Directly Traceable

Balance Gas: NITROGEN

*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
CRM 1679	12-20-94	AAL1355	96.67 ppm CO in N_2

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
CO: Horiba/OPE 144E/560172153	4-6-93	Non-Dispersive Infrared

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
Carbon Monoxide	Date: 4-12-93 Response Units: mv Z1=0.00 R1=170.0 T1=106.4 R2=170.0 Z2=0.00 T2=106.4 Z3=0.00 T3=106.4 R3=170.0 Avg. Conc. of Cust. Cyl. 60.13 ppm	Date: 4-19-93 Response Units: mv Z1=0.00 R1=170.0 T1=106.2 R2=170.0 Z2=0.00 T2=106.2 Z3=0.00 T3=106.2 R3=170.0 Avg. Conc. of Cust. Cyl. 60.02 ppm	Concentration=$A+Bx+Cx^2+Dx^3+Ex^4$ r=0.99999 CRM 1679 Constants: A=-0.02233189 B=0.5597086 C=0.000053352 D=0 E=0
			Concentration=$A+Bx+Cx^2+Dx^3+Ex^4$
			Concentration=$A+Bx+Cx^2+Dx^3+Ex^4$

Special Notes
If this product is used for Acid Rain Rule Compliance, the *Acid Rain Expiration Date* noted above applies per 40 CFR Part 75, Appendix H. Otherwise, the *General Expiration Date* applies.

Analyst Frank P. Doran

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FAX# 213-585-0582

LIQUID CARBONIC

CYLINDER GAS PRODUCTS

5700 SOUTH ALEMEDA STREET • LOS ANGELES, CALIFORNIA 90058

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS8U

CUSTOMER ENV. & INDUST. DIST. P.O NUMBER 022293-3

REFERENCE STANDARD

COMPONENT		NIST SRM NO.	CYLINDER NO.	CONCENTRATION
OXYGEN	GMIS	vs 2629a	632487	21.00 %

ANALYZER READINGS

R=REFERENCE STANDARD Z=ZERO GAS C=GAS CANDIDATE

1. COMPONENT OXYGEN GMIS ANALYZER MAKE-MODEL-S/N Siemens Oxymat 5E S/N A12-839
ANALYTICAL PRINCIPLE Paramagnetic LAST CALIBRATION DATE 12/08/92
FIRST ANALYSIS DATE 03/01/93 SECOND ANALYSIS DATE

Z 0.00	R 21.00	C 20.05	CONC.	20.05 %	Z	R	C	CONC.	
R 21.00	Z 0.00	C 20.00	CONC.	20.00 %	R	Z	C	CONC.	
Z 0.00	C 20.05	R 21.00	CONC.	20.05 %	Z	C	R	CONC.	
U/M %		MEAN TEST ASSAY		20.03 %	U/M %			MEAN TEST ASSAY	

THIS CYLINDER NO. SA 6957
HAS BEEN CERTIFIED ACCORDING TO SECTION 3.0.4
OF TRACEABILITY PROTOCOL NO. 1
PROCEDURE G1
CERTIFIED ACCURACY ± 1 % NIST TRACEABLE
CYLINDER PRESSURE 2000 PSIG
CERTIFICATION DATE 03/01/93
EXPIRATION DATE 09/01/94

CERTIFIED CONCENTRATION

OXYGEN	20.03 %
NITROGEN	BALANCE

ANALYZED BY Maria E. Rochon 21
MARIA E. ROCHON

CERTIFIED BY Kwan T. Young
KWAN T. YOUNG

LIQUID CARBONIC

CYLINDER GAS PRODUCTS

213-585-2154
FAX# 213-585-0582

5700 SOUTH ALEMEDA STREET • LOS ANGELES, CALIFORNIA 90058

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

CUSTOMER ENV. & INDUST. DIST. P.O NUMBER 031993-4

REFERENCE STANDARD

COMPONENT		NIST SRM NO.	CYLINDER NO.	CONCENTRATION
OXYGEN	GMIS	vs 2629a	632487	21.00 %

ANALYZER READINGS

R=REFERENCE STANDARD *Z=ZERO GAS* *C=GAS CANDIDATE*

1. COMPONENT OXYGEN GMIS ANALYZER MAKE-MODEL-S/N Siemens Oxymat 5E S/N A12-839

ANALYTICAL PRINCIPLE Paramagnetic LAST CALIBRATION DATE 03/08/93

FIRST ANALYSIS DATE 03/29/93 SECOND ANALYSIS DATE

Z 0.00	R 21.00	C 11.95	CONC.	11.95 %	Z	R	C	CONC.	
R 21.00	Z 0.00	C 11.95	CONC.	11.95 %	R	Z	C	CONC.	
Z 0.00	C 11.95	R 21.00	CONC.	11.95 %	Z	C	R	CONC.	
U/M %			MEAN TEST ASSAY	11.95 %	U/M %			MEAN TEST ASSAY	

THIS CYLINDER NO. SA 6956
HAS BEEN CERTIFIED ACCORDING TO SECTION 3.0.4
OF TRACEABILITY PROTOCOL NO. 1
PROCEDURE G1
CERTIFIED ACCURACY ± 1 % NIST TRACEABLE
CYLINDER PRESSURE 2000 PSIG
CERTIFICATION DATE 03/29/93
EXPIRATION DATE 09/29/94

CERTIFIED CONCENTRATION	
OXYGEN	11.95 %
NITROGEN	BALANCE

ANALYZED BY Kelly Gallagher
KELLY GALLAGHER

CERTIFIED BY
KWAN YOONG

METHOD 5: PROBE NOZZLE FIELD CALIBRATION DATA

Fugro & McClelland

Nozzle Identification Number: 3-10	
Client: MASTER	Project No.:
Source:	Date: 4-18-94
Analyst:	Micrometer:
Scale:	Tolerence:

CALIBRATION DATA

Trial Number	Run	Run	Run	Run
1	.370			
2	.370			
3	.370			
4	.370			
5	.371			
6	.370			
7				
8				
9				
10				
AVERAGE	.370			

Comments:

METHOD 5: PROBE NOZZLE FIELD CALIBRATION DATA

FUGRO & McClelland

Nozzle Identification Number: 3-4	
Client: Master	Project No.:
Source:	Date:
Analyst:	Micrometer:
Scale:	Tolerence:

CALIBRATION DATA

Trial Number	Run	Run	Run	Run
1	0.299			
2	0.302			
3	0.299			
4	0.302			
5	0.299			
6				
7				
8				
9				
10				
AVERAGE	0.300			

Comments:

APPENDIX F

Data Logger Strip Chart Recordings

CONTINUOS EMISSIONS MONITORING DATA SHEET

PLANT MARSEILLES BRICK DATE 5-10-94

SOURCE NORTH STACK (DRYER) RUN # 1

TIME	NOX (ppm-dry)	CO (ppm-dry)	SO2 (ppm-dry)	C02 (ppm-dry)	O2 (ppm-dry)	VOC (ppm-dry)	THC OTHER (ppm-dry)
1 START 1253	6	17		.4	20.625		5
2	7	17.5		.4	20.75		5.5
3	8	16.5		.4	20.5		3.5
4	9.5	6		.5	20.25		3
5	11	5		.6	20.125		3.5
6	11.5	5		.6	20		3.2
7	11.5	5		.6	20.125		3
8	12	5		.6	20.125		3.5
9	12.5	5		.6	20.125		3.5
10	12.5	5.5		.6	20.3		3.5
11	12.5	5.5		.6	20.375		3.6
12	13	5.5		.5	20.5		3.9
13	13	5.5		.5	20.625		3.4
14	13.5	5		.56	20.5		3.5
15	14	6.5		.56	20.625		3.8
16	14	7.5		.56	20.5		3.5
17	14	7.5		.56	20.625		4
18	14	9.5		.58	20.625		4
19	14	10		.58	20.725		4
20 /1353	14	10		.5	20.7		4
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
AVERAGE	11.875	8.0		0.540	20.436		3.745

NOTES:

CONTINUOS EMISSIONS MONITORING DATA SHEET

PLANT MARSEILLES BRICK DATE 5-10-94

SOURCE NORTH STACK (DRYER) RUN # 2

TIME	NOX (ppm dry)	CO (ppm dry)	SO2 (ppm dry)	CO2 (ppm dry)	O2 (ppm dry)	VOC (ppm dry)	THC OTHER (ppm dry)
1 1448	4	15		.4	20.5		5.9
2	4	15		.4	20.5		6
3	4	15		.4	20.58		6
4	4	15		.4	20.58		6
5	4	15.5		.4	20.55		6
6	4	15		.4	20.55		6
7	4	17.5		.4	20.53		6
8	4	20		.4	20.53		6.3
9	4	20		.4	20.53		6.5
10	3.5	20		.4	20.55		6.5
11	3.5	20		.4	20.63		6.3
12	3.1	20		.4	20.63		6
13	3.1	20		.4	20.63		6
14	3.1	20		.4	20.63		6
15	3	20		.4	20.63		6
16	3	20		.4	20.63		6
17	3	20		.4	20.63		6
18	3	21.5		.4	20.63		6
19	3	22.5		.4	20.63		6.4
20 1548	3	22.5		.4	20.63		6.5
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
AVERAGE	3.515	18.625		0.4	19.653		6.120

NOTES:

CONTINUOS EMISSIONS MONITORING DATA SHEET

PLANT MARSELLES BRICK DATE 5-10-94

SOURCE NORTH STACK (DRYER) RUN # 3

TIME	NOX (ppm dry)	CO (ppm dry)	SO2 (ppm dry)	CO2 (ppm dry)	O2 (ppm dry)	VOC (ppm dry)	THC OTHER (ppm dry)
1 1630	2.5	22.5		.4	20.38		7
2	2.8	23		.4	20.5		7.5
3	2.8	24		.4	20.5		7.5
4	2.5	24		.4	20.5		7
5	2	24		.4	20.5		7
6	2	24		.4	20.5		7.5
7	2	22.5		.4	20.55		7.5
8	2	24		.4	20.5		7
9	2	24.5		.4	20.5		7
10	2	24.5		.4	20.63		7
11	2	24		.4	20.5		7
12	2	24		.4	20.55		7
13	2	23.5		.4	20.5		7.2
14	0	24.5		.4	20.5		7.5
15	2	24.5		.4	20.5		7.6
16	2	24.5		.4	20.58		7.5
17	2	24.5		.4	20.5		7.5
18 1724	2	25.0		.4	20.5		7.5
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
AVERAGE	2.05	23.97		.4	20.51		7.26

NOTES:

CONTINUOS EMISSIONS MONITORING DATA SHEET

PLANT MARSEILLES BRICK DATE 5-11-94

SOURCE DRYER STACK 2 RUN # 1

TIME	NOX (ppm dry)	CO (ppm dry)	SO2 (ppm dry)	C02 (ppm dry)	O2 (ppm dry)	VOC (ppm dry)	THC OTHER (ppm dry)
1 0750	1.5	15		.5	20.63		3
2	1.5	15		.5	20.63		3
3	1.5	15		.5	20.7		3
4	1.5	15		.5	20.75		3
5	1.5	14		.5	20.75		3
6	1.5	14		.5	20.75		3
7	1.5	14		.5	20.7		3
8	1.5	14		.5	20.75		3
9	1.5	12.5		.5	20.75		3
10	1.2	15		.5	20.63		3
11	1.3	15		.5	20.75		3
12	1.2	15		.5	20.88		3
13	1.2	15		.5	20.75		3
14	1.3	15		.5	20.7		3
15	1.5	15		.5	20.75		3
16	1.8	15		.5	20.75		3
17	1.5	15		.5	20.65		3
18	1.5	16		.5	20.75		3
19	1.5	17.5		.5	20.75		3
20 0850	1.5	15		.5	20.75		3
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
AVERAGE	1.450	14.85		.5	20.73		3

NOTES:

CONTINUOS EMISSIONS MONITORING DATA SHEET

PLANT MARSEILLES BRICK DATE 5-11-94

SOURCE DRYER STACK 2 RUN # 2

TIME	NOX (ppm dry)	CO (ppm dry)	SO2 (ppm dry)	C02 (ppm dry)	O2 (ppm dry)	VOC (ppm dry)	THC OTHER (ppm dry)
1 0930	2	17.5		.4	20.75		.5
2	2	17.5		.4	20.75		.5
3	2	17.5		.4	20.75		.5
4	2	17.5		.4	20.75		.5
5	2	17.5		.4	20.75		.5
6	2	19		.4	20.75		.5
7	2	17.5		.4	20.75		.5
8	2	17.5		.4	20.75		.5
9	2	19		.4	20.75		.5
10	2	20		.4	20.75		2.5
11	2	20		.4	20.75		4.5
12	2.5	20		.5	20.75		4.5
13	2.5	20		.5	20.75		4
14	2.5	20		.5	20.75		4.5
15	2.5	20		.5	20.75		4.5
16	2.5	20		.5	20.75		4
17	2.5	20		.5	20.75		4.5
18	2.5	20		.5	20.75		4.5
19	2.5	20		.5	20.75		4.5
20 1030	2.5	20		.5	20.75		4.5
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
AVERAGE	2.225	19.03		.45	20.75		2.55

NOTES:

CONTINUOS EMISSIONS MONITORING DATA SHEET

PLANT *Marseilles Brick* DATE *5-11-94*

SOURCE *Dryer Stack 2* RUN # *3*

TIME	NOX (ppm dry)	CO (ppm dry)	SO2 (ppm dry)	CO2 (ppm dry)	O2 (ppm dry)	VOC (ppm dry)	THC OTHER (ppm dry)
1 1106	3	20		.4	20.75		4.5
2	3	20		.4	20.75		4.5
3	3	20		.4	20.75		4.5
4	3	20		.4	20.75		4.5
5	3	20		.4	20.75		4.5
6	3	20		.4	20.75		4.5
7	3	20		.4	20.75		5
8	3	20		.4	20.75		5
9	3	20		.4	20.75		5
10	3	20		.4	20.75		5
11	3	20		.4	20.75		5
12	3	20		.4	20.75		5
13	3	20		.4	20.875		5
14	3	20		.4	20.75		5
15	3	20		.4	20.875		5
16	3	20		.4	20.875		5
17	3	20		.4	20.875		5
18	3	20		.4	20.875		5
19	3	20		.4	20.875		5
20 1206	3	20		.4	20.875		5
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
AVERAGE	3	20		.4	20.79		4.85

NOTES:

CONTINUOS EMISSIONS MONITORING DATA SHEET

PLANT MARSEILLES BRICK DATE 5-11-94

SOURCE KILM RUN # 1

TIME	NOX (ppm dry)	CO (ppm dry)	SO2 (ppm dry)	C02 (ppm dry)	O2 (ppm dry)	VOC (ppm dry)	THC OTHER (ppm dry)
1 1515	24.5	127.5		2	18		10
2	26	127.5		2	17.875		9.8
3	24	127.5		2	18		10
4	25	132.5		2	18.125		9.5
5	24	130		2	18		9
6	23.5	127.5		2	18		9
7	24	125		1.96	18.125		8.5
8	24	122.5		2	18		8
9	24	122.5		2	18		8
10	21	115		1.6	18.75		8
11	28	112.5		2.2	17.5		8
12	28	117.5		2.4	17.125		8.5
13	30	120		2.3	17.25		9
14	27	122.5		2.3	17.25		9.5
15	28	125		2.2	17.5		9.5
16	27	130		2.1	17.75		10
17	29	132.5		2.1	17.75		10
18	26.5	132.5		2.2	17.625		10
19	29	132.5		2.1	17.75		10
20 1615	25	132.5		2.1	17.875		10
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
AVERAGE	25.88	125.75		2.08	17.87		9.275

NOTES:

CONTINUOS EMISSIONS MONITORING DATA SHEET

PLANT MARSEILLES BRICK DATE 5-11-94

SOURCE KILN RUN # 2

TIME	NOX (ppm dry)	CO (ppm dry)	SO2 (ppm dry)	CO2 (ppm dry)	O2 (ppm dry)	VOC (ppm dry)	THC OTHER (ppm dry)
1 1700	27	125		2.1	17.75		9
2	26	127.5		2	17.75		9
3	28	127.5		2.1	17.875		9
4	25	130		2.1	17.875		9
5	28	127.5		2.2	17.75		9
6	26	127.5		2	18		8.5
7	27	125		2	18		8.5
8	26	122.5		2.1	18		8.5
9	23	120		1.8	17.875		8.5
10	29	115		2.2	18.5		8.5
11	30	115		2.6	17.5		9
12	29	120		2.4	16.875		9
13	30	120		2.4	17.25		9
14	29	120		2.3	17.5		9
15	30	122.5		2.2	17.5		9
16	29	122.5		2.2	17.5		9
17	28	122.5		2.1	17.625		9
18	28	122.5		2.1	17.875		9
19	28	120		2	17.875		8.5
20 1800	26	122.5		2	17.875		8
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
AVERAGE	27.6	122.75		2.15	17.737		8.8

NOTES:

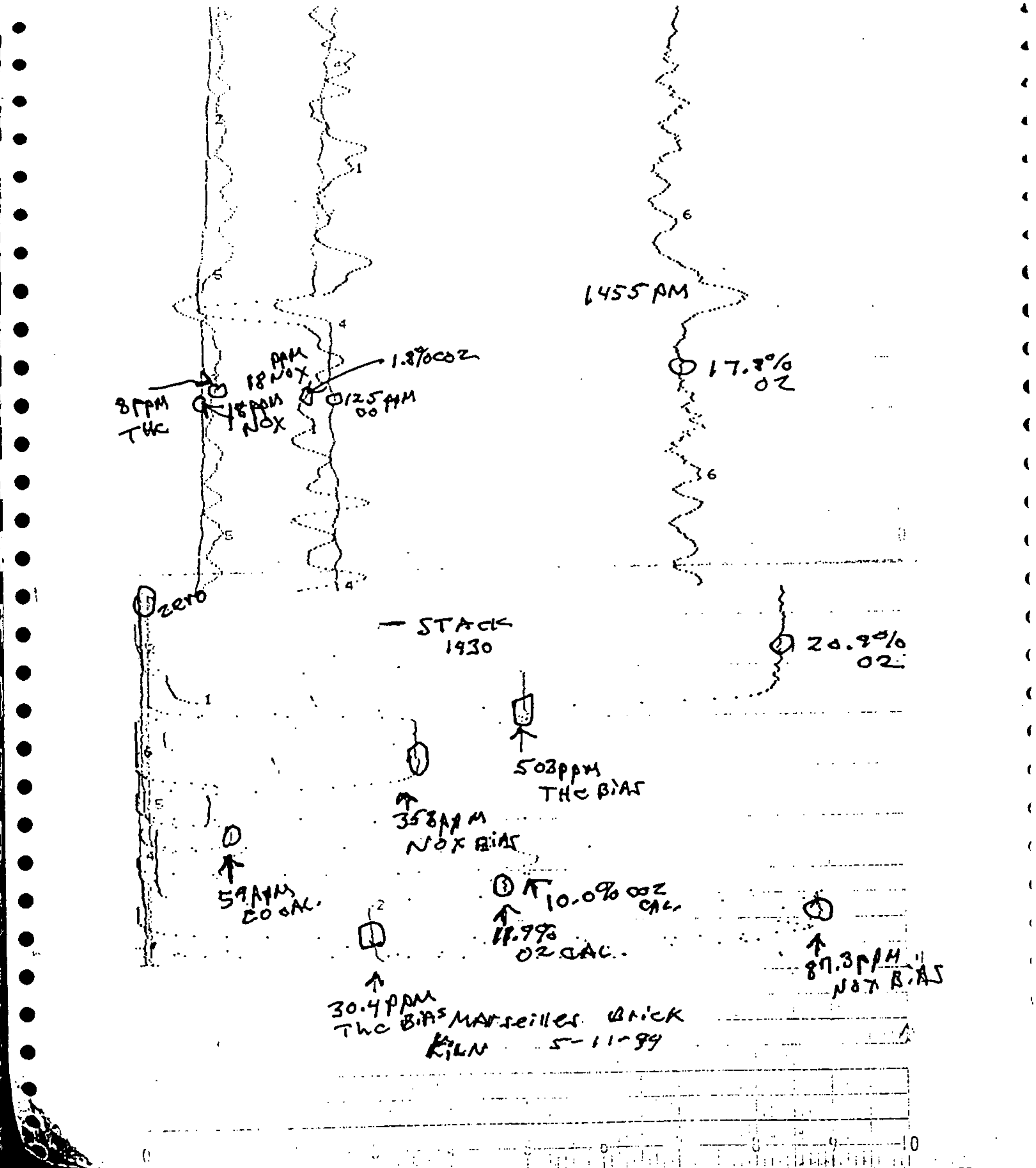
CONTINUOS EMISSIONS MONITORING DATA SHEET

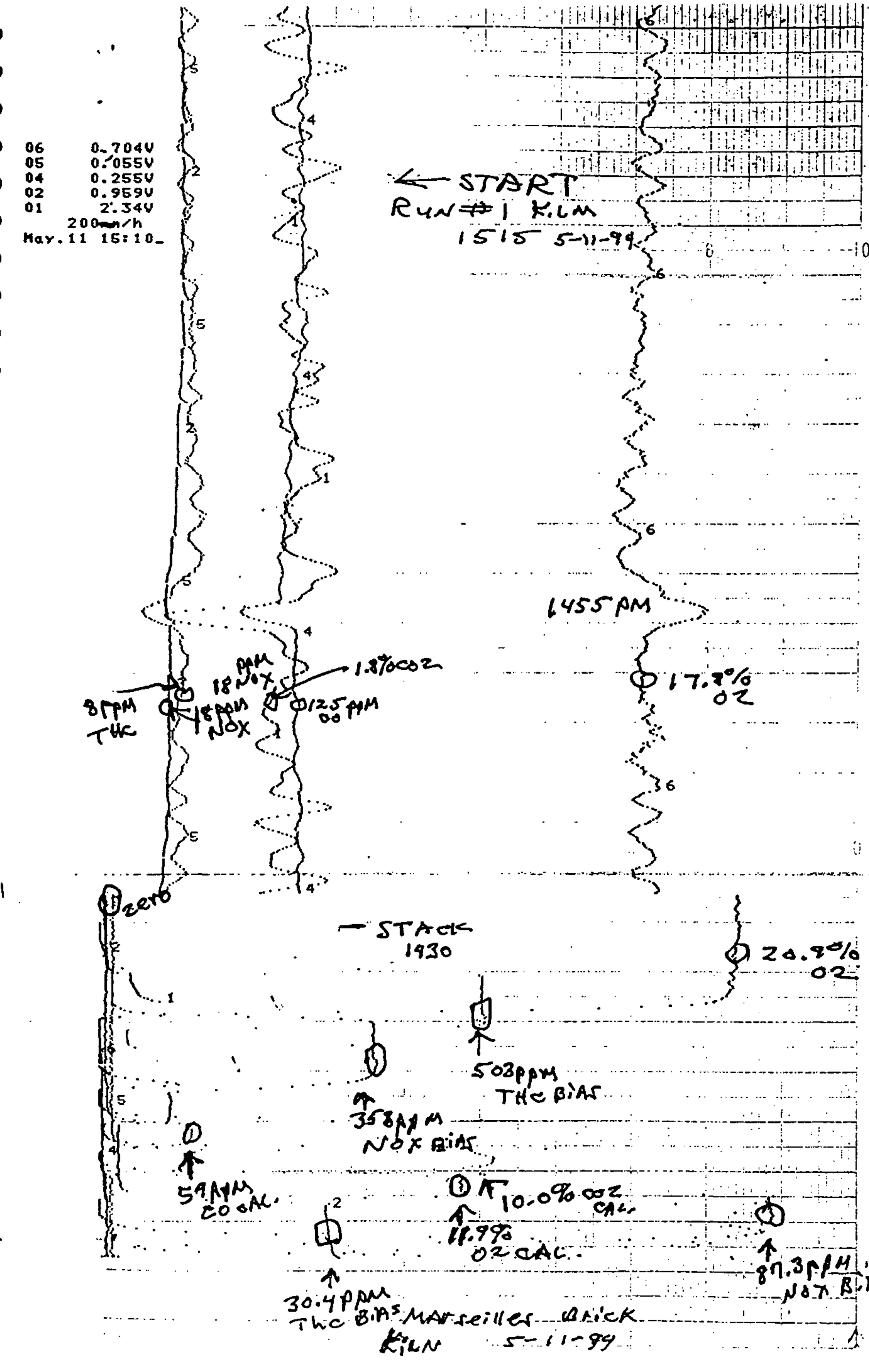
PLANT Marseilles Brick DATE 5-11-94

SOURCE Kilm RUN # 3

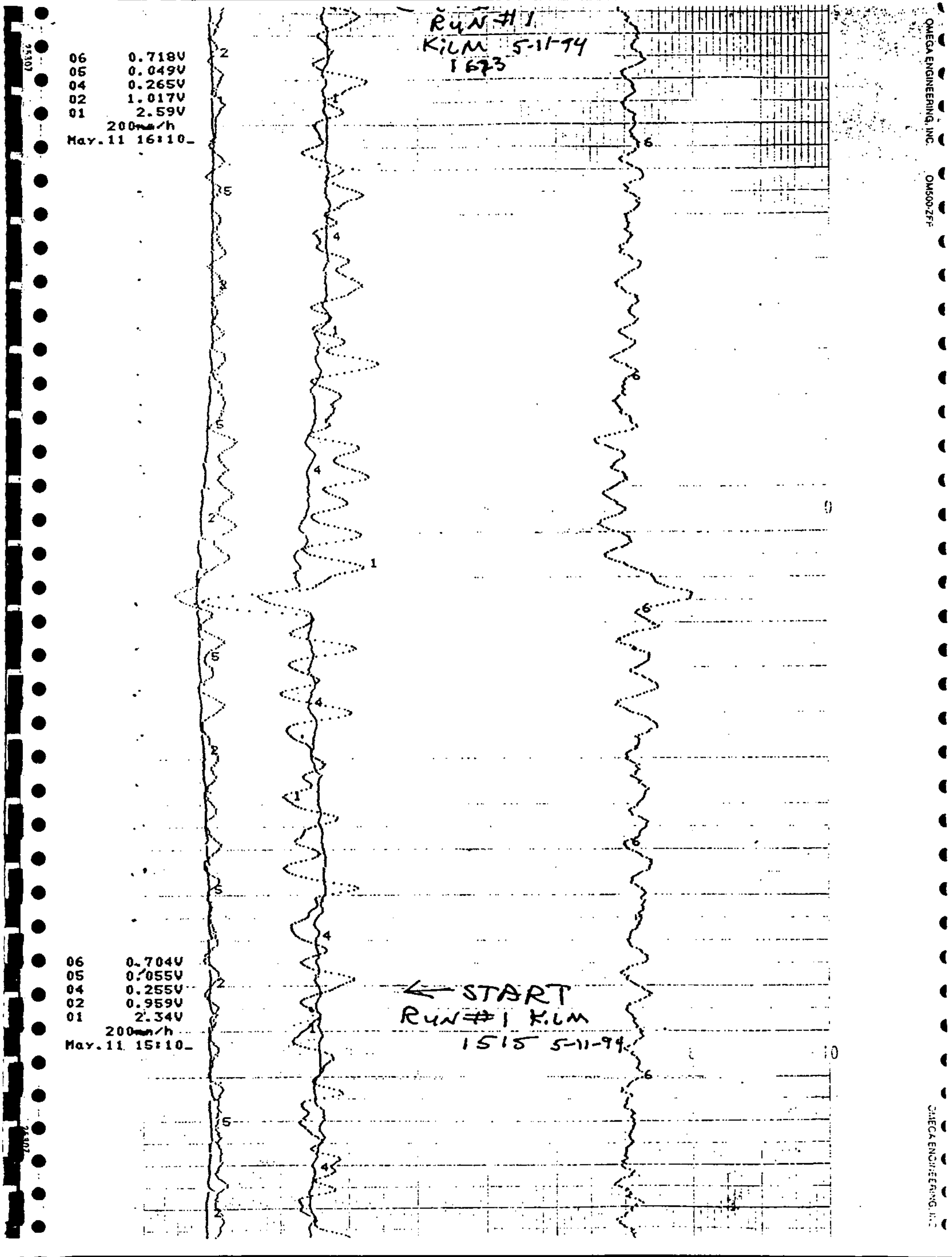
TIME	NOX (ppm dry)	CO (ppm dry)	SO2 (ppm dry)	C02 (ppm dry)	O2 (ppm dry)	VOC (ppm dry)	THC OTHER (ppm dry)
1 1840	26	135		2.2	17.75		8
2	27	132.5		2.2	17.875		8
3	26.5	130		2.1	17.875		8
4	28	127.5		2.1	17.75		8
5	26	127.5		2.1	17.875		8
6	26	127.5		2	17.875		8
7	26	130		2.2	17.75		8
8	29	120		1.7	18.75		8
9	30	120		2.6	17.		8
10	30	120		2.6	17.25		8
11	29	122.5		2.4	17.5		8
12	29	125		2.4	17.5		8
13	28	125		2.2	17.75		8
14	30	125		2.3	17.5		7.5
15	29.5	125		2.2	17.75		7.5
16	30	125		2.2	18		7.5
17	27	122.5		2.2	18		7.5
18	28	125		2.1	17.75		7.5
19	27	122.5		2.1	18		7.5
20 1940	27.5	122.5		2.1	18		7.5
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
AVERAGE	27.38	125.5		2.2	17.78		7.83

NOTES:

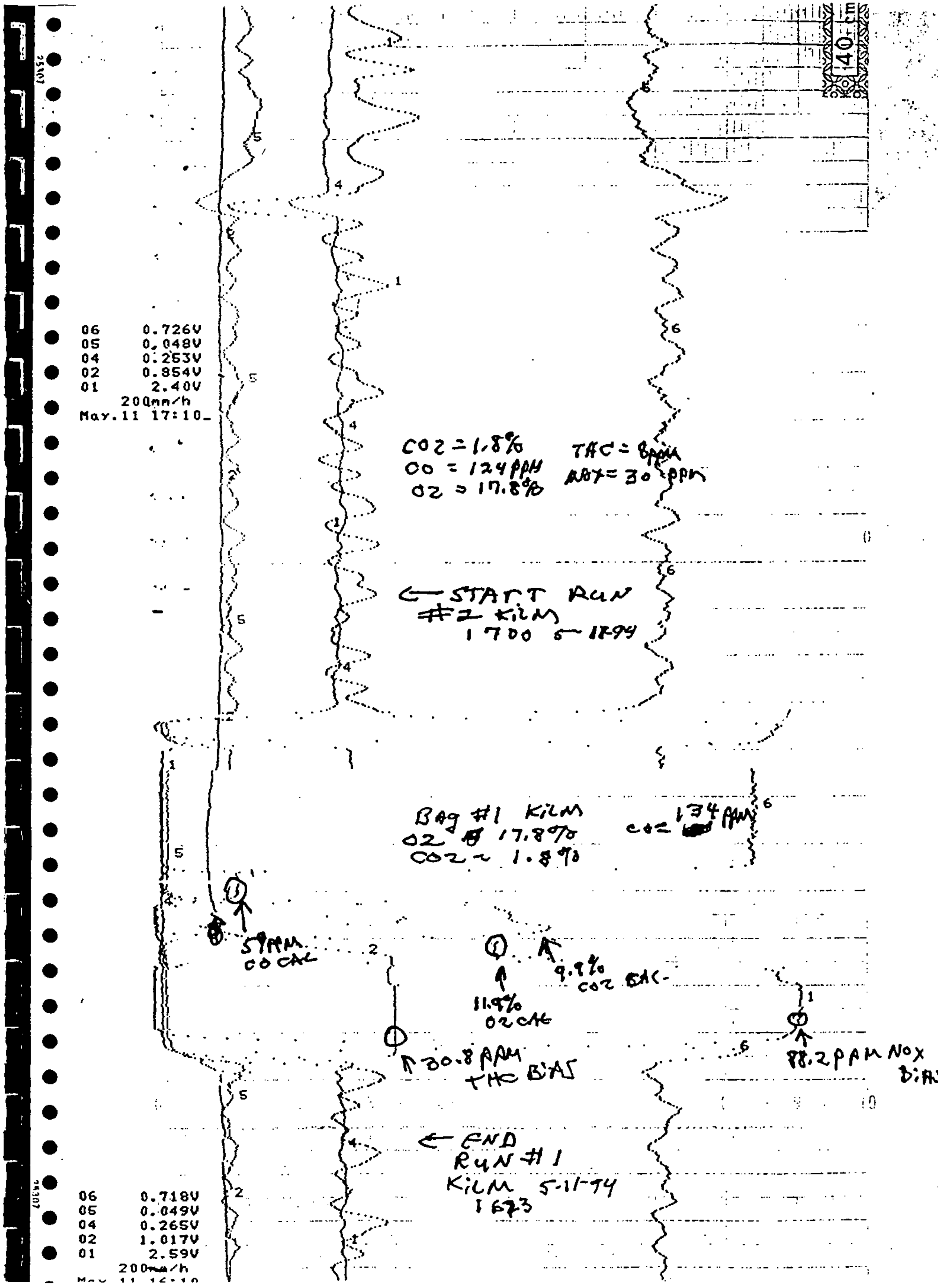

1455 PM
17.8% O2
PPM
18 NOX
1.8% CO2
8 PPM
THC
18 PPM
NOX
125 PPM
CO
zero
STACK
1930
20.8%
O2
502ppm
THC BIAS
358 PPM
NOX BIAS
59 PPM
CO CAL.
10.0% O2
CAL.
11.9%
O2 CAL.
87.3 PPM
NOX BIAS
30.4 PPM
THC BIAS
Marseilles Brick
Kiln 5-11-99

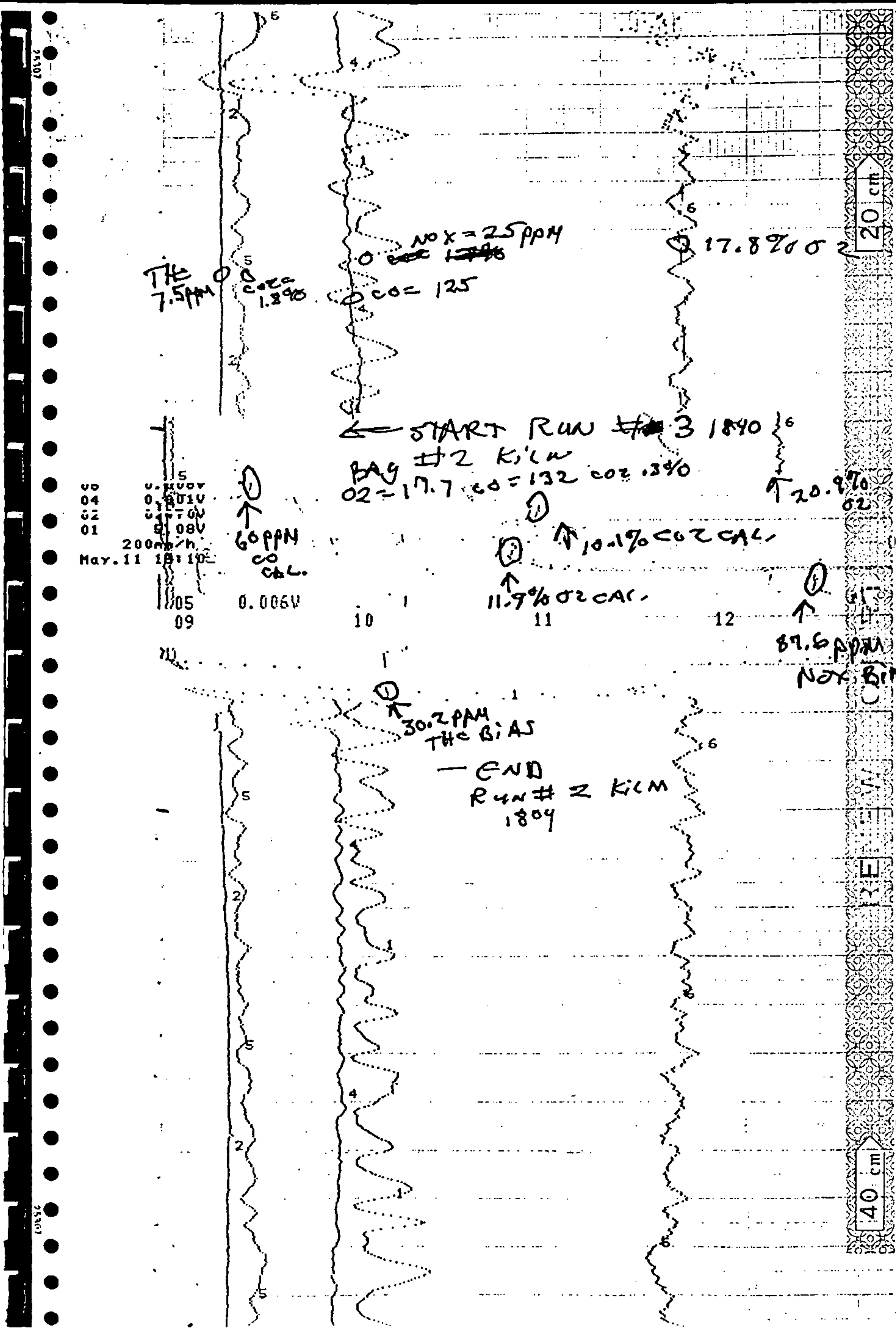


06 0.704V
05 0.055V
04 0.255V
02 0.959V
01 2.34V
200mm/h
May.11 15:10
START
RUN #1 KILN
1515 5-11-99
1455 PM
1.8% CO2
18 PPM NOX
8 PPM THC
18 PPM NOX
125 PPM CO
17.8% O2
zero
STACK
1930
20.8% O2
503 PPM THC BIAS
358 PPM NOX BIAS
59 PPM CO CAL.
10.0% CO2 CAL.
11.9% O2 CAL.
30.4 PPM THC BIAS
87.3 PPM NOX BIAS
Marseilles Brick Kiln 5-11-99

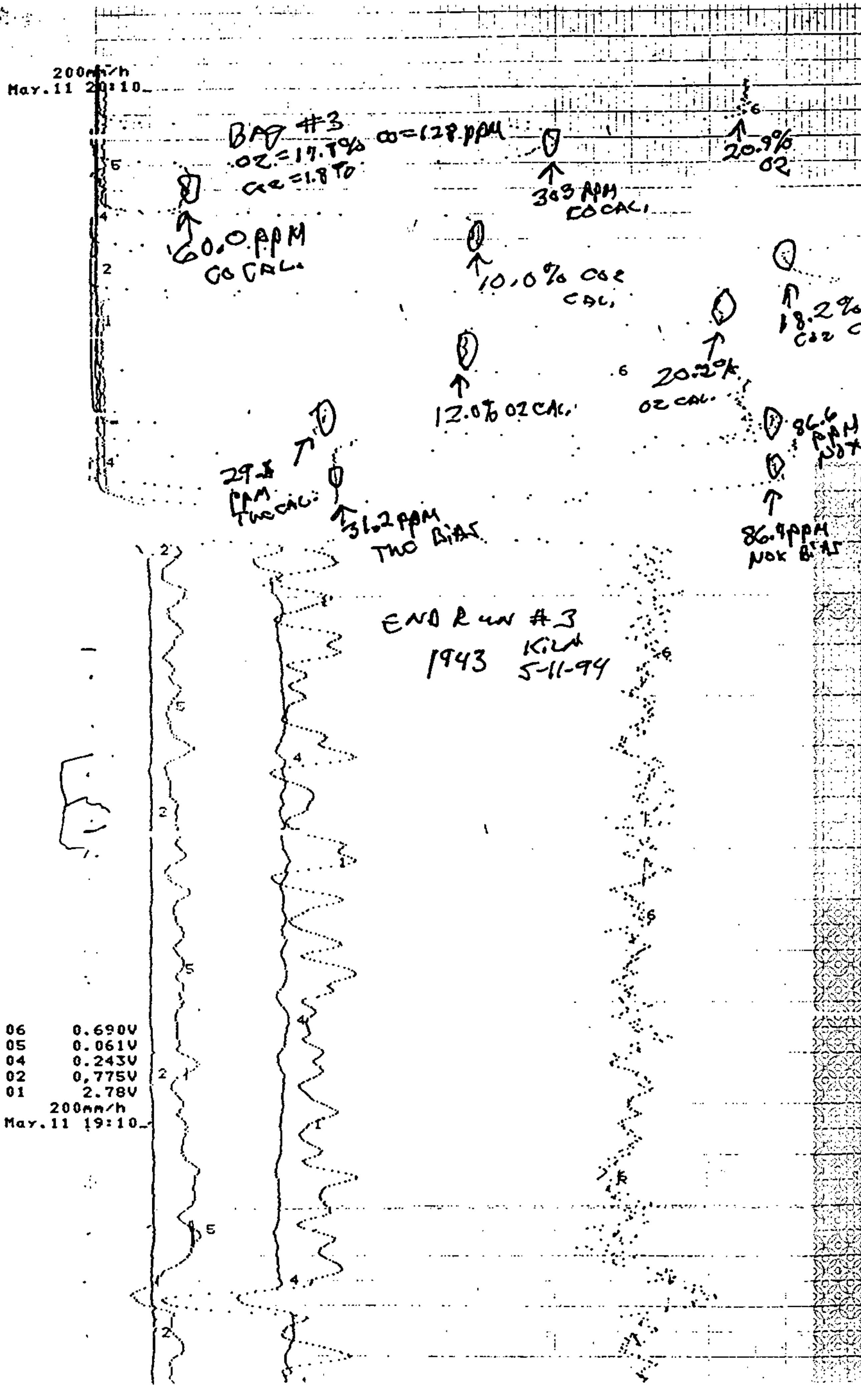


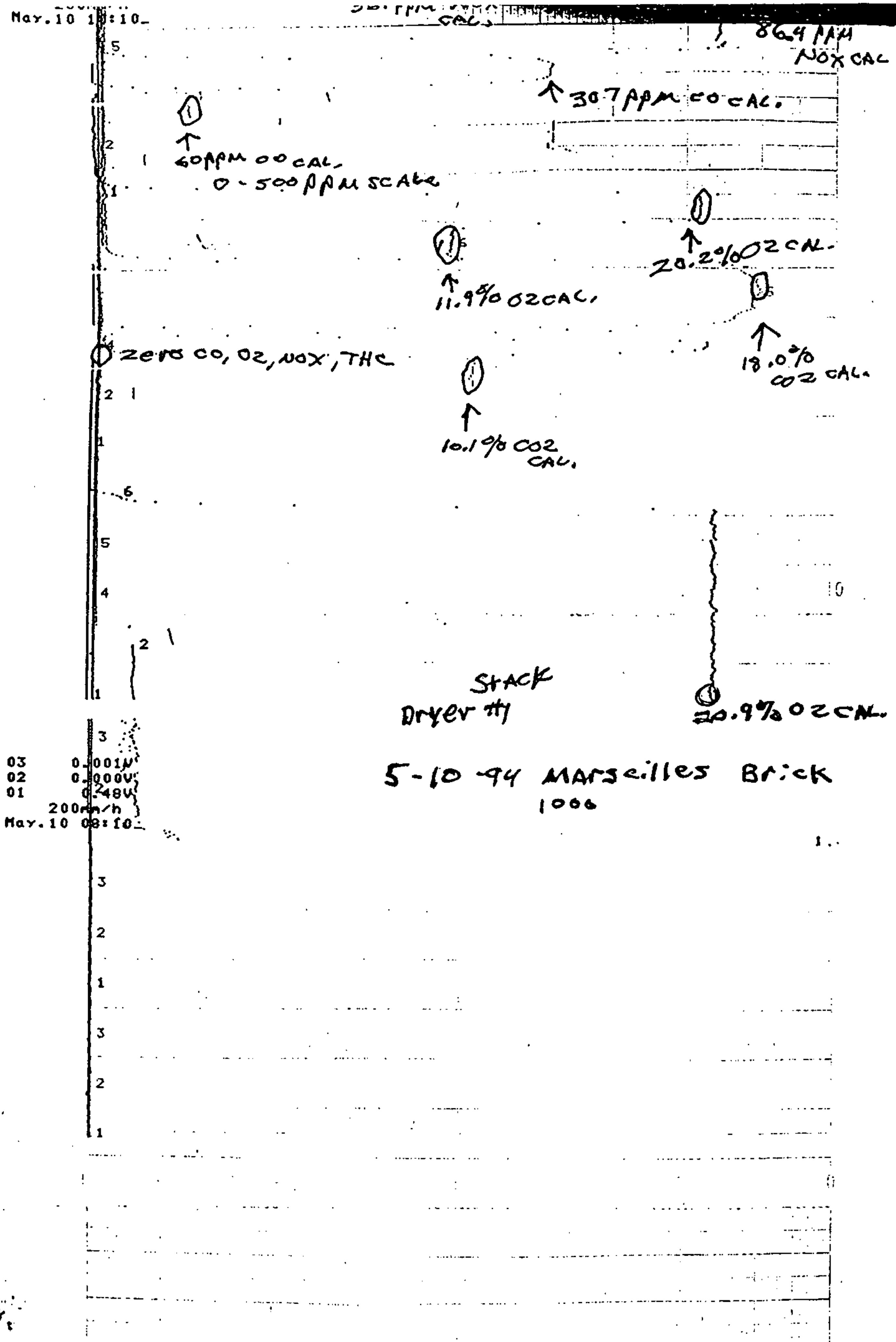
RUN #1
KILM 5-11-94
1673
06 0.718V
05 0.049V
04 0.265V
02 1.017V
01 2.59V
200mm/h
May.11 16:10
06 0.704V
05 0.055V
04 0.255V
02 0.959V
01 2.34V
200mm/h
May.11 15:10
← START
RUN #1 KILM
1515 5-11-94
OMEGA ENGINEERING, INC.
OM500-ZFF


06 0.726V
05 0.048V
04 0.253V
02 0.854V
01 2.40V
200mm/h
May.11 17:10
CO2 = 1.8% THC = 8ppm
CO = 124 PPM NOX = 30 ppm
O2 = 17.8%
← START RUN #2 KILN 1700 5-11-94
Bag #1 KILN
O2 17.8% CO = 134 PPM
CO2 ~ 1.8%
59 PPM CO CAL
11.9% O2 CAL
9.9% CO2 CAL
30.8 PPM THC BIAS
88.2 PPM NOX BIAS
← END RUN #1 KILN 5-11-94 1623
06 0.718V
05 0.049V
04 0.265V
02 1.017V
01 2.59V
200mm/h

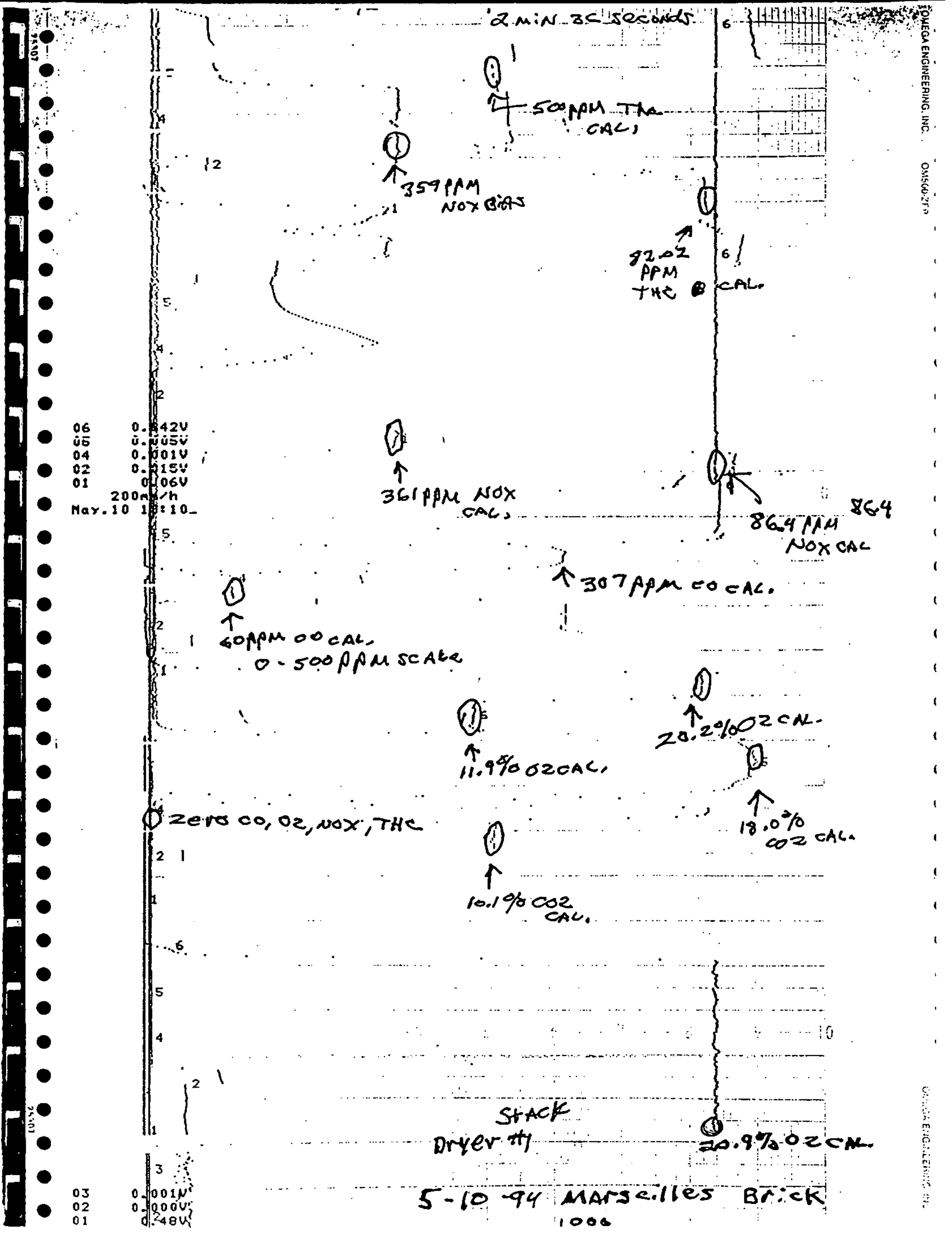


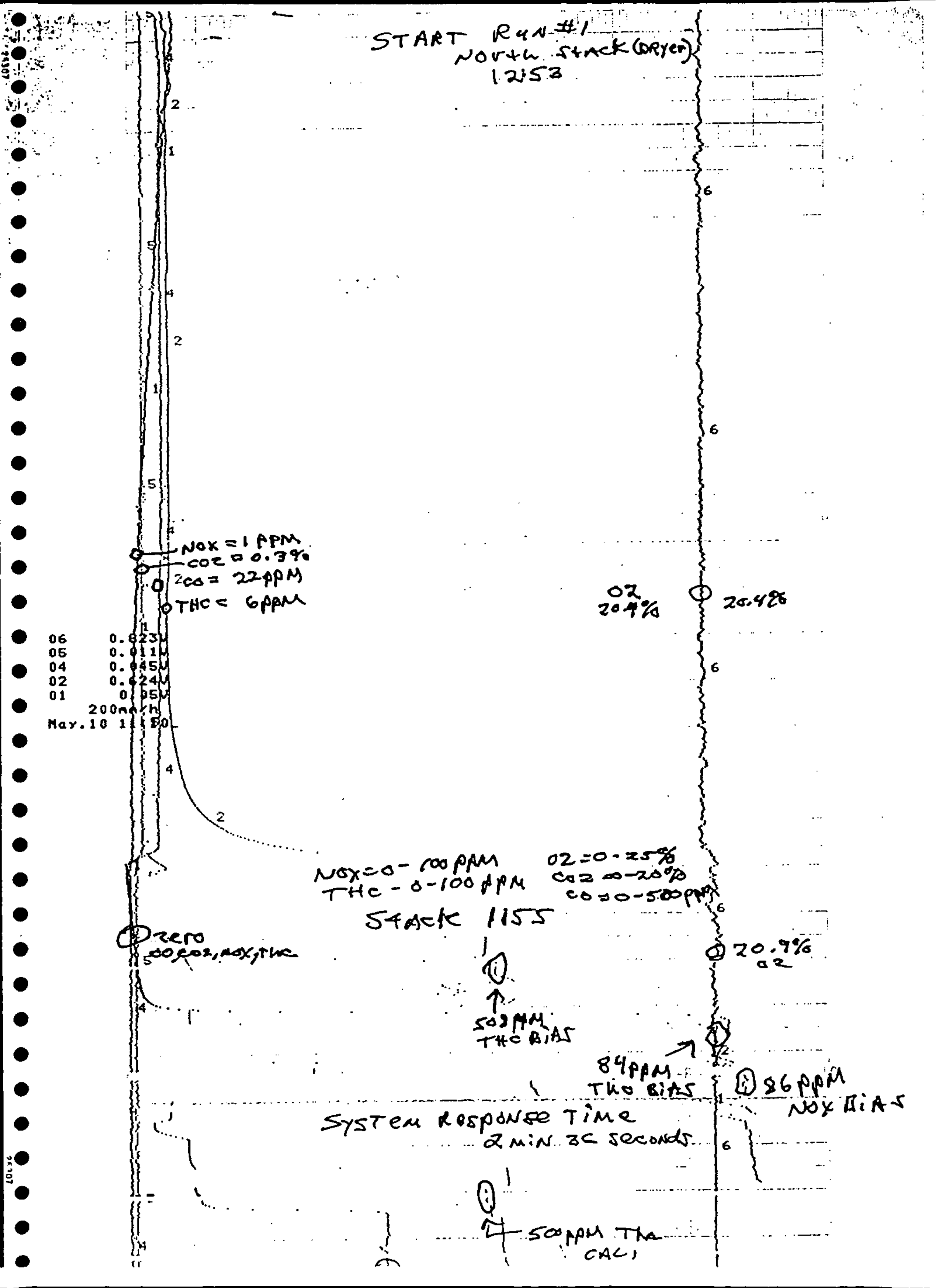
OMEGA ENGINEERING, INC. OM500-ZFP

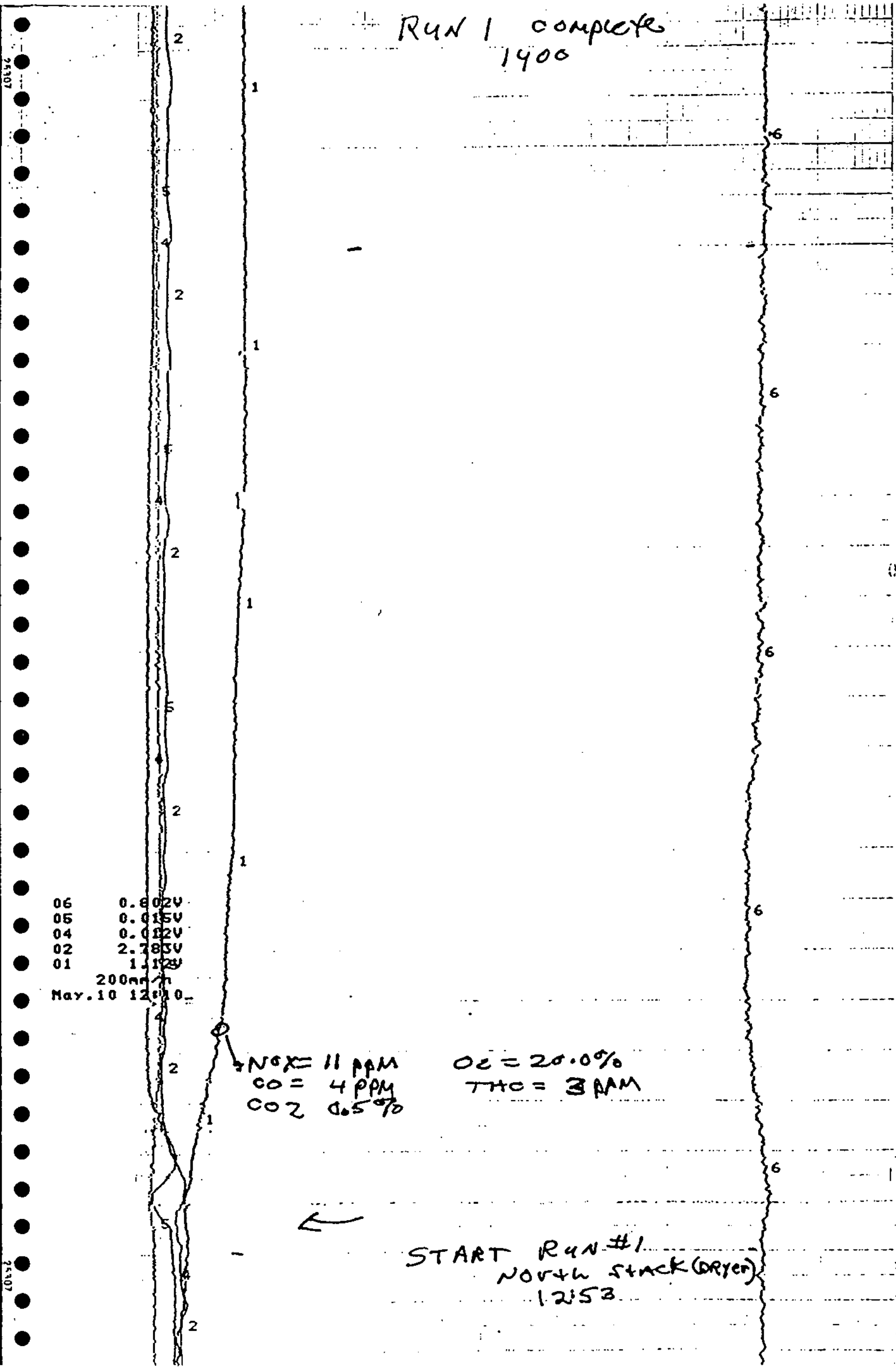

200mm/h
May.11 20:10
BAG #3
O2 = 17.7%
CO = 128 ppm
CO2 = 1.8%
60.0 ppM
CO CAL.
303 ppM
CO CAL.
20.9%
O2
10.0% CO2
CAL.
18.2%
CO2 CAL.
12.0% O2 CAL.
20.2%
O2 CAL.
86.6
PPM
NOX CAL
29.8
PPM
THC CAL.
31.2 ppM
THC BIAS
86.9 ppM
NOX BIAS
END RUN #3
1943
KILN
5-11-94
06 0.690V
05 0.061V
04 0.243V
02 0.775V
01 2.78V
200mm/h
May.11 19:10



5-10-94 Marseilles Brick
1006


2 MIN 30 seconds
500PPM THC CAL.
359 PPM NOX BIAS
82.2 PPM THC CAL.
06 0.842V
05 0.005V
04 0.001V
02 0.015V
01 0.06V
200mm/h
May.10 10:10
361 PPM NOX CAL.
864 PPM NOX CAL
864
307 PPM CO CAL.
60PPM CO CAL.
0-500PPM SCALE
20.2% O2 CAL.
11.9% O2 CAL.
zero CO, O2, NOX, THC
18.0% CO2 CAL.
10.1% CO2 CAL.
STACK
Dryer #1
20.9% O2 CAL.
5-10-94 Marseilles Brick
1006
03 0.001V
02 0.000V
01 0.48V
OMEGA ENGINEERING, INC.
OM560-27P


START RUN #1
North Stack (DRYER)
12:53
NOX = 1 PPM
CO2 = 0.3%
CO = 22 PPM
THC = 6 PPM
O2
20.4%
20.4%
06 0.823V
05 0.011V
04 0.045V
02 0.624V
01 0.95V
200mm/h
May.10 1 :50
NOX=0-100 PPM
O2=0-25%
THC-0-100 PPM
CO2=0-20%
CO=0-500 PPM
Stack 1155
zero
CO,CO2,NOX,THC
20.9%
O2
50 PPM
THC BIAS
84 PPM
THC BIAS
86 PPM
NOX BIAS
SYSTEM RESPONSE TIME
2 MIN 36 seconds
500 PPM THC
CAL


RUN 1 COMPLETE
1400
06 0.602V
05 0.015V
04 0.012V
02 2.783V
01 1.1[illegible]V
200mm/h
May.10 12:10
NOX = 11 ppM
CO = 4 PPM
CO2 0.5 %
O2 = 20.0%
THC = 3 PPM
START RUN #1
NORTH STACK (DRYER)
12:53

06 0.822V
05 0.011V
04 0.031V
02 0.631V
01 0.55V
200mm/h
May.10 15:10

CO_2 = 0.3%   THC = 5.3 PPM   20.4%
CO = 12 PPM   NOx = 3.5 PPM O_2

START RUN #2
1448

$\boxed{\text{BAG \#1, Run = 1}}$
CO = 4 PPM O_2 = 20.2%
CO_2 = 0.3%

20.9%
O_2

Zero

60 PPM
CO CAL.

10.2%
CO_2 CAL.

11.9% O_2
CAL

20.0%
O_2
CAL.

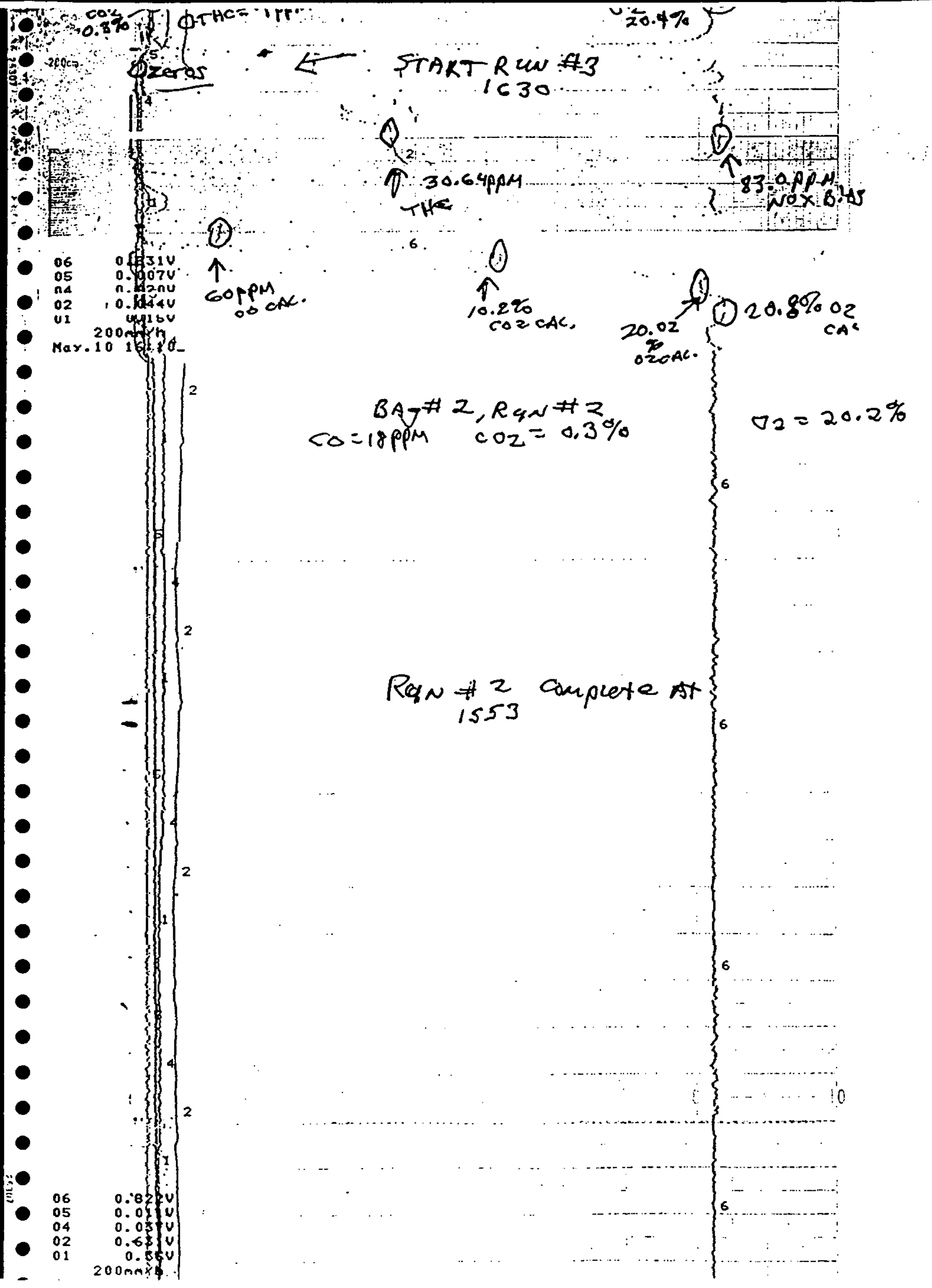
31 PPM THC
BIAS

86.0 PPM
NOx BIAS

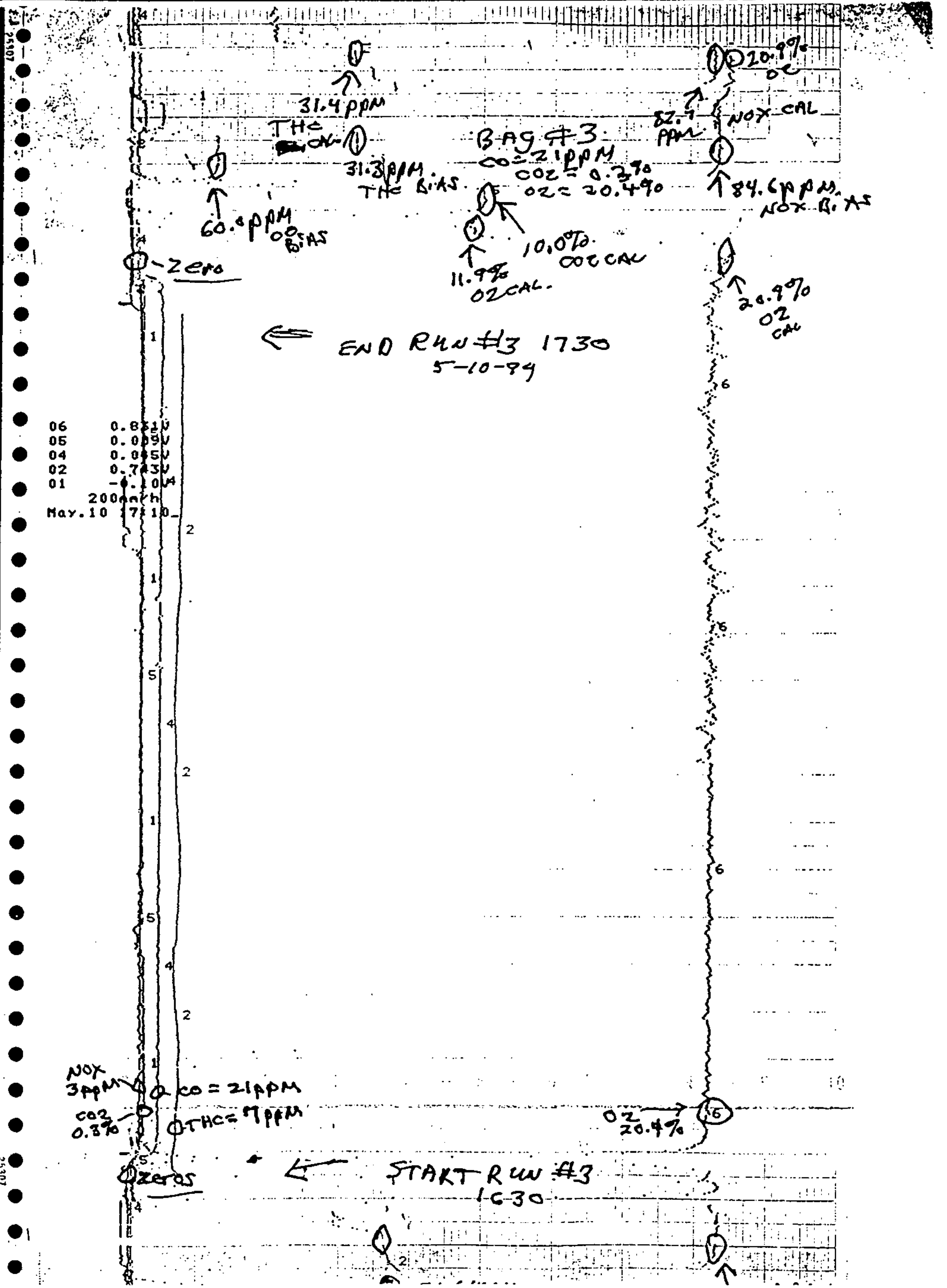
05 0.?07V
04 0.016V
02 0.200V
01 1.29V
200mm/h
May.10 14:10

20.9%
O_2

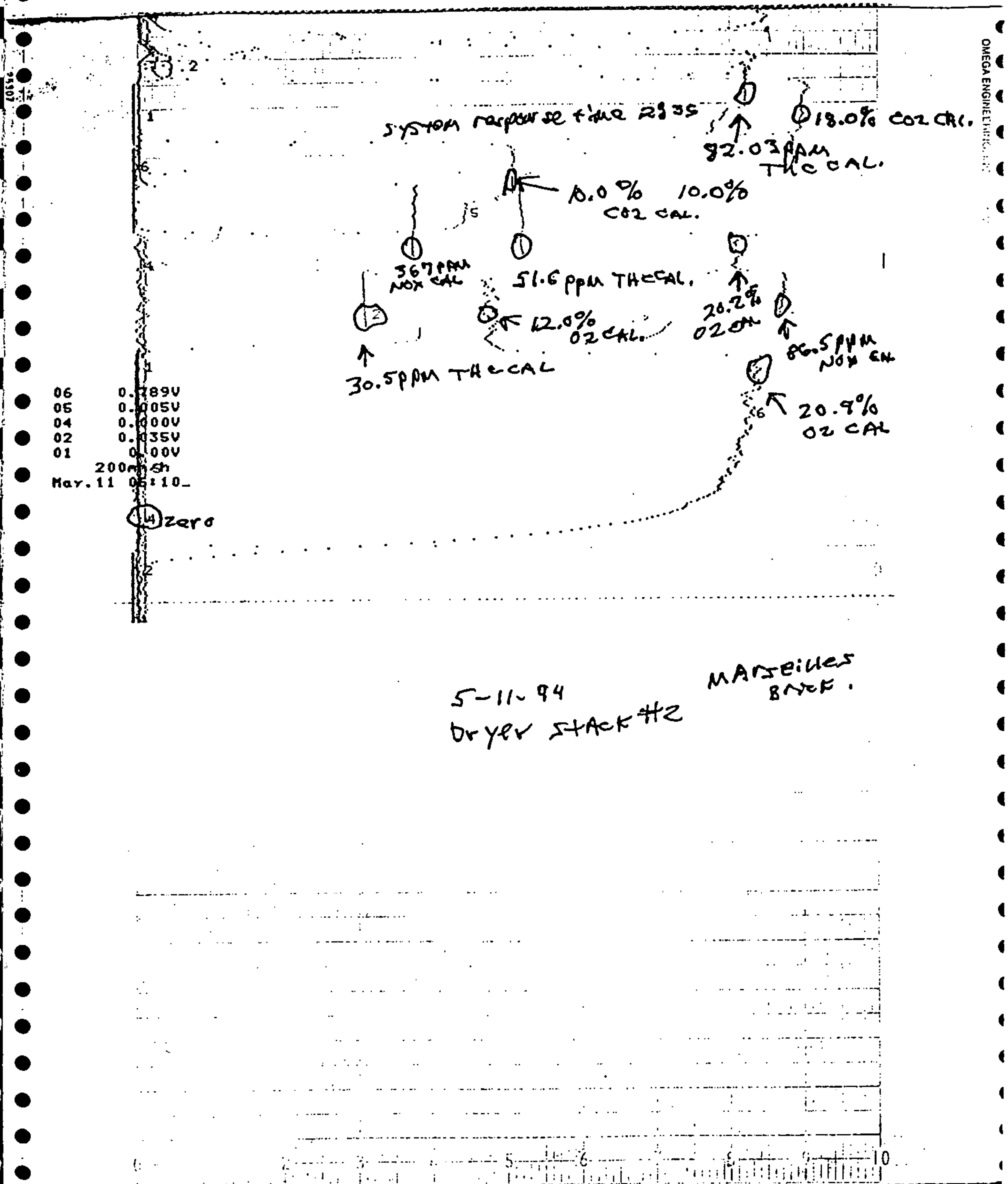
RUN 1 complete
1400

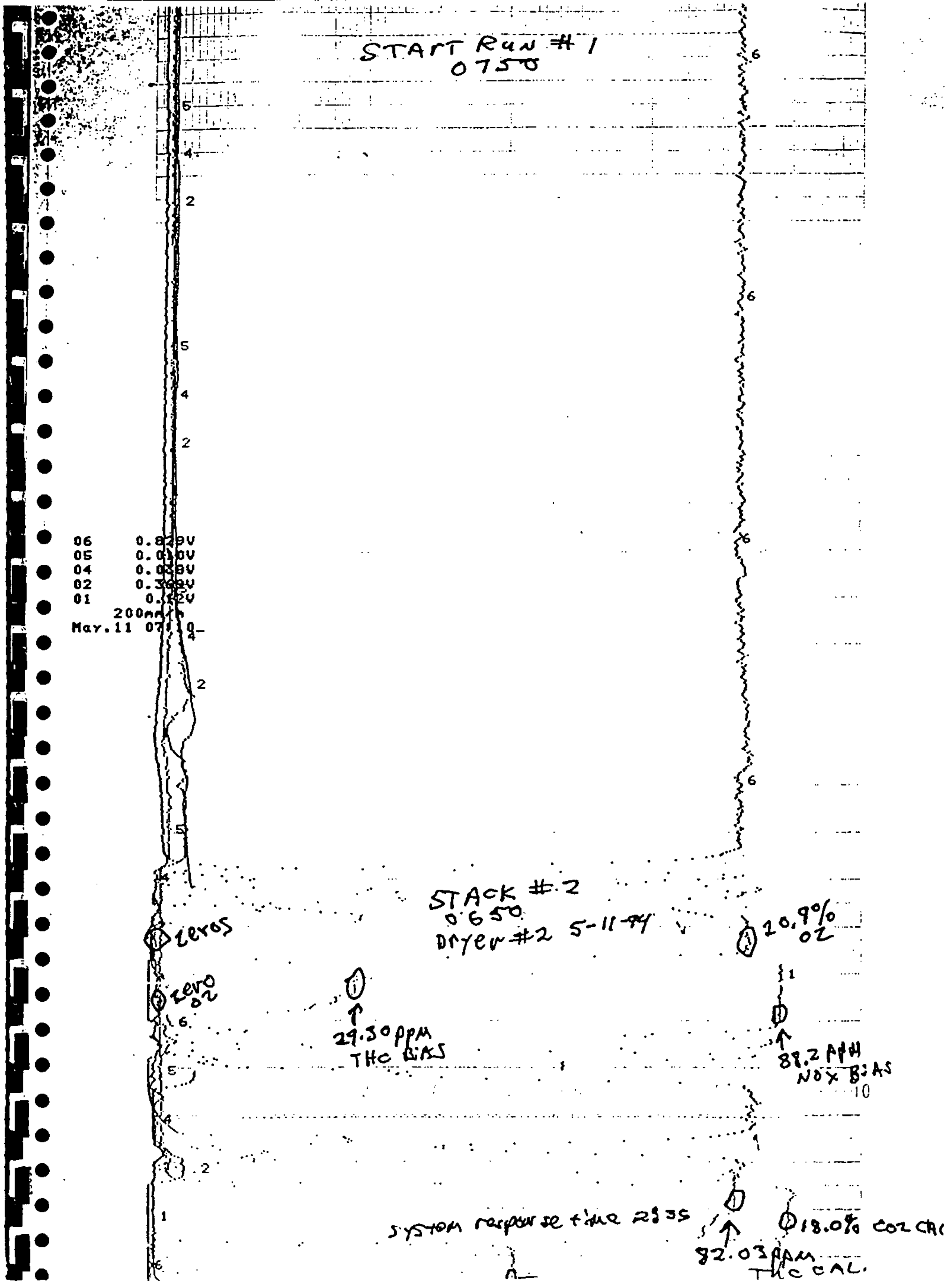


CO2 0.8%
THC=
20.4%
Zeros
START RUN #3
1630
30.64PPM
THC
83.0PPM
NOX BIAS
60PPM
CO CAL.
10.2%
CO2 CAL.
20.02
%
O2 CAL.
20.8% O2
CAL
06 0.1831V
05 0.0007V
04 0.0120V
02 0.0044V
01 0.0016V
200mm/h
May.10 16:10
BAG #2, RUN #2
CO=18PPM CO2=0.3%
O2 = 20.2%
RUN #2 Complete At
1553
06 0.822V
05 0.011V
04 0.031V
02 0.631V
01 0.36V
200mm/h

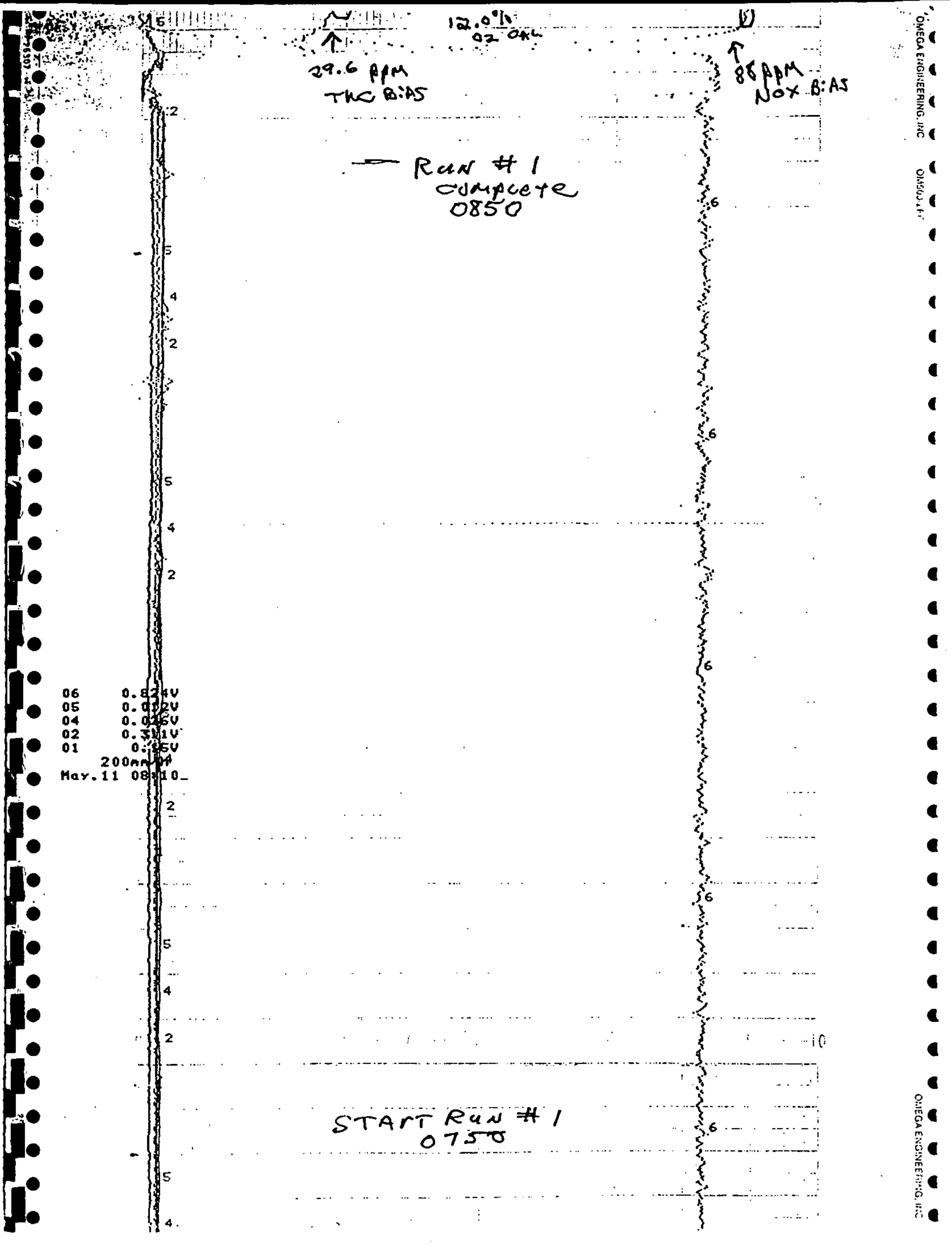


31.4 ppm
THC
31.3 ppm
THC BIAS
60.0 ppm
CO BIAS
Zero
BAG #3
CO = 21 ppm
CO2 = 0.3%
O2 = 20.4%
10.0%
CO2 CAL
11.9%
O2 CAL
20.9%
O2
82.9 ppm
NOX CAL
84.6 ppm
NOX BIAS
20.9%
O2
CAL
END RUN #3 1730
5-10-94
06 0.831V
05 0.009V
04 0.005V
02 0.743V
01 -0.10V
200mm/h
May.10 17:10
NOX
3 ppm
CO = 21 ppm
CO2
0.3%
THC = 9 ppm
O2
20.4%
Zeros
START RUN #3
1630

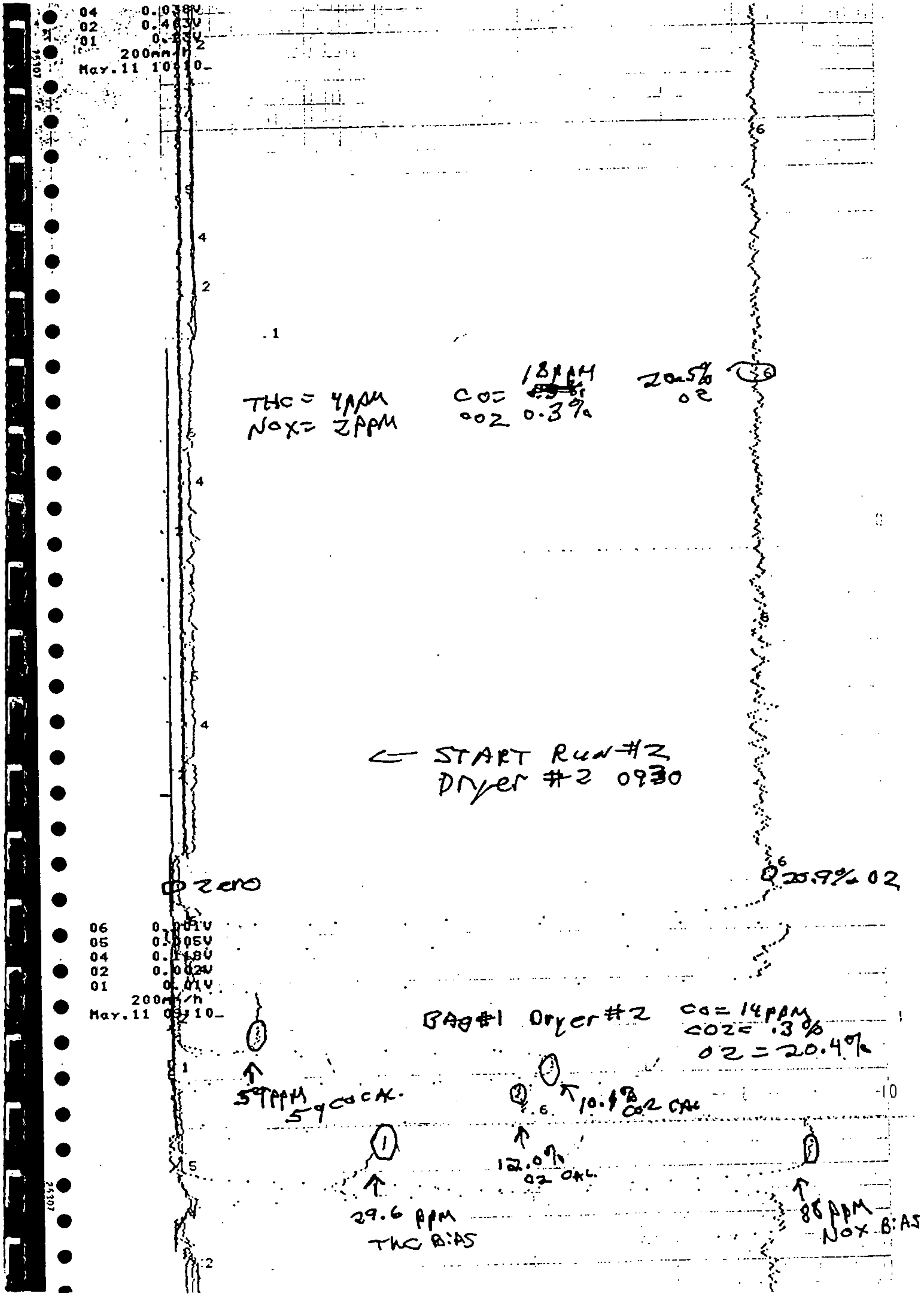

OMEGA ENGINEERING
system response time 23 35
18.0% CO2 CAL.
82.03 PPM THC CAL.
10.0% 10.0% CO2 CAL.
367 PPM NOX CAL
51.6 ppm THC CAL.
20.2% O2 CAL
12.0% O2 CAL.
86.5 PPM NOX CAL
30.5 PPM THC CAL
20.9% O2 CAL
06 0.789V
05 0.005V
04 0.000V
02 0.035V
01 0.000V
200mm/h
May.11 06:10
14 zero
5-11-94
Dryer stack #2
Marseilles BNCF.
5
6
10



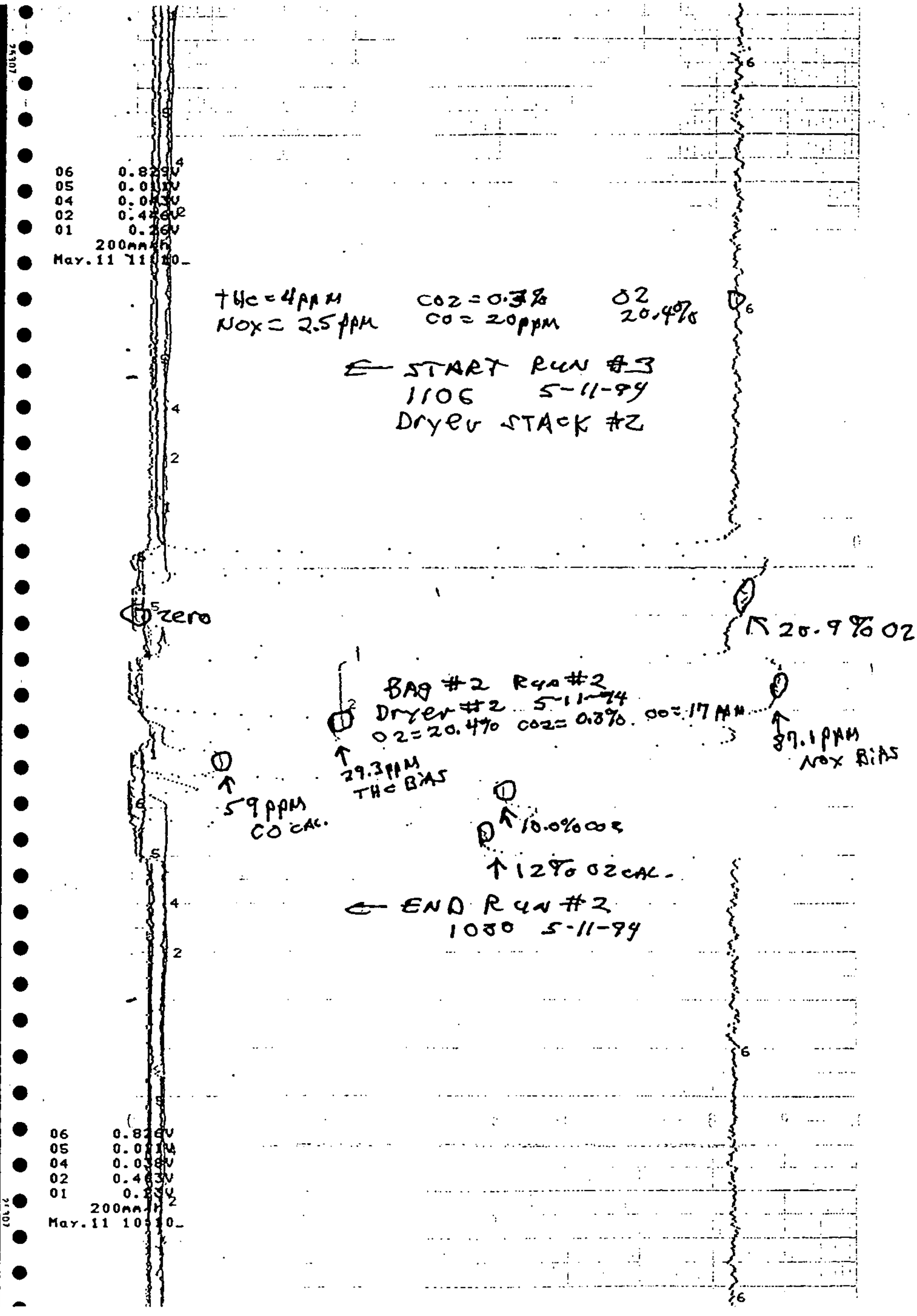
START RUN #1
0750
06 0.8?9V
05 0.0?0V
04 0.0?8V
02 0.3??V
01 0.?2V
200mm/h
May.11 07:?0
STACK #2
0650
Dryer #2 5-11-94
zeros
20.9%
O2
zero
O2
29.50 ppm
THC BIAS
88.2 PPM
NOX BIAS
system response time 23:35
18.0% CO2 CAL.
82.03 PPM
THC CAL.

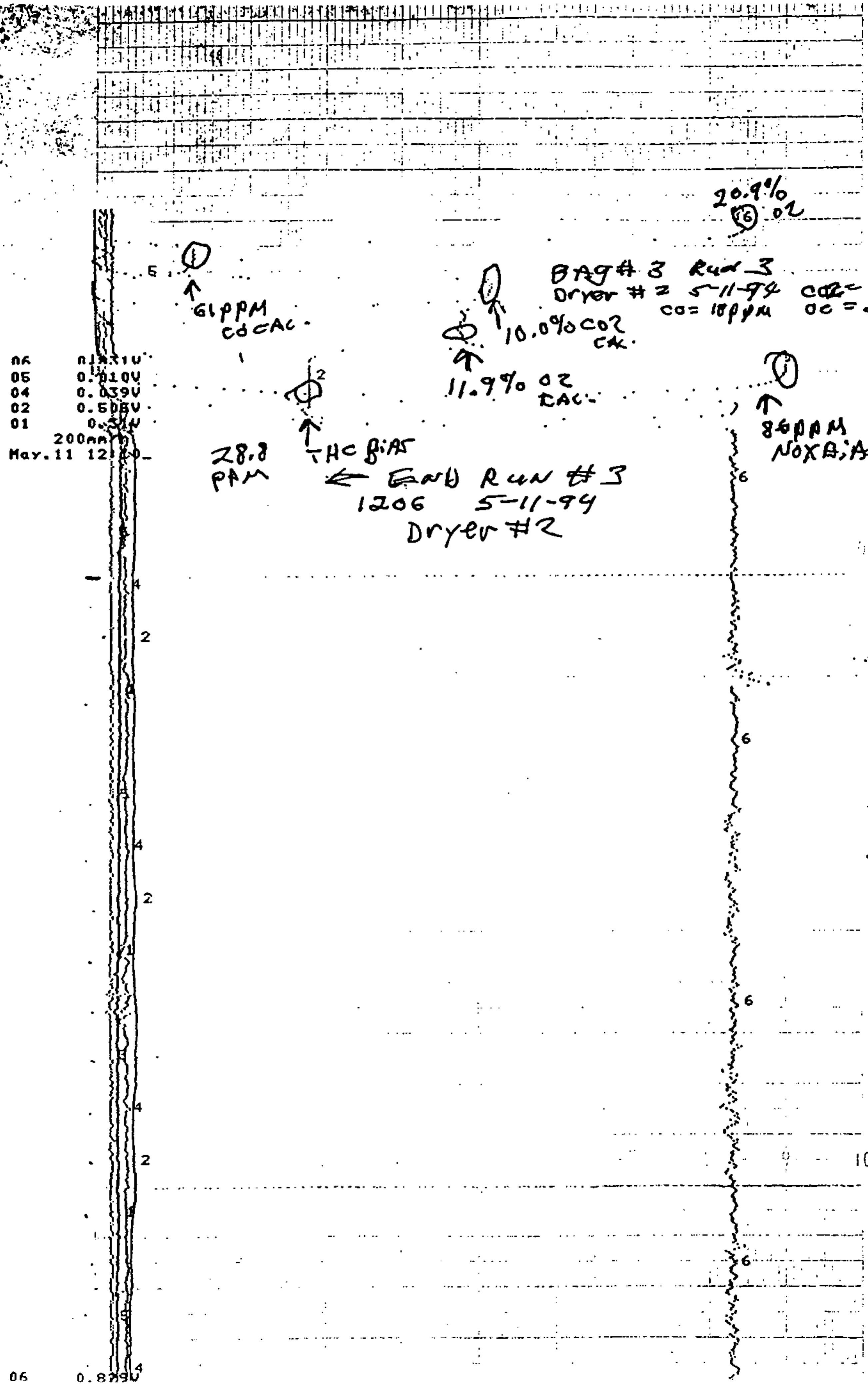


12.0%
O2 CAL
29.6 PPM
THC BIAS
88 PPM
NOx BIAS
Run # 1
complete
0850
06 0.824V
05 0.012V
04 0.026V
02 0.311V
01 0.15V
200mm/H
May.11 08:10
START Run # 1
0750
OMEGA ENGINEERING, INC



04 0.038V
02 0.463V
01 0.13V
200mm/h
May.11 10:10_
THC = 4PPM
NOx = 2PPM
CO = 18PPM
CO2 0.3%
20.5% O2
START Run #2
Dryer #2 0930
zero
20.9% O2
06 0.001V
05 0.005V
04 0.118V
02 0.002V
01 0.01V
200mm/h
May.11 09:10_
BAG#1 Dryer #2
CO = 14PPM
CO2 = .3%
O2 = 20.4%
59PPM CO CAL.
10.1% CO2 CAL
12.0% O2 CAL.
29.6 PPM THC BIAS
88 PPM NOx BIAS
OMEGA ENGINEERING, INC.


06 0.829V
05 0.011V
04 0.043V
02 0.446V
01 0.26V
200mm/h
May.11 11:10
THC = 4ppm
NOx = 2.5ppm
CO2 = 0.3%
CO = 20ppm
O2
20.4%
← START RUN #3
1106 5-11-94
Dryer STACK #2
zero
↖ 20.9% O2
BAG #2 RUN #2
Dryer #2 5-11-94
O2 = 20.4% CO2 = 0.8% CO = 17 PPM
87.1 PPM
NOx BIAS
29.3 PPM
THC BIAS
59 PPM
CO CAL.
10.0% CO2
12% O2 CAL.
← END RUN #2
1030 5-11-94
06 0.826V
05 0.011V
04 0.038V
02 0.463V
01 0.24V
200mm/h
May.11 10:10


20.9% O2
61 PPM CO CAL
BAG # 3 Run 3
Dryer # 2 5-11-94
CO2 = 0.3%
CO = 18 ppm
O2 = 20.4%
10.0% CO2 CAL
11.9% O2 CAL
86 PPM NOX BIAS
28.8 PPM
THC BIAS
← END RUN #3
1206 5-11-94
Dryer #2
05 0.010V
04 0.039V
02 0.508V
200mm/h
May.11
06 0.879V

APPENDIX G

Example Calculations

DRYER STACK #1

EMISSION RATE CALCULATION

OXIDES OF NITROGEN (NOx)

En	–	OXIDES OF NITROGEN (NOx) Emission Rate; lb/hr
Qsd	–	Volumetric Flow Rate of Stack Gas, Corrected to Dry, Standard Conditions; DSCF/min.
Mw	–	Molecular Weight of OXIDES OF NITROGEN (NOx)0 46.0 g/gmole
Cn	–	Concentration of OXIDES OF NITROGEN (NOx); Dry Basis
K1	–	Conversion Factor; Part Per Million
K2	–	Conversion Factor; 385.3 g/gmole–lb/ft3
k3	–	Conversion Factor; 60 Minutes Per Hour

$$En = \frac{Cn*Mw*Qsd*K3}{K1*K2}$$

TEST DATA

DRYER STACK #1

RUN 1:	Cn =	11.8750	Qsd =	15196.28
RUN 2:	Cn =	3.5150	Qsd =	18680.31
RUN 3:	Cn =	2.0300	Qsd =	17769.43
AVERAGE:	=	5.81		

OXIDES OF NITROGEN (NOx) Emission

CALCULATIONS:

DRYER STACK #1

RUN 1:
$$\frac{11.875 * 46 * 15196.28 * 60}{(385.3\ E6)}$$

= 1.292650 LB/HR

RUN 2:
$$\frac{3.515 * 46 * 18680.31 * 60}{(385.3\ E6)}$$

= 0.470348 LB/HR

RUN 3:
$$\frac{2.03 * 46 * 17769.43 * 60}{(385.3\ E6)}$$

= 0.258392 LB/HR

AVERAGE: = 0.673796 LB/HR

DRYER STACK #2

EMISSION RATE CALCULATION

OXIDES OF NITROGEN (NOx)

- En – OXIDES OF NITROGEN (NOx) Emission Rate; lb/hr
- Qsd – Volumetric Flow Rate of Stack Gas, Corrected to Dry, Standard Conditions; DSCF/min.
- Mw – Molecular Weight of OXIDES OF NITROGEN (NOx)0 46.0 g/gmole
- Cn – Concentration of OXIDES OF NITROGEN (NOx); Dry Basis
- K1 – Conversion Factor; Part Per Million
- K2 – Conversion Factor; 385.3 g/gmole–lb/ft3
- k3 – Conversion Factor; 60 Minutes Per Hour

$$En = \frac{Cn*Mw*Qsd*K3}{K1*k2}$$

TEST DATA

DRYER STACK #2

RUN 1:	Cn =	1.4500	Qsd =	16051.47
RUN 2:	Cn =	2.2250	Qsd =	18029.04
RUN 3:	Cn =	3.0000	Qsd =	16454.38
AVERAGE:	=	**2.23**		

OXIDES OF NITROGEN (NOx) Emission CALCULATIONS:

DRYER STACK #2

RUN 1: $$\frac{1.45 * 46 * 16051.47 * 60}{(385.3\ E6)}$$

= **0.166721** LB/HR

RUN 2: $$\frac{2.225 * 46 * 18029.04 * 60}{(385.3\ E6)}$$

= **0.287350** LB/HR

RUN 3: $$\frac{3 * 46 * 16454.38 * 60}{(385.3\ E6)}$$

= **0.353600** LB/HR

AVERAGE: = **0.269224** LB/HR

KILN STACK
EMISSION RATE CALCULATION
OXIDES OF NITROGEN (NOx)

En – OXIDES OF NITROGEN (NOx) Emission Rate: lb/hr
Qsd – Volumetric Flow Rate of Stack Gas, Corrected to Dry, Standard Conditions; DSCF/min.
Mw – Molecular Weight of OXIDES OF NITROGEN (NOx)0 46.0 g/gmole
Cn – Concentration of OXIDES OF NITROGEN (NOx); Dry Basis
K1 – Conversion Factor: Part Per Million
K2 – Conversion Factor; 385.3 g/gmole–lb/ft3
k3 – Conversion Factor, 60 Minutes Per Hour

$$En = \frac{Cn*Mw*Qsd*K3}{K1*k2}$$

TEST DATA
KILN STACK

RUN 1:	Cn =	25.8600	Qsd =	12729.78
RUN 2:	Cn =	27.6000	Qsd =	13516.06
RUN 3:	Cn =	27.9800	Qsd =	12449.05
AVERAGE:	=	27.15		

OXIDES OF NITROGEN (NOx) Emission CALCULATIONS:
KILN STACK

RUN 1:
$$\frac{25.86 * 46 * 12729.78 * 60}{(385.3\ E6)}$$
= 2.359908 LB/HR

RUN 2:
$$\frac{27.6 * 46 * 13516.06 * 60}{(385.3\ E6)}$$
= 2.672201 LB/HR

RUN 3:
$$\frac{27.98 * 46 * 12449.05 * 60}{(385.3\ E6)}$$
= 2.495134 LB/HR

AVERAGE: = 2.509081 LB/HR

DRYER STACK #1
EMISSION RATE CALCULATION
CARBON MONOXIDE (CO)

En – Carbon monoxide Emission Rate; lb/hr
Qsd – Volumetric Flow Rate of Stack Gas, Corrected to Dry, Standard Conditions; DSCF/min.
Mw – Molecular Weight of Carbon Monoxide; 28.0 g/gmole
Cn – Concentration of Carbon Monoxide; Dry Basis
K1 – Conversion Factor; Part Per Million
K2 – Conversion Factor, 385.3 g/gmole–lb/ft3
k3 – Conversion Factor: 60 Minutes Per Hour

$$En = \frac{Cn*Mw*Qsd*K3}{K1*k2}$$

TEST DATA
DRYER STACK #1

RUN 1:	Cn =	8.00	Qsd =	15196.28
RUN 2:	Cn =	18.675	Qsd =	18680.31
RUN 3:	Cn =	23.97	Qsd =	17769.43
AVERAGE: =		**16.88**		**17215.34**

Carbon Monoxide (CO) Emissions
CALCULATIONS:
DRYER STACK #1

RUN 1: $$\frac{8 * 28 * 15196.28 * 60}{(385.3\ E6)}$$

= **0.530075 LB/HR**

=

RUN 2: $$\frac{18.675 * 28 * 18680.31 * 60}{(385.3\ E6)}$$

= **1.521090 LB/HR**

=

RUN 3: $$\frac{23.97 * 28 * 17769.43 * 60}{(385.3\ E6)}$$

= **1.857170 LB/HR**

AVERAGE: = 1.302778 LB/HR

DRYER STACK #2
EMISSION RATE CALCULATION
CARBON MONOXIDE (CO)

En – Carbon monoxide Emission Rate; lb/hr
Qsd – Volumetric Flow Rate of Stack Gas, Corrected to Dry, Standard Conditions: DSCF/min.
Mw – Molecular Weight of Carbon Monoxide; 28.0 g/gmole
Cn – Concentration of Carbon Monoxide; Dry Basis
K1 – Conversion Factor, Part Per Million
K2 – Conversion Factor, 385.3 g/gmole–lb/ft3
k3 – Conversion Factor: 60 Minutes Per Hour

$$En = \frac{Cn*Mw*Qsd*K3}{K1*k2}$$

TEST DATA
DRYER STACK #2

RUN 1:	Cn =	14.85	Qsd =	16051.47
RUN 2:	Cn =	19.03	Qsd =	18029.04
RUN 3:	Cn =	20.00	Qsd =	16454.38
AVERAGE: =		17.96		16844.96

Carbon Monoxide (CO) Emissions
CALCULATIONS:
DRYER STACK #2

RUN 1: $\frac{14.85 * 28 * 16051.47 * 60}{(385.3\ E6)}$

= 1.039325 LB/HR

RUN 2: $\frac{19.03 * 28 * 18029.04 * 60}{(385.3\ E6)}$

= 1.495965 LB/HR

RUN 3: $\frac{20 * 28 * 16454.38 * 60}{(385.3\ E6)}$

= 1.434900 LB/HR

AVERAGE: = 1.323397 LB/HR

KILN STACK
EMISSION RATE CALCULATION
CARBON MONOXIDE (CO)

En – Carbon monoxide Emission Rate; lb/hr
Qsd – Volumetric Flow Rate of Stack Gas, Corrected to Dry, Standard Conditions: DSCF/min.
Mw – Molecular Weight of Carbon Monoxide: 28.0 g/gmole
Cn – Concentration of Carbon Monoxide; Dry Basis
K1 – Conversion Factor, Part Per Million
K2 – Conversion Factor; 385.3 g/gmole-- lb/ft3
k3 – Conversion Factor; 60 Minutes Per Hour

$$En = \frac{Cn*Mw*Qsd*K3}{K1*k2}$$

TEST DATA
KILN STACK

RUN 1:	Cn =	125.75	Qsd =	12729.78
RUN 2:	Cn =	122.75	Qsd =	13516.06
RUN 3:	Cn =	125.50	Qsd =	12449.05
AVERAGE: =		**124.67**		**12898.30**

Carbon Monoxide (CO) Emissions
CALCULATIONS:
KILN STACK

RUN 1:
$$\frac{125.75 * 28 * 12729.78 * 60}{(385.3 E6)}$$
= **6.979738** LB/HR

=

RUN 2:
$$\frac{122.75 * 28 * 13516.06 * 60}{(385.3 E6)}$$
= **7.234056** LB/HR

=

RUN 3:
$$\frac{125.5 * 28 * 12449.05 * 60}{(385.3 E6)}$$
= **6.812244** LB/HR

AVERAGE: = **7.008679** LB/HR

DRYER STACK #1

EMISSION RATE CALCULATION

TOTAL HYDROCARBONS (THC)

En – TOTAL HYDROCARBONS (THC) Emission Rate; lb/hr
Qsd – Volumetric Flow Rate of Stack Gas, Corrected to Dry, Standard Conditions: DSCF/min.
Mw – Molecular Weight of TOTAL HYDROCARBONS (THC); 44.0 g/gmole
Cn – Concentration of TOTAL HYDROCARBONS (THC); Dry Basis
K1 – Conversion Factor, Part Per Million
K2 – Conversion Factor; 385.3 g/gmole–lb/ft3
k3 – Conversion Factor: 60 Minutes Per Hour

$$En = \frac{Cn*Mw*Qsd*K3}{K1*k2}$$

TEST DATA

DRYER STACK #1

RUN 1:	Cn =	3.745	Qsd =	15196.28
RUN 2:	Cn =	6.12	Qsd =	18680.31
RUN 3:	Cn =	7.26	Qsd =	17769.43
AVERAGE:	=	**5.708333**		

TOTAL HYDROCARBONS (THC) Emission

CALCULATIONS:

DRYER STACK #1

RUN 1: $$\frac{3.745 * 44 * 15196.28 * 60}{(385.3\ E6)}$$

= **0.369936** LB/HR

RUN 2: $$\frac{6.12 * 44 * 18680.31 * 60}{(385.3\ E6)}$$

= **0.783322** LB/HR

RUN 3: $$\frac{7.26 * 44 * 17769.43 * 60}{(385.3\ E6)}$$

= **0.883924** LB/HR

AVERAGE: = **0.685727** LB/HR

DRYER STACK #2

EMISSION RATE CALCULATION

TOTAL HYDROCARBONS (THC)

En – TOTAL HYDROCARBONS (THC) Emission Rate; lb/hr
Qsd – Volumetric Flow Rate of Stack Gas, Corrected to Dry, Standard Conditions: DSCF/min.
Mw – Molecular Weight of TOTAL HYDROCARBONS (THC); 44.0 g/gmole
Cn – Concentration of TOTAL HYDROCARBONS (THC); Dry Basis
K1 – Conversion Factor, Part Per Million
K2 – Conversion Factor: 385.3 g/gmole–lb/ft3
k3 – Conversion Factor: 60 Minutes Per Hour

$$En = \frac{Cn*Mw*Qsd*K3}{K1*k2}$$

TEST DATA

DRYER STACK #2

RUN 1:	Cn =	3.00	Qsd =	16051.47
RUN 2:	Cn =	2.55	Qsd =	18029.04
RUN 3:	Cn =	4.85	Qsd =	16454.38
AVERAGE:	=	3.466666		

TOTAL HYDROCARBONS (THC) Emission

CALCULATIONS:

DRYER STACK #2

RUN 1:
$$\frac{3 * 44 * 16051.47 * 60}{(385.3\ E6)}$$
= 0.329944 LB/HR

RUN 2:
$$\frac{2.55 * 44 * 18029.04 * 60}{(385.3\ E6)}$$
= 0.315005 LB/HR

RUN 3:
$$\frac{4.85 * 44 * 16454.38 * 60}{(385.3\ E6)}$$
= 0.546799 LB/HR

AVERAGE: = 0.397249 LB/HR

KILN STACK
EMISSION RATE CALCULATION
TOTAL HYDROCARBONS (THC)

En – TOTAL HYDROCARBONS (THC) Emission Rate; lb/hr
Qsd – Volumetric Flow Rate of Stack Gas, Corrected to Dry, Standard Conditions: DSCF/min.
Mw – Molecular Weight of TOTAL HYDROCARBONS (THC); 44.0 g/gmole
Cn – Concentration of TOTAL HYDROCARBONS (THC); Dry Basis
K1 – Conversion Factor, Part Per Million
K2 – Conversion Factor: 385.3 g/gmole–lb/ft3
k3 – Conversion Factor: 60 Minutes Per Hour

$$En = \frac{Cn*Mw*Qsd*K3}{K1*k2}$$

TEST DATA
KILN STACK

RUN 1:	Cn =	9.22	Qsd =	12729.78
RUN 2:	Cn =	8.8	Qsd =	13516.06
RUN 3:	Cn =	7.83	Qsd =	12449.05
AVERAGE:	=	8.615		

TOTAL HYDROCARBONS (THC) Emission CALCULATIONS: KILN STACK

RUN 1: $$\frac{9.215 * 44 * 12729.78 * 60}{(385.3\ E6)}$$

= **0.803750 LB/HR**

RUN 2: $$\frac{8.8 * 44 * 13516.06 * 60}{(385.3\ E6)}$$

= **0.814962 LB/HR**

RUN 3: $$\frac{7.83 * 44 * 12449.05 * 60}{(385.3\ E6)}$$

= **0.667886 LB/HR**

AVERAGE: = 0.762199 LB/HR

MOISTURE CONTENT DETERMINATION
EPA Method 4 Calculations
TEST RUN #1

Parameter	Definition	Unit
Pm	- Absolute Meter Pressure	in. Hg.
Po	- Average Meter Orifice Differential Pressure	in. H2O
Pstd	- Absolute Standard Barometric Pressure (29.92)	in. Hg.
Pb	- Absolute Barometric Pressure	in. Hg.
k	- Standard Volume H2O Vapor/Unit Weight Liquid Constant = 0.04715 cu. ft./g	ft./g
Tm(F)	- Average Meter Temperature Degrees F:	degrees (F)
Tm	- Average Meter Temperature Degrees R:	degrees (R)
Tstd	- Absolute Standard Temperature (528 R)	degrees (R)
Y	- Dry Gas Meter Correction Factor	dimensionless
Vlcg	- Total condensate Collected	grams/ml H2O
Vm	- Metered Dry Sample Gas Volume	dcf
Vmstd	- Volume of Water Vapor Collected at Standard Conditions (528 R, 1 atmosphere)	scf
Bws	- Moisture Content (mole fraction)	mole fraction
Bwd	- Moisture Content (% Volume)	% volume

TEST DATA
RUN # 1

Pb	29.85	Y	1.001
Vm	51.565	Tm(F)	88.952381
Vlcg	74.50	Tm	548.95238
Tstd	528.00	Po	2.414
Pstd	29.92	k	0.04715

MOISTURE DETERMINATION CALCULATIONS:

1. Meter Pressure:

$Pm = (Po/13.6)+Pb$

Pm =	2.414285714 divided by	13.6	+	29.85
			=	30.0275 in. Hg.

2. Standard Meter Volume:

$$Vmstd = \frac{17.64 * Vm * Y * Pm}{Tm}$$

Vmstd =

$$\frac{17.64 \quad * \quad 51.565 \quad * \quad 1.001 \quad * \quad 30.0275}{548.952381} = 49.8049 \text{ dscf}$$

3. Meter Temperature:

$Tm = Tm(F)+460$

Tm = 88.95238095 + 460 = 548.952381 Deg. (R)

4. Standard Water Volume:

$Vwstd = k*Vlcg$

Vwstd = 0.04715 * 74.5 = 3.512675 scf

5a. Moisture Content:

$$Bws = \frac{Vwstd}{Vwstd+Vmstd}$$

$$Bws = \frac{3.512675}{3.512675 + 49.8049} = 0.0659 \text{ mole frac.}$$

5b. $Bwd = Bws*100$

Bwd = 0.065882064 * 100 = 6.5882 % H_2O

5c. Dry Gas Fraction:

$Fdg = 1-Bws$

Fdg = 1 - 0.0659 = 0.9341 FDG

VELOCITY AND VOLUMETRIC FLOWRATE DETERMINATION
EPA METHOD 2 CALCULATIONS
TEST RUN #1

Parameter	Definition	Units
Cp	– Pitot Tube Coefficient	dimensionless
Vs	– Gas Stream Velocity	ft./second
Qsd	– Volumetric Flow Rate at Standard Condition,Dry Basis	dscfm
Qact	– Actual Volumetric Flow Rate, Wet Basis	acfm
Bws	– Moisture Content	mole fraction
Dp	– Average Square Root of Velocity Head	in. H2O
Pb	– Absolute Barometric Pressure	in. Hg.
Kp	– Constant=89.49(ft)(lb/lb–mol)(in.Hg ^0.5)/(s)(R)	in.H2O
Ts	– Absolute Stack Gas Temperature (R)	Degrees (R)
Ms	– Sample Gas Molecular Weight, Wet Basis	lb/lb–mole
Sp	– Static Pressure of Gas Stream	in. H2O
Abs	– Absolute Standard Temperature	528 degrees R
Sd	– Stack Diameter	in.
Csa	– Stack Cross–sectional Area	ft2
Ps	– Absolute Stack Gas Pressure	in. Hg.
Sm	– Conversion Factor	60 sec/min
Pi	– Constant Ratio	3.1415927 dimensionless
Dn	– Nozzle Diameter	in.
An	– Nozzle Area	ft.2
Tstd	– Absolute Standard Temperature (528) (R	degrees R

TEST DATA
TEST RUN #1

Ms	28.2767	Cp	0.84
Bws	0.0659	Pb	29.85
Sp	–0.11	Ts	941.57
Sd	41.00	Dp	0.4585
Tstd	528.00	Dn	0.3700

VELOCITY AND VOLUMETRIC FLOWRATE CALCULATIONS:

1. Stack Pressure:

Ps = Pb+(Sp/13.6)

Ps=	29.85	+	−0.11	/	13.6
				=	29.8419 in. Hg.

2. Velocity of Stack Gas:

Vs=85.49	*Cp*Dp*[(	SQRT[(Ts)/(Ps*Ms)]	30.6850	29.0488
Vs=85.49*	0.38516278 *	1.056328127		
			=	34.7823 ft./sec.

3. Stack Cross−sectional Area:

Csa = (pi)[(Sd)^2]/[(4)(144)]			
Csa=3.141592654	*	1681 divided by	576
		=	9.16843273 ft2

4a. Volumetric Flowrate, Wet Basis:

Qact =	(Vs*Csa)*60			
Qact=	34.7823 *	550.1060		
			=	19133.9584 acfm

4b. Volumetric Flowrate at Standard Conditions, Dry Basis:

$$Qsd = \frac{(Qact)(1-Bws)\ (Tstd)(Ps)}{(Ts)(29.92)} =$$

$$Qsd = \frac{19133.95844 * 0.934117936 * 15756.52941}{28171.81714}$$

Qsd = 9996.5983 dscfm

MOLECULAR WEIGHT DETERMINATION
EPA METHOD 3 CALCULATIONS
TEST RUN # 1

Parameter	Definition	Units
Md	– Sample Gas Molecular Weight, Dry Basis	lb/lb–mole
Ms	– Sample Gas Molecular Weight, Wet Basis	lb/lb–mole
Bws	– Moisture Content	mole fraction
%O2	– Oxygen (O2) Concentration, Dry Basis	% volume
%CO2	– Carbon Dioxide (CO2) Concentration, Dry Basis	% volume
%CO	– Carbon Monoxide (CO) Concentration, Dry Basis	% volume
%N2	– Nitrogen (N2) Concentration, Dry Basis (gas balance)	% volume
0.32	– Molecular Weight of Oxygen (O2) divided by 100	lb/lb–mole
0.44	– Molecular Weight of Carbon Dioxide (CO2) / by 100	lb/lb–mole
0.28	– Molecular Weight of Carbon Monoxide (CO) / by 100	lb/lb–mole
0.28	– Molecular Weight of Nitrogen (N2) divided by 100	lb/lb–mole
18.00	– Molecular Weight of Water	lb/lb–mole

TEST DATA
TEST RUN #1

Bws	0.0659	%N2	80.4
%O2	17.8		
%CO2	1.8		
%CO	0		

1. MOLECULAR WEIGHT, DRY:

Md = 0.44*%CO2+0.32*%O2+0.28*%N2+%CO

0.792 + 5.696 + 22.512 + 0

Md = 29.0000 lb/lb-mole

2. <u>MOLECULAR WEIGHT, WET:</u>

Ms = Md*(1-Bws)+18.00*Bws

29 * 0.934117936 + 1.185877146

Ms = 28.2753 lb/lb-mole

PARTICULATE MATTER EMISSION DETERMINATION
EPA METHOD 5 CALCULATIONS
TEST RUN # 1

Parameter	Definition	Units
Fdg	– (1–Bws)	fraction
I	– Percent of Isokinetic Sampling	%
Ts	– Absolute Average Stack Gas Temperature	degrees R
Vmstd	– Volume of Stack Gas Sampled, Corrected to Dry, Standard Conditions	dscf
Vs	– Stack Gas Velocity	ft./second
T	– Sample Time Interval	minutes
An	– Cross–Sectional Area of Sampling Nozzle	ft2
Ps	– Absolute Stack Gas Pressure	in. Hg
Dn	– Sampling Nozzle Diameter	inches
Pi	– Constant (3.141592654)	dimensionless
K2	– Conversion Factor (144)	in.2/ft.2
K3	– Conversion Factor (0.002669)	in. Hg–ft.3/ml–R
K4	– Conversion Factor (17.64)	deg.R/in. Hg
1.67	– Conversion Factor	%–sec/min

TEST DATA
TEST RUN #1

Bws	0.0659		
Vs	34.7823	Ts	941.57
Vlcg	74.5000	Ps	29.8419
K3	0.0027	T	60
K4	0.0945	Dn	0.3700
Fdg	0.9341	Vmstd	49.8049

1. Nozzle Area:

An=(Dn/24)^2*Pi
An= 0.000237674 * 3.1415927
An = = 0.00074667 ft.2

2. I = ISOKINETICS (%):

0.0945*Ts*Vmstd

Ps*Vs*An*T*Fdg   An*T*Fdg = 0.041848876

0.0945 * 941.5714286 * 49.804948

29.84191 * 34.78231415 * 0.0418489

= 102.02 % I

PARTICULATE MATTER EMISSION DETERMINATION
EPA METHOD 5 CALCULATIONS
TEST RUN # 1

Parameter	Definition	Units
Pc	– Total Particulate Catch	mg
Pg	– Total Particulate Catch (mg/1000)	grams
Vmstd	– Volume of Stack Gas Sampled, Corrected to Dry, Standard Conditions	dscf
Cs	– Concentration of Particulate in Stack Gas, Corrected to Dry, Standard Conditions (grams/dscf)	gm/dscf
Cg	– Concentration of Particulate Matter (grains)	gr/dscf
Pcs	– Concentration of Particulate (lb/hour)	lb/hour
K3	– Conversion Factor (15.43)	gr/gm
Qsd	– Stack Gas Volumetric Flow Rate, Corrected to Dry, Standard Conditions	dscf/min
K2	– Conversion Factor (0.002205)	lb/gm
K1	– Conversion Factor (0.001)	gm/mg
K4	– Conversion Factor (60)	min/hour
Pe	– Particulate Matter Emission Rate	lb/hour

TEST DATA
TEST RUN #1

Pc	125.5	K4	60.00
Pg	0.1255	Qsd	9996.5983
Vmstd	49.8049	K1	0.001000
K2	0.002205	K3	15.43

PARTICULATE MATTER EMISSIONS CALCULATIONS:

1a.	Total Particulate Catch :					
	Cs =	Pg/Vmstd				
		0.1255	/	49.80494752		
	Cs =	0.0025 grams/dscf				
1b.	Cg =	K3*Cs				
		15.43	*	0.00251983		
	Cg =	0.0389 grains/dscf				
1c.	Pcs =	K2*Cs				
		0.002205	*	0.00251983		
	Pcs =	0.00000556 lb/dscf				
1d.	Pe =	K4	*	Pcs	*	Qsd
		60	*	5.5562E-06	*	9996.598308
	Pe =	3.3326 lbs/hour		Total Particulate Emissions.		