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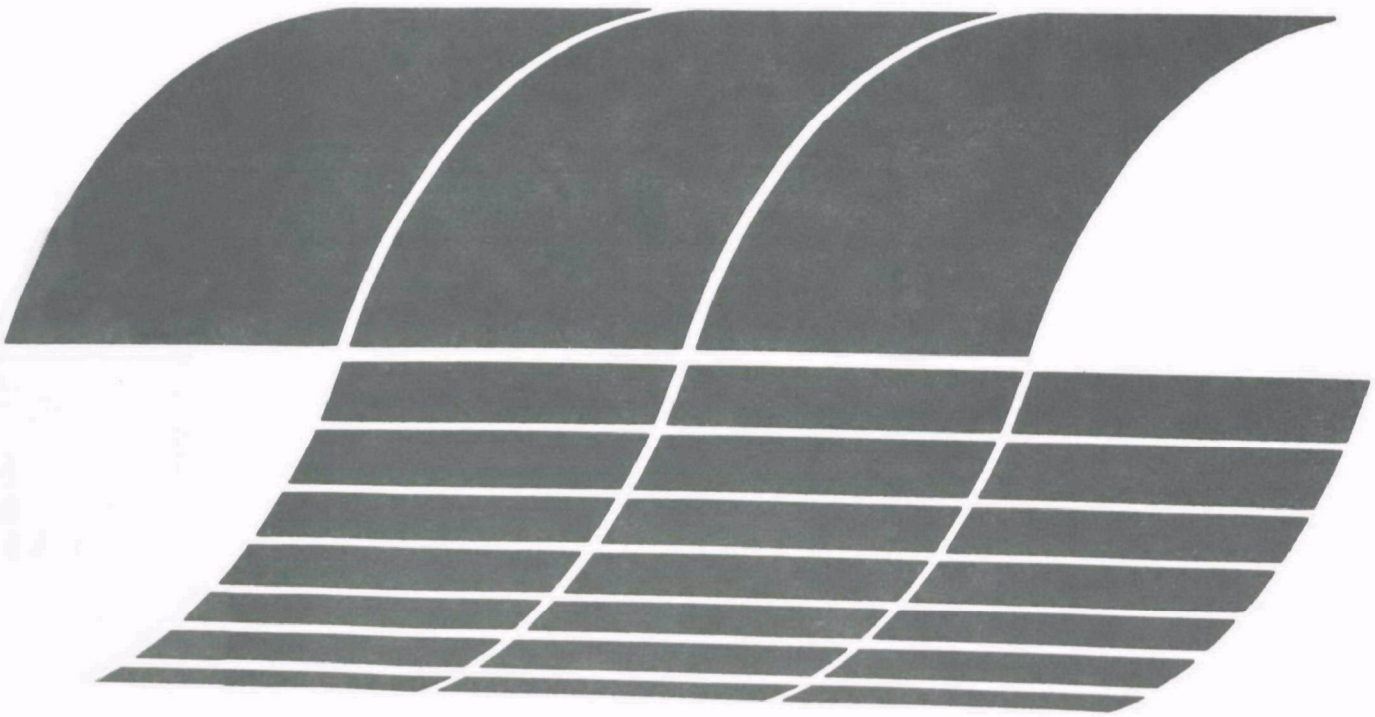
Thirty-day Field Tests of Industrial Boilers: Site 2 — Residual-oil-fired Boiler

Interagency Energy/Environment R&D Program Report



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Thirty-day Field Tests of Industrial Boilers: Site 2 — Residual-oil-fired Boiler

by

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ABSTRACT

This is a final report on a test program to evaluate the long term effectiveness of combustion modifications on industrial boilers. During previous programs short term tests have been performed on industrial boilers to determine the effect of combustion modifications on air pollutant emissions such as NO_x, SO_x, CO, HC, and particulate. The objective of this program was to determine whether the combustion modification techniques which were effective for short duration tests are feasible for a longer period. This report presents results of a 30-day field test of a 26.4 MW output (90,000 lb steam/hr) residual-oil-fired boiler. The NO_x control technology employed on this unit was staged combustion air. The as found concentration of NO_x was 130 ng/J (235 ppm at 3% O_2, dry). Firing in the low NO_x mode, with staged combustion air, resulted in a reduction in NO_x emission of approximately 23 percent to 100 ng/J (181 ppm at 3% O_2, dry).

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SECTION 1.0

SUMMARY

1.1 OBJECTIVE AND SCOPE

The objective of this field test was to determine whether combustion modification techniques which demonstrated reductions in air pollutant emissions during short-term tests are feasible for longer periods. In addition, boiler performance and reliability were monitored. The combustion modifications have previously been shown to be effective on industrial boilers. (Reference 1 and 2).

The program scope provided for thirty-day field tests of a total of seven industrial boilers with design capacities ranging from 14.65 to 73.25 MW output (50,000 to 250,000 lb steam/hr). This final report is for the second of the seven, a 26.4 MW output (90,000 lb steam/hr) residual-oil-fired boiler using staged combustion air and low excess air as the NO_x emission control technology.

During the test period, continuous-monitor certification tests were performed concurrently with low NO_x testing. Emissions measured were particulate, NO, CO_2, CO, and O_2. Boiler efficiency was measured several times during the program to determine the effect of combustion modification on boiler efficiency.

This is a final report on the thirty-day test documenting the test equipment, a summary of the test data, and a discussion of the data in relation to the control technology employed for this type of boiler.

1.2 RESULTS

The initial task of this program was to select industrial boiler test sites which fit the categories set forth in the statement of work. Further, it was desired to find a site which had previously been tested to minimize the setup time and eliminate the need for extensive combustion modification testing. A survey of previous test sites was made to locate a residual-oil-fired boiler which employed staged combustion air and low excess air as the NO_x control technologies. Boilers which were tested by KVB under previous programs (cited in the document footnoted on the previous page) were reviewed. The boiler which best met the above criteria was selected for testing.

Following test site selection, the KVB continuous monitor was shipped to the site and installed. Continuous-monitor certification tests, as outlined in Performance Specifications 2 and 3, 40 CFR 60, Appendix B, were then begun.

The 30-day field test was begun after the continuous monitor certification tests were completed. The test was performed according to "Plan for Performing Source Evaluation Tests in Support of the NSPS for Industrial Boilers." Emissions of NO, CO, CO_2 and O_2 were measured continuously. Particulate measurements were made in triplicate at the start, midpoint and conclusion of the test period. Triplicate particulate measurements were also made with the boiler in the as-found condition. Measurements of polycyclic organic matter were made in both the modified and as-found conditions.

The results of the 30-day test are discussed in detail in Section 3.0.

Table 1-1 is a summary of the 24-hour averages of gaseous emissions compiled from the analyzer strip chart recordings and plant steam flow charts. An analysis of the field test data was prepared. A log-probability plot of 24-hour averages is presented in Figure 1-1 for the low NO_x condition. The mean value for the NO is 100 ng/J with a geometric dispersion of 1.12.

TABLE 1-1. SUMMARY OF 24-HOUR AVERAGE GASEOUS EMISSIONS

SITE 2

24 HOUR DATA DRY STACK GAS CONCENTRATION							
DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/14/79		15.2	8.7	8.7	181.	266.	147.
3/15/79		16.0	9.0	9.2	183.	274.	151.
3/16/79		15.4	8.5	10.9	163.	236.	130.
3/17/79		15.3	8.1	11.9	157.	220.	121.
3/18/79		18.1	8.1	10.5	196.	273.	151.
3/19/79		16.5	7.7	11.4	162.	219.	121.
3/20/79		16.7	7.6	12.6	152.	204.	112.
3/21/79		16.6	7.5	11.4	132.	175.	97.
3/22/79		16.5	7.6	10.1	121.	163.	90.
3/23/79		16.5	7.6	10.1	119.	160.	88.
3/24/79		16.4	7.9	9.8	132.	182.	100.
3/25/79		16.3	8.5	9.6	135.	195.	107.
3/26/79		16.4	8.0	9.9	132.	183.	101.
3/27/79		16.6	7.8	10.4	111.	151.	83.
3/28/79		16.6	7.9	10.4	119.	164.	90.
3/29/79		11.2	10.5	8.8	0.	0.	0.
3/30/79		12.9	10.5	7.9	125.	216.	119.
3/31/79		13.9	10.1	8.3	133.	220.	121.
4/ 1/79		13.6	10.8	7.7	121.	214.	118.
4/ 2/79		15.7	9.2	8.9	127.	196.	108.
4/ 3/79		16.1	8.1	9.9	117.	163.	90.
4/ 4/79		16.0	8.3	10.1	123.	176.	97.
4/ 5/79		16.3	7.3	10.1	126.	165.	91.
4/ 6/79		16.8	7.1	10.1	123.	160.	88.
4/ 7/79		17.2	6.8	10.4	153.	194.	107.
4/ 8/79		20.6	6.7	10.5	163.	205.	113.
4/ 9/79		20.7	6.3	10.6	187.	229.	126.
4/10/79		17.8	6.8	10.5	181.	230.	127.
4/11/79		13.9	10.1	8.2	132.	218.	120.
4/12/79		17.3	8.1	9.6	165.	231.	127.
4/13/79		19.2	8.8	9.3	158.	234.	129.
4/14/79		18.5	6.7	10.1	181.	229.	126.
4/15/79		18.9	7.2	10.0	166.	218.	120.
4/16/79		19.5	7.4	10.1	173.	230.	127.
4/17/79		17.0	7.7	10.0	161.	218.	120.
4/18/79		16.8	7.9	9.9	137.	190.	105.
4/19/79		16.7	9.2	9.7	121.	184.	101.

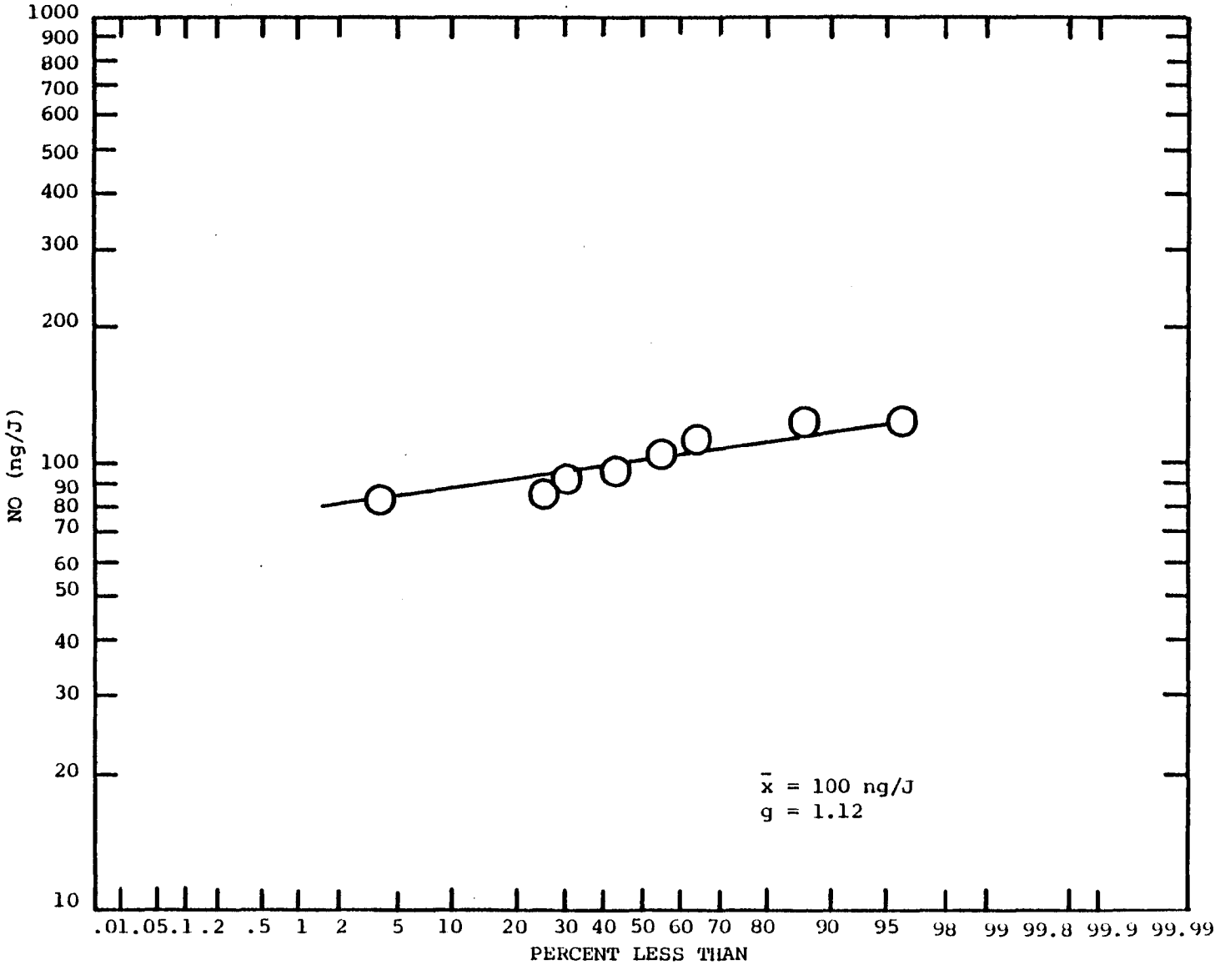


Figure 1-1. Site 2 - Residual Oil Fired Boiler-Staged Combustion Air (BOOS)

1.3 CONCLUSIONS

Based on the results of this 30-day field test, several important conclusions can be drawn.

1. Staged combustion air (SCA) is an effective NO_x control technology for residual-oil-fired boilers. Staged combustion air was achieved by removing one burner from service in a triangular burner pattern. Removing one burner from service resulted in an NO emission level of 100 ng/J (178 ppm at 3 percent O_2, dry). This level represents a reduction of approximately 23 percent from the condition where all burners are firing. All burners firing produce NO emissions of 130 ng/J (232 ppm at 3 percent O_2 dry). It was not possible to operate the entire test with one burner out of service due to steam demand. As a result, the average NO emission level for the 30-day test was 110 ng/J (196 ppm at 3 percent O_2, dry).

2. Operation of the boiler in the low NO_x mode resulted in 48 percent higher particulate emissions than did normal operation. The particulate emission level with all burners firing was 25.6 ng/J (0.0594 lb/10^6 Btu), while the low NO_x mode with one burner out of service resulted in 37.8 ng/J (0.0878 lb/ 10^6 Btu).

3. Boiler operation with one burner out of service results in reduced capacity for the boiler due to oil supply pressure limitations. In order to operate at full capacity with two burners, new oil tips would be required. These were not available for this test.

4. The continuous-monitor system utilizing an extractive sample system provided accurate, reliable data. The NO analyzer was out of service for two days during the duration of the test. The CO analyzer was out of service 23 days during the same period.

5. POM measurements showed a slight decrease when operating in the low NO_x mode. Total POM in the baseline condition were 7.6 <11.36 $\mu g/m^3$ and 4.6 <9.7 $\mu g/m^3$ in the low NO_x mode.

SECTION 2.0

INSTRUMENTATION AND PROCEDURES

This section presents a description of the instrumentation used to measure the gaseous and particulate emissions, the test procedures, the techniques for certifying the continuous monitor, and a description of the boiler tested.

2.1 EMISSIONS MEASUREMENT INSTRUMENTATION

The emissions measurements were made using a continuous monitor fabricated by KVB for this program. The analytical instrumentation and sample handling equipment are contained in a cabinet 1.2 m wide x 0.76 m deep x 183 m high (48"W x 30"D x 72"H). A photograph of the continuous monitor is shown in Figure 2-1. Gaseous emission measurements were made with the analytical instruments listed in Table 2-1.

Total particulate measurements were made using an EPA Method 5 sampling train manufactured by Western Precipitation Division of Joy Manufacturing Company. Samples for measurement of polycyclic organic matter (POM) were obtained using an XAD-2 module supplied by Battelle Columbus Laboratories. These modules were returned to Battelle for analysis following the test.

2.1.1 Gaseous Emissions

The continuous monitor is equipped with analytical instruments to measure concentrations of NO, CO, CO_2, and O_2. The sample gas is delivered to the analyzers at the proper condition and flow rate through the sampling

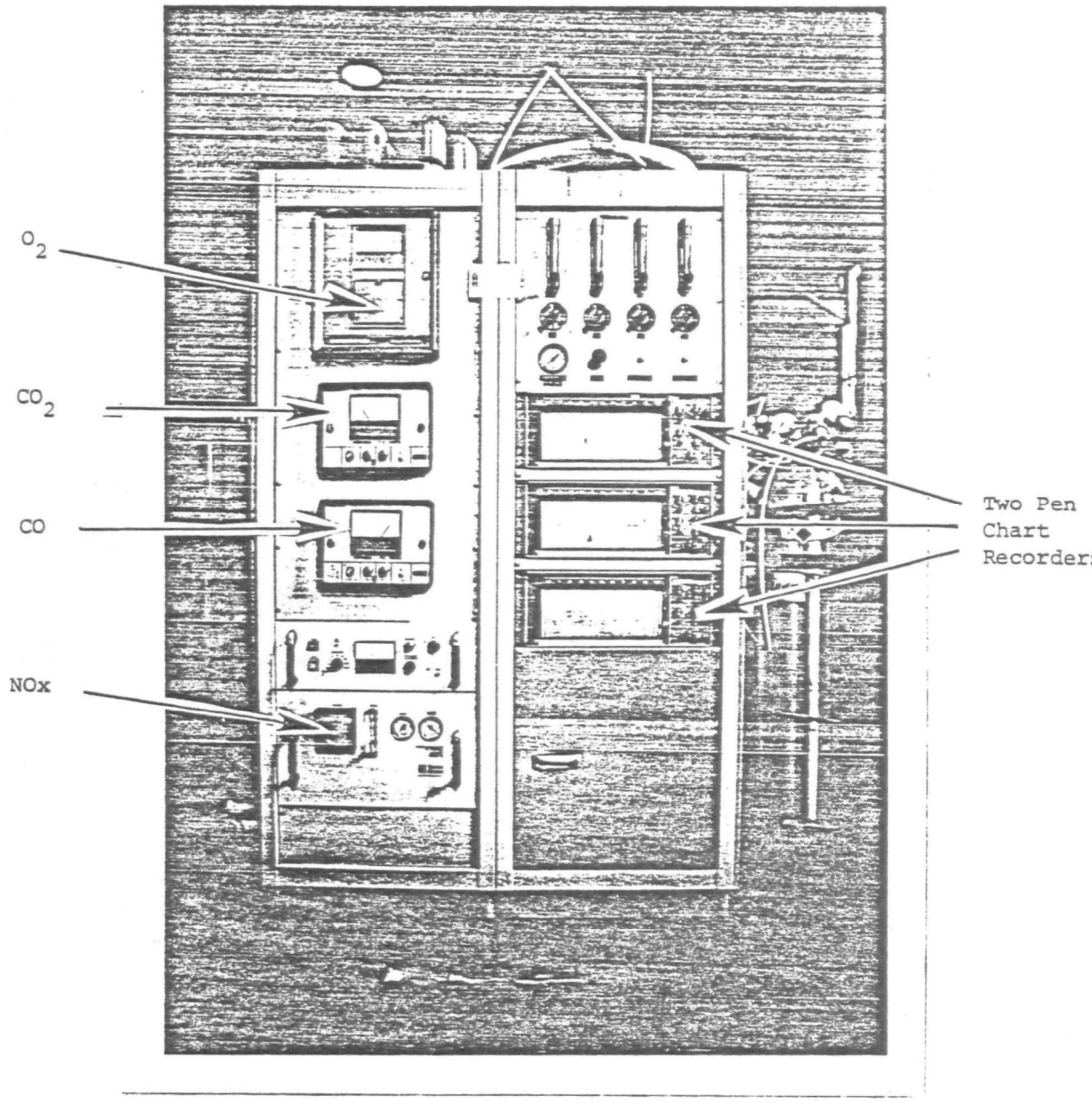


Figure 2-1. Photograph of KVB Continuous Monitor for Measuring Gaseous Emissions

TABLE 2-1. ANALYTICAL INSTRUMENTATION

Emission Species	Manufacturer	Measurement Method	Model No.
Nitrogen Oxides	Thermo Electron	Chemiluminescent	10A
Oxygen	Beckman Instrument	Polarographic	742
Carbon Dioxide	Horiba Instrument	NDIR	PIR-2000
Carbon Monoxide	Horiba Instrument	NDIR	PIR-2000
Opacity	Dynatron	Transmissometer	1100

and conditioning system shown schematically in Figure 2-2. A probe with a 0.7-micrometer sintered stainless steel filter was installed in the stack to sample the flue gas. The following paragraphs describe the analytical instrumentation.

A. Nitrogen Oxides--

The oxides of nitrogen monitoring instrument used was a Thermo Electron chemiluminescent nitric oxide analyzer. The operational basis of the instrument is the chemiluminescent reaction of NO and O_3 to form NO_2 in an excited state. Light emission results when excited NO_2 molecules revert to their ground state. The resulting chemiluminescence is monitored through an optical filter by a high sensitivity photomultiplier tube, the output of which is electronically processed so it is linearly proportional to the NO concentration.

Air for the ozonator is drawn from ambient through an air dryer and a 10-micrometer filter element. Flow control for the instrument is accomplished by means of a small bellows pump mounted on the vent of the instrument downstream of a separator which insures that no water collects in the pump.

The basic analyzer is sensitive only to NO molecules. To measure NO_x (i.e., NO + NO_2), the NO_2 is first converted to NO. This is accomplished by a converter which is included with the analyzer. The conversion occurs as the gas passes through a thermally insulated, resistance heated, stainless steel coil. With the application of heat, NO_2 molecules in the sample gas are reduced to NO molecules, and the analyzer then reads NO_x. NO_2 is obtained by the difference in readings obtained with and without the converter in operation.

Specifications

Accuracy: 1 percent of full scale
Span drift: ± 1 percent of full scale in 24 hours
Zero drift: ± 1 ppm in 24 hours

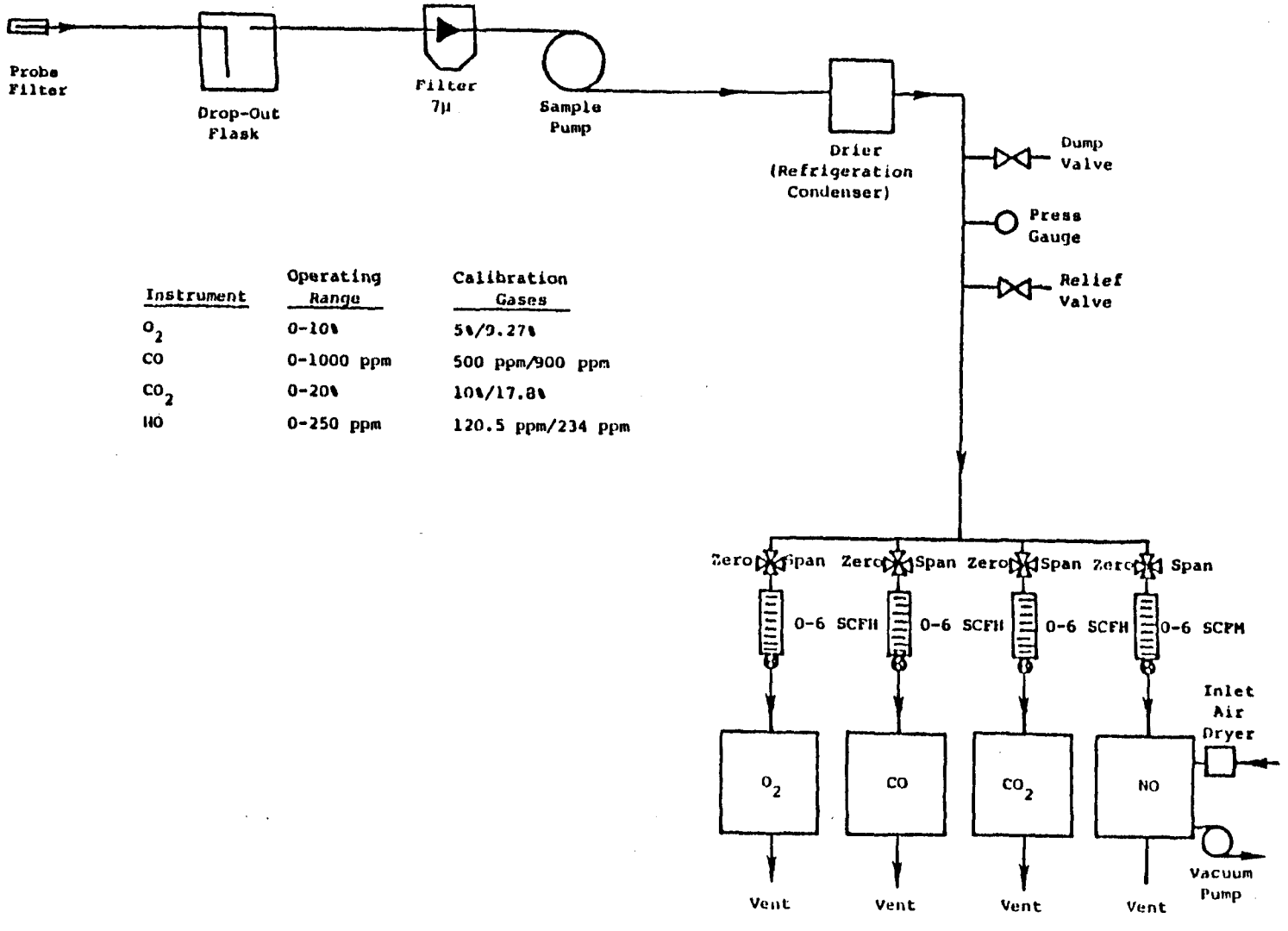


Figure 2-2. Schematic of continuous monitor sampling and conditioning system.

Power requirements: 115 ± 10V, 60 Hz, 1000 watts

Response: 90 percent of F.S. in 1 sec (NO_x mode); 0.7 sec (NO mode)

Output: 4 to 20 ma

Sensitivity: 0.5 ppm

Linearity: ± 1 percent of full scale

Vacuum detector operation

Range: 2.5, 10 25, 100, 250, 1000, 2500, 10,000 ppm F.S.

Only the NO concentration was measured during this program. Because of the added complexity of heated sample lines and controllers necessary for measuring NO_2 and the small percentage of NO_2 in the flue gas, based on previous tests (Reference 1, 2 and 3) EPA decided that only NO measurement was necessary. Therefore, an unheated sample line was installed and the moisture was removed from the sample gas by a dropout flask and a refrigerated condenser.

B. Carbon Monoxide and Carbon Dioxide--

Carbon monoxide (CO) and carbon dioxide (CO_2) concentrations were measured by Horiba Instruments PIR-2000 short-path-length nondispersive infrared analyzers. These instruments measure the differential in infrared energy absorbed from energy beams passed through a reference cell (containing a gas selected to have minimal absorption of infrared energy in the wave length absorbed by the gas component of interest) and a sample cell through which the sample gas flows continuously. The differential absorption appears as a reading on a scale of zero to 100 percent and is then related to the concentration of the species of interest by calibration curves supplied with the instrument. A linearizer was supplied with the CO analyzer to provide a linear output over the range of interest. The operating ranges for the CO analyzer are zero to 500, zero to 1000, and zero to 2000 ppm, and the ranges for the CO_2 analyzer are zero to 5, zero to 10, and zero to 20 percent.

Specifications

Accuracy: 1 percent of full scale

Repeatability: ± 0.5 percent of full scale

Zero drift: ± 1 percent of full scale in 24 hours

Span drift: ± 1 percent of full scale in 24 hours

Response time selectable: 90 percent of full scale in 0.5, 1.2, 3, or 5 seconds

Power requirements: 115 VAC ± 10 percent, 60 Hz

Warmup time: 30 minutes

Output: 0-10 MV

C. Oxygen--

A Beckman Model 742 oxygen analyzer was used to continuously determine the oxygen content of the flue gas sample. The oxygen measuring element contains a silver anode and gold cathode that are protected from the sample by a thin membrane of Teflon. An aqueous KCl solution is retained in the sensor by the membrane and serves as an electrolytic agent. As Teflon is permeable to gases, oxygen will diffuse from the sample to the cathode in the following oxidation-reduction reaction:

Cathode reaction: $O_2 + 2H_2O + 4e \rightarrow 4OH$

Anode reaction: $4Ag + 4Cl \rightarrow 4AgCl + 4e$

With an applied potential between the cathode and anode, oxygen will be reduced at the cathode, causing a current to flow. The magnitude of this current is proportional to the partial pressure of oxygen present in the sample. The instrument has operating ranges of zero to 1 percent, zero to 10 percent, and zero to 25 percent oxygen.

Specifications

Accuracy: ± 1 percent of full scale or ± 0.05 percent O_2, whichever is greater

Sensor stability: ± 1 percent of full scale per 24 hours

Response time: 90 percent in 20 seconds

Output: 0 to 10 MV

Power requirement: 120 ± 10 VAC, 60 Hz

2.1.2 Particulate Emissions

Particulate samples were taken from ports on the vertical side of the rectangular duct at the boiler outlet. The boiler had no port. Four ports were located 0.28 m (11 inches) apart up the side of the duct. The samples were taken using a Joy Manufacturing Company portable effluent sampler. This system, which meets the EPA design specifications for Test Method 5 (Determination of Particulate Emissions from Stationary Sources, Federal Register, Volume 42, No. 160, page 41754, August 18, 1977), is used to perform both the initial velocity traverse and the particulate sample collection. Dry particulates are collected in a heated case that contains, first, a cyclone to separate particles larger than 5 microns and, second, a 100-mm glass-fiber filter for retention of particles as small as 0.3 micrometer. Condensible particulates are collected in a train of four Greenburg-Smith impingers in a chilled water bath.

2.1.3 Polycyclic Organic Matter (POM) Emissions

Particulate and gaseous samples for analysis of POM were taken at the sample port used for Method 5 particulate tests. The sampling system is a modified Method 5 sampling train developed by Battelle Columbus Laboratories. A combination of conventional filtration with collection of organic vapors by means of a high-surface-area polymeric adsorbent (XAD-2) has proved to be highly efficient for collection of all but the more volatile organic species. The modified sampling system consists of the standard EPA train with the adsorbent sampler (Figure 2-3) located between the filter and the impingers. With this system, filterable particulate can be determined from the filter catch and the probe wash according to Method 5; the organic materials present can be determined from the analysis of the filterable particulate and the adsorbent sampler catch. The impingers are only used to cool the stream and protect the dry-gas meter, and their contents are discarded.

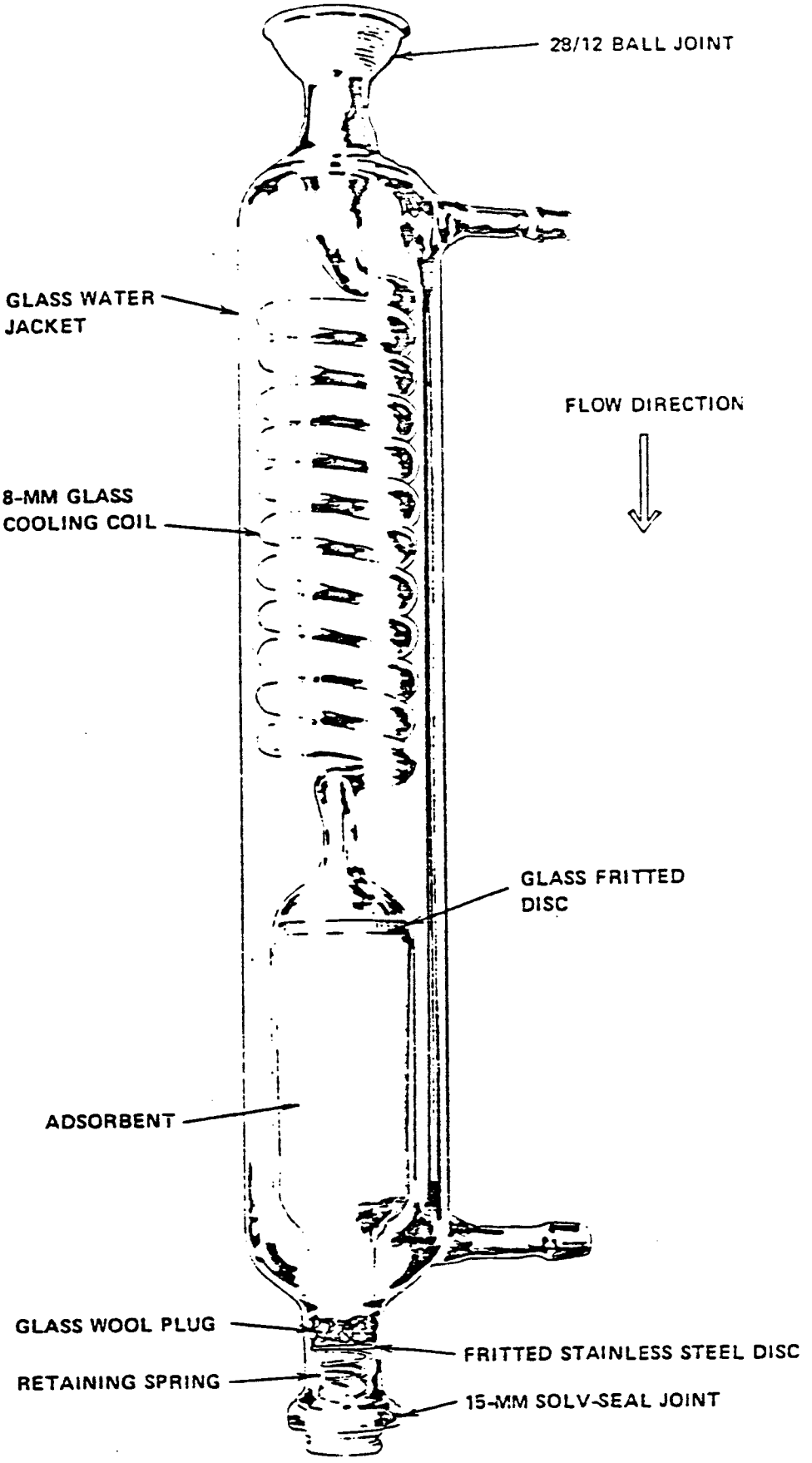


Figure 2-3. Mark III adsorbent sampling system.

2.1.4 Opacity Measurement

Stack opacity was measured with a Dynatron Model 1100 Opacity Monitoring System. The Model 1100 opacity monitor is a double pass transmissometer which measures the light transmittance through a flue gas. The transceiver unit contains the light source, the detector, and electronic circuitry. A reflector is mounted in the end of a slotted probe which is attached to the transceiver and is inserted into a stack or duct through a conventional stack sampling port. The probe causes negligible flow disturbance, and an air purge keeps the optical window and reflector clean. The transceiver output is transmitted to a portable control unit which displays either opacity or optical density automatically correlated from differences between the path length of the transmissometer and the mean diameter of the stack outlet.

Specifications

Peak spectral response: 500 to 600 nm
Mean spectral response: 500 to 600 nm
Relative response: < 10 percent
Angle of view: < 4 degrees
Angle of projection: < 2 degrees
Calibration error: < 2 percent
Response time: 1 second
Zero drift: < 1 percent (24 hours)
Calibration drift: < 1 percent (24 hours)
Operational test period: 168 hours
Output: 0 to 1 VDC
Power requirements: 115 VAC/60Hz
Temperature range: 40°F to 125°F
Weight: 27 pounds (approximate)

The transceiver lenses are cleaned daily, and an air purge is used to keep the lenses free of dirt while inserted in the stack.

2.2 BOILER DESCRIPTION AND CHARACTERISTICS

The boiler at Site 2 was manufactured by Babcock and Wilcox in 1935. It is an integral furnace watertube boiler with an original rated capacity of 26.4 MW (90,000 lb steam/hr). The current top load capability of 79,000 lb steam/hr is limited by the fan. The furnace wall consists of watertubes 76 mm (3 inches) in diameter spaced 260 mm (10.25 inches) on centers. The wall exposure between the tubes consists of refractory; the furnace was rebricked in 1972. The boiler operates at a nominal steam pressure of 2.2 MPa (320 psig) and a steam temperature of 493K (428°F).

The boiler is fired with three B&W steam-atomized burners arranged in a triangular pattern with the top burner spaced directly above the center of the lower two burners. The vertical spacing is 0.91 m (36 inches); the horizontal spacing is 0.94 m (37 inches). The oil guns use a B&W Y-jet steam atomizer with the steam pressure at the burner nominally 0.24 MPa (35 psi) greater than the oil pressure. The boiler fires No. 6 oil, and the temperature of the oil at the burner was approximately 367K (200°F). The nominal oil pressure at top load was 0.58 MPa (85 psi). The boiler is outfitted with a tubular air heater to preheat the combustion air.

The test boiler was situated in the main power plant of a chemical process plant and was one of four boilers used for supplying process steam. The NO_x control technology employed at this test site was staged combustion air, which was shown previously to be effective for reducing NO_x emissions from this boiler. Staged combustion was achieved by removing the upper burner (#1) from service. This does not upset the symmetry of the furnace because of the triangular arrangement of the burners. By terminating the fuel flow to the #1 burner and leaving the air register 100 percent open, the excess air to the active burners was reduced to two-thirds of its original value with all burners in service, because the remaining one-third of the air was injected through the out-of-service burner port. When firing with one burner out of service, the maximum steam flow possible was 17.6 MW thermal

output (60,000 lb/hr). The load was restricted to this value by fuel pressure. A maximum fuel pressure of 0.689 MPa (100 psi) was available which, coupled with the oil gun orifices, limited the fuel flow.

2.3 DAILY TEST ACTIVITY

This section describes the daily test activity at Site 2 following the monitor certification tests. The schedule of monitor certification test events is presented in Section 3-1. A schedule of daily events is presented in Table 2-2.

The data from the gaseous analyzers (NO, CO, CO_2, and O_2) were continuously recorded on strip chart recorders. Gaseous data were read five times daily and recorded on the form shown in Figure B-6, Appendix B. These data were subsequently used for verification of the data reduced from the strip charts for analysis. Boiler operating data were recorded periodically by KVB personnel. Daily charts of steam flow for the entire test period were provided by the boiler operators. The strip chart recorders recorded gaseous emissions 24 hours per day, 7 days per week. No control room data were recorded on weekends; however, the technician did calibrate the instruments on the weekend.

Daily tasks consisted of (1) instrument calibration and recording of control room and emissions data; (2) consultation with boiler operators regarding boiler operation in the low NO_x mode; (3) periodic maintenance of instruments and sample system; (4) visual inspection and troubleshooting of the sampling system and instrumentation console; and (5) procuring supplies and equipment for the particulate and Method 7 tests.

TABLE 2-2. SCHEDULE OF DAILY EVENTS - SITE 2

Time	Event
0800	Calibrate (zero and span) gaseous analyzers (NO, CO_2, CO, and O_2). Record gaseous emissions data. Record boiler control room data. Consult with operators concerning boiler operation.
0845	Calibrate opacity monitor.
0900	Perform daily systems checkout.
1000	Calibrate and record gaseous emissions data.
1200	Calibrate and record gaseous emissions data. Record control room data.
1400	Calibrate and record gaseous emissions data.
1600	Calibrate and record gaseous emissions data. Record control room data.
1700	Calibrate analyzers prior to departing plant. Perform visual check of sampling systems and boiler operation. Leave instructions with operators.

SECTION 3.0

TEST RESULTS

This section summarizes the emission and efficiency data collected on the residual-oil-fired boiler. The NO_x control technology employed on this boiler was staged combustion air. The boiler was tested in the as-found condition initially and in the low NO_x mode for 32 days. The boiler fires No. 6 fuel oil. The results presented herein summarize the gaseous and particulate emissions data, efficiency, and present conclusions for the boiler operating under low NO_x conditions for extended duration.

3.1 CONTINUOUS-MONITOR CERTIFICATION TESTS

The continuous monitor described in the previous section was used to measure the boiler gaseous emissions. Following shipment to the test site, the monitoring system was installed and certification tests performed in accordance with Performance Specifications 2 (PS2) and 3 (PS3), 40 CFR 60, Appendix B (reproduced here as Appendix D). This appendix establishes minimum performance specifications that the NO monitoring system must meet in terms of eight parameters: accuracy, calibration error, 2- and 24-hour zero drifts, 2- and 24-hour calibration drifts, response time, and operational period.

The continuous-monitor system was installed and instruments were initially calibrated on March 13, 1979. The following day the monitor performance certification began. A daily event schedule for the certification tests is presented in Table 3-1.

The performance of the continuous monitor is summarized in Table 3-2. Also shown in the table are the monitor specifications extracted from PS2 and PS3. Included in this table is the performance of the CO analyzers which is

TABLE 3-1. SCHEDULE OF CERTIFICATION TEST EVENTS

Date	Time	Event
3/14/79	1000	Initial 24-hour zero and span reading.
3/15/79	1000	Initial 2-hour zero and span reading.
3/15/79	1200	1st 2-hour zero and span drift point.
3/15/79	1400	2nd 2-hour zero and span drift point.
3/15/79	1600	3rd 2-hour zero and span drift point.
3/15/79	1800	4th 2-hour zero and span drift point.
3/15/79	2000	5th 2-hour zero and span drift point.
3/15/79	1000	1st 24-hour zero and calibration drift point. Initial 2-hour zero and calibration reading - 2nd day.
3/16/79	1200	6th 2-hour zero and span drift point.
3/16/79	1400	7th 2-hour zero and span drift point.
3/16/79	1600	8th 2-hour zero and span drift point.
3/16/79	1800	9th 2-hour zero and span drift point.
3/16/79	1000	2nd 24-hour zero and calibration drift point.
3/17/79	1000	3rd 24-hour zero and calibration drift point.
3/18/79	1000	4th 24-hour zero and calibration drift point.
3/19/79	1000	5th 24-hour zero and calibration drift point.
3/19/79	1050	1st set of relative accuracy samples taken.
3/19/79	1150	2nd set of relative accuracy samples taken.
3/19/79	1200	10th 2-hour zero and span drift point.
3/19/79	1250	3rd set of relative accuracy samples taken.
3/19/79	1355	4th set of relative accuracy samples taken.
3/19/79	1400	11th 2-hour zero and span drift point.
3/19/79	1455	5th set of relative accuracy samples taken.
3/19/79	1555	6th set of relative accuracy samples taken.
3/19/79	1600	12th 2-hour zero and span drift point.
3/19/79	1655	7th set of relative accuracy samples taken.
3/19/79	1755	8th set of relative accuracy samples taken.
3/19/79	1800	13th 2-hour zero and span drift point.
3/19/79	1855	9th set of relative accuracy samples taken.
3/20/79	1000	6th 24-hour zero and calibration drift point.
3/20/79	1100	Instrument response time tests.
3/20/79	1200	14th 2-hour zero and span drift point.
3/20/79	1400	15th 2-hour zero and span drift point.
3/20/79	1500	Calibration error determination.
3/21/79	1000	7th and final 24-hour zero and calibration drift point.
4/19/79	4930	Relative accuracy samples taken, 3/19 series duplicated.

TABLE 3-2. INSTRUMENT SPECIFICATIONS AND PERFORMANCE

Parameter		Specifications*	Performance
A. Thermo Electron Series 10 NOx Analyzer			
1. Accuracy		≤ 20% of mean ref. value	8.72%
2. Calibration error	mid	≤ 5% cal gas value	4.30%
	high	≤ 5% of cal gas value	3.40%
3. Zero drift (2-hour)		2% of span	0.88%
4. Zero drift (24-hour)		2% of span	1.68%
5. Calibration drift (2-hour)		2% of span	1.68%
6. Calibration drift (24-hour)		2.5% of span	1.08%
7. Response time		15-minute maximum	5.5 sec.
8. Operational period		168-hour minimum	
B. Horiba Instruments PIR 2000 CO_2 Analyzer			
1. Zero drift (2-hour)		≤ 0.4 pct CO_2	0 %
2. Zero drift (24-hour)		≤ 0.5 pct CO_2	0.04%
3. Calibration drift (2-hour)		≤ 0.4 pct CO_2	0.13%
4. Calibration drift (24-hour)		≤ 0.5 pct CO_2	0.34%
5. Response time		10 minutes	4.2 sec.
6. Operational period		168-hour minimum	
C. Beckman Instruments Model 742 O_2 Analyzer			
1. Zero drift (2-hour)**		≤ 0.4 pct O_2	DNA
2. Zero drift (24-hour)**		≤ 0.5 pct O_2	DNA
3. Calibration drift (2-hour)		≤ 0.4 pct O_2	0.09
4. Calibration drift (24-hour)		≤ 0.5 pct O_2	0.25%
5. Response time		10 minutes	10.1 sec.
6. Operational period		168-hour minimum	
D. Horiba Instruments PIR 2000 CO Analyzer			
1. Calibration error	mid	≤ 5% of cal gas value	4.8%
	high	≤ 5% of cal gas value	1.4%
2. Zero drift (2-hour)		2% of span	0.12%
3. Zero drift (24-hour)		2% of span	0.23%
4. Calibration drift (2-hour)		2% of span	0.17%
5. Calibration drift (24-hour)		2.5% of span	0.39%
6. Response time		15-minute maximum	8.5 sec.
7. Operational period		168-hour minimum	

*Performance specifications from 40 CFR 60, Appendix B, reproduced here as Appendix D.
**Instrument has no zero adjustment.

not covered by the performance specification. The CO analyzer is used to monitor the combustion conditions in the boiler since it is a very sensitive indicator of combustion performance. Tables C-1 through C-18, Appendix C, show the performance of each of the analyzers for the certification tests.

The data presented in Table 3-2 show analyzers in the continuous monitor bettered the performance specification values for each parameter for each instrument.

Certified calibration gases were obtained from Scott Environmental Technology Inc. The calibration gases included 50 percent and 90 percent span gases for the NO, CO_2, CO, and O_2 analyzers, and a zero gas. In addition to the certified analysis supplied by the vendor, sample flasks were taken for each calibration gas and sent to an independent laboratory for analysis.

Relative accuracy tests for the NO analyzer were performed as outlined in PS2 using EPA Reference Method 7 (phenoldisulfonic acid [PDS] colorimetric) as the standard. Nine sets of three PDS flasks were collected at one-hour intervals at the beginning and end of the 30-day test period. At the fifteenth day, an abbreviated series of six flasks were taken. All sample flasks were returned to an independent laboratory for analysis. The results of the relative accuracy determination are shown in Tables C-17 and C-18 for the start and end of the 30-day tests. Both tests showed that the NO instrument greatly bettered the accuracy requirements of PS2. The relative accuracy of the Thermo Electron NO analyzer was about 8 percent based on the first test series and about 10.5 percent based on the final test series. The relative accuracy requirement published in PS2 is $\leq$ 20 percent of mean reference value.

3.2 RESIDUAL-OIL-FIRED BOILER TESTS

The continuous monitor was installed by KVB personnel on March 13, 1979, at Site 2, a residual-oil-fired water tube boiler. A single unheated 9.5 mm (3/8-inch) nylon sample line was strung from the duct downstream of the combustion air preheater to the continuous monitor. A single stainless steel filter was installed on the centerline of the duct. Particulate samples were taken from three ports on the side of the duct.

The boiler was initially tested in the as-found condition on March 15, 1979. The boiler load during this test was 16.1 MW thermal input (55,000 lb steam/hr). All burners were in service at this time.

Following the tests in the as-found condition, boiler operation was adjusted, under KVB supervision, to the low NO_x configuration. The top burner in the triangular arrangement was taken out of service. All air registers remained 100 percent open.

Triplicate Method 5 particulate tests were completed after boiler operation in the low NO_x mode stabilized. Triplicate Method 5 measurements under low NO_x operation were also made at the end of the 30-day test period. Method 5 particulate tests were also conducted with all burners in service. During one low NO_x particulate test and one baseline test, samples were collected for POM analysis. The method for collecting this sample was described in paragraph 2.1.3.

Fuel oil samples were collected periodically and submitted to an independent laboratory for analysis. Fuel samples were taken each time a particulate test was made and each time an oil delivery or change of tanks occurred.

A daily summary of the gaseous emissions observations is presented in Table 3-3 for each day of testing. In addition to the strip chart recording of each analyzer, readings were taken five times daily beginning at 0800. Boiler operating data were recorded four times daily and a 24-hour record of steam flow was obtained. A control room data sheet for this test site is included in Appendix B.

3.2.1 Gaseous Emissions

The boiler at Site 2 was tested during a previous EPA-sponsored program (Reference 1). During the previous tests the effect of boiler load on NO_x emissions was determined over a range of thermal output of 11.7 to

TABLE 3-3. SUMMARY OF OBSERVATIONS, COMMENTS AND GASEOUS AND PARTICULATE EMISSIONS SITE 2, RESIDUAL-OIL-FIRED BOILER

Date	Steam Flow MW	Steam Flow 10^3 lb/hr	O_2 % dry	CO_2 % dry	NO ppm	NO ng/J	CO ppm	CO ng/J	Particulate lb/10^6 Btu	Particulate ng/J	Opacity %	Stack Temp °F	Comments
3-14	16.4	56.0	8.8	8.5	281	158	Instrument		0.0551	23.676	0	440	Baseline, all burners firing
3-15	16.1	55.0	8.9	9.5	252	142	out of		0.0475	20.409	0	440	Baseline, part test 1-1, 1-2, all burners firing
3-16	16.0	54.7	8.3	11.2	186	104	Service		0.0849	36.521	4	458	Baseline of BOOS[a] Particulate test 2-1
3-17	15.3	52.2	7.5	12.2	239	134							
3-18	18.1	61.8	8.3	9.6	240	135			0.0760	32.666		460	BOOS, All burners firing
3-19	16.4	55.9	7.8	12.0	194	109			0.0653	28.084	1	455	Particulate tests 2-2, 2-3, PDS, BOOS
3-20	16.6	56.8	7.6	12.8	167	94					0		BOOS
3-21	16.6	56.5	7.5	10.5	165	93					0		BOOS
3-22	16.4	56.0	7.6	10.2	170	96					0		BOOS
3-23	16.6	56.8	7.6	9.9	166	93					0		BOOS
3-24	16.4	56.0	8.3	9.7	194	109							BOOS
3-25	16.3	55.8	8.3	9.7	138	77							BOOS
3-26	16.4	56.0	7.8	10.2	180	101					4		BOOS
3-27	16.6	56.8	7.9	10.4	148	83							Technician ill, BOOS
3-28	16.5	56.3	7.9	10.2	180	101					0		Vacuum pump out NO_x 5 hr avg, BOOS
3-29	9.7	33.0	10.7	7.7	I.O.O.S.	-					4		Vacuum pump out, low load, BOOS, High O_2
3-30	12.6	43.0	10.3	8.8	220	124					0		Low load, High O_2, BOOS
3-31	13.9	47.4	10.2	8.2	218	122							Low load, High O_2
4-1	13.6	46.4	11.2	7.4	226	127							Low load, High O_2, BOOS
4-2	15.8	53.8	8.0	9.7	161	90					3		BOOS
4-3	16.1	55.0	8.6	9.9	I.O.O.S.	-					3		BOOS
4-4	16.0	54.8	7.3	10.1	161	90					0		BOOS
4-5	16.0	54.5	7.2	10.1	163	92					0		BOOS
4-6	16.3	55.8	6.9	10.2	161	90	21	7			1		BOOS
4-7	17.2	58.7	7.1	10.4	187	105							All burners firing
4-8	20.6	70.3	6.3	10.5	230	129							All burners firing
4-9	21.2	72.5	6.55	10.7	223	125	19	6			7		High load
4-10	20.2	69.0	7.7	9.9	234	132	17	6			9		High load, all burners firing
4-11	13.9	47.5	10.0	7.9	232	130	22	8			9		High load, High O_2, BOOS
4-12	16.3	55.7	7.6	10.0	216	121	20	7			8		High load, all burners firing
4-13	19.6	66.8	9.2	8.4	243	137	23	8			10		High load, all burners firing
4-14	18.5	63.1	7.0	10.0	252	141							All burners firing
4-15	18.9	64.5	7.3	10.1	209	117							All burners firing
4-16	19.7	67.3	7.5	10.1	242	136	19	6			3		All burners firing
4-17	16.4	56.0	7.6	9.9	224	126	19	6	0.0757	32.557	11	435	All burners firing particulate/ POM 1-3
4-18	16.8	57.5	8.1	9.7	165	93	25	9	0.1088	46.785	4	428	Particulate/POM test 2-4, BOOS
4-19	16.5	56.3	8.0	9.8	164	92	25	9	0.1038 0.0882	44.650 37.943	2	428 439	Particulate 2-5, 2-6, BOOS PDS flasks

[a]BOOS: Burner out of service

23.1 MW (40,000 to 79,000 lb/hr steam flow). These data are shown in Figure D-1 in Appendix D which shows that the maximum NO_x levels occur at approximately 19.6 MW (67,000 lb/hr steam flow). The maximum NO_x level measured was 245 ppm (3 percent O_2, dry). The NO_x level at 17.6 MW (60,000 lb/hr), the test condition for one burner out of service, was 240 ppm.

During this program, no provision was included for evaluating the effect of various operating parameters on NO_x emissions. Instead, the conditions previously determined to yield low NO_x operation were duplicated as nearly as possible. The boiler was tested in the as-found condition at the initiation of the test program. Since the maximum capacity of the boiler with one burner out of service is approximately 16.4 MW (56,000 lb/hr steam flow) the boiler was tested in the as-found conditions at this load.

The effect of excess oxygen on NO_x emissions is shown in Figure 3-1 for the boiler at Site 2. Excess oxygen was not intentionally varied, but normal operation resulted in some variation in excess oxygen due to operator technique and the lack of sufficient instrumentation and controls to accurately hold a given excess air condition. The lower curve corresponds to operation with one burner out of service (staged combustion air). The upper curve represents the condition where all burners are firing normally. The solid points in the upper curve are at a higher load condition: 19.6 to 21.1 MW (67,000 to 72,000 lb steam/hour). As the previous data showed, operation at higher load resulted in about a 5 ppm increase over the test load condition.

Over the 30-day period during which the test was performed, there were occasions where the demand was greater than the boiler could provide with one burner out of service. The operators then put the third burner back in service. As a result, the 30-day average represents operation in the low NO_x mode except for the periods when steam demand precluded staged combustion.

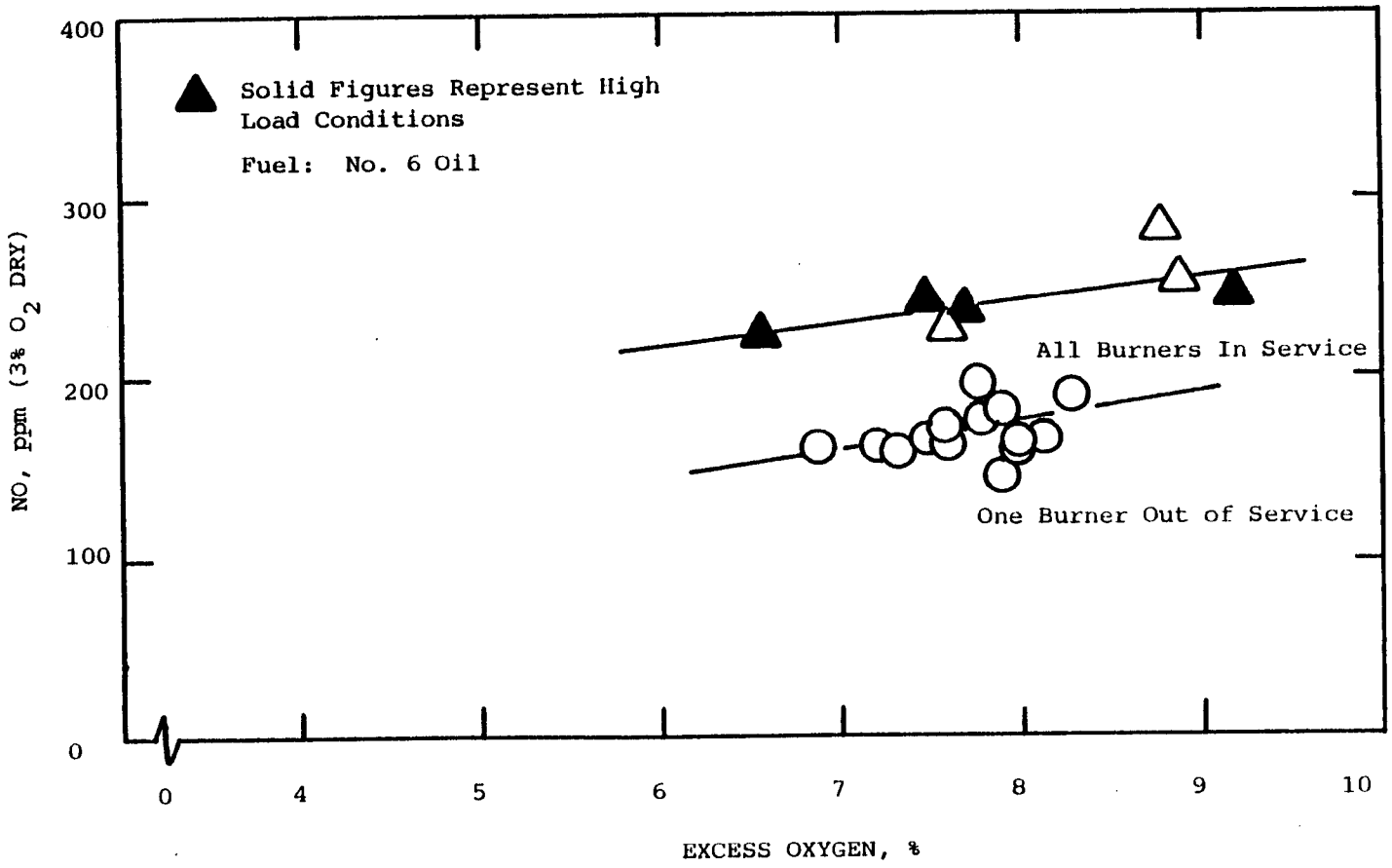


Figure 3-1. The Effect of Excess Oxygen on NO Emissions Site 2 - Residual-Oil-Fired Boiler.

3.2.2 Particulate Emissions

The results of the particulate tests conducted at Site 2 are presented in Table 3-4 for the baseline and low NO_x test conditions. Two of the tests were also used for collecting samples for analysis of polycylic organic matter (POM) by modifying the EPA Method 5 train as described in paragraph 2.1.3. The average particulate loading for baseline conditions, all burners firing, was measured at 25.6 ng/J (0.0594 $lb/10^6$ Btu). The average particulate in the low NO_x condition, one burner out of service, was 37.8 ng/J (0.0878 $lb/10^6$ Btu). The average particulate loading increased 48 percent due to operation in the low NO_x mode.

Visual inspection of the particulate filter in the sampling train showed a much darker particulate deposit, indicating that the particulate contained considerable unburned carbon in the low NO_x mode.

The particulate data for this test site were plotted as a function of excess oxygen in the stack. Figure 3-2 shows particulate loading as a function of stack excess oxygen. The data indicate that particulate loading is not a function of excess oxygen alone. It can also be seen from these data that operation in the low NO_x mode with one burner out of service results in higher particulate loading.

3.2.3 POM Emissions

Samples were collected for analysis of polycyclic organic matter (POM) using a Method 5 sampling train with XAD-2, a POM absorber, inserted. Sample time was extended to two hours to provide a large enough sample for Battelle to analyze. Following the sampling period, the organic resin module was sealed and returned to Battelle Columbus Laboratories for analysis. The sampling probe and glassware were washed with a 50-50 mixture of methylene chloride and methanol per Battelle instructions. The filter and wash were also sent to Battelle following weighing.

These samples were analyzed by capillary-EI GC-MS utilizing a 30M SE-52 column with hydrogen as a carrier gas. All data were collected by single ion monitoring to improve selectivity and sensitivity.

TABLE 3-4. PARTICULATE DATA SUMMARY FOR SITE 2
RESIDUAL-OIL-FIRED BOILER

Test No.	Date 1979	Load MW	Load 10^3 lb/hr	O_2 %	Opacity %	Particulate ng/J	Particulate $lb/10^6$ Btu	Description
1-1	3-15	16.1	55	8.9	0	20.4	0.0475	Baseline
1-2	3-15	16.1	55	9.0	0	23.7	0.0551	Baseline
2-1	3-16	16.1	55	8.1	3	36.5	0.0849	Low NO_x
2-2	3-19	16.4	56	7.7	2	28.1	0.0653	Low NO_x
2-3	3-19	16.4	56	7.4	2	32.7	0.0760	Low NO_x
1-3	4-17	16.4	56	7.6	11	32.6	0.0757	Baseline/POM
2-4	4-18	17.0	58	8.1	3	46.8	0.1088	Low NO_x/POM
2-5	4-19	16.4	56	7.8	2	44.6	0.1038	Low NO_x
2-6	4-19	16.4	56	8.0	2	37.9	0.0882	Low NO_x

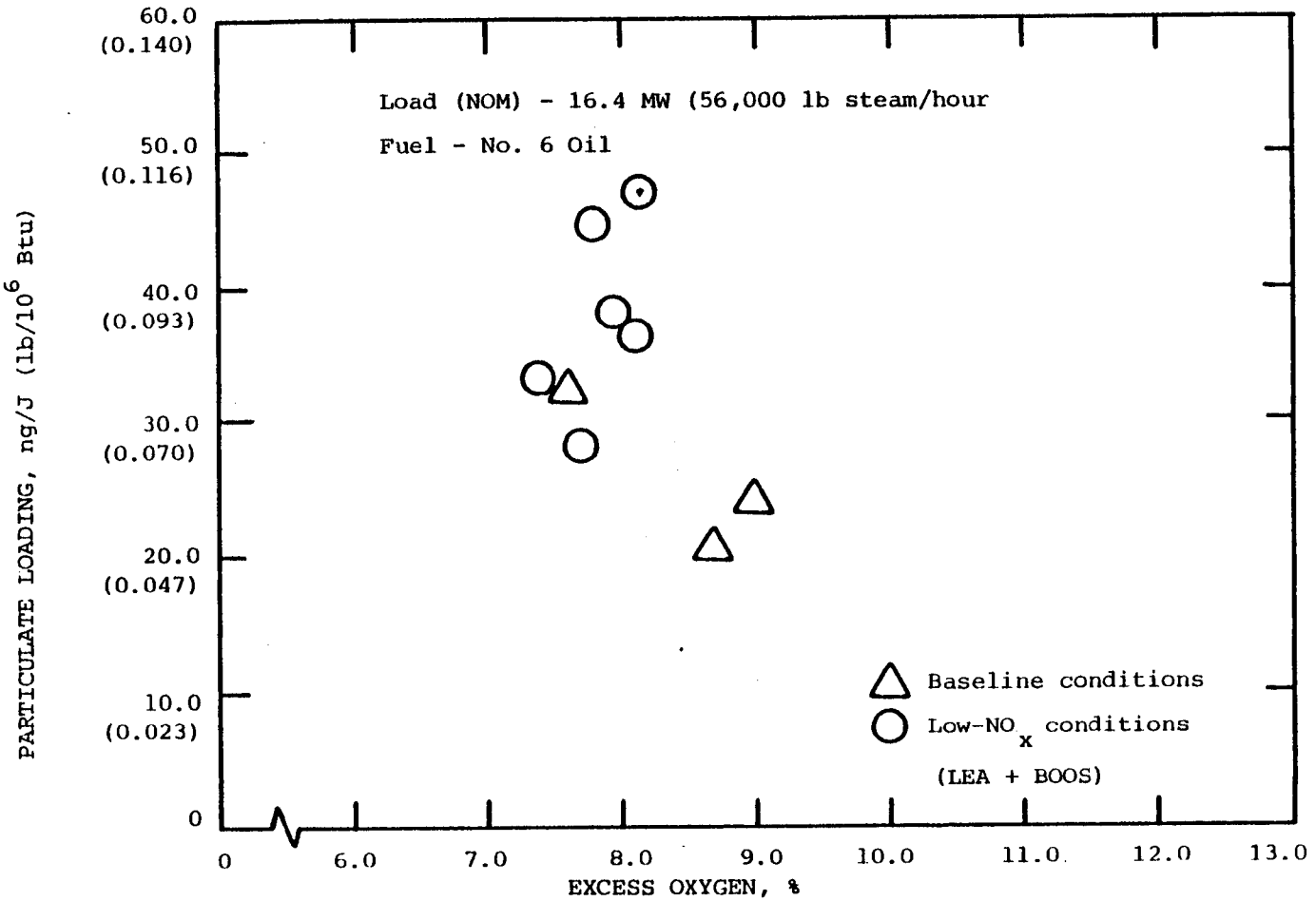


Figure 3-2. Particulate Loading vs. Stack Excess Oxygen for 30-Day Test Location 6017-2

The results of the analyses are presented in µg per total sample. The quantitative detection limit was 0.5 µg; thus samples with POM present at levels lower than this are reported as <0.5 µg (the standard deviation at lower levels was prohibitively high for accurate quantification). Samples reporting POM values of ND (none detected) are at a level of less than 0.1 µg (the approximate qualitative detection limit). The standard deviation on points around 0.5 µg averaged ±20 percent. At levels around 5 µg it averaged ±15 percent, and at levels above 12 µg the standard deviation averaged ±10 percent.

The results of the Battelle analyses are presented in Table 3-5 for the low NO_x and baseline operating conditions. The first three columns present the data for the low NO_x test; the last three columns represent the baseline condition. The XAD-2 module was analyzed separately, with the filter and probe wash samples combined for analysis.

The data indicate a slightly lower (18 to 30 percent) concentration of POM when operating in the low NO_x mode. The only components with significant levels are phenanthrene, anthracene, and methyl anthracenes/phenanthrenes. POM accounted for less than 0.01 percent of the total particulate.

3.2.4 Boiler Efficiency

Boiler efficiency calculations were made for as-found and low NO_x operating conditions. The ASME Abbreviated Efficiency Test method was used to determine the boiler efficiency. This test method is described in Appendix A.

Fuel oil samples were collected during each particulate test and when oil shipments were received or tanks changed. Fuel oil samples were submitted to an independent laboratory for ultimate and heating value analyses. The results of the fuel oil analyses are tabulated in Table 3-6. The data, tabulated chronologically, indicate that oil properties did not change significantly during the test period.

Table 3-7 presents a summary of boiler efficiency measurements made at baseline and low NO_x conditions. The average boiler efficiency under baseline conditions (all burners firing) was 81.9 percent; average efficiency under low NO_x conditions (one burner out of service) was 82.6 percent or an average increase of 0.7 percent.

Table 3-5. SUMMARY OF POM ANALYSES FOR SITE 2 - RESIDUAL-OIL-FIRED BOILER

	BASELINE TEST						LOW NOx TEST					
	XAD-2 MODULE		FILTER AND PROBE WASH		TOTAL		XAD-2 MODULE		FILTER AND PROBE WASH		TOTAL	
POM	µg	µg/m^3	µg	µg/m^3	µg	µg/m^3	µg	µg/m^3	µg	µg/m^3	µg	µg/m^3
Phenanthrene	1.8	1.04	1.6	0.92	3.4	1.96	1.2	0.68	1.7	0.97	2.9	1.66
Anthracene	0.9	0.52	ND	ND	0.9	0.52	<0.5	<0.28	ND	ND	<0.5	<0.28
Methyl Anthracenes/Phenanthrenes	3.6	2.07	1.3	0.75	4.9	2.82	3.2	1.83	0.6	0.34	3.8	2.17
Fluoranthene	0.5	0.29	<0.5	<0.29	0.5<1.0	0.29<0.58	<0.5	<0.28	<0.5	<0.28	<1.0	<0.57
Pyrene	0.6	0.34	<0.5	<0.29	0.6<1.1	0.34<0.63	<0.5	<0.28	<0.5	<0.28	<1.0	<0.57
Methyl Pyrene/Fluoranthene	<0.5	<0.29	<0.5	<0.29	<1.0	<0.58	<0.5	<0.28	ND	ND	<0.5	<0.28
Benzo[c]phenanthrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benz[a]anthracene	<0.5	<0.29	<0.5	<0.29	<1.0	<0.58	<0.5	<0.28	<0.5	<0.28	<1.0	<0.57
Chrysene	0.6	0.34	<0.5	<0.29	0.6<1.1	0.34<0.63	<0.5	<0.28	<0.5	<0.28	<1.0	<0.57
Methyl Chrysenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dimethylbenzanthracenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzofluoranthenes	0.9	0.52	ND	ND	0.9	0.52	0.8	0.46	<0.5	<0.28	0.8<1.3	0.46<0.74
Benz[e]pyrene	0.7	0.40	ND	ND	0.7	0.40	<0.5	<0.28	<0.5	<0.28	<1.0	<0.57
Benz[a]pyrene	ND	ND	ND	ND	ND	ND	ND	ND	<0.5	<0.28	<0.5	<0.28
Perylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Indeno-pyrene	<0.5	<0.29	<0.5	<0.29	<1.0	<0.58	ND	ND	ND	ND	ND	ND
Benzo[ghi]perylene	<0.5	<0.29	<0.5	<0.29	<1.0	<0.58	<0.5	<0.28	<0.5	<0.28	<1.0	<0.57
3-Methylcholanthrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzanthracenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzpyrenes	ND	ND	0.5	0.29	0.5	<0.29	ND	ND	0.5	0.28	0.5	<0.28
Coronene	<0.5	<0.29	0.7	0.40	0.7<1.2	0.4<0.69	0.5	<0.28	0.5	0.28	0.5<1.0	0.28<0.57
Sample Volume	1.739						1.751					

TABLE 3-6. SUMMARY OF FUEL OIL ANALYSES FROM SITE 2, RESIDUAL-OIL-FIRED BOILER

	Dates and Sample Numbers		
	3-15-79 1	3-16-79 2	3-19-79 3
Carbon, %	85.78	85.82	85.86
Hydrogen, %	12.26	12.16	12.14
Nitrogen, %	0.27	0.28	0.28
Sulfur, %	0.97	0.93	0.94
Ash, %	0.021	0.027	0.027
Oxygen (by difference), %	0.70	0.78	0.75
API Gravity at 60°F	21.6	21.6	21.6
Gross Heat of Combustion, Btu/lb	18,950	19,000	18,960
Net Heat of Combustion, Btu/lb	17,830	17,890	17,850
	3-20-79 4	4-12-79 5	4-17-79 6
Carbon, %	85.76	86.21	86.24
Hydrogen, %	12.03	12.08	12.10
Nitrogen, %	0.24	0.24	0.24
Sulfur, %	0.99	0.85	0.88
Ash, %	0.028	0.026	0.025
Oxygen (by difference), %	0.95	0.59	0.52
API Gravity at 60°F	21.7	20.9	21.9
Gross Heat of Combustion, Btu/lb	19,000	19,050	19,020
Net Heat of Combustion, Btu/lb	17,900	17,950	17,920
	4-18-79 7	4-18-79 8	4-19-79 9
Carbon, %	86.00	85.97	85.85
Hydrogen, %	12.06	11.97	11.97
Nitrogen, %	0.27	0.27	0.28
Sulfur, %	0.96	0.96	1.02
Ash, %	0.024	0.024	0.024
Oxygen (by difference), %	0.69	0.81	0.86
API Gravity at 60°F	21.2	20.7	20.9
Gross Heat of Combustion, Btu/lb	19,000	18,980	19,040
Net Heat of Combustion, Btu/lb	17,900	17,890	17,950

TABLE 3-7. SUMMARY OF BOILER EFFICIENCY CALCULATIONS FOR SITE 2, RESIDUAL-OIL-FIRED BOILER

Test No. Date	1-1 3/15/79	1-2 3/15/79	2-1 3/16/79	2-2 3/19/79	2-3 3/19/79	1-3 4/17/79	2-4 4/18/79	2-5 4/19/79	2-6 4/19/79
Test Load									
10^3 lb/hr	55	55	55	56	56	56	58	56	56
MW	16.1	16.1	16.1	16.4	16.4	16.4	17.0	16.4	16.4
% of Capacity	61.11	61.11	61.11	62.22	62.22	62.22	64.44	62.22	62.22
Stack O_2, %	8.9	8.9	7.5	7.8	7.8	7.6	8.1	8.0	8.0
Stack CO, ppm	I.O.O.S.	I.O.O.S.							0.0
Stack Temp. (K/°F)	500/440	500/440	510/458	508/455	511/460	497/435	493/428	493/428	499/439
Ambient Temp. (K/°F)	294/70	294/70	294/70	294/70	294/70	294/70	294/70	294/70	294/70
Boiler Heat Losses									
Dry Gas, %	10.58	10.58	10.42	8.79	8.90	10.03	10.79	9.89	10.19
Moisture in Fuel, %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moisture from H_2, %	6.76	6.76	6.69	6.57	6.57	6.65	6.59	6.57	6.57
Combustibles, %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Radiation, %	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Losses, %	18.34	18.34	18.11	16.35	16.47	17.68	18.38	17.46	17.76
Boiler Efficiency, %	81.66	81.66	81.89	83.65	83.53	82.32	81.62	82.54	82.24

Average Baseline Efficiency $\bar{n}$ = 81.9%

Average Low NO_x Efficiency $\bar{y}$ = 82.6%

3.2.5 Data Reduction

The gaseous emissions data measured by the analyzers were recorded on strip chart recorders as described earlier. An automatic data logger was ordered but was not available for this 30-day test. The only alternative was manual reduction of strip chart records and punched cards for computer data input as was the case for Site 1. This procedure required a very large manpower effort to produce the data required for analysis.

Strip chart records were collected from the recorders along with copies of the appropriate control room data logs. The recorder charts were reviewed to detect any possible data gaps. In addition, the strip chart records were verified by comparison with measurements recorded by a technician on a two-hour basis.

A tabulation of 15-minute averages was compiled for the entire test period. After the data were compiled, they were spot checked and edited to detect obvious errors and anomalies. The data were then keypunched on cards for input to the computer. Figure 3-3 shows an example of the list of 15-minute averages. The entire list of 15-minute averages is presented in Appendix F.

After data editing was completed, 24-hour averages were calculated For an average to be valid, at least 75 percent of the 15-minute points in that interval had to be valid. Figure 3-4 shows a summary of the 24-hour averages for the 30-day test at Site 1.

A statistical summary was prepared to determine the following parameters for the 24-hour averages: mean, standard deviation, maximum, minimum, range, and average deviation. These parameters were calculated assuming the data were normally distributed. The 24-hour averages were tabulated in ascending order and divided into 10 groups. A frequency histogram was then prepared. Table 3-8 presents the frequency distribution of the 24 hour averages of NO emissions of all data. These data were then plotted to determine the distribution. When the data were plotted on normal probability paper (Figure 3-5) it was apparent that the data were not normally

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/14/79	1215	11.4	9.6	7.9	162.	257.	142.
3/14/79	1230	11.4	9.7	7.9	161.	258.	142.
3/14/79	1245	11.4	9.7	7.9	156.	249.	137.
3/14/79	1300	11.4	9.7	7.9	153.	246.	136.
3/14/79	1315	13.6	9.6	8.3	165.	262.	145.
3/14/79	1330	13.6	9.1	8.7	173.	263.	145.
3/14/79	1345	13.6	8.5	8.9	184.	267.	147.
3/14/79	1400	13.6	8.4	8.9	186.	268.	148.
3/14/79	1415	16.3	8.3	8.9	189.	269.	148.
3/14/79	1430	16.3	8.4	8.9	191.	273.	151.
3/14/79	1445	16.3	8.3	8.9	193.	275.	152.
3/14/79	1500	16.3	8.3	8.9	196.	279.	154.
3/14/79	1515	16.4	8.3	8.9	199.	282.	156.
3/14/79	1530	16.4	8.3	8.9	200.	285.	157.
3/14/79	1545	16.4	8.3	8.9	203.	289.	159.
3/14/79	1600	16.4	8.3	8.9	203.	289.	159.
3/14/79	1615	16.4	8.4	8.9	191.	274.	151.
3/14/79	1630	16.4	8.5	8.9	191.	275.	151.
3/14/79	1645	16.4	8.5	8.9	191.	274.	151.
3/14/79	1700	16.4	8.5	8.9	190.	274.	151.
3/14/79	1715	16.3	8.5	8.8	190.	274.	151.
3/14/79	1730	16.3	8.5	8.8	189.	274.	151.
3/14/79	1745	16.3	8.5	8.8	189.	274.	151.
3/14/79	1800	16.3	8.6	8.8	188.	273.	150.
3/14/79	1815	16.3	8.6	8.8	186.	272.	150.
3/14/79	1830	16.3	8.6	8.8	185.	270.	149.
3/14/79	1845	16.3	8.7	8.8	183.	268.	148.
3/14/79	1900	16.3	8.6	8.8	182.	266.	147.
3/14/79	1915	16.3	8.6	8.8	180.	262.	144.
3/14/79	1930	16.3	8.6	8.9	179.	260.	143.
3/14/79	1945	16.3	8.5	8.9	178.	258.	142.
3/14/79	2000	16.3	8.5	8.9	177.	256.	141.
3/14/79	2015	16.3	8.5	8.9	176.	253.	140.
3/14/79	2030	16.3	8.5	8.9	173.	250.	138.
3/14/79	2045	16.3	8.5	8.9	172.	248.	137.
3/14/79	2100	16.3	8.5	8.9	172.	249.	137.
3/14/79	2115	16.1	8.5	8.9	172.	250.	138.
3/14/79	2130	16.1	8.5	8.9	173.	251.	138.
3/14/79	2145	16.1	8.5	8.8	173.	251.	138.
3/14/79	2200	16.1	8.6	8.8	171.	248.	137.
3/14/79	2215	16.1	8.5	8.8	173.	250.	138.
3/14/79	2230	16.1	8.5	8.8	180.	260.	143.
3/14/79	2245	16.1	8.5	8.8	182.	263.	145.
3/14/79	2300	16.1	8.5	8.8	185.	267.	147.
3/14/79	2315	16.1	8.5	8.8	189.	274.	151.
3/14/79	2330	16.1	8.5	8.8	191.	277.	153.
3/14/79	2345	16.1	8.6	8.7	194.	282.	156.
3/14/79	2400	16.1	8.7	8.7	197.	289.	159.

Figure 3-3. Format of 15-Minute Emissions Data, Site 6017-2

24 HOUR DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/14/79		15.2	8.7	8.7	181.	266.	147.
3/15/79		16.0	9.0	9.2	183.	274.	151.
3/16/79		15.4	8.5	10.9	163.	236.	130.
3/17/79		15.3	8.1	11.9	157.	220.	121.
3/18/79		18.1	8.1	10.5	196.	273.	151.
3/19/79		16.5	7.7	11.4	162.	219.	121.
3/20/79		16.7	7.6	12.6	152.	204.	112.
3/21/79		16.6	7.5	11.4	132.	175.	97.
3/22/79		16.5	7.6	10.1	121.	163.	90.
3/23/79		16.5	7.6	10.1	119.	160.	88.
3/24/79		16.4	7.9	9.8	132.	182.	100.
3/25/79		16.3	8.5	9.6	135.	195.	107.
3/26/79		16.4	8.0	9.9	132.	183.	101.
3/27/79		16.6	7.8	10.4	111.	151.	83.
3/28/79		16.6	7.9	10.4	119.	164.	90.
3/29/79		11.2	10.5	8.4	0.	0.	0.
3/30/79		12.9	10.5	7.9	125.	216.	119.
3/31/79		13.9	10.1	8.3	133.	220.	121.
4/ 1/79		13.6	10.8	7.7	121.	214.	118.
4/ 2/79		15.7	9.2	8.9	127.	196.	108.
4/ 3/79		16.1	8.1	9.9	117.	163.	90.
4/ 4/79		16.0	8.3	10.1	123.	176.	97.
4/ 5/79		16.3	7.3	10.1	126.	165.	91.
4/ 6/79		16.8	7.1	10.1	123.	160.	88.
4/ 7/79		17.2	6.8	10.4	153.	194.	107.
4/ 8/79		20.6	6.7	10.5	163.	205.	113.
4/ 9/79		20.7	6.3	10.6	187.	229.	126.
4/10/79		17.8	6.8	10.5	181.	230.	127.
4/11/79		13.9	10.1	8.2	132.	218.	120.
4/12/79		17.3	8.1	9.6	165.	231.	127.
4/13/79		19.2	8.8	9.3	158.	234.	129.
4/14/79		18.5	6.7	10.1	181.	229.	126.
4/15/79		18.9	7.2	10.0	166.	218.	120.
4/16/79		19.5	7.4	10.1	173.	230.	127.
4/17/79		17.0	7.7	10.0	161.	218.	120.
4/18/79		16.8	7.9	9.9	137.	190.	105.
4/19/79		16.7	9.2	9.7	121.	184.	101.

Figure 3-4. Summary of 24-hour Average Data

TABLE 3-8. NO EMISSIONS FREQUENCY DATA
SITE 2

Cell	Frequency	Cum. Frequency	Plot Percent
83- 89.80	3	3	8.1
89.81- 96.60	4	7	18.9
96.61-103.40	5	12	32.4
103.41-110.20	4	16	43.2
110.21-117.00	2	18	48.7
117.01-123.80	8	26	70.3
123.81-130.60	7	33	89.2
130.61-137.40	0	33	89.2
137.41-144.20	0	33	89.2
144.21-151.00	3	36	97.3

g (geometric dispersion) = 1.17

$\bar{x}$ (geometric median) = 110 ng/J

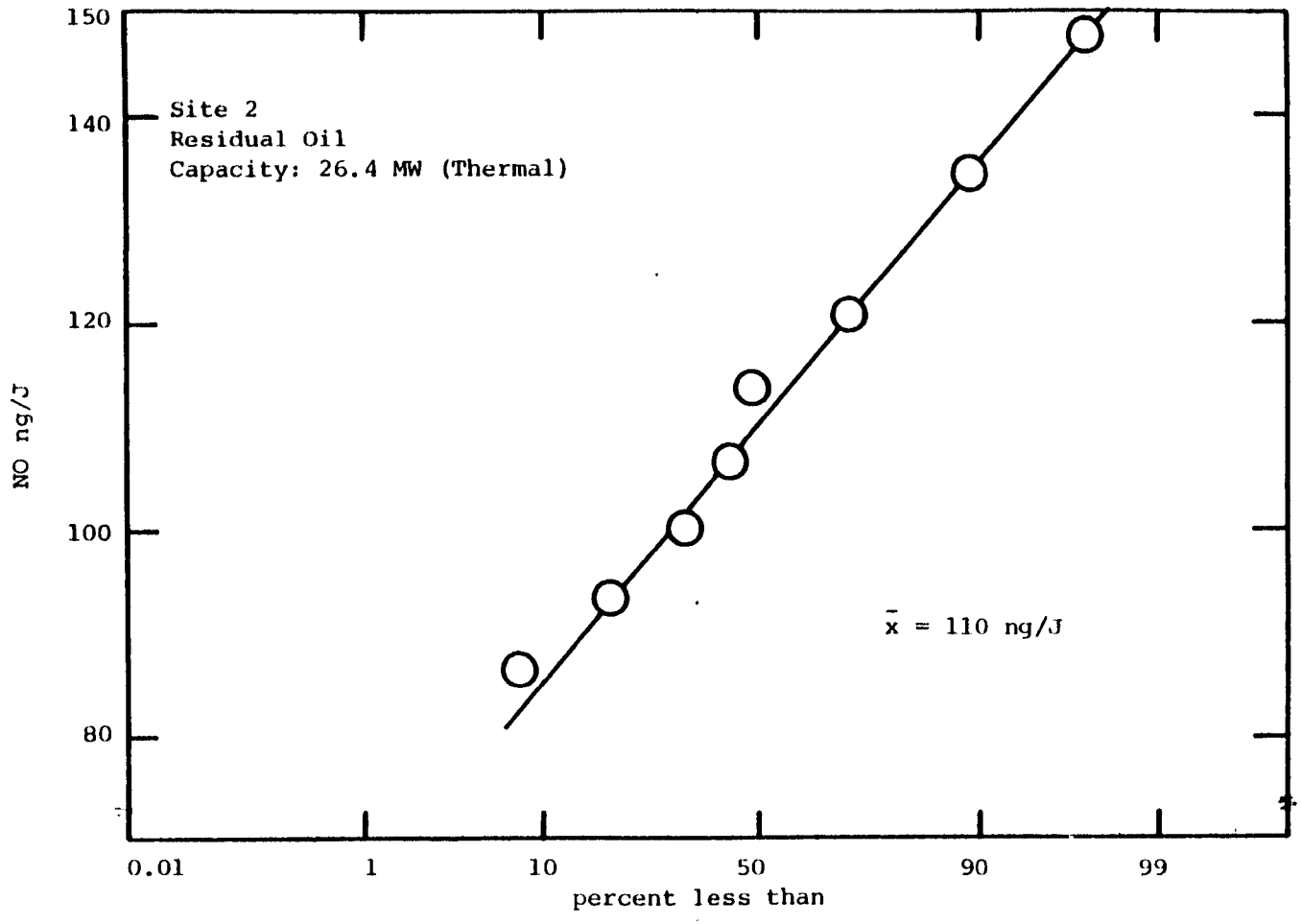


Figure 3-5. Normal-probability plot of 24-hour averages of NO emissions from a residual oil fired boiler.

distributed. Further analysis indicated that the data were log-normally distributed. The data and log sheets were reviewed to separate the emissions data into two groups corresponding to low NO_x firing conditions (one burner out of service) and normal operating conditions. Table 3-9 presents the frequency distribution of the boiler NO emissions while operating in the SCA condition. Table 3-10 shows the frequency distribution with the boiler operating in the normal mode. A log-normal plot of NO emissions is presented as Figure 3-6 for the residual oil fired boiler at Site 2 under low NO_x operating conditions. The graph shown in Figure 3-7 illustrates the performance of the residual oil fired boiler with all burners in service based on the 24-hour averages. The mean NO emission rate is 100 ng/J with a geometric dispersion of 1.12 while operating with SCA. The NO emission rate from the boiler while operating in the normal mode (all burners firing) was determined to be 130 ng/J with a geometric dispersion of 1.11.

A daily plot of the NO emissions is shown in Figure 3-8. This plot shows high levels in NO emissions when all burners are firing a large fraction of the day or when the excess O_2 level is high. Figure 3-9 presents a daily plot of excess O_2. High values of excess O_2 correspond to high NO emission rates, even if a burner is out of service. The high excess O_2 levels generally correspond to week-ends where KVB personnel were not on hand to advise the operational personnel on the excess air condition.

Staged combustion as a NO_x control technique resulted in a 23 percent reduction from the baseline value of 130 ng/J. Under low NO_x operation (SCA), 99 percent of the values were less than 130 ng/J. Under normal operating conditions, 99 percent of the values were less than 170 ng/J.

TABLE 3-9. FREQUENCY DATA FOR SITE 2 BOILER WITH SCA

Burner Status	Cell	Frequency	Cumulative Frequency	Percent Plot
2,3	81- 85	1	1	4
	86- 90	5	6	24
	91- 95	1	7	28
	96-100	3	10	40
	101-105	3	13	52
	106-110	3	16	64
	111-115	2	18	72
	116-120	2	20	80
	121-125	2	22	88
	126-130	2	24	96
	$\bar{x}$ = 100 ng/J	n = 24		
	g.d. = 1.12			

TABLE 3-10. FREQUENCY DATA FOR SITE 2 BOILER UNDER NORMAL FIRING CONDITIONS

Burner Status	Cell	Frequency	Cumulative Frequency	Percent Plot
1,2,3	118-120	2	2	15
	121-213	2	4	31
	125-126	2	6	46
	129-129	2	8	62
	130-132	2	10	77
	133-135	0	10	77
	136-138	0	10	77
	139-141	0	10	77
	142-144	0	10	77
	145-147	1	11	85
	148-150	0	11	85
	151-153	0	11	85
	154-156	1	12	92
	x = 130 ng/J			
	g.d. = 1.11			

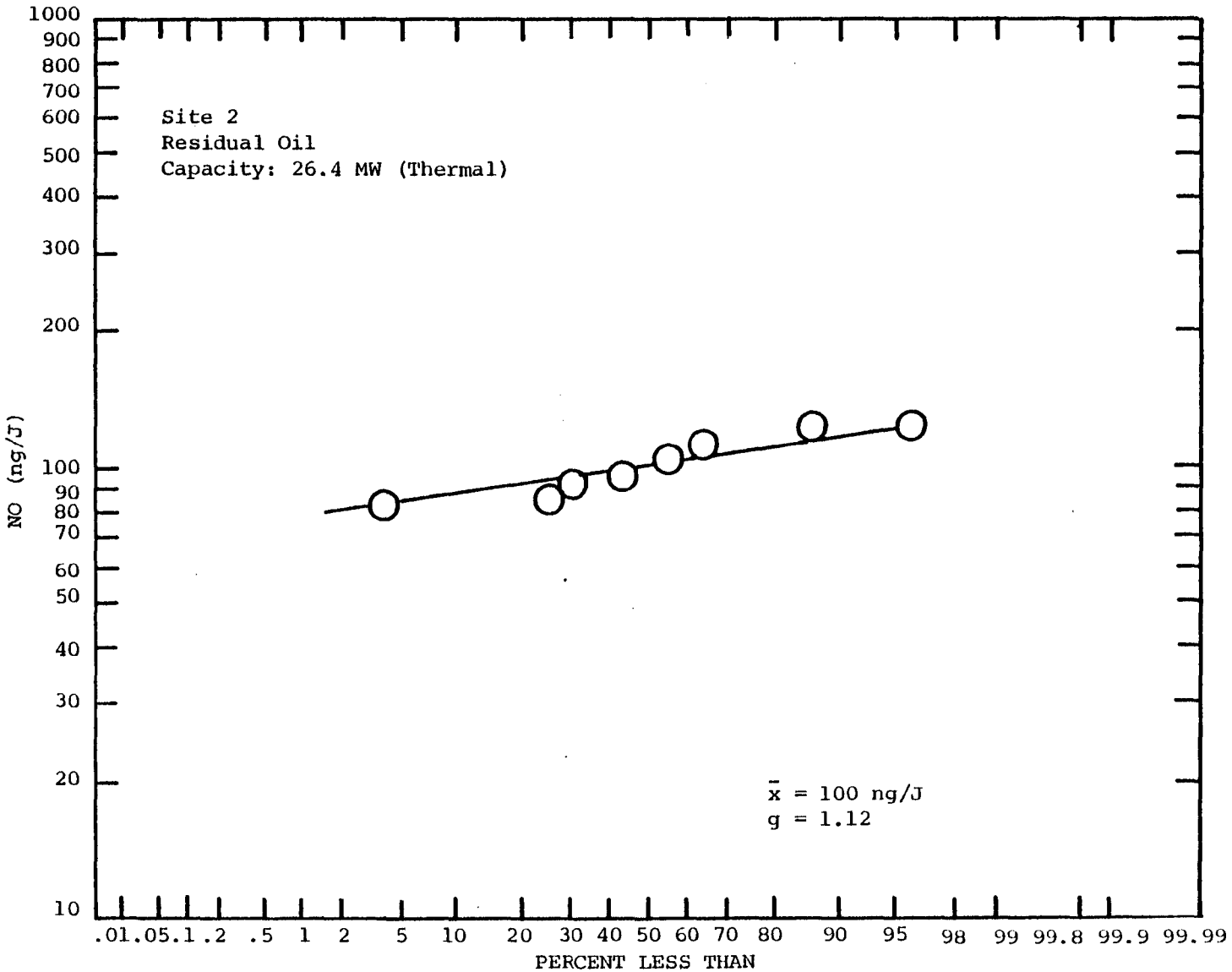
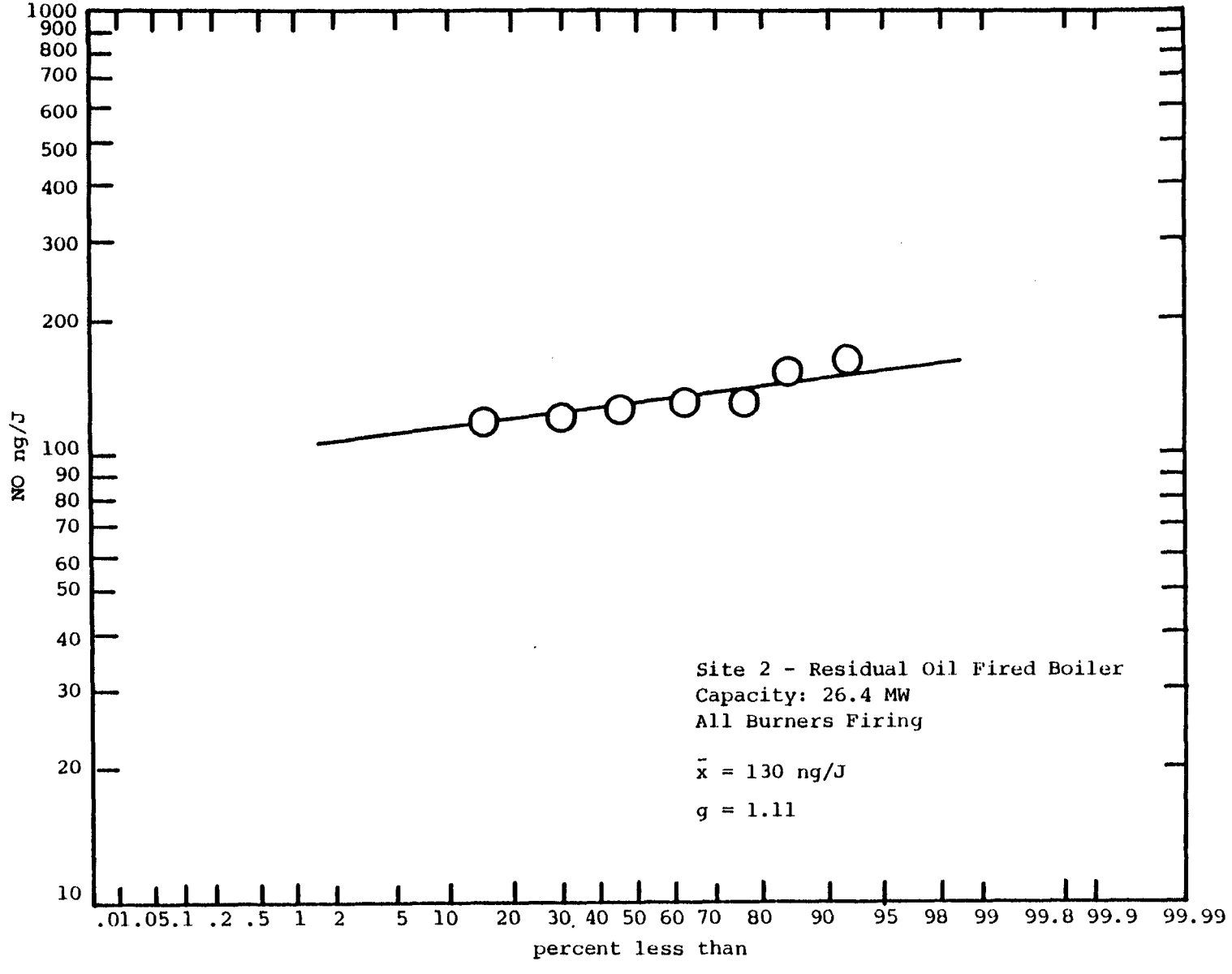


Figure 3-6. Log-Probability plot of 24-hour averages of NO Emissions from a Residual Oil Fired Boiler under low NO_x conditions.


1000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
10
ng/J NO
.01 .05 .1 .2 .5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.8 99.9 99.99
percent less than
Site 2 - Residual Oil Fired Boiler
Capacity: 26.4 MW
All Burners Firing
$\bar{x}$ = 130 ng/J
g = 1.11

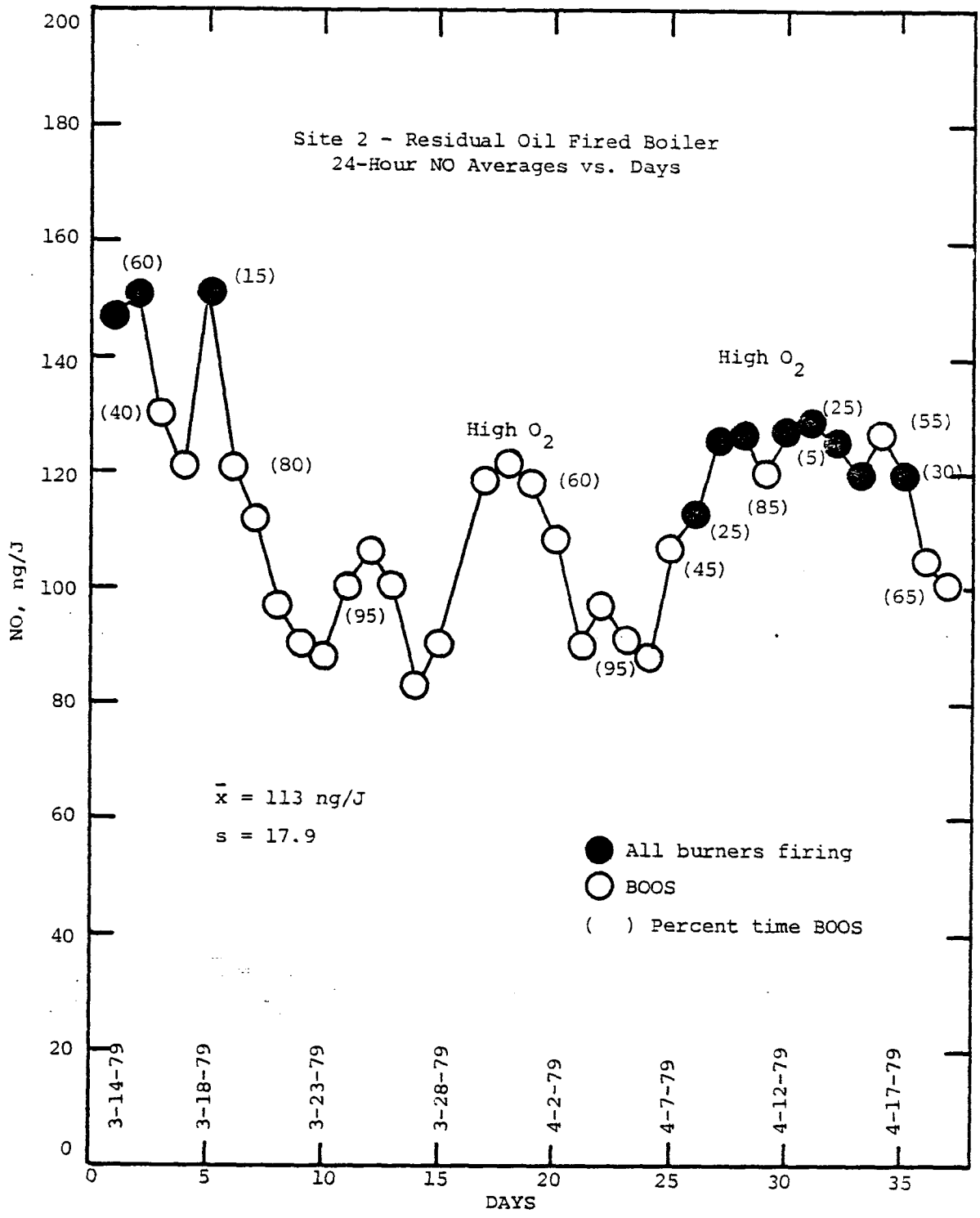


Figure 3-8. Daily Plot of NO Emissions

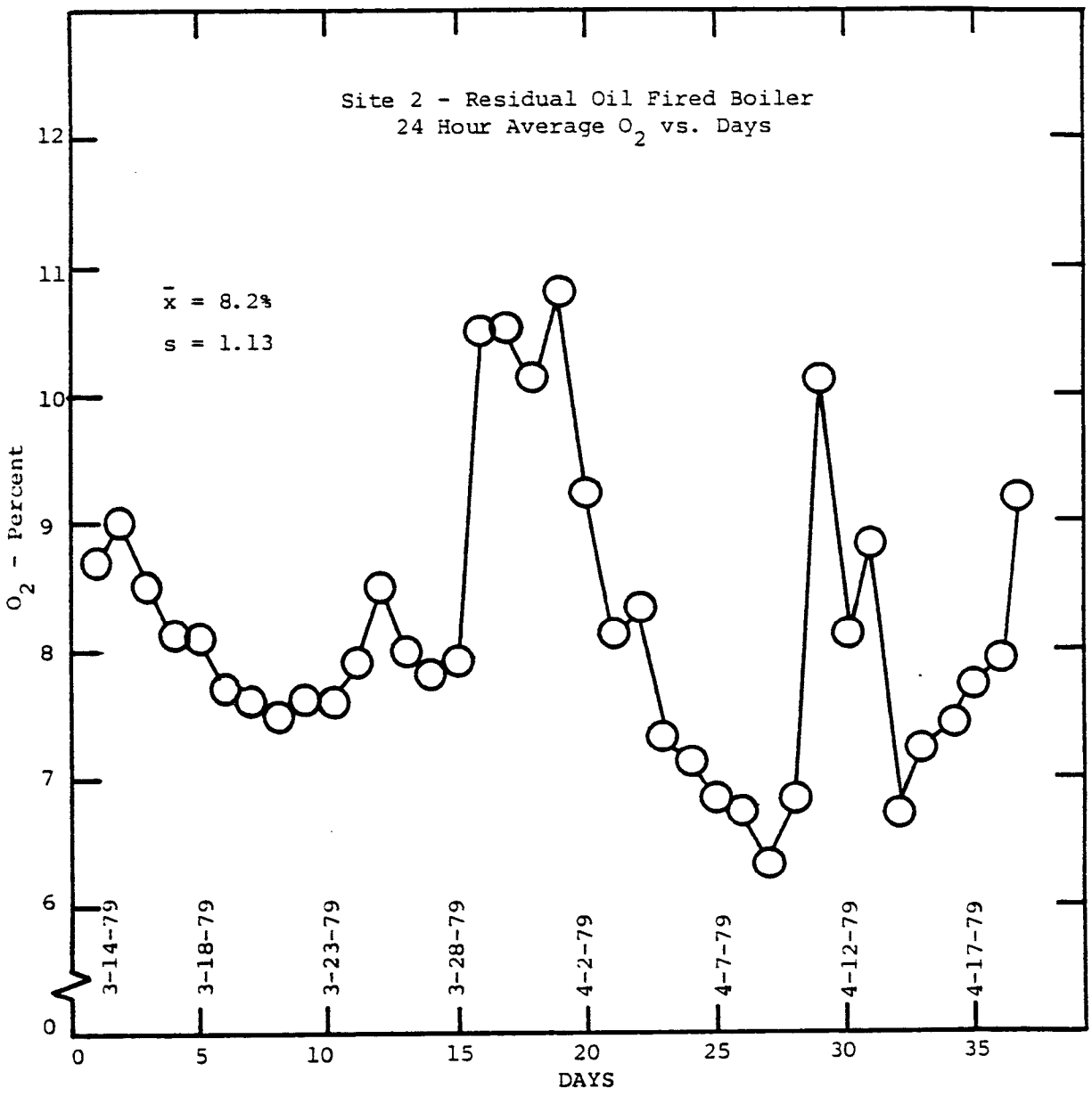


Figure 3-9. Daily Plot of Excess O_2

Emission factors for the residual oil fired boiler were calculated using the procedure set forth in 40CFR60, Subpart D. The NO emission factor (dry basis) was calculated using the following equation:

$$D = C_d F_d \frac{20.9}{20.9 - \% O_{2_d}}$$

Where E = Pollutant emission rate, ng/J (lb/million Btu)

C_d = NO concentration, ng/scm (lb/scf)

F_d = Stoichiometric conversion factor, 2.47×10^{-7} dscm/J (9,190 dscf/million Btu), for residual oil

O_{2_d} = Oxygen concentration, percent by volume, dry

The conversion of measured NO values (ppmv) to ng/scm is made by multiplying by 1.912×10^{6}. To convert from ppm to lb/scf, multiply by 1.19×10^{-7}.

NO_x emissions were measured as NO and the NO_x emission rates reported herein are calculated based on the molecular weight of NO_2.

SECTION 4.0

REFERENCES

1. Cato, G. A., et al., "Field Testing: Application of Combustion Modifications to Control Pollutant Emissions from Industrial Boilers - Phase I," EPA 650/2-74-078a, NTIS No. PB 238 920, June 1975.

2. Cato, G. A., et al., "Field Testing: Application of Combustion Modifications to Control Emissions from Industrial Boilers - Phase II," EPA 600/2-76-086a, NTIS No. PB 253 500, April 1976.

3. Maloney, K. L., et al., "Systems Evaluation of the Use of Low-Sulfur Western Coal in Existing Small and Intermediate-Sized Boilers," EPA Contract No. 68-02-1863, EPA 600/7-78-153a.

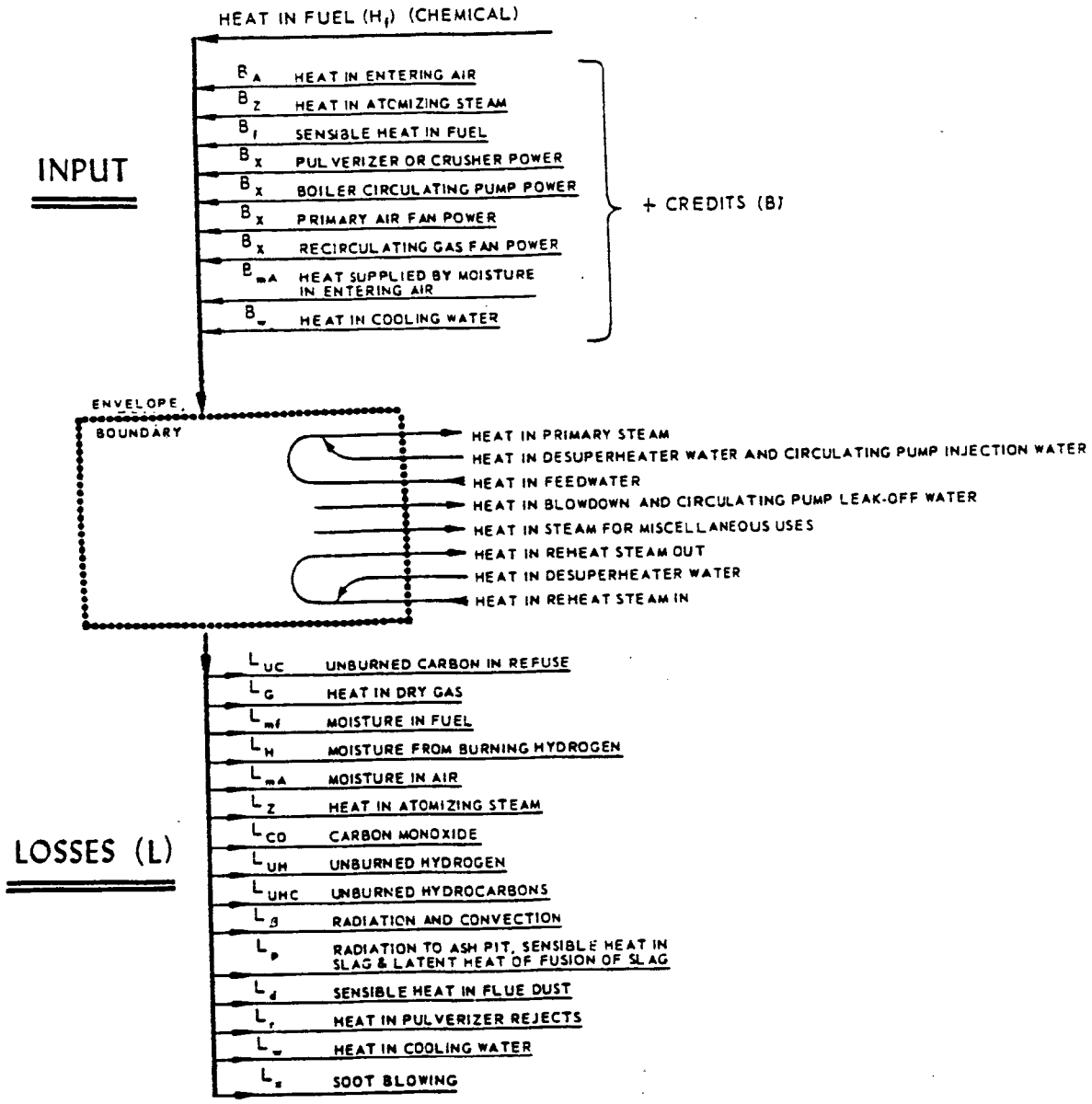
APPENDIX A

EFFICIENCY MEASUREMENTS

EFFICIENCY

Unit efficiencies for boilers are calculated and reported according to the ASME Power Test Codes for Steam Generation Units, PTC 4.1-1965. These codes present instructions for two acceptable methods of determining thermal efficiency. One method is the direct measurement of input and output and requires the accurate measurement of the quantity and high-heating value of the fuel, heat credits, and the heat absorbed by the working fluids. The second method involves the direct measurements of heat losses and is referred to as the heat loss method. This method requires the determination of losses, heat credits, and ultimate analysis and high-heat value of the fuel. Some of the major heat losses include losses due to heat in dry flue gas, losses due to fuel moisture content, losses due to combustible material in refuse and flue gas, and radiation losses. Heat credits are defined as those amounts added to the process in forms other than the chemical heat in the fuel "as fired." These include quantities such as sensible heat in the fuel, heat in the combustion air, and heat from power conversion in a pulverizer or fan. The relationships between input, output, credits, and losses for a steam generator are illustrated in Figure A-1.

KVB's experience has shown the heat-loss efficiency determination method to be the most reliable when working with industrial boilers. Accurate fuel input measurements are rarely possible on industrial boilers due to the lack of adequate instrumentation, thus making the input-output method undesirable. The accuracy of the efficiency based on the heat loss method is determined primarily by the accuracy of the flue gas temperature measurement immediately following the last heat removal station, the stack gas excess O_2 level, the fuel analysis, the ambient temperature, and proper identification of the combustion device external surfaces (for radiation losses). Determination of the radiation and other associated losses may appear to be a rather imposing calculation, but in practice it can be accomplished by utilizing standard efficiency calculation procedures. Inaccuracies in determining efficiency occasionally occur even with the heat



OUTPUT = INPUT − LOSSES

DEFINITION: EFFICIENCY (PERCENT) = η_g (%) = $\frac{\text{OUTPUT}}{\text{INPUT}} \times 100 = \frac{\text{INPUT} - L}{H_f + B} \times 100$

HEAT BALANCE: $H_f + B$ = OUTPUT + L OR η_g (%) = $\left[1 - \frac{L}{H_f + B}\right] \times 100$

Figure A-1. Heat balance of steam generator.

loss method primarily because of out-of-calibration unit instrumentation such as the stack gas exit temperature. However, this problem has been resolved by KVB test engineers through the use of portable instrumentation and separate temperature readings.

The abbreviated efficiency test procedure which considers only the major losses and the chemical heat in the fuel as input will be followed. Tables A-1 and A-2 are the ASME Test Forms for Abbreviated Efficiency Tests on steam generators which exemplify the type of forms to be used for recording the necessary data and performing the required calculations.

KVB has developed a program for the HP-67 calculator which will provide the heat loss efficiency from the stack data. Figure A-2 shows the HP-67 keyed calculation sheet for calculating efficiency by the ASME Heat Loss Method.

TABLE A-1

ASME TEST FORM FOR ABBREVIATED EFFICIENCY TEST

SUMMARY SHEET — PTC 4.1-a (1964)

	TEST NO.	BOILER NO.	DATE
OWNER OF PLANT	LOCATION		
TEST CONDUCTED BY	OBJECTIVE OF TEST		DURATION
BOILER MAKE & TYPE		RATED CAPACITY	
STOKER TYPE & SIZE			
PULVERIZER, TYPE & SIZE		BURNER, TYPE & SIZE	
FUEL USED	MINE	COUNTY STATE	SIZE AS FIRED

PRESSURES & TEMPERATURES

1	STEAM PRESSURE IN BOILER DRUM	psia	
2	STEAM PRESSURE AT S. H. OUTLET	psia	
3	STEAM PRESSURE AT R. H. INLET	psia	
4	STEAM PRESSURE AT R. H. OUTLET	psia	
5	STEAM TEMPERATURE AT S. H. OUTLET	F	
6	STEAM TEMPERATURE AT R H INLET	F	
7	STEAM TEMPERATURE AT R.H. OUTLET	F	
8	WATER TEMP. ENTERING (ECON.) (BOILER)	F	
9	STEAM QUALITY % MOISTURE OR P. P. M.		
10	AIR TEMP. AROUND BOILER (AMBIENT)	F	
11	TEMP AIR FOR COMBUSTION (This is Reference Temperature) †	F	
12	TEMPERATURE OF FUEL	F	
13	GAS TEMP. LEAVING (Boiler) (Econ.) (Air Htr.)	F	
14	GAS TEMP. ENTERING AH (If conditions to be corrected to guarantee)	F	

UNIT QUANTITIES

15	ENTHALPY OF SAT. LIQUID (TOTAL HEAT)	Btu/lb	
16	ENTHALPY OF (SATURATED) (SUPERHEATED) STM.	Btu/lb	
17	ENTHALPY OF SAT. FEED TO (BOILER) (ECON.)	Btu/lb	
18	ENTHALPY OF REHEATED STEAM R.H. INLET	Btu/lb	
19	ENTHALPY OF REHEATED STEAM R. H. OUTLET	Btu/lb	
20	HEAT ABS/LB OF STEAM (ITEM 16 – ITEM 17)	Btu/lb	
21	HEAT ABS/LB R.H. STEAM (ITEM 19 – ITEM 18)	Btu/lb	
22	DRY REFUSE (ASH PIT + FLY ASH) PER LB AS FIRED FUEL	lb/lb	
23	Btu PER LB IN REFUSE (WEIGHTED AVERAGE)	Btu/lb	
24	CARBON BURNED PER LB AS FIRED FUEL	lb/lb	
25	DRY GAS PER LB AS FIRED FUEL BURNED	lb/lb	

HOURLY QUANTITIES

26	ACTUAL WATER EVAPORATED	lb/hr	
27	REHEAT STEAM FLOW	lb/hr	
28	RATE OF FUEL FIRING (AS FIRED wt)	lb/hr	
29	TOTAL HEAT INPUT $\frac{(\text{Item 28} \times \text{Item 41})}{1000}$	kB/hr	
30	HEAT OUTPUT IN BLOW-DOWN WATER	kB/hr	
31	TOTAL HEAT OUTPUT $\frac{(\text{Item 26} \times \text{Item 20}) + (\text{Item 27} \times \text{Item 21}) + \text{Item 30}}{1000}$	kB/hr	

FLUE GAS ANAL. (BOILER) (ECON) (AIR HTR) OUTLET

32	CO_2	% VOL	
33	O_2	% VOL	
34	CO	% VOL	
35	N_2 (BY DIFFERENCE)	% VOL	
36	EXCESS AIR	%	

FUEL DATA

COAL AS FIRED PROX. ANALYSIS

37	MOISTURE	% wt	
38	VOL MATTER		
39	FIXED CARBON		
40	ASH		
	TOTAL		
41	Btu per lb AS FIRED		
42	ASH SOFT TEMP.* ASTM METHOD		

COAL OR OIL AS FIRED ULTIMATE ANALYSIS

43	CARBON		
44	HYDROGEN		
45	OXYGEN		
46	NITROGEN		
47	SULPHUR		
40	ASH		
37	MOISTURE		
	TOTAL		

COAL PULVERIZATION

48	GRINDABILITY INDEX*		
49	FINENESS % THRU 50 M*		
50	FINENESS % THRU 200 M*		
64	INPUT-OUTPUT EFFICIENCY OF UNIT %		$\frac{\text{ITEM 31} \times 100}{\text{ITEM 29}}$

OIL

51	FLASH POINT F*		
52	Sp. Gravity Deg. API*		
53	VISCOSITY AT SSU* BURNER SSF		
44	TOTAL HYDROGEN % wt		
41	Btu per lb		

GAS

			% VOL
54	CO		
55	CH_4 METHANE		
56	C_2H_2 ACETYLENE		
57	C_2H_4 ETHYLENE		
58	C_2H_6 ETHANE		
59	H_2S		
60	CO_2		
61	H_2 HYDROGEN		
	TOTAL		
	TOTAL HYDROGEN % wt		
62	DENSITY 68 F ATM. PRESS.		
63	Btu PER CU FT		
41	Btu PER LB		

HEAT LOSS EFFICIENCY

		Btu/lb A. F. FUEL	% of A. FUEL
65	HEAT LOSS DUE TO DRY GAS		
66	HEAT LOSS DUE TO MOISTURE IN FUEL		
67	HEAT LOSS DUE TO H_2O FROM COMB. OF H_2		
68	HEAT LOSS DUE TO COMBUST. IN REFUSE		
69	HEAT LOSS DUE TO RADIATION		
70	UNMEASURED LOSSES		
71	TOTAL		
72	EFFICIENCY = (100 – Item 71)		

* Not Required for Efficiency Testing

† For Point of Measurement See Par. 7.2.8.1-PTC 4.1-1964

KVB 6017-1216

ASME TEST FORM FOR ABBREVIATED EFFICIENCY TEST

CALCULATION SHEET *Revised September, 19*

OWNER OF PLANT | TEST NO. | BOILER NO. | DATE

30 HEAT OUTPUT IN BOILER BLOW-DOWN WATER = LB OF WATER BLOW-DOWN PER HR × [(ITEM 15 − ITEM 17) / 1000] = ... kB/hr

24 *If impractical to weigh refuse, this item can be estimated as follows*

DRY REFUSE PER LB OF AS FIRED FUEL = (% ASH IN AS FIRED COAL) / (100 − % COMB. IN REFUSE SAMPLE)

CARBON BURNED PER LB AS FIRED FUEL = (ITEM 43 / 100) − [(ITEM 22 × ITEM 23) / 14,500] = ...

NOTE: IF FLUE DUST & ASH PIT REFUSE DIFFER MATERIALLY IN COMBUSTIBLE CONTENT, THEY SHOULD BE ESTIMATED SEPARATELY. SEE SECTION 7, COMPUTATIONS.

25 DRY GAS PER LB AS FIRED FUEL BURNED = $\frac{11CO_2 + 8O_2 + 7(N_2 + CO)}{3(CO_2 + CO)}$ × (LB CARBON BURNED PER LB AS FIRED FUEL + $\frac{3}{8}$ S)

$$= \frac{11 \times \text{ITEM 32} + 8 \times \text{ITEM 33} + 7(\text{ITEM 35} + \text{ITEM 34})}{3 \times (\text{ITEM 32} + \text{ITEM 34})} \times \left[\text{ITEM 24} + \frac{\text{ITEM 47}}{267}\right] = ...$$

36 EXCESS AIR † $= 100 \times \frac{O_2 - \frac{CO}{2}}{.2682N_2 - (O_2 - \frac{CO}{2})} = 100 \times \frac{\text{ITEM 33} - \frac{\text{ITEM 34}}{2}}{.2682\,(\text{ITEM 35}) - (\text{ITEM 33} - \frac{\text{ITEM 34}}{2})} = ...$

	HEAT LOSS EFFICIENCY	Btu/lb AS FIRED FUEL	$\frac{\text{LOSS}}{\text{HHV}} \times \frac{}{100} =$
65	HEAT LOSS DUE TO DRY GAS = LB DRY GAS PER LB AS FIRED FUEL × C_p × ($t_{lvg} - t_{air}$) = ITEM 25 × 0.24 × (ITEM 13) − (ITEM 11) = ...	.....	$\frac{65}{41} \times 100 =$
66	HEAT LOSS DUE TO MOISTURE IN FUEL = LB H_2O PER LB AS FIRED FUEL × [(ENTHALPY OF VAPOR AT 1 PSIA & T GAS LVG) − (ENTHALPY OF LIQUID AT T AIR)] = $\frac{\text{ITEM 37}}{100}$ × [(ENTHALPY OF VAPOR AT 1 PSIA & T ITEM 13) − (ENTHALPY OF LIQUID AT T ITEM 11)] = ...	.....	$\frac{66}{41} \times 100 =$
67	HEAT LOSS DUE TO H_2O FROM COMB. OF H_2 = $9H_2$ × [(ENTHALPY OF VAPOR AT 1 PSIA & T GAS LVG) − (ENTHALPY OF LIQUID AT T AIR)] = 9 × $\frac{\text{ITEM 44}}{100}$ × [(ENTHALPY OF VAPOR AT 1 PSIA & T ITEM 13) − (ENTHALPY OF LIQUID AT T ITEM 11)] = ...	.....	$\frac{67}{41} \times 100 =$
68	HEAT LOSS DUE TO COMBUSTIBLE IN REFUSE = ITEM 22 × ITEM 23 = ...	.....	$\frac{68}{41} \times 100 =$
69	HEAT LOSS DUE TO RADIATION* = TOTAL BTU RADIATION LOSS PER HR / (LB AS FIRED FUEL − ITEM 28)	.....	$\frac{69}{41} \times 100 =$
70	UNMEASURED LOSSES **	.....	$\frac{70}{41} \times 100 =$
71	TOTAL	.....	.....
72	EFFICIENCY = (100 − ITEM 71)	.....	.....

† For rigorous determination of excess air see Appendix 9.2 – PTC 4.1-1964

* If losses are not measured, use ABMA Standard Radiation Loss Chart, Fig. 8, PTC 4.1-1964

** Unmeasured losses listed in PTC 4.1 but not tabulated above may by provided for by assigning a mutually agreed upon value for Item 70.

FIGURE A-2

HP-67 KEYED CALCULATION SHEET

ASME ABBREVIATED EFFICIENCY CALCULATION - HEAT LOSS METHOD

Test No._____ Date_____ Location_____ Unit No._____ Fuel_____

(Turn Calculator Off and Then On. Load Program Card.)

A. FROM FUEL ANALYSIS:
Wt. % in as-fired fuel: C _____ (A1: STO 0) %, Moisture _____ (A2: STO 1) %, H _____ (A3: STO 2) %, S _____ (A4: STO 3) %
High heating value of fuel as-fired _____ (A5: STO 4) Btu/lb

B. FROM FLUE GAS ANALYSIS:
Volume % in flue gas of: O_2 _____ (B1: STO 5) %, CO_2 _____ (B2: STO 6) %, CO _____ (B3: STO 7) %

C. FROM REFUSE (FLY ASH AND ASH PIT) ANALYSIS:
C1. Fraction of dry refuse in fuel _____ (STO 8) lbs dry refuse/lb as-fired fuel
C2. Heating value of dry refuse (weighted average) _____ (STO 9) Btu/lb dry refuse
C3. Wt. % of combustibles in refuse _____ (f P ≷ S)(STO 4)(f P ≷ S) %

D. MEASURED TEMPERATURES
D1. Gas temp. leaving boiler, econ. or air heater _____ (STO A) °F
D2. Comb. air temp. _____ (STO B) °F

E. FROM STEAM TABLES:
E1. Enthalpy: $H_2O(g)$ at temp. D1 & 1 psia _____ (STO C) Btu/lb
E2. Enthalpy: $H_2O(l)$ at comb. air temp. _____ (STO D) Btu/lb

F. FROM ABMA STANDARD RADIATION LOSS CHART (UNLESS MEASURED):
F1. Heat loss due to radiation _____ (STO E) % of gross heat input

G. FROM UNIT SPECIFICATIONS (if available, otherwise enter 0):
G1. Unmeasured losses _____ (f P ≷ S)(STO 0)(f P ≷ S) % of gross heat input

1. Excess Air $\approx \dfrac{100\,(2B1 - B3)}{0.5364(100 - B1 - B2) - (2B1 - B3)}$ (A)_____ %

2. (Optional) Pounds dry gas per pound of fuel =

$$\frac{B1 + 4B2 + 700}{3(B2 + B3)} \times \left[\frac{A1}{100} - \frac{C1 \times C2}{14500\left(1 - \frac{C3}{100}\right)} + \frac{3A4}{800}\right]$$

(R/S)_____ lbs dry gas/lb as-fired fuel

Heat Losses	% of Gross Heat Input	(Optional) Btu/lb as-fired fuel*
3. Due to dry gas = $\frac{24 \times EQ.2 \times (D1 - D2)}{A5}$	(B)_____	(R/S)_____
4. Due to moisture in fuel = $\frac{A2 \times (E1 - E2)}{A5}$	(C)_____	(R/S)_____
5. Due to H_2O from combustion of H_2 = $\frac{9 \times A3(E1 - E2)}{A5}$	(D)_____	(R/S)_____
6. Due to combustibles in refuse = $\frac{100 \times C1 \times C2}{A5}$	(E)_____	(R/S)_____
7. Total Losses = Sum of calculated losses + F1 + G1	(f a)_____	(R/S)_____
8. Efficiency = 100 - Total Losses	(f b)_____	

*Calculated as percent of gross heat input x A5 ÷ 100

APPENDIX B

DATA RECORDING FORMATS

DOCUMENTATION OF RESULTS

Field Measurements

During testing, two sets of measurements are recorded: 1) control room data which indicate the operating condition of the device and 2) emissions data that are the readouts of the individual analyzers.

The concentration of nitric oxide (NO), carbon dioxide (CO_2), carbon monoxide (CO), and oxygen (O_2) are measured and recorded. The concentration of these species are measured and displayed continuously by analyzers and strip chart recorders mounted in a console. The strip chart recordings are retained for future reference. Opacity, particulate loading, and POM concentration are measured at the sampling port and the measurements recorded on data sheets.

A number of data sheets have been developed for use in field measurements. These data sheets are listed below together with their purpose. An example of each sheet follows.

Figure No.	Title	Purpose
B-1	Thirty-Day Field Test Data Sheets	Record control room data
B-2	Gaseous Emissions Data	Record Gaseous Emissions Analyzer data
B-3	Nozzle Size, Q_m and ΔH Calculations	Calculate nozzle size, flow rate, and ΔH for Method 5 Test
B-4	Response Time for Continuous Instruments	Continuous monitor certification
B-5	Zero and Calibration Drift (24 hr)	Continuous monitor certification
B-6	Zero and Calibration Drift (2 hr)	Continuous monitor certification
B-7	Accuracy Determination (NOx)	Continuous monitor certification
B-8	Calibration Error Determination	Continuous monitor certification

Figure No.	Title	Purpose
B-9	Analysis of Calibration Gas Mixture	Continuous monitor certification
B-10	Particulate Calculation Sheet	Calculate weight of solid particulate catch
B-11	Stack Data	Record volumes, temperatures, pressures of Method 5 control unit.
B-12	Particulate Emission Caculations	Calculate particulate emmision factors
B-13	Velocity Traverse	Record temperature and velocity profile of stack
B-14	Liquid or Solid Fuel Calculation	Calculate stoichiometric properties of fuel

Figure B-1.

KVB, Inc.

THIRTY DAY FIELD TEST DATA SHEET

Site _____ Fuel _____

Test No.			
Date			
Time			
Load			
Test Description			
Windbox, in. H_2O			
Furnace, in. H_2O			
Overfire air, in. H_2O			
Boiler exit, in. H_2O			
Economizer exit, in. H_2O			
ID fan inlet, in. H_2O			
Steam flow, kpph			
Integrated steam flow Time/k lbs			
Air flow indic.			
Superheater outlet temp. °F			
Flue gas temp, economizer inlet, °F			
Flue gas temp, economizer outlet, °F			
Temp F.W. economizer outlet, °F			
Feed Water Control, %			
Temp F.W. heater, °F			
F.W. economizer inlet, °F			
Steam pressure, psig			
Fuel feed			
Overfire air damper			
F.D. fan			
F.D. fan damper			
I.D. fan			
I.D. fan damper			

(continued)

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Figure B-1. (Continued)

THIRTY DAY FIELD TEST DATA SHEET

Test No.			
Smoke Indicator Chart			
Rotary speed			
Spill plate setting			
Grate speed			
Overfire air damper, % open			
Fuel flow, Time/lbs			
Flame observations			
Bed thickness			
General furnace appearance			
Clinkers			
Ambient air temp, °F & F.D. fan inlet temp.			

Comments:

Figure B-2.

KVB, INC. Date_____

GASEOUS EMISSIONS DATA Engr._____

Low NO_x Control Method_____

Unit No._____ Location_____

Fuel_____ Capacity_____

Unit Type_____ Burner Type_____

1. Test No.										
2. Time										
3. Load										
4. Process Rate										
5. Flue Diam. or Size, ft										
6. Probe Position										
7. Oxygen (%)										
8. NO_x (hot) read/3% O_2 (ppm)										
9. NO (hot) read/3% O_2 (ppm)										
10. NO_2 (hot) read/3% O_2 (ppm)										
11. Carbon Dioxide (%)										
12. Carbon Monoxide (ppm) uncor/cor										
13. Opacity										
14. Atmos. Temp. (°F/°C)										
15. Dew Point Temp. (°F/°C)										
16. Atmos. Pressure (in. Hg)										
17. Relative Humidity (%)										

Data Sheet
6015-23
9/29/78
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Figure B-3.

HP-67 Keyed Calculation Sheet

NOZZLE SIZE, Q_m and ΔH CALCULATIONS

Test No._____ Date_____ Location_____

Unit No._____ Fuel_____ Sampling Method_____

Crew: Engr._____ Techs._____

DATA

Constants		Key	Actual Conditions		Key
Pitot Factor, F_s		(STO 1)	Meter Temperature, T_m (°F)		(STO 5)
Orifice Factor, J		(STO 2)	Barom. Press., P_{Bar} (in. Hg)		(STO 6)
Orifice Diam., D_o (in.)		(STO 3)	Static Press. Diff., ΔP_s (iwg)		(STO 7)
Ideal Meter Flow, Q_n (ACFM)		(STO 4)	Nozzle Temp., T_n (°F)		(STO 8)
			Stack Vel. Press., Δp (iwg)		(STO 9)

NOTE: TO RECALCULATE IDEAL NOZZLE SIZE, RESTORE DATA IN REGISTERS 4 THRU 8, CLEAR STACK AND RE-ENTER % H_2O, % O_2, and % CO_2

Gaseous Stack Composition

% H_2O	(%)	_____	ENTER
% O_2 dry	(%)	_____	ENTER
% CO_2 dry	(%)	_____	

IDEAL NOZZLE CALCULATION

(A) Ideal Nozzle Size, $D_{n(Ideal)}$ _____ inches

METER FLOW RATE AND ORIFICE PRESS. DIFF. CALCULATIONS

Actual Nozzle Size, $D_{n(Actual)}$ _____ inches

(C) Actual Meter Flow Rate, $Q_{m(Actual)}$ _____ ACFM (on meter)

(RCL 7) Orifice Press. Diff., ΔH to obtain $Q_{m(Actual)}$ _____ iwg

NOTE: To Determine Q_m and ΔH for Other Actual Nozzle Size, Key in $D_{n(Actual)}$, Press C for Q_m, then RCL 7 for ΔH.

For one $D_{n(Actual)}$ with Changing Stack Velocity Pressure (Δp) and Nozzle Temperature (T_n)
(It is not necessary to restore data in registers 4-8 for these calculations)

Δp (ENTER) (iwg)	T_n (°F)	(E) Q_m (ACFM)	(R/S) $\Delta H'$ (iwg)

EQUATIONS

(1) $M_d = 1/25\ (4 \% CO_2 + \% O_2) + 28$ (lb/lb mole)

(2) $M_s = M_d \left(\frac{\% H_2O - 100}{-100}\right) + \frac{18}{100}\ (\% H_2O)$ (lb/lb mole)

(3) $P_s = 13.6\ P_{Bar} + \Delta P_s$ (in. of water)

(4) $V_n = 18892\ F_s \sqrt{(\Delta p\ (T_n + 460))/P_s M_s}$ (ft/min)

(5) $$Q_n = \frac{Q_{n(Ideal)}\ (T_n + 460)\ 13.6\ P_{Bar}\ [828475\ \pi^2 J^2 D_o^4\ (T_m + 460)]}{[1 - (\% H_2O/100)]\ (T_m + 460)\ P_s [828475\ \pi^2 J^2 D_o^4\ (T_m + 460) - 768\ M_d\ Q^2_{n(Ideal)}]}$$ (ACFM)

(6) $D_{n(Ideal)} = \sqrt{183.35\ (Q_n/V_n)}$ (in.)

(7) $Q_{n(Actual)} = [V_n\ D^2_{n(Actual)}]/183.35$ (ACFM)

(8) $$Q_{m_i} = \frac{Q_{m(Actual)}\ (T_m + 460)(1 - \% H_2O/100)(13.6\ P_{Bar} + \Delta P_s)}{(T_n + 460)(13.6\ P_{Bar} + \Delta H_{i-1})}$$ assume $\Delta H_o = \Delta P_s$ (ACFM)

$i = 1,n$ where n = number of iterations to obtain ΔH_i s.t. $\frac{(\Delta H_{i-1} - \Delta H_i)}{\Delta H_{i-1}} \leq 0.001$

(9) $$\Delta H_i = \frac{768\ Q_{m_i}^2\ M_d\ 13.6\ P_{Bar}}{828475\ \pi^2 J^2 D_o^4\ (T_m + 460) - 768\ Q_{m_i}^2\ M_d}$$ (in. of water)

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Figure B-4.

KVB

Engineer_____

MONITOR PERFORMANCE TEST DATA SHEET

RESPONSE TIME FOR CONTINUOUS INSTRUMENTS

Date of Test _____

Span Gas Concentration _____ppm

Analyzer Span Setting _____ppm

Upscale	1	_____seconds
	2	_____seconds
	3	_____seconds

Average upscale response _____seconds

Downscale	1	_____seconds
	2	_____seconds
	3	_____seconds

Average downscale response _____seconds.

System average response time (slower time) = _____seconds.

$$\text{\% deviation from slower system average response} = \left[\frac{\text{average upscale minus average downscale}}{\text{slower time}}\right] \times 100\% = \_\_\_\_.$$

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Figure B-5.

KVB

Engineer_____

MONITOR PERFORMANCE TEST DATA SHEET

ZERO AND CALIBRATION DRIFT (24-HOUR)

Date and Time	Zero Reading	Zero Drift (ΔZero)	Span Reading (After Zero Adjustment)	Calibration Drift (ΔSpan)

Zero Drift = [Mean Zero Drift* _____ + C.I. (Zero) _____]
÷ [Instrument Span] x 100 = _____.

Calibration Drift = [Mean Span Drift* _____ + C.I. (Span) _____]
÷ [Instrument Span] x 100 = _____.

*Absolute Value

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MONITOR PERFORMANCE TEST DATA SHEET

Engineer_____

ZERO AND CALIBRATION DRIFT (2 HOUR)

Data Set No.	Time Begin	Time End	Date	Zero Reading	Zero Drift (ΔZero)	Span Reading	Span Drift (ΔSpan)	Calibration Drift (Span-Zero)
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

Zero Drift = [Mean Zero Drift* _____ + CI (Zero) _____] ÷ [Span] x 100 = _____.

Calibration Drift = [Mean Span Drift* _____ + CI (Span) _____] ÷ [Span] x 100 = _____.

*Absolute Value.

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Figure B-6.

KVB

MONITOR PERFORMANCE TEST DATA SHEET

ACCURACY DETERMINATION (NO_x)

Engineer_____

Test No.	Date and Time	Reference Method Samples				Analyzer 1-Hour Average (ppm)*		Difference (ppm)	
		NO_x Sample 1 (ppm)	NO_x Sample 2 (ppm)	NO_x Sample 3 (ppm)	NO_x Sample Average (ppm)	NO_x		NO_x	
1									
2									
3									
4									
5									
6									
7									
8									
9									

Mean reference method test value (NO_x) _____

Mean of the differences _____

95% Confidence intervals = ± _____ ppm (NO_x)

Accuracies = $\frac{\text{Mean of the differences + 95\% confidence interval}}{\text{Mean reference method value}} \times 100$ = _____ % (NO_x)

* Explain and report method used to determine integrated averages

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Figure B-7.

KVB

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Figure B-8.

KVB

Engineer _____

MONITOR PERFORMANCE TEST DATA SHEET

CALIBRATION ERROR DETERMINATION

Calibration Gas Mixture Data

Mid (50%) _____ppm High (90%) _____ppm

Run #	Calibration Gas Concentration, ppm	Measurement System Reading, ppm	Differences[1], ppm
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

	Mid	High
Mean difference	_____	_____
Confidence interval	+_____	+_____
Calibration error = $\frac{\text{Mean Difference}^2 + \text{C.I.}}{\text{Average Calibration Gas Concentration}} \times 100$	_____%	_____%

[1] Calibration gas concentration - measurement system reading

[2] Absolute value

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Figure B-9.

KVB

Engineer_____

MONITOR PERFORMANCE TEST DATA SHEET

ANALYSIS OF CALIBRATION GAS MIXTURES

Date:_____ Reference Method Used:_____

Mid-Range Calibration Gas Mixture

Sample 1 _____ppm

Sample 2 _____ppm

Sample 3 _____ppm

Average _____ppm

High-Range (span) Calibration Gas Mixture

Sample 1 _____ppm

Sample 2 _____ppm

Sample 3 _____ppm

Average _____ppm

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Figure B-10. PARTICULATE CALCULATION SHEET

Test Crew _____

Test No. _____ Date _____ Location _____

Box No. _____ Sample Probe Position _____

Test Description

Dry Gas Meter Vol. (ft^3)

Final _____

Initial _____

Total _____

Impinger Water Vol (ml)

	1	2	3	S. Gel	Total
Final					
Initial					
Δ Vol					

Beaker No.					Filter No.	Blank No.
Date Weighed						
Tare Wt. 1						
2						
3						
4						
5						
6						
Avg						
Bottle No.						
Content	Impinger (Water)	Probe (Acetone)	Probe (Water)	Cyclone (Acetone)	Flask (Dry)	
Rinse (ml)						
Date Weighed for 250 Bake						
Final Wt. 250 1						
2						
3						
4						
5						
6						
Avg						
Residue wt Final 250-Tare						
Date Weighed or 650 Bake						
Final Wt. 650 1						
2						
3						
4						
5						
6						
Avg						
Residue Wt Final 650-Tare						

Comments:

Data Sheet 6002-3

Figure B-11.

K V B. INC.

STACK DATA

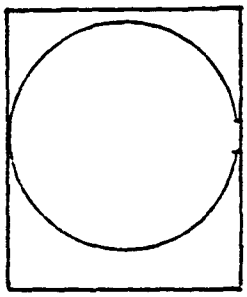
Test No._____
Engr._____

Date_____ Location_____ Unit No._____ Fuel_____

Load_____ K#/hr or MBtu/hr Filter No._____

Sample Box No._____ Meter Box No._____ Probe No._____ Probe Length_____

Filter Heater Setting _____
Probe Heater Setting _____
Stack Moisture _____ %
Ambient Temperature _____ °F
Nozzle Diameter _____ in.
Atmospheric Pressure _____ in.Hg
Weather _____
Stack Gas Pressure, Ps _____ iwg
Abs. Stack Press., AP=P_s +407=_____ iwga
Stack Gas Sp. Gravity, Gs_____ n.d.
Stack Area, As _____ ft^2



Remarks

Final Meter: _____

Initial Meter: _____

Time	Vm Meter Volume Reading (CF)	Vacuum Gage Reading (iwg)	ΔP Pitot Tube Pressure (iwg)	H Orfice Pressure Diff (°F)	Stack Temp. (°F)	Impinger Temperature Out (°F)	Impinger Temperature In (°F)	Filter Box Temp. (°F)	Meter Temp. (°F)
Total					°F				
Avg.					°F				
					+ 460				

Ts= _____ °R

60-13

11/20/75

HP-67 KEYED CALCULATION SHEET*

Figure B-12. PARTICULATE EMISSION CALCULATIONS

Test No._____ Date_____ Location_____ Engr._____

Unit No._____ Fuel_____ Sampling Train and Method _____

Pitot Factor, Fs .83 Barometric Pressure, P_{bar} (STO 0)_____ in. Hg

Tot. Liquid Collected, V_{lc} (STO 1)_____ ml Total Particulate, M_n (STO 2)_____ gm

Velocity Head, ΔP (STO 3)_____ iwg Stack Temp., Ts (STO 4)_____ °F Stack Area, As (STO 5)_____ ft^2

Sample Volume, Vm (STO 6)_____ ft^3 Stack Press., Psg (STO 7)_____ iwg Excess O_2, XO_2% (STO 8)_____ %

Orifice Press. Diff., H (STO 9)_____ iwg, (Flue Gas Density/Air Density) @ T_s, Gs (STO A)_____ n.d.

Sample Time, θ (STO B)_____ min Nozzle Dia., Dn (STO C)_____ in. Meter Temp., T_m (STO D)_____ °F

Select Fe	Oil (A)	Gas (B)	Coal (C)	Other:
SC Feet/10^4 Btu	92.2	87.4	98.2	(E)

Press (E) if meter is not temperature compensated.

1. Sample Gas Volume $Vm_{std} = 0.0334\ Vm(P_{bar} + H/13.6)$ _____ SCF

2. Water Vapor $Vw_{std} = 0.0474\ V_{lc}$ _____ SCF

3. Moisture Content Bwo = Eq. 2/(Eq. 1 + Eq. 2) _____ N.D.

4. Concentration
   a. $C = 0.0154\ Mn/Vm_{std}$ _____ grains/DSCF
   b. $C = 2.205 \times 10^{-6}\ Mn/Vm_{std}$ _____ lb/DSCF
   c. C = Eq. 4b x 16.018×10^3 _____ grams/DSCM

5. Abs. Stack Press. $Ps = P_{bar} \times 13.6 + Psg$ _____ in. w abs.

6. Stack Gas Speed $Vs = 174\ Fs \sqrt{\Delta PTs} \sqrt{\frac{407}{Ps} \times \frac{1.00}{Gs}}$ _____ ft/min

7. Stack Gas Flow Rate @ 70°F
   a. $Qsw = \text{Eq. 6} \times As \times \frac{530}{Ts} \times \frac{Ps}{407}$ _____ WSCF/min
   b. Qsd = Eq. 7a x (1. - Eq. 3) _____ DSCF/min

8. Material Flow Ms = Eq. 7b x Eq. 4b x 60 _____ lb/hr

9. XO_2 factor $XO_2f = 2090/(20.9 - XO_2\%)$ _____ N.D.

10. Emission
    a. E = Eq. 4b x Fe x Eq. 9 _____ lb/MMBtu
    b. E = Eq. 4c x Fm x Eq. 9 x 1000 _____ ng/joule

11. % Isokinetic $I = \frac{14077 \times Ts(Vm_{std} + Vw_{std})}{\theta \times Vs \times Ps \times Dn^2}$ _____ %

*If calculating by hand:
1) Convert T_s and T_m to °R
2) Multiply EQ 1 by $530/T_m$(°R) if meter not temperature compensated.
3) $F_m = 2.684 \times 10^{-5} \times Fe$

Data Sheet 6002-4
Revised 9/27/78
KVB 6017-1216

KVB, Inc.

Figure B-13.

VELOCITY TRAVERSE

Project: _____ Test Description: ___

Date: _____ _____

Location: _____ _____

Unit: _____ _____

Test: _____ Personnel: _____

Fuel: _____ _____

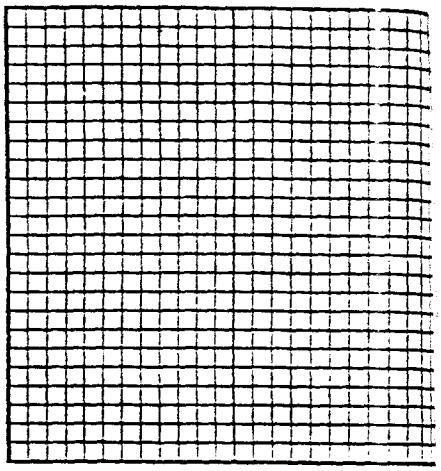
Barometric Press. (in. Hg): _____

Absolute Static Press. in Stack (in. Hg): _____ (P_s)

Pitot Tube Coefficient: _____ (C_p)

$$V_S = 85.48\ C_p \left[\frac{T_S \Delta P}{P_S M_S}\right]^{1/2}$$

Stack Cross Section



Time	Traverse Point Port	Depth	Velocity Head (in. H_2O)	Gas Temp. (°F)	Gas Temp. (°R)	Molecular Wt.	Velocity (ft/sec)	O_2 Conc. (% Dry)
			ΔP		T_S	M_S	V_S	

Figure B-14.

KVB

Test No._____ Date_____ Location_____ Unit No._____

Fuel_____ Fuel Sample No._____ Fuel Sample Point_____

LIQUID OR SOLID FUEL CALCULATIONS

(f)(CL REG), (f) (P>S), (f)(CL REG), Load data card, then PGRM card (both sides)

*Input HHV (Btu/lb) _____, (A)
*Input wt % C _____, (R/S)
*Input wt % H _____, (R/S)
*Input wt % S _____, (R/S)
*Input wt % O _____, (R/S)
*Input wt % N _____, (R/S) - decimal point blinks after pressing; item #1 displayed

1. Dry stoichiometric moles flue gas/lb fuel = _____.
(One may proceed to items 9, 17, or 18 by pressing (f)(A), (E), or entering MW and pressing (B), respectively.)

---

*Input wt % H_2O in fuel (0 if none) _____

(C)	2. Moles H_2O in flue gas/lb fuel	_____
(R/S)	3. Total moles of flue gas (stoichiometric)/lb fuel	_____
(R/S)	4. Dry volume/wet volume	_____
(R/S)	5. Volume % H_2O in flue gas	_____
(R/S)	6. Volume % CO_2, dry in flue gas	_____
(R/S)	7. SO_2 (ppm by vol.), dry at stoichiometric	_____
(R/S)	8. NO (ppm by vol.), dry at stoichiometric	_____

(f)(A) 9. Stoichiometric air/fuel ratio (lb air/lb fuel) _____

(Before items 10-16 may be determined, items 1-9 must be completed.)

(D) - 20.95 displayed

*Input measured vol. % O_2 for O_2 correction _____ _____ _____ _____

(R/S)	10. $\frac{\text{Gas moles at \% } O_2}{\text{Gas moles, stoic.}} = \frac{20.95}{20.95 - \text{\% } O_2} =$	_____	_____	_____	_____
(R/S)	11. Dry moles flue gas/lb fuel at % O_2	_____	_____	_____	_____
(R/S)	12. Vol. % CO_2, dry at % O_2	_____	_____	_____	_____
(R/S)	13. SO_2 (ppm by vol.) dry at % O_2	_____	_____	_____	_____
(R/S)	14. NO (ppm by vol.) dry at % O_2	_____	_____	_____	_____
(R/S)	15. Vol. % H_2O at % O_2	_____	_____	_____	_____
(R/S) (decimal pt. blinks)	16. Percent Excess Air	_____	_____	_____	_____

(RCL)(2)(E) 17. Converts item 1 to SCF dry flue gas at stoich/10^6 Btu = _____

Item 18.

a. *Input MW, (B), program calculates K (lb/10^6 Btu = ppm/K)
(MW = 46 for NOx, CO = 28, HC = 16, SOx = 64)
1. *Input measured ppm at 3% O_2, dry, (R/S), program calculates lb/10^6 Btu.
2. (Optional) No input, (R/S), program converts lb/10^6 Btu = ng/J
3. Repeat steps (1) and (2) as necessary.

b. *Enter next value of MW, complete step (a) followed by steps (1), (2), and (3). Repeat for all species desired.

	MW	K for lb/10^6 Btu
NOx	46	_____
CO	28	_____
HC	16	_____
SOx	64	_____

*Indicates input is required

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APPENDIX C

CONTINUOUS MONITOR CERTIFICATION DATA SHEETS

KVB

Engineer_____

MONITOR PERFORMANCE TEST DATA SHEET

CALIBRATION ERROR DETERMINATION

MAR 2 0 1979

Calibration Gas Mixture Data

Mid (50%) 120 ppm High (90%) 234 ppm

NO_x Analyzer - Teco Series 10

Run #	Calibration Gas Concentration, ppm	Measurement System Reading, ppm	Differences[1], ppm
1 O	0	0	0
2 M	120	114	6
3 O	0	0	0
4 H	234	234	0
5 M	120	119	1
6 H	234	240	6
7 M	120	120	0
8 O	0	.5	.5
9 M	120	120	0
10 O	0	.5	.5
11 H	234	241	7
12 M	120	123	3
13 H	234	241	7
14 O	0	2	2
15 H	234	242	8

	Mid	High
Mean difference	2.0	6.6
Confidence interval	±3.2	±1.4
Calibration error = $\frac{\text{Mean Difference}^2 + \text{C.I.}}{\text{Average Calibration Gas Concentration}} \times 100$	4.3 %	3.4 %

[1] Calibration gas concentration - measurement system reading

[2] Absolute value

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Engineer _____

MONITOR PERFORMANCE TEST DATA SHEET

CALIBRATION ERROR DETERMINATION

MAR 2 0 1979

Calibration Gas Mixture Data

Mid (50%) 10% ~~ppm~~ High (90%) 17.8 % ~~ppm~~

CO_2 Analyzer - Horiba PIR 2000

Run #		Calibration Gas Concentration, ppm	Measurement System Reading, ~~ppm~~ %	Differences[1], ~~ppm~~ %	
1	O	0	0	0	
2	M	10%	10%	0	
3	O	0	0	0	
4	H	17.8%	17.5	.3	
5	M	10%	10%	0	
6	H	17.8%	17.4	.4	
7	M	10%	9.9	.1	✓
8	O	0	0	0	
9	M	10%	9.9	.1	✓
10	O	0	0	0	
11	H	17.8	17.4	.4	
12	M	10.0	9.9	.1	✓
13	H	17.8	17.4	.4	
14	O	0	0	0	
15	H	17.8	17.4	.4	

	Mid	High
Mean difference	.06	.38
Confidence interval	±.07	±.20
Calibration error = $\frac{\text{Mean Difference}^2 + \text{C.I.}}{\text{Average Calibration Gas Concentration}} \times 100$	1.3 %	3.2 %

[1] Calibration gas concentration - measurement system reading

[2] Absolute value

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Engineer_____

MONITOR PERFORMANCE TEST DATA SHEET

CALIBRATION ERROR DETERMINATION MAR 20 1979

Calibration Gas Mixture Data

Mid (50%) 500 ppm High (90%) 900 ppm

CO Analyzer - Horiba PIR-2000

Run #	Calibration Gas Concentration, ppm	Measurement System Reading, ppm	Differences[1], ppm
1	0	0	0
2	500	490	10
3	0	0	0
4	900	900	0
5	500	485	15
6	900	900	0
7	500	480	20
8	0	0	0
9	500	475	25
10	0	0	0
11	900	890	10
12	500	485	15
13	900	890	10
14	0	0	0
15	900	890	10

	Mid	High
Mean difference	12.0	6.0
Confidence interval	+7.1	+6.6
Calibration error = $\frac{\text{Mean Difference}^2 + \text{C.I.}}{\text{Average Calibration Gas Concentration}} \times 100$	4.8 %	1.7 %

[1] Calibration gas concentration - measurement system reading

[2] Absolute value

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MONITOR PERFORMANCE TEST DATA SHEET

CALIBRATION ERROR DETERMINATION

MAR 2 0 1979

Calibration Gas Mixture Data

Mid (50%) 5.0 ~~ppm~~ % High (90%) 9.3 ~~ppm~~ %

O_2 Analyzer - Beckman Model 7003

Run #	Calibration Gas Concentration, ~~ppm~~ %	Measurement System Reading, ~~ppm~~ %	Differences[1], ~~ppm~~ %
1 O	—	—	
2 M	5.0	5.2	.2
3 O	-	-	
4 H	9.3	9.2	0
5 M	5.0	5.2	.2 ✓
6 H	9.3	9.4	.1
7 M	5.0	5.2	.2 ✓
8 O	—	-	-
9 M	5.0	5.2	.2 ✓
10 O	-	-	-
11 H	9.3	9.3	0
12 M	5.0	5.1	.1 ✓
13 H	9.3	9.4	.1
14 O	0	—	—
15 H	9.3	9.4	.1

	Mid	High
Mean difference	.17	.03
Confidence interval	+.06	+.07
Calibration error = $\frac{\text{Mean Difference}^2 + \text{C.I.}}{\text{Average Calibration Gas Concentration}} \times 100$	4.8 %	1.4 %

[1] Calibration gas concentration - measurement system reading

[2] Absolute value

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MONITOR PERFORMANCE TEST DATA SHEET

Engineer_____

ZERO AND CALIBRATION DRIFT (2 HOUR)

NO_x Analyzer

Data Set No.	Time Begin	Time End	Date	Zero Reading	Zero Drift (ΔZero)	Span Reading	Span Drift (ΔSpan)	Calibration Drift (Span-Zero)
1 START	1000		3-15-79	0	-	234	-	-
2	1200			-2	-2	233	-1	+1
3	1400			-3	-1	230	-3	-2
4	1600			-6	-3	220	-10	-7
5	1800			-8	-2	219	-1	+1
6	2000			-9.5	-1.5	218	-1	+1.5
7 START	1000		3-16-79	0	-	234	-	-
8	1200			0	0	234	0	0
9	1400			1	1	234	0	-1
10	1600			3	2	230	-4	-6
11	1800			5	2	232	+2	0
12 START	1000		3-19-79	0	-	234	-	-
13	1200			0	0	238	+4	+4
14	1400			2.5	3.5	243	+5	+1.5
15	1600			4.5	1.0	239	-4	-5

Zero Drift = [Mean Zero Drift* 1.60 + CI (Zero) .61] ÷ [Span] x 100 = .88%.

Calibration Drift = [Mean Span Drift* 2.73 + CI (Span) [illegible]] ÷ [Span] x 100 = 1.68%.

*Absolute Value.

	1800				0	234		
START	1000		3-20-79	0	-	234	-	
	1200			2	3	237	4	
	1400			5	2	240	2	

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ZERO AND CALIBRATION DRIFT (2 HOUR)

CO_2 Instr

Data Set No.	Time Begin	Time End	Date	Zero Reading	Zero Drift (ΔZero)	Span Reading	Span Drift (ΔSpan)	Calibration Drift (Span-Zero)
1 Start	1000		3-15-79	1%	-	17.8	-	-
2	1200		3-15-79	0.9	-.01	17.8	0	-.01
3	1400		3-15-79	0.9	0	17.8	0	0
4	1600		3-15-79	0.9	0	17.8	0	0
5	1800		3-15-79	0.9	0	17.8	0	0
6	2000		3-15-79	0.9	0	17.8	0	0
7 Start	1000		3-16-79	* 0	-	17.8	-	-
8	1200		3-16-79	0	0	17.7	-.1	-.1
9	1400		3-16-79	0	0	17.6	-.1	-.1
10	1600		3-16-79	0	0	17.6	0	0
11	1800		3-16-79	0	0	17.6	0	0
12 Start	1000		3-19-79	0	-	17.8	-	-
13	1200		3-19-79	0	0	17.8	0	0
14	1400		3-19-79	0	0	17.6	-.2	-.2
15	1600		3-19-79	0	0	17.7	+.1	+.1
16	1800		3-19-79	0	0	17.7	0	0
17	1000		3-20-79	0	0	17.7	0	0
18	1200		3-20-79	0	0	17.7	0	0
19	1400		3-20-79	0	0	17.8	+.1	+.1

Zero Drift = [Mean Zero Drift* _____ + CI (Zero) _____] ÷ [Span] x 100 = 0%.

Calibration Drift = [Mean Span Drift* .04 + CI (Span) .075] ÷ [Span] x 100 = .646%

*Absolute Value.

* 10% offset by recorder

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ZERO AND CALIBRATION DRIFT (2 HOUR)

CO Instrument Cyl. #AAL 2150

Data Set No.	Time Begin	Time End	Date	Zero Reading ppm	Zero Drift (ΔZero)	Span Reading ppm	Span Drift (ΔSpan)	Calibration Drift (ΔSpan-Zero)
1 Start	1000		3-15-79	0	–	900	–	–
2	1200			0	0	896	-4	-4
3	1400			-5	-5	892	-4	
4	1600			-3	+2	895	+3	
5	1800			-3	0	897	+2	
6	2000			0	+3	902	+5	
7 Start	1000		3-16-79	0	–	900	–	–
8	1200			0	0	902	+2	
9	1400			0	0	900	-2	
10	1600			-2	-2	900	0	
11	1800			-2	0	900	0	
12 Start	1000		3-19-79	0	–	900	–	–
13	1200			-4	-4	905	+5	
14	1400			-2	+2	903	-2	
15	1600			-6	-4	900	-3	

Zero Drift = [Mean Zero Drift* 1.47 + CI (Zero) 1.[illegible]] ÷ [Span] x 100 = .124.

Calibration Drift = [Mean Span Drift* 2.53 + CI (Span) .7326] ÷ [Span] x 100 = .1731.

*Absolute Value.

	1800	3-19-79	-6	0	900	0
Start	1000	3-20-79	0	–	900	–
	1200		0	0	896	-4
	1400		0	0	898	+2

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ZERO AND CALIBRATION DRIFT (2 HOUR)

O_2 Analyzer

Data Set No.	Time Begin	Time End	Date	Zero Reading	Zero Drift (ΔZero)	Span Reading	Span Drift (ΔSpan)	Calibration Drift (Span-Zero)
1 START	1000		3/15	DNA	—	9.27	—	
2	1200					9.0	-.27	
3	1400					9.2	+.20	
4	1600					9.1	-.10	
5	1800					9.0	-.10	
6	2000					9.0	0	
7 START	1000		3/16			9.27	—	
8	1200					9.27	0	
9	1400					9.27	0	
10	1600					9.27	0	
11	1800					9.25	-.02	
12 START	1000		3/19			9.27	—	
13	1200					9.27	0	
14	1400					9.27	0	
15	1600					9.27	0	

Zero Drift = [Mean Zero Drift* _____ + CI (Zero) _____] ÷ [Span] x 100 = DNA .

Calibration Drift = [Mean Span Drift* .039 + CI (Span) .047] ÷ [Span] x 100 = 0.93%

*Absolute Value.

	1600	3/19		9.27	0
START	1000	3/20		9.27	—
	1200			9.25	-.02
	1400			9.25	0

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MONITOR PERFORMANCE TEST DATA SHEET

ZERO AND CALIBRATION DRIFT (24-HOUR)

NOx Analyzer

Cylinder No. AAL-379

Date and Time	Zero Reading	Zero Drift (ΔZero)	Span Reading (After Zero Adjustment)	Calibration Drift (ΔSpan)
3-14-79 1000	0	-	234	-
3/15 1000	0	0	237	3
3/16 1000	2	2	236	2
1000	3	3	237	3
3/18 1000	0	-2	235	1
3/19 1000	-2	-2	235	1
3/20 1000	-5	-5	236	2
3-21 1000	-2	-2	235	+1

Zero Drift = [Mean Zero Drift* 1.71 + C.I. (Zero) 1.48]
÷ [Instrument Span] x 100 = 1.68.

Calibration Drift = [Mean Span Drift* 1.86 + C.I. (Span) .832]
÷ [Instrument Span] x 100 = 1.08.

~~*Absolute Value~~

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MONITOR PERFORMANCE TEST DATA SHEET

ZERO AND CALIBRATION DRIFT (24-HOUR)

CO_2 Instrum.

Cyl. # AAL-1827

Date and Time	Zero Reading	Zero Drift (ΔZero)	Span Reading (After Zero Adjustment)	Calibration Drift (ΔSpan)
3-14-79	1000 0	-	17.8 %	-
3-15-79	1000 0	0	17.8	0
3-16-79	1000 -.1	-.1	18.2	+.4
3-17-79	1000 0	0	17.8	0
3-18-79	1000 0	0	17.5	-.3
3-19-79	1000 0	0	18.2	+.4
3-20-79	1000 0	0	17.8	0
3-21-79	1000 0	0	17.8	0

Zero Drift = [Mean Zero Drift* .0014 + C.I. (Zero) .019]
÷ [Instrument Span] x 100 = .020 .

Calibration Drift = [Mean Span Drift* .157 + C.I. (Span) .194]
÷ [Instrument Span] x 100 = 1.70 . .34% Co~

*Absolute Value
* Calibrating on 0-20% Range

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MONITOR PERFORMANCE TEST DATA SHEET

ZERO AND CALIBRATION DRIFT (24-HOUR)

CO Instr

Cyl. # AAL 2150

Date and Time	Zero Reading	Zero Drift (ΔZero)	Span Reading (After Zero Adjustment)	Calibration Drift (ΔSpan)
3-14-79 1000	0	-	900	-
3-15-79 "	0	0	905	+5
3-16-79 "	0	0	900	0
3-17-79 "	4	+4	907	+7
3-18-79 "	0	0	892	-8
3-19-79 "	8	+8	905	+5
3-20-79 "	0	0	908	+8
3-21-79 "	0	0	904	+4

Zero Drift = [Mean Zero Drift* 1.71 + C.I. (Zero) 2.91]
÷ [Instrument Span] x 100 = 0.23 .

Calibration Drift = [Mean Span Drift* 5.29 + C.I. (Span) 2.60]
÷ [Instrument Span] x 100 = .39 .

*Absolute Value

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MONITOR PERFORMANCE TEST DATA SHEET

ZERO AND CALIBRATION DRIFT (24-HOUR)

O2 Instr

Date and Time	Zero Reading	Zero Drift (ΔZero)	Span Reading (After Zero Adjustment)	Calibration Drift (ΔSpan)
3-14-79 1000	DNA		9.27	-
3/15			9.25	-.02
3/16			9.00	-.27
3/17			9.25	-.02
3/18			9.20	-.07
3/19			9.27	0
3/20			8.90	-.37
3-21	1000		9.30	+.03

Zero Drift = [Mean Zero Drift* _____ + C.I. (Zero) _____]
÷ [Instrument Span] x 100 = DNA.

Calibration Drift = [Mean Span Drift* .111 + C.I. (Span) .1359]
÷ [Instrument Span] x 100 = 2.47.

*Absolute Value

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MONITOR PERFORMANCE TEST DATA SHEET

RESPONSE TIME FOR CONTINUOUS INSTRUMENTS

NO_x Analyzer

Date of Test MAR 20 1978

Span Gas Concentration _____ ppm

Analyzer Span Setting _____ ppm

Upscale	1	5.8 seconds
	2	5.1 seconds
	3	5.7 seconds
	Average upscale response	5.5 seconds
Downscale	1	5.3 seconds
	2	5.0 seconds
	3	5.0 seconds
	Average downscale response	5.1 seconds.

System average response time (slower time) = 5.5 seconds.

% deviation from slower system average response = $\left[\frac{\text{average upscale minus average downscale}}{\text{slower time}}\right]$ x 100% = 7.2%

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MONITOR PERFORMANCE TEST DATA SHEET

RESPONSE TIME FOR CONTINUOUS INSTRUMENTS

CO_2 Analyzer

Date of Test MAR 20 1979

Span Gas Concentration 17.8 ~~ppm~~ %

Analyzer Span Setting 95 ~~ppm~~ %

Upscale	1	4.6 seconds
	2	3.8 seconds
	3	4.2 seconds
	Average upscale response	4.2 seconds
Downscale	1	3.8 seconds
	2	3.4 seconds
	3	4.2 seconds
	Average downscale response	3.8 seconds.

System average response time (slower time) = 4.2 seconds.

$$\% \text{ deviation from slower system average response} = \left[\frac{\text{average upscale minus average downscale}}{\text{slower time}}\right] \times 100\% = 9.5\%$$

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Engineer_____

MONITOR PERFORMANCE TEST DATA SHEET

RESPONSE TIME FOR CONTINUOUS INSTRUMENTS

Date of Test MAR 20 1979

Span Gas Concentration 900 ppm

Analyzer Span Setting 90 ~~ppm~~ %

Upscale	1	9.7 seconds
	2	9.3 seconds
	3	9.8 seconds

Average upscale response 9.6 seconds

Downscale	1	9.4 seconds
	2	8.2 seconds
	3	8.0 seconds

Average downscale response 8.5 seconds.

System average response time (slower time) = 8.5 seconds.

$$\text{\% deviation from slower system average response} = \left[\frac{\text{average upscale minus average downscale}}{\text{slower time}}\right] \times 100\% = 13\%$$

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Engineer _____

MONITOR PERFORMANCE TEST DATA SHEET

O_2 Instr.

RESPONSE TIME FOR CONTINUOUS INSTRUMENTS

Date of Test MAR 2 0 1979

Span Gas Concentration 9.3 ~~ppm~~ %

Analyzer Span Setting 9.3·25 ~~ppm~~ %

Upscale	1	10	seconds
	2	10	seconds
	3	10.2	seconds
	Average upscale response	10.1	seconds
Downscale	1	9	seconds
	2	10	seconds
	3	10	seconds
	Average downscale response	9.7	seconds.

System average response time (slower time) = 10.1 seconds.

$$\text{\% deviation from slower system average response} = \left[\frac{\text{average upscale minus average downscale}}{\text{slower time}}\right] \times 100\% = 4\%$$

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MONITOR PERFORMANCE TEST DATA SHEET

ACCURACY DETERMINATION (NO_x)

Engineer K.

Test No.	Date and Time	Reference Method Samples: NO_x Sample 1 (ppm) @ 3% O_2	NO_x Sample 2 (ppm) @ 3% O_2	NO_x Sample 3 (ppm) @ 3% O_2	NO_x Sample Average (ppm) @ 3% O_2	Analyzer 1-Hour Average (ppm)* NO_x @ 3% O_2		Difference (ppm) NO_x @ 3% O_2	
1	3-19-79 10:50	198	197	201	199		190		9
2	3-19-79 11:50	197	200	202	200		192		8
3	3-19-79 12:50	197	204	197	199		199		0
4	3-19-79 13:55	—	198	201	200		193		7
5	3-19-79 14:55	191	192	192	192		201		9
6	3-19-79 15:55	196	188	188	191		214		23
7	3-19-79 16:55	187	195	208	197		188		9
8	3-19-79 17:55	194	Broken	200	197		193		4
9	3-19-79 18:55	197	191	188	192		188		4
							195		

Mean reference method test value (NO_x) 196

Mean of the differences 8.1

95% Confidence intervals = ± 4.92 ppm (NO_x)

$$\text{Accuracies} = \frac{\text{Mean of the differences + 95\% confidence interval}}{\text{Mean reference method value}} \times 100 = 6.64\ \%\ (NO_x)$$

* Explain and report method used to determine integrated averages

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APPENDIX D

CONTINUOUS MONITOR PERFORMANCE SPECIFICATIONS

PERFORMANCE SPECIFICATION 2—PERFORMANCE SPECIFICATIONS AND SPECIFICATION TEST PROCEDURES FOR MONITORS OF SO_2 AND NO_x FROM STATIONARY SOURCES

1. Principle and Applicability.

1.1 Principle. The concentration of sulfur dioxide or oxides of nitrogen pollutants in stack emissions is measured by a continuously operating emission measurement system. Concurrent with operation of the continuous monitoring system, the pollutant concentrations are also measured with reference methods (Appendix A). An average of the continuous monitoring system data is computed for each reference method testing period and compared to determine the relative accuracy of the continuous monitoring system. Other tests of the continuous monitoring system are also performed to determine calibration error, drift, and response characteristics of the system.

1.2 Applicability. This performance specification is applicable to evaluation of continuous monitoring systems for measurement of nitrogen oxides or sulfur dioxide pollutants. These specifications contain test procedures, installation requirements, and data computation procedures for evaluating the acceptability of the continuous monitoring systems.

2. Apparatus.

2.1 Calibration Gas Mixtures. Mixtures of known concentrations of pollutant gas in a diluent gas shall be prepared. The pollutant gas shall be sulfur dioxide or the appropriate oxide(s) of nitrogen specified by paragraph 6 and within subparts. For sulfur dioxide gas mixtures, the diluent gas may be air or nitrogen. For nitric oxide (NO) gas mixtures, the diluent gas shall be oxygen-free (<10 ppm) nitrogen, and for nitrogen dioxide (NO_2) gas mixtures the diluent gas shall be air. Concentrations of approximately 50 percent and 90 percent of span are required. The 90 percent gas mixture is used to set and to check the span and is referred to as the span gas.

2.2 Zero Gas. A gas certified by the manufacturer to contain less than 1 ppm of the pollutant gas or ambient air may be used.

2.3 Equipment for measurement of the pollutant gas concentration using the reference method specified in the applicable standard.

2.4 Data Recorder. Analog chart recorder or other suitable device with input voltage range compatible with analyzer system output. The resolution of the recorder's data output shall be sufficient to allow completion of the test procedures within this specification.

2.5 Continuous monitoring system for SO_2 or NO_x pollutants as applicable.

3. Definitions.

3.1 Continuous Monitoring System. The total equipment required for the determination of a pollutant gas concentration in a source effluent. Continuous monitoring systems consist of major subsystems as follows:

3.1.1 Sampling Interface. That portion of an extractive continuous monitoring system that performs one or more of the following operations: Acquisition, transportation, and conditioning of a sample of the source effluent or that portion of an in-situ continuous monitoring system that protects the analyzer from the effluent.

3.1.2 Analyzer. That portion of the continuous monitoring system which senses the pollutant gas and generates a signal output that is a function of the pollutant concentration.

3.1.3 Data Recorder. That portion of the continuous monitoring system that provides a permanent record of the output signal in terms of concentration units.

3.2 Span. The value of pollutant concentration at which the continuous monitoring system is set to produce the maximum data display output. The span shall be set at the concentration specified in each applicable subpart.

3.3 Accuracy (Relative). The degree of correctness with which the continuous monitoring system yields the value of gas concentration of a sample relative to the value given by a defined reference method. This accuracy is expressed in terms of error, which is the difference between the paired concentration measurements expressed as a percentage of the mean reference value.

3.4 Calibration Error. The difference between the pollutant concentration indicated by the continuous monitoring system and the known concentration of the test gas mixture.

3.5 Zero Drift. The change in the continuous monitoring system output over a stated period of time of normal continuous operation when the pollutant concentration at the time for the measurements is zero.

3.6 Calibration Drift. The change in the continuous monitoring system output over a stated time period of normal continuous operations when the pollutant concentration at the time of the measurements is the same known upscale value.

3.7 Response Time. The time interval from a step change in pollutant concentration at the input to the continuous monitoring system to the time at which 95 percent of the corresponding final value is reached as displayed on the continuous monitoring system data recorder.

3.8 Operational Period. A minimum period of time over which a measurement system is expected to operate within certain performance specifications without unscheduled maintenance, repair, or adjustment.

3.9 Stratification. A condition identified by a difference in excess of 10 percent between the average concentration in the duct or stack and the concentration at any point more than 1.0 meter from the duct or stack wall.

4. Installation Specifications. Pollutant continuous monitoring systems (SO_2 and NO_x) shall be installed at a sampling location where measurements can be made which are directly representative (4.1), or which can be corrected so as to be representative (4.2) of the total emissions from the affected

facility. Conformance with this requirement shall be accomplished as follows:

4.1 Effluent gases may be assumed to be nonstratified if a sampling location eight or more stack diameters (equivalent diameters) downstream of any air in-leakage is selected. This assumption and data correction procedures under paragraph 4.2.1 may not be applied to sampling locations upstream of an air preheater in a steam generating facility under Subpart D of this part. For sampling locations where effluent gases are either demonstrated (4.3) or may be assumed to be nonstratified (eight diameters), a point (extractive systems) or path (in-situ systems) of average concentration may be monitored.

4.2 For sampling locations where effluent gases cannot be assumed to be nonstratified (less than eight diameters) or have been shown under paragraph 4.3 to be stratified, results obtained must be consistently representative (e.g. a point of average concentration may shift with load changes) or the data generated by sampling at a point (extractive systems) or across a path (in-situ systems) must be corrected (4.2.1 and 4.2.2) so as to be representative of the total emissions from the affected facility. Conformance with this requirement may be accomplished in either of the following ways:

4.2.1 Installation of a diluent continuous monitoring system (O_2 or CO_2 as applicable) in accordance with the procedures under paragraph 4.2 of Performance Specification 3 of this appendix. If the pollutant and diluent monitoring systems are not of the same type (both extractive or both in-situ), the extractive system must use a multipoint probe.

4.2.2 Installation of extractive pollutant monitoring systems using multipoint sampling probes or in-situ pollutant monitoring systems that sample or view emissions which are consistently representative of the total emissions for the entire cross section. The Administrator may require data to be submitted to demonstrate that the emissions sampled or viewed are consistently representative for several typical facility process operating conditions.

4.3 The owner or operator may perform a traverse to characterize any stratification of effluent gases that might exist in a stack or duct. If no stratification is present, sampling procedures under paragraph 4.1 may be applied even though the eight diameter criteria is not met.

4.4 When single point sampling probes for extractive systems are installed within the stack or duct under paragraphs 4.1 and 4.2.1, the sample may not be extracted at any point less than 1.0 meter from the stack or duct wall. Multipoint sampling probes installed under paragraph 4.2.2 may be located at any points necessary to obtain consistently representative samples.

5. Continuous Monitoring System Performance Specifications.

The continuous monitoring system shall meet the performance specifications in Table 2-1 to be considered acceptable under this method.

TABLE 2-1.—*Performance specifications*

Parameter	Specification
1. Accuracy [1]	≤20 pct of the mean value of the reference method test data.
2. Calibration error [1]	≤5 pct of each (50 pct, 90 pct) calibration gas mixture value.
3. Zero drift (2 h) [1]	2 pct of span
4. Zero drift (24 h) [1]	Do.
5. Calibration drift (2 h) [1]	Do.
6. Calibration drift (24 h) [1]	2.5 pct. of span
7. Response time	15 min maximum.
8. Operational period	168 h minimum.

[1] Expressed as sum of absolute mean value plus 95 pct confidence interval of a series of tests.

6. Performance Specification Test Procedures. The following test procedures shall be used to determine conformance with the requirements of paragraph 5. For NO_x analyzers that oxidize nitric oxide (NO) to nitrogen dioxide (NO_2), the response time test under paragraph 6.3 of this method shall be performed using nitric oxide (NO) span gas. Other tests for NO_x continuous monitoring systems under paragraphs 6.1 and 6.2 and all tests for sulfur dioxide systems shall be performed using the pollutant span gas specified by each subpart.

6.1 Calibration Error Test Procedure. Set up and calibrate the complete continuous monitoring system according to the manufacturer's written instructions. This may be accomplished either in the laboratory or in the field.

6.1.1 Calibration Gas Analyses. Triplicate analyses of the gas mixtures shall be performed within two weeks prior to use using Reference Methods 6 for SO_2 and 7 for NO_x. Analyze each calibration gas mixture (50%, 90%) and record the results on the example sheet shown in Figure 2-1. Each sample test result must be within 20 percent of the averaged result or the tests shall be repeated. This step may be omitted for non-extractive monitors where dynamic calibration gas mixtures are not used (6.1.2).

6.1.2 Calibration Error Test Procedure. Make a total of 15 nonconsecutive measurements by alternately using zero gas and each calibration gas mixture concentration (e.g. 0%, 50%, 0%, 90%, 50%, 90%, 50%, 0%, etc.). For nonextractive continuous monitoring systems, this test procedure may be performed by using two or more calibration gas

cells whose concentrations are certified by the manufacturer to be functionally equivalent to these gas concentrations. Convert the continuous monitoring system output readings to ppm and record the results on the example sheet shown in Figure 2-2.

6.2 Field Test for Accuracy (Relative), Zero Drift, and Calibration Drift. Install and operate the continuous monitoring system in accordance with the manufacturer's written instructions and drawings as follows:

6.2.1 Conditioning Period. Offset the zero setting at least 10 percent of the span so that negative zero drift can be quantified. Operate the system for an initial 168-hour conditioning period in normal operating manner.

6.2.2 Operational Test Period. Operate the continuous monitoring system for an additional 168-hour period retaining the zero offset. The system shall monitor the source effluent at all times except when being zeroed, calibrated, or backpurged.

6.2.2.1 Field Test for Accuracy (Relative). For continuous monitoring systems employing extractive sampling, the probe tip for the continuous monitoring system and the probe tip for the Reference Method sampling train should be placed at adjacent locations in the duct. For NO_x continuous monitoring systems, make 27 NO_x concentration measurements, divided into nine sets, using the applicable reference method. No more than one set of tests, consisting of three individual measurements, shall be performed in any one hour. All individual measurements of each set shall be performed concurrently, or within a three-minute interval and the results averaged. For SO_2 continuous monitoring systems, make nine SO_2 concentration measurements using the applicable reference method. No more than one measurement shall be performed in any one hour. Record the reference method test data and the continuous monitoring system concentrations on the example data sheet shown in Figure 2-3.

6.2.2.2 Field Test for Zero Drift and Calibration Drift. For extractive systems, determine the values given by zero and span gas pollutant concentrations at two-hour intervals until 15 sets of data are obtained. For nonextractive measurement systems, the zero value may be determined by mechanically producing a zero condition that provides a system check of the analyzer internal mirrors and all electronic circuitry including the radiation source and detector assembly or by inserting three or more calibration gas cells and computing the zero point from the upscale measurements. If this latter technique is used, a graph(s) must be retained by the owner or operator for each measurement system that shows the relationship between the upscale measurements and the zero point. The span of the system shall be checked by using a calibration gas cell certified by the manufacturer to be functionally equivalent to 60 percent of span concentration. Record the zero and span measurements (or the computed zero drift) on the example data sheet shown in Figure 2-4. The two-hour periods over which measurements are conducted need not be consecutive but may not overlap. All measurements required under this paragraph may be conducted concurrent with tests under paragraph 6.2.2.1.

6.2.2.3 Adjustments. Zero and calibration corrections and adjustments are allowed only at 24-hour intervals or at such shorter intervals as the manufacturer's written instructions specify. Automatic corrections made by the measurement system without operator intervention or initiation are allowable at any time. During the entire 168-hour operational test period, record on the example sheet shown in Figure 2-5 the values given by zero and span gas pollutant concentrations before and after adjustment at 24-hour intervals.

6.3 Field Test for Response Time.

6.3.1 Scope of Test. Use the entire continuous monitoring system as installed, including sample transport lines if used. Flow rates, line diameters, pumping rates, pressures (do not allow the pressurized calibration gas to change the normal operating pressure in the sample line), etc., shall be at the nominal values for normal operation as specified in the manufacturer's written instructions. If the analyzer is used to sample more than one pollutant source (stack), repeat this test for each sampling point.

6.3.2 Response Time Test Procedure. Introduce zero gas into the continuous monitoring system sampling interface or as close to the sampling interface as possible. When the system output reading has stabilized, switch quickly to a known concentration of pollutant gas. Record the time from concentration switching to 95 percent of final stable response. For non-extractive monitors, the highest available calibration gas concentration shall be switched into and out of the sample path and response times recorded. Perform this test sequence three (3) times. Record the results of each test on the example sheet shown in Figure 2-6.

7. Calculations, Data Analysis and Reporting.

7.1 Procedure for determination of mean values and confidence intervals.

7.1.1 The mean value of a data set is calculated according to equation 2-1.

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \qquad \text{Equation 2-1}$$

where:

x_i = absolute value of the measurements,
Σ = sum of the individual values,
$\bar{x}$ = mean value, and
n = number of data points.

7.1.2 The 95 percent confidence interval (two-sided) is calculated according to equation 2-2:

$$C.I._{95} = \frac{t_{.975}}{n\sqrt{n-1}}\sqrt{n(\Sigma x_i^2) - (\Sigma x_i)^2} \qquad \text{Equation 2-2}$$

where:

$\sum x_i$ = sum of all data points,
$t_{.975} = t_t - \alpha/2$, and
C.I.$_{95}$ = 95 percent confidence interval estimate of the average mean value.

Values for $t_{.975}$

n	$t_{.975}$
2	12.706
3	4.303
4	3.182
5	2.776
6	2.571
7	2.447
8	2.365
9	2.306
10	2.262
11	2.228
12	2.201
13	2.179
14	2.160
15	2.145
16	2.131

The values in this table are already corrected for n-1 degrees of freedom. Use n equal to the number of samples as data points.

7.2 Data Analysis and Reporting.

7.2.1 Accuracy (Relative). For each of the nine reference method test points, determine the average pollutant concentration reported by the continuous monitoring system. These average concentrations shall be determined from the continuous monitoring system data recorded under 7.2.2 by integrating or averaging the pollutant concentrations over each of the time intervals concurrent with each reference method testing period. Before proceeding to the next step, determine the basis (wet or dry) of the continuous monitoring system data and reference method test data concentrations. If the bases are not consistent, apply a moisture correction to either reference method concentrations or the continuous monitoring system concentrations as appropriate. Determine the correction factor by moisture tests concurrent with the reference method testing periods. Report the moisture test method and the correction procedure employed. For each of the nine test runs determine the difference for each test run by subtracting the respective reference method test concentrations (use average of each set of three measurements for NO_x) from the continuous monitoring system integrated or averaged concentrations. Using these data, compute the mean difference and the 95 percent confidence interval of the differences (equations 2-1 and 2-2). Accuracy is reported as the sum of the absolute value of the mean difference and the 95 percent confidence interval of the differences expressed as a percentage of the mean reference method value. Use the example sheet shown in Figure 2-3.

7.2.2 Calibration Error. Using the data from paragraph 6.1, subtract the measured pollutant concentration determined under paragraph 6.1.1 (Figure 2-1) from the value shown by the continuous monitoring system for each of the five readings at each concentration measured under 6.1.2 (Figure 2-2). Calculate the mean of these difference values and the 95 percent confidence intervals according to equations 2-1 and 2-2. Report the calibration error (the sum of the absolute value of the mean difference and the 95 percent confidence interval) as a percentage of each respective calibration gas concentration. Use example sheet shown in Figure 2-2.

7.2.3 Zero Drift (2-hour). Using the zero concentration values measured each two hours during the field test, calculate the differences between consecutive two-hour readings expressed in ppm. Calculate the mean difference and the confidence interval using equations 2-1 and 2-2. Report the zero drift as the sum of the absolute mean value and the confidence interval as a percentage of span. Use example sheet shown in Figure 2-4.

7.2.4 Zero Drift (24-hour). Using the zero concentration values measured every 24 hours during the field test, calculate the differences between the zero point after zero adjustment and the zero value 24 hours later just prior to zero adjustment. Calculate the mean value of these points and the confidence interval using equations 2-1 and 2-2. Report the zero drift (the sum of the absolute mean and confidence interval) as a percentage of span. Use example sheet shown in Figure 2-5.

7.2.5 Calibration Drift (2-hour). Using the calibration values obtained at two-hour intervals during the field test, calculate the differences between consecutive two-hour readings expressed as ppm. These values should be corrected for the corresponding zero drift during that two-hour period. Calculate the mean and confidence interval of these corrected difference values using equations 2-1 and 2-2. Do not use the differences between non-consecutive readings. Report the calibration drift as the sum of the absolute mean and confidence interval as a percentage of span. Use example sheet shown in in Figure 2-4.

7.2.6 Calibration Drift (24-hour). Using the calibration values measured every 24 hours during the field test, calculate the differences between the calibration concentration reading after zero and calibration adjustment, and the calibration concentration reading 24 hours later after zero adjustment but before calibration adjustment. Calculate the mean value of these differences and the confidence interval using equations 2-1 and 2-2. Report the calibration drift (the sum of the absolute mean and confidence interval) as a percentage of span. Use the example sheet shown in Figure 2-5.

7.2.7 Response Time. Using the charts from paragraph 6.3, calculate the time interval from concentration switching to 95 percent to the final stable value for all upscale and downscale tests. Report the mean of the three upscale test times and the mean of the three downscale test times. The two average times should not differ by more than 15 percent of the slower time. Report the slower

time as the system response time. Use the example sheet shown in Figure 2–6.

7.2.8 Operational Test Period. During the 168-hour performance and operational test period, the continuous monitoring system shall not require any corrective maintenance, repair, replacement, or adjustment other than that clearly specified as required in the operation and maintenance manuals as routine and expected during a one-week period. If the continuous monitoring system operates within the specified performance parameters and does not require corrective maintenance, repair, replacement or adjustment other than as specified above during the 168-hour test period, the operational period will be successfully concluded. Failure of the continuous monitoring system to meet this requirement shall call for a repetition of the 168-hour test period. Portions of the test which were satisfactorily completed need not be repeated. Failure to meet any performance specifications shall call for a repetition of the one-week performance test period and that portion of the testing which is related to the failed specification. All maintenance and adjustments required shall be recorded. Output readings shall be recorded before and after all adjustments.

8. References.

8.1 "Monitoring Instrumentation for the Measurement of Sulfur Dioxide in Stationary Source Emissions," Environmental Protection Agency, Research Triangle Park, N.C., February 1973.

8.2 "Instrumentation for the Determination of Nitrogen Oxides Content of Stationary Source Emissions," Environmental Protection Agency, Research Triangle Park, N.C., Volume 1, APTD–0847, October 1971; Volume 2, APTD–0942, January 1972.

8.3 "Experimental Statistics," Department of Commerce, Handbook 91, 1963, pp. 3–31, paragraphs 3–3.1.4.

8.4 "Performance Specifications for Stationary-Source Monitoring Systems for Gases and Visible Emissions," Environmental Protection Agency, Research Triangle Park, N.C., EPA–650/2–74–013, January 1974.

Date _____ Reference Method Used ____

Mid-Range Calibration Gas Mixture

Sample 1 _____ ppm

Sample 2 _____ ppm

Sample 3 _____ ppm

Average _____ ppm

High-Range (span) Calibration Gas Mixture

Sample 1 _____ ppm

Sample 2 _____ ppm

Sample 3 _____ ppm

Average _____ ppm

Figure 2-1. Analysis of Calibration Gas Mixtures

Calibration Gas Mixture Data (From Figure 2-1)

Mid (50%) _____ppm High (90%) _____ppm

Run #	Calibration Gas Concentration, ppm	Measurement System Reading, ppm	Differences,[1] ppm
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

	Mid	High
Mean difference	____	____
Confidence interval	± ____	± ____
Calibration error = $\frac{\text{Mean Difference}^{2} + \text{C.I.}}{\text{Average Calibration Gas Concentration}} \times 100$	____%	____%

[1] Calibration gas concentration - measurement system reading
[2] Absolute value

Figure 2-2. Calibration Error Determination

Test No.	Date and Time	Reference Method Samples: SO_2 Sample 1 (ppm)	NO Sample 1 (ppm)	NO Sample 2 (ppm)	NO Sample 3 (ppm)	NO_x Sample Average (ppm)	Analyzer 1-Hour Average (ppm)* SO_2	Analyzer 1-Hour Average (ppm)* NO_x	Difference (ppm) SO_2	Difference (ppm) NO_x
1										
2										
3										
4										
5										
6										
7										
8										
9										

Mean reference method test value (SO_2) _____ Mean reference method test value (NO_x) _____ Mean of the differences _____

95% Confidence intervals = ± _____ ppm (SO_2) = ± _____ ppm (NO_x)

Accuracies = $\frac{\text{Mean of the differences} + 95\% \text{ confidence interval}}{\text{Mean reference method value}} \times 100$ = ____% (SO_2) = ____% (NO_x)

* Explain and report method used to determine integrated averages

Figure 2-3. Accuracy Determination (SO_2 and NO_x)

Data Set No.	Time Begin	Time End	Date	Zero Reading	Zero Drift (aZero)	Span Reading	Span Drift (aSpan)	Calibration Drift (Span- Zero)
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

Zero Drift = [Mean Zero Drift* _____ ± CI (Zero) _____] ÷ [Span] x 100 = _____.

Calibration Drift = [Mean Span Drift* _____ ± CI (Span) _____] ÷ [Span] x 100 = _____.

*Absolute Value.

Figure 2-4. Zero and Calibration Drift (2 hour)

Date and Time	Zero Reading	Zero Drift (ΔZero)	Span Reading (After zero adjustment)	Calibration Drift (ΔSpan)

Zero Drift = [Mean Zero Drift* _____ ÷ C.I. (Zero) _____]

÷ [Instrument Span] x 100 = _____.

Calibration Drift = [Mean Span Drift* _____ ÷ C.I. (Span) _____]

÷ [Instrument Span] x 100 = _____.

* Absolute value

Figure 2-5. Zero and Calibration Drift (24-hour)

Date of Test _____

Span Gas Concentration _____ppm

Analyzer Span Setting _____ppm

Upscale	1	_____seconds
	2	_____seconds
	3	_____seconds
Average upscale response		_____seconds
Downscale	1	_____seconds
	2	_____seconds
	3	_____seconds
Average downscale response		_____seconds

System average response time (slower time) = _____seconds.

$$\%\text{deviation from slower system average response} = \left[\frac{\text{average upscale minus average downscale}}{\text{slower time}}\right] \times 100\% = \_\_\_\_.$$

CO_2 & O_2

Figure 2-6. Response Time

Performance Specification 3—Performance specifications and specification test procedures for monitors of CO_2 and O_2 from stationary sources.

1. Principle and Applicability.

1.1 Principle. Effluent gases are continuously sampled and are analyzed for carbon dioxide or oxygen by a continuous monitoring system. Tests of the system are performed during a minimum operating period to determine zero drift, calibration drift, and response time characteristics.

1.2 Applicability. This performance specification is applicable to evaluation of continuous monitoring systems for measurement of carbon dioxide or oxygen. These specifications contain test procedures, installation requirements, and data computation procedures for evaluating the acceptability of the continuous monitoring systems subject to approval by the Administrator. Sampling may include either extractive or non-extractive (in-situ) procedures.

2. Apparatus.

2.1 Continuous Monitoring System for Carbon Dioxide or Oxygen.

2.2 Calibration Gas Mixtures. Mixture of known concentrations of carbon dioxide or oxygen in nitrogen or air. Midrange and 90 percent of span carbon dioxide or oxygen concentrations are required. The 90 percent of span gas mixture is to be used to set and check the analyzer span and is referred to as span gas. For oxygen analyzers, if the span is higher than 21 percent O_2, ambient air may be used in place of the 90 percent of span calibration gas mixture. Triplicate analyses of the gas mixture (except ambient air) shall be performed within two weeks prior to use using Reference Method 3 of this part.

2.3 Zero Gas. A gas containing less than 100 ppm of carbon dioxide or oxygen.

2.4 Data Recorder. Analog chart recorder or other suitable device with input voltage range compatible with analyzer system output. The resolution of the recorder's data output shall be sufficient to allow completion of the test procedures within this specification.

3. Definitions.

3.1 Continuous Monitoring System. The total equipment required for the determination of carbon dioxide or oxygen in a given source effluent. The system consists of three major subsystems:

3.1.1 Sampling Interface. That portion of the continuous monitoring system that performs one or more of the following operations: Delineation, acquisition, transportation, and conditioning of a sample of the source effluent or protection of the analyzer from the hostile aspects of the sample or source environment.

3.1.2 Analyzer. That portion of the continuous monitoring system which senses the pollutant gas and generates a signal output that is a function of the pollutant concentration.

3.1.3 Data Recorder. That portion of the continuous monitoring system that provides a permanent record of the output signal in terms of concentration units.

3.2 Span. The value of oxygen or carbon dioxide concentration at which the continuous monitoring system is set that produces the maximum data display output. For the purposes of this method, the span shall be set no less than 1.5 to 2.5 times the normal carbon dioxide or normal oxygen concentration in the stack gas of the affected facility.

3.3 Midrange. The value of oxygen or carbon dioxide concentration that is representative of the normal conditions in the stack gas of the affected facility at typical operating rates.

3.4 Zero Drift. The change in the continuous monitoring system output over a stated period of time of normal continuous operation when the carbon dioxide or oxygen concentration at the time for the measurements is zero.

3.5 Calibration Drift. The change in the continuous monitoring system output over a stated time period of normal continuous operation when the carbon dioxide or oxygen continuous monitoring system is measuring the concentration of span gas.

3.6 Operational Test Period. A minimum period of time over which the continuous monitoring system is expected to operate within certain performance specifications without unscheduled maintenance, repair, or adjustment.

3.7 Response time. The time interval from a step change in concentration at the input to the continuous monitoring system to the time at which 95 percent of the corresponding final value is displayed on the continuous monitoring system data recorder.

4. Installation Specification.

Oxygen or carbon dioxide continuous monitoring systems shall be installed at a location where measurements are directly representative of the total effluent from the affected facility or representative of the same effluent sampled by a SO_2 or NO_x continuous monitoring system. This requirement shall be complied with by use of applicable requirements in Performance Specification 2 of this appendix as follows:

4.1 Installation of Oxygen or Carbon Dioxide Continuous Monitoring Systems Not Used to Convert Pollutant Data. A sampling location shall be selected in accordance with the procedures under paragraphs 4.2.1 or 4.2.2, or Performance Specification 2 of this appendix.

4.2 Installation of Oxygen or Carbon Dioxide Continuous Monitoring Systems Used to Convert Pollutant Continuous Monitoring System Data to Units of Applicable Standards. The diluent continuous monitoring system (oxygen or carbon dioxide) shall be installed at a sampling location where measurements that can be made are representative of the effluent gases sampled by the pollutant continuous monitoring system(s). Conformance with this requirement may be accomplished in any of the following ways:

4.2.1 The sampling location for the diluent system shall be near the sampling location for the pollutant continuous monitoring system such that the same approximate point(s) (extractive systems) or path (in-situ systems) in the cross section is sampled or viewed.

4.2.2 The diluent and pollutant continuous monitoring systems may be installed at different locations if the effluent gases at both sampling locations are nonstratified as determined under paragraphs 4.1 or 4.3, Performance Specification 2 of this appendix and there is no in-leakage occurring between the two sampling locations. If the effluent gases are stratified at either location, the procedures under paragraph 4.2.2, Performance Specification 2 of this appendix shall be used for installing continuous monitoring systems at that location.

5. Continuous Monitoring System Performance Specifications.

The continuous monitoring system shall meet the performance specifications in Table 3–1 to be considered acceptable under this method.

6. Performance Specification Test Procedures.

The following test procedures shall be used to determine conformance with the requirements of paragraph 4. Due to the wide variation existing in analyzer designs and principles of operation, these procedures are not applicable to all analyzers. Where this occurs, alternative procedures, subject to the approval of the Administrator, may be employed. Any such alternative procedures must fulfill the same purposes (verify response, drift, and accuracy) as the following procedures, and must clearly demonstrate conformance with specifications in Table 3–1.

6.1 Calibration Check. Establish a calibration curve for the continuous monitoring system using zero, midrange, and span concentration gas mixtures. Verify that the resultant curve of analyzer reading compared with the calibration gas value is consistent with the expected response curve as described by the analyzer manufacturer. If the expected response curve is not produced, additional calibration gas measurements shall be made, or additional steps undertaken to verify the accuracy of the response curve of the analyzer.

6.2 Field Test for Zero Drift and Calibration Drift. Install and operate the continuous monitoring system in accordance

with the manufacturer's written instructions and drawings as follows:

TABLE 3-1.—*Performance specifications*

Parameter	*Specification*
1. Zero drift (2 h) [1]	≤0.4 pct O_2 or CO_2.
2. Zero drift (24 h) [1]	≤0.5 pct O_2 or CO_2.
3. Calibration drift (2 h) [1]	≤0.4 pct O_2 or CO_2.
4. Calibration drift (24 h) [1]	≤0.5 pct O_2 or CO_2.
5. Operational period	168 h minimum.
6. Response time	10 min.

[1] Expressed as sum of absolute mean value plus 95 pct confidence interval of a series of tests.

6.2.1 Conditioning Period. Offset the zero setting at least 10 percent of span so that negative zero drift may be quantified. Operate the continuous monitoring system for an initial 168-hour conditioning period in a normal operational manner.

6.2.2. Operational Test Period. Operate the continuous monitoring system for an additional 168-hour period maintaining the zero offset. The system shall monitor the source effluent at all times except when being zeroed, calibrated, or backpurged.

6.2.3 Field Test for Zero Drift and Calibration Drift. Determine the values given by zero and midrange gas concentrations at two-hour intervals until 15 sets of data are obtained. For non-extractive continuous monitoring systems, determine the zero value given by a mechanically produced zero condition or by computing the zero value from upscale measurements using calibrated gas cells certified by the manufacturer. The midrange checks shall be performed by using certified calibration gas cells functionally equivalent to less than 50 percent of span. Record these readings on the example sheet shown in Figure 3-1. These two-hour periods need not be consecutive but may not overlap. In-situ CO, or O_2 analyzers which cannot be fitted with a calibration gas cell may be calibrated by alternative procedures acceptable to the Administrator. Zero and calibration corrections and adjustments are allowed only at 24-hour intervals or at such shorter intervals as the manufacturer's written instructions specify. Automatic corrections made by the continuous monitoring system without operator intervention or initiation are allowable at any time. During the entire 168-hour test period, record the values given by zero and span gas concentrations before and after adjustment at 24-hour intervals in the example sheet shown in Figure 3-2.

6.3 Field Test for Response Time.

6.3.1 Scope of Test.

This test shall be accomplished using the continuous monitoring system as installed, including sample transport lines if used. Flow rates, line diameters, pumping rates, pressures (do not allow the pressurized calibration gas to change the normal operating pressure in the sample line), etc., shall be at the nominal values for normal operation as specified in the manufacturer's written instructions. If the analyzer is used to sample more than one source (stack), this test shall be repeated for each sampling point.

6.3.2 Response Time Test Procedure.

Introduce zero gas into the continuous monitoring system sampling interface or as close to the sampling interface as possible. When the system output reading has stabilized, switch quickly to a known concentration of gas at 90 percent of span. Record the time from concentration switching to 95 percent of final stable response. After the system response has stabilized at the upper level, switch quickly to a zero gas. Record the time from concentration switching to 95 percent of final stable response. Alternatively, for nonextractive continuous monitoring systems, the highest available calibration gas concentration shall be switched into and out of the sample path and response times recorded. Perform this test sequence three (3) times. For each test, record the results on the data sheet shown in Figure 3-3.

7. Calculations, Data Analysis, and Reporting.

7.1 Procedure for determination of mean values and confidence intervals.

7.1.1 The mean value of a data set is calculated according to equation 3-1.

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \qquad \text{Equation 3-1}$$

where:

x_i = absolute value of the measurements,
Σ = sum of the individual values,
$\bar{x}$ = mean value, and
n = number of data points.

7.2.1 The 95 percent confidence interval (two-sided) is calculated according to equation 3-2:

$$C.I._{95} = \frac{t_{.975}}{n\sqrt{n-1}}\sqrt{n(\Sigma x_i^2) - (\Sigma x_i)^2} \qquad \text{Equation 3-2}$$

where:

ΣX = sum of all data points,
$t_{.975} = t_{1-\alpha/2}$, and
$C.I._{95}$ = 95 percent confidence interval estimates of the average mean value.

Values for $t_{.975}$

n	$t_{.975}$
2	12.706
3	4.303
4	3.182
5	2.776
6	2.571
7	2.447
8	2.365
9	2.306
10	2.262
11	2.228
12	2.201
13	2.179
14	2.160
15	2.145
16	2.131

The values in this table are already corrected for n–1 degrees of freedom. Use n equal to the number of samples as data points.

7.2 Data Analysis and Reporting.

7.2.1 Zero Drift (2-hour). Using the zero concentration values measured each two hours during the field test, calculate the differences between the consecutive two-hour readings expressed in ppm. Calculate the mean difference and the confidence interval using equations 3–1 and 3–2. Record the sum of the absolute mean value and the confidence interval on the data sheet shown in Figure 3–1.

7.2.2 Zero Drift (24-hour). Using the zero concentration values measured every 24 hours during the field test, calculate the differences between the zero point after zero adjustment and the zero value 24 hours later just prior to zero adjustment. Calculate the mean value of these points and the confidence interval using equations 3–1 and 3–2. Record the zero drift (the sum of the absolute mean and confidence interval) on the data sheet shown in Figure 3–2.

7.2.3 Calibration Drift (2-hour). Using the calibration values obtained at two-hour intervals during the field test, calculate the differences between consecutive two-hour readings expressed as ppm. These values should be corrected for the corresponding zero drift during that two-hour period. Calculate the mean and confidence interval of these corrected difference values using equations 3–1 and 3–2. Do not use the differences between non-consecutive readings. Record the sum of the absolute mean and confidence interval upon the data sheet shown in Figure 3–1.

7.2.4 Calibration Drift (24-hour). Using the calibration values measured every 24 hours during the field test, calculate the differences between the calibration concentration reading after zero and calibration adjustment and the calibration concentration reading 24 hours later after zero adjustment but before calibration adjustment. Calculate the mean value of these differences and the confidence interval using equations 3–1 and 3–2. Record the sum of the absolute mean and confidence interval on the data sheet shown in Figure 3–2.

7.2.5 Operational Test Period. During the 168-hour performance and operational test period, the continuous monitoring system shall not receive any corrective maintenance, repair, replacement, or adjustment other than that clearly specified as required in the manufacturer's written operation and maintenance manuals as routine and expected during a one-week period. If the continuous monitoring system operates within the specified performance parameters and does not require corrective maintenance, repair, replacement or adjustment other than as specified above during the 168-hour test period, the operational period will be successfully concluded. Failure of the continuous monitoring system to meet this requirement shall call for a repetition of the 168 hour test period. Portions of the test which were satisfactorily completed need not be repeated. Failure to meet any performance specifications shall call for a repetition of the one-week performance test period and that portion of the testing which is related to the failed specification. All maintenance and adjustments required shall be recorded. Output readings shall be recorded before and after all adjustments.

7.2.6 Response Time. Using the data developed under paragraph 5.3, calculate the time interval from concentration switching to 95 percent to the final stable value for all upscale and downscale tests. Report the mean of the three upscale test times and the mean of the three downscale test times. The two average times should not differ by more than 15 percent of the slower time. Report the slower time as the system response time. Record the results on Figure 3–3.

8. References.

8.1 "Performance Specifications for Stationary Source Monitoring Systems for Gases and Visible Emissions," Environmental Protection Agency, Research Triangle Park, N.C., EPA–650/2–74–013, January 1974.

8.2 "Experimental Statistics," Department of Commerce, National Bureau of Standards Handbook 91, 1963, pp. 3–31, paragraphs 3–3.1.4.

Data Set No.	Time Begin	Time End	Date	Zero Reading	Zero Drift (aZero)	Span Reading	Span Drift (aSpan)	Calibration Drift (aSpan-aZero)
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

Zero Drift = |Mean Zero Drift* _____ + CI (Zero) _____| = _____.
Calibration Drift = |Mean Span Drift* _____ + CI (Span _____| = _____.
*Absolute Value.

Figure 3-1. Zero and Calibration Drift (2 Hour).

Date and Time	Zero Reading	Zero Drift (ΔZero)	Span Reading (After zero adjustment)	Calibration Drift (ΔSpan)

Zero Drift = [Mean Zero Drift* _____ + C.I. (Zero) _____]

= _____.

Calibration Drift = [Mean Span Drift* _____ + C.I. (Span) _____]

= _____.

* Absolute value

Figure 3-2. Zero and Calibration Drift (24-hour)

Date of Test _____

Span Gas Concentration _____ ppm

Analyzer Span Setting _____ ppm

Upscale
1. _____ seconds
2. _____ seconds
3. _____ seconds

Average upscale response _____ seconds

Downscale
1. _____ seconds
2. _____ seconds
3. _____ seconds

Average downscale response _____ seconds

System average response time (slower time) = _____ seconds

% deviation from slower system average response = $\frac{\text{average upscale minus average downscale}}{\text{slower time}} \times 100\%$

= _____.

Figure 3-3. Response

[40 FR 46259, Oct. 6, 1975; 40 FR 59204, 59205, Dec. 22, 1975, as amended at 42 FR 5937, Jan. 31, 1977]

APPENDIX C—DETERMINATION OF EMISSION RATE CHANGE

1. *Introduction.*

1.1 The following method shall be used to determine whether a physical or operational change to an existing facility resulted in an increase in the emission rate to the atmosphere. The method used is the Student's *t* test, commonly used to make inferences from small samples.

2. *Data.*

2.1 Each emission test shall consist of *n* runs (usually three) which produce *n* emission rates. Thus two sets of emission rates are generated, one before and one after the change, the two sets being of equal size.

2.2 When using manual emission tests, except as provided in § 60.8(b) of this part, the reference methods of Appendix A to this part shall be used in accordance with the procedures specified in the applicable subpart both before and after the change to obtain the data.

2.3 When using continuous monitors, the facility shall be operated as if a manual emission test were being performed. Valid data using the averaging time which would be required if a manual emission test were being conducted shall be used.

3. *Procedure.*

3.1 Subscripts a and b denote prechange and postchange respectively.

3.2 Calculate the arithmetic mean emission rate, $\bar{E}$, for each set of data using Equation 1.

$$\bar{E} = \sum_{i=1}^{n} \frac{E_i}{n} = \frac{E_1 + E_2 \ldots + E_n}{n} \quad (1)$$

where:

E_i = Emission rate for the *i* th run.

n = number of runs

3.3 Calculate the sample variance, S^2, for each set of data using Equation 2.

$$S^2 = \frac{\sum_{i=1}^{n} (E_i - \bar{E})^2}{n-1} = \frac{\sum_{i=1}^{n} E_i^2 - \left(\sum_{i=1}^{n} E_i\right)^2 \Big/ n}{n-1} \quad (2)$$

3.4 Calculate the pooled estimate, S_p, using Equation 3.

$$S_p = \left[\frac{(n_a - 1)\, S_a^2 + (n_b - 1)\, S_b^2}{n_a + n_b - 2}\right]^{1/2} \quad (3)$$

3.5 Calculate the test statistic, *t*, using Equation 4.

APPENDIX E

SUMMARY OF PREVIOUS DATA FROM SITE 2

Location No. 18, Test No. 9

Boiler No. 2 at Location 18 is a Babcock and Wilcox integral furnace watertube boiler with a rated capacity of 90,000 lbs/hr steam flow and was installed in 1935. The current top load capability is 79,000 lbs/hr steam flow and is limited by the fans. The furnace wall consists of watertubes approximately 3 inches in diameter spaced 10.25 inches on centers. The wall exposure between the tubes consists of refractory; the furnace was rebricked in 1972. The boiler operates at a nominal steam pressure of 320 psig and steam temperature of 428°F (saturation).

Three B&W steam-atomized burners are spaced in a triangular pattern, with the top burner spaced directly above the center position of the lower two burners. The vertical spacing (height of the triangle) is 36 inches, and the horizontal spacing (base of the triangle) is 37 inches. The oil guns use a B&W Y-jet steam atomizer with the steam pressure at the burner nominally 35 psi greater than the oil pressure. No. 6 fuel oil was used for this test. The temperature of the oil at the burner varied from 185°F at the lower loads to 208°F at top load. The oil pressure at the burner at top load was 85 psig. A tubular type preheater is used to preheat the combustion air; however, no air temperature data were available during this test.

The furnace volume and area loading, i.e., ft^3/MBtu/hr and ft^2/MBtu/hr, and burner loading are all about average for boilers of this capacity.

The NO_x emissions and excess O_2 levels as a function of boiler steam flow are presented in Figure E-1. Although the O_2 levels are high over the entire load range investigated, there is not the sharp increase in O_2 at lower loads which has typically caused the emissions from other boilers to increase at lower loads. This practice of holding the excess oxygen relatively constant over the load range is unique to location 18 boilers and is followed consistently at most facilities of the same company.

Maximum NO_x levels were found to occur at baseline to top load operating conditions. The effect of excess O_2 on NO_x emissions is presented in Figure E-2 and shows a relatively strong effect, especially for the high operating excess

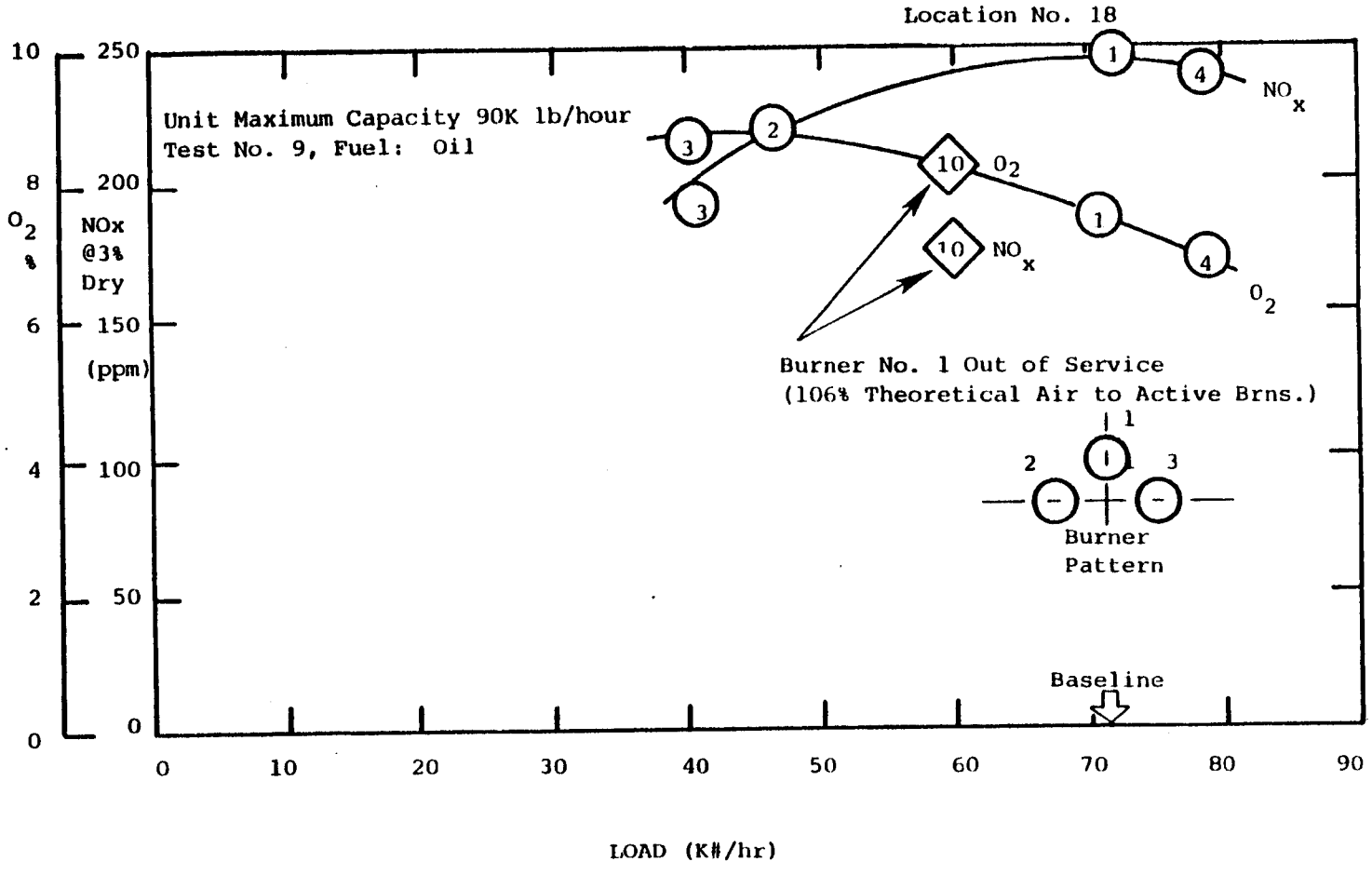

Figure E-1. Effect of Load

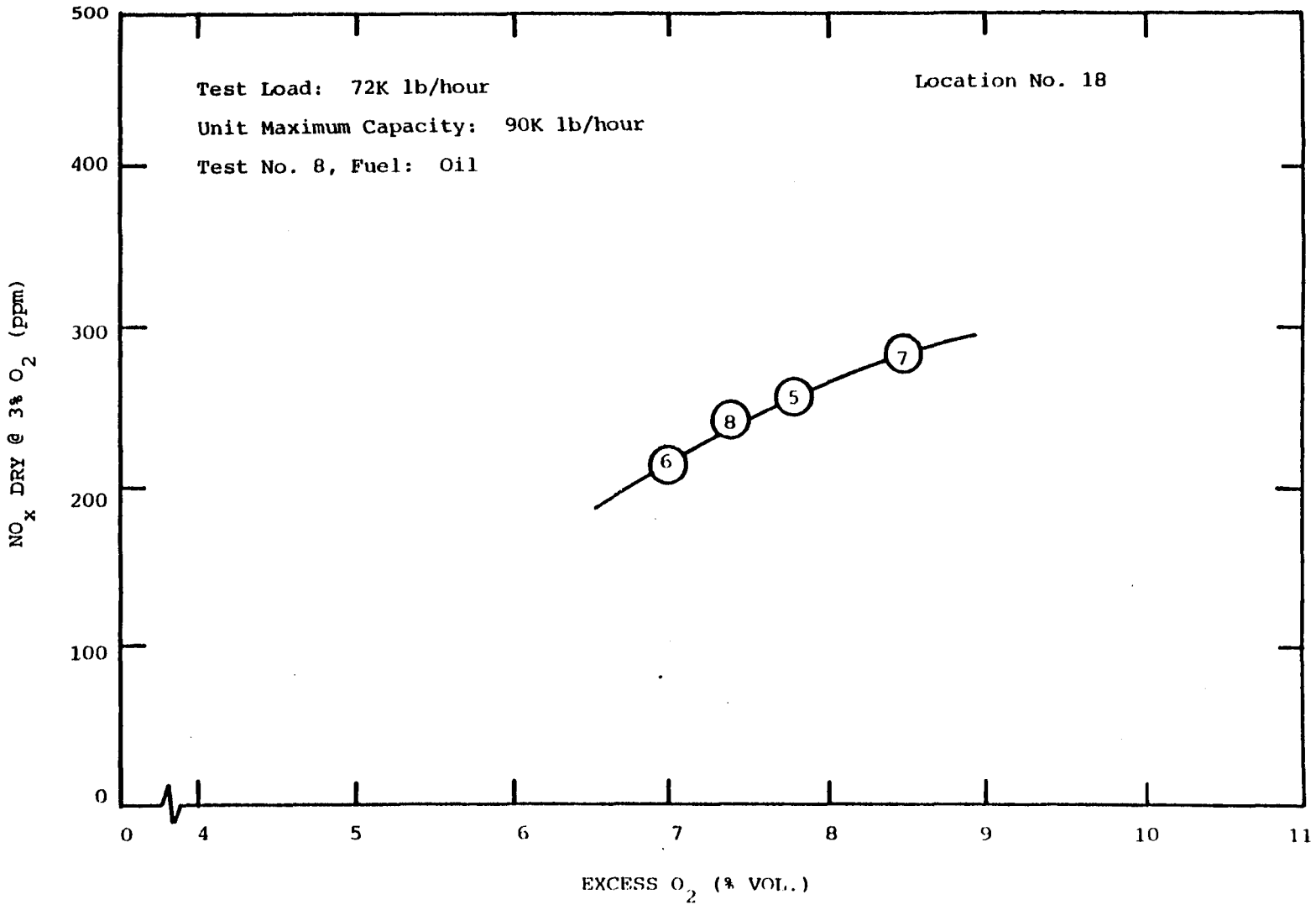

Figure E-2. Effect of Excess Oxygen

O_2 levels. Since the furnace pressure is slightly negative, air may be leaking into the flue passes through the boiler casing into the backpasses and flue duct, such that the O_2 levels in the furnace may be substantially lower than those measured downstream at the sampling port.

The burner pattern previously described offered the opportunity of experimenting with off-stoichiometric combustion by removing the center burner (No. 1). This did not upset the symmetry of the furnace because of the triangular arrangement of the burners. Figure E-1 presents the NO_x and O_2 data for this test. By terminating the fuel flow to the No. 1 burner and leaving the air registers 100 percent open, the excess air to the active burners was reduced to two-thirds of its original value with all burners in service, because the remaining one-third of the air was injected through the out-of-service burner port. This test was conducted at 60,000 lbs/hr steam flow and an excess O_2 level of 8.2 percent. Assuming the excess O_2 levels measured in the flue duct are representative of the air flow through the burners, the percent theoretical air at the burner was reduced from 162 percent to 106 percent. The NO_x emissions were reduced from 240 ppm to 175 ppm or a reduction of 27 percent.

Sulfur oxide concentrations for the baseline operating condition were found to be 485 ppm of total SO_x with 465 ppm of SO_2. The ratio of SO_3/SO_x for this test is 4 percent and the range of data obtained for this SO_x concentration is from 2 percent to 5 percent. Particulate emissions of 0.134 lbs/10^6 Btu were measured for the baseline operating condition which is about average for steam-atomized No. 6 fuel oil tests.

APPENDIX F

TABULATION OF 15-MINUTE DATA

24 HOUR DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/14/79		15.2	8.7	8.7	181.	266.	147.
3/15/79		16.0	9.0	9.2	183.	274.	151.
3/16/79		15.4	8.5	10.9	163.	236.	130.
3/17/79		15.3	8.1	11.9	157.	220.	121.
3/18/79		18.1	8.1	10.5	196.	273.	151.
3/19/79		16.5	7.7	11.4	162.	219.	121.
3/20/79		16.7	7.6	12.6	152.	204.	112.
3/21/79		16.6	7.5	11.4	132.	175.	97.
3/22/79		16.5	7.6	10.1	121.	163.	90.
3/23/79		16.5	7.6	10.1	119.	160.	88.
3/24/79		16.4	7.9	9.8	132.	182.	100.
3/25/79		16.3	8.5	9.6	135.	195.	107.
3/26/79		16.4	8.0	9.9	132.	183.	101.
3/27/79		16.6	7.8	10.4	111.	151.	83.
3/28/79		16.6	7.9	10.4	119.	164.	90.
3/29/79		11.2	10.5	8.4	0.	0.	0.
3/30/79		12.9	10.5	7.9	125.	216.	119.
3/31/79		13.9	10.1	8.3	133.	220.	121.
4/ 1/79		13.6	10.8	7.7	121.	214.	118.
4/ 2/79		15.7	9.2	8.9	127.	196.	108.
4/ 3/79		16.1	8.1	9.9	117.	163.	90.
4/ 4/79		16.0	8.3	10.1	123.	176.	97.
4/ 5/79		16.3	7.3	10.1	126.	165.	91.
4/ 6/79		16.8	7.1	10.1	123.	160.	88.
4/ 7/79		17.2	6.8	10.4	153.	194.	107.
4/ 8/79		20.6	6.7	10.5	163.	205.	113.
4/ 9/79		20.7	6.3	10.6	187.	229.	126.
4/10/79		17.8	6.8	10.5	181.	230.	127.
4/11/79		13.9	10.1	8.2	132.	218.	120.
4/12/79		17.3	8.1	9.6	165.	231.	127.
4/13/79		19.2	8.8	9.3	158.	234.	129.
4/14/79		18.5	6.7	10.1	181.	229.	126.
4/15/79		18.9	7.2	10.0	166.	218.	120.
4/16/79		19.5	7.4	10.1	173.	230.	127.
4/17/79		17.0	7.7	10.0	161.	218.	120.
4/18/79		16.8	7.9	9.9	137.	190.	105.
4/19/79		16.7	9.2	9.7	121.	184.	101.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
3/14/79	1100	11.1	9.9	7.8	156.	255.	140.
3/14/79	1115	11.6	9.8	7.8	161.	259.	143.
3/14/79	1130	11.6	9.7	7.8	164.	262.	145.
3/14/79	1145	11.6	9.7	7.8	163.	260.	143.
3/14/79	1200	11.6	9.6	7.9	163.	258.	142.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/14/79	1215	11.4	9.6	7.9	162.	257.	142.
3/14/79	1230	11.4	9.7	7.9	161.	258.	142.
3/14/79	1245	11.4	9.7	7.9	156.	249.	137.
3/14/79	1300	11.4	9.7	7.9	153.	246.	136.
3/14/79	1315	13.6	9.6	8.3	165.	262.	145.
3/14/79	1330	13.6	9.1	8.7	173.	263.	145.
3/14/79	1345	13.6	8.5	8.9	184.	267.	147.
3/14/79	1400	13.6	8.4	8.9	186.	268.	148.
3/14/79	1415	16.3	8.3	8.9	189.	269.	148.
3/14/79	1430	16.3	8.4	8.9	191.	273.	151.
3/14/79	1445	16.3	8.3	8.9	193.	275.	152.
3/14/79	1500	16.3	8.3	8.9	196.	279.	154.
3/14/79	1515	16.4	8.3	8.9	199.	282.	156.
3/14/79	1530	16.4	8.3	8.9	200.	285.	157.
3/14/79	1545	16.4	8.3	8.9	203.	289.	159.
3/14/79	1600	16.4	8.3	8.9	203.	289.	159.
3/14/79	1615	16.4	8.4	8.9	191.	274.	151.
3/14/79	1630	16.4	8.5	8.9	191.	275.	151.
3/14/79	1645	16.4	8.5	8.9	191.	274.	151.
3/14/79	1700	16.4	8.5	8.9	190.	274.	151.
3/14/79	1715	16.3	8.5	8.8	190.	274.	151.
3/14/79	1730	16.3	8.5	8.8	189.	274.	151.
3/14/79	1745	16.3	8.5	8.8	189.	274.	151.
3/14/79	1800	16.3	8.6	8.8	188.	273.	150.
3/14/79	1815	16.3	8.6	8.8	186.	272.	150.
3/14/79	1830	16.3	8.6	8.8	185.	270.	149.
3/14/79	1845	16.3	8.7	8.8	183.	268.	148.
3/14/79	1900	16.3	8.6	8.8	182.	266.	147.
3/14/79	1915	16.3	8.6	8.8	180.	262.	144.
3/14/79	1930	16.3	8.6	8.9	179.	260.	143.
3/14/79	1945	16.3	8.5	8.9	178.	258.	142.
3/14/79	2000	16.3	8.5	8.9	177.	256.	141.
3/14/79	2015	16.3	8.5	8.9	176.	253.	140.
3/14/79	2030	16.3	8.5	8.9	173.	250.	138.
3/14/79	2045	16.3	8.5	8.9	172.	248.	137.
3/14/79	2100	16.3	8.5	8.9	172.	249.	137.
3/14/79	2115	16.1	8.5	8.9	172.	250.	138.
3/14/79	2130	16.1	8.5	8.9	173.	251.	138.
3/14/79	2145	16.1	8.5	8.8	173.	251.	138.
3/14/79	2200	16.1	8.6	8.8	171.	248.	137.
3/14/79	2215	16.1	8.5	8.8	173.	250.	138.
3/14/79	2230	16.1	8.5	8.8	180.	260.	143.
3/14/79	2245	16.1	8.5	8.8	182.	263.	145.
3/14/79	2300	16.1	8.5	8.8	185.	267.	147.
3/14/79	2315	16.1	8.5	8.8	189.	274.	151.
3/14/79	2330	16.1	8.5	8.8	191.	277.	153.
3/14/79	2345	16.1	8.6	8.7	194.	282.	156.
3/14/79	2400	16.1	8.7	8.7	197.	289.	159.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/15/79	15	16.1	8.8	8.8	201.	298.	164.
3/15/79	30	16.1	8.8	8.8	203.	300.	165.
3/15/79	45	16.1	8.8	8.8	205.	303.	167.
3/15/79	100	16.1	8.8	8.8	207.	306.	169.
3/15/79	115	16.0	8.8	8.8	207.	306.	169.
3/15/79	130	16.0	8.9	8.7	204.	304.	168.
3/15/79	145	16.0	9.0	8.7	202.	303.	167.
3/15/79	200	16.0	8.9	8.7	204.	305.	168.
3/15/79	215	15.8	9.0	8.7	204.	306.	169.
3/15/79	230	15.8	9.0	8.8	205.	309.	170.
3/15/79	245	15.8	9.0	8.8	206.	310.	171.
3/15/79	300	15.8	9.0	8.7	205.	309.	170.
3/15/79	315	16.1	9.0	8.7	205.	309.	170.
3/15/79	330	16.1	9.0	8.8	205.	308.	170.
3/15/79	345	16.1	9.0	8.7	205.	308.	170.
3/15/79	400	16.1	9.0	8.8	205.	309.	170.
3/15/79	415	16.0	9.0	8.8	205.	308.	170.
3/15/79	430	16.0	9.0	8.8	205.	308.	170.
3/15/79	445	16.0	9.0	8.8	204.	307.	169.
3/15/79	500	16.0	9.0	8.8	204.	307.	169.
3/15/79	515	16.0	9.0	8.8	203.	305.	168.
3/15/79	530	16.0	9.0	8.8	202.	304.	168.
3/15/79	545	16.0	9.0	8.8	202.	303.	167.
3/15/79	600	16.0	9.0	8.8	201.	301.	166.
3/15/79	615	16.0	9.0	8.8	200.	300.	165.
3/15/79	630	16.0	9.0	8.8	199.	299.	165.
3/15/79	645	16.0	9.0	8.8	199.	300.	165.
3/15/79	700	16.0	9.0	8.8	199.	300.	165.
3/15/79	715	16.0	9.0	8.8	199.	299.	165.
3/15/79	730	16.0	9.0	8.8	198.	297.	164.
3/15/79	745	16.0	9.0	8.8	199.	300.	165.
3/15/79	800	16.0	9.0	8.9	200.	300.	166.
3/15/79	815	16.0	9.0	8.9	200.	301.	166.
3/15/79	830	16.0	9.0	8.9	201.	301.	166.
3/15/79	845	16.0	8.9	8.9	201.	300.	166.
3/15/79	900	16.0	9.0	8.9	-1.	-1.	-1.
3/15/79	915	16.1	8.9	8.8	199.	296.	163.
3/15/79	930	16.1	8.9	8.8	201.	300.	165.
3/15/79	945	16.1	9.0	8.8	180.	270.	149.
3/15/79	1000	16.1	9.1	8.8	176.	268.	148.
3/15/79	1015	16.0	9.1	.0	179.	272.	150.
3/15/79	1030	16.0	9.2	9.4	181.	277.	152.
3/15/79	1045	16.0	9.1	9.4	175.	267.	147.
3/15/79	1100	16.0	9.1	9.4	173.	262.	144.
3/15/79	1115	16.0	9.0	9.4	174.	264.	145.
3/15/79	1130	16.0	9.0	9.4	176.	264.	146.
3/15/79	1145	16.0	9.0	9.4	176.	265.	146.
3/15/79	1200	16.0	9.0	9.4	177.	267.	147.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/15/79	1215	16.0	9.0	9.4	178.	267.	147.
3/15/79	1230	16.0	9.0	9.4	180.	269.	148.
3/15/79	1245	16.0	9.0	9.4	182.	272.	150.
3/15/79	1300	16.0	9.0	9.4	182.	274.	151.
3/15/79	1315	16.1	9.0	9.4	182.	274.	151.
3/15/79	1330	16.1	9.0	9.4	182.	273.	151.
3/15/79	1345	16.1	9.0	9.4	182.	274.	151.
3/15/79	1400	16.1	9.0	9.4	181.	273.	151.
3/15/79	1415	16.4	8.8	9.5	182.	269.	148.
3/15/79	1430	16.4	8.7	9.7	179.	263.	145.
3/15/79	1445	16.4	8.7	9.8	176.	258.	142.
3/15/79	1500	16.4	8.7	9.7	172.	253.	139.
3/15/79	1515	16.0	9.0	9.6	167.	252.	139.
3/15/79	1530	16.0	9.0	9.4	166.	250.	138.
3/15/79	1545	16.0	9.0	9.4	169.	254.	140.
3/15/79	1600	16.0	9.0	9.4	167.	251.	138.
3/15/79	1615	16.1	9.0	9.4	166.	249.	138.
3/15/79	1630	16.1	9.0	9.4	167.	250.	138.
3/15/79	1645	16.1	8.9	9.5	167.	249.	137.
3/15/79	1700	16.1	8.9	9.5	167.	248.	137.
3/15/79	1715	16.0	8.9	9.5	167.	248.	137.
3/15/79	1730	16.0	9.0	9.5	166.	250.	138.
3/15/79	1745	16.0	9.0	9.4	165.	249.	137.
3/15/79	1800	16.0	9.0	9.4	165.	249.	137.
3/15/79	1815	16.0	9.0	9.4	166.	249.	137.
3/15/79	1830	16.0	9.0	9.4	166.	249.	137.
3/15/79	1845	16.0	9.0	9.4	165.	249.	137.
3/15/79	1900	16.0	9.1	9.5	164.	249.	137.
3/15/79	1915	16.0	9.0	9.4	165.	249.	137.
3/15/79	1930	16.0	9.0	9.4	165.	249.	138.
3/15/79	1945	16.0	9.0	9.5	165.	249.	137.
3/15/79	2000	16.0	9.0	9.5	165.	249.	137.
3/15/79	2015	15.8	9.0	9.5	165.	248.	137.
3/15/79	2030	15.8	9.0	9.5	165.	249.	137.
3/15/79	2045	15.8	9.0	9.5	166.	249.	137.
3/15/79	2100	15.8	9.1	9.3	163.	248.	137.
3/15/79	2115	16.0	8.9	9.5	162.	242.	134.
3/15/79	2130	16.0	8.9	9.5	163.	244.	134.
3/15/79	2145	16.0	8.9	9.6	164.	243.	134.
3/15/79	2200	16.0	8.9	9.6	164.	244.	134.
3/15/79	2215	16.0	8.8	9.6	163.	242.	133.
3/15/79	2230	16.0	8.9	9.6	163.	244.	134.
3/15/79	2245	16.0	8.8	9.6	163.	242.	134.
3/15/79	2300	16.0	8.9	9.6	163.	243.	134.
3/15/79	2315	16.0	8.8	9.6	163.	242.	133.
3/15/79	2330	16.0	8.8	9.6	163.	242.	134.
3/15/79	2345	16.0	8.9	9.5	163.	242.	134.
3/15/79	2400	16.0	8.8	9.6	163.	241.	133.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O$_2$	NO NG/J
3/16/79	15	14.6	8.8	9.7	163.	242.	133.
3/16/79	30	14.6	8.8	9.7	164.	242.	133.
3/16/79	45	14.6	8.8	9.7	164.	242.	133.
3/16/79	100	14.6	8.8	9.6	162.	240.	132.
3/16/79	115	14.6	8.8	9.6	162.	240.	132.
3/16/79	130	14.6	8.8	9.7	162.	239.	132.
3/16/79	145	14.6	8.8	9.7	163.	240.	132.
3/16/79	200	14.6	8.8	9.6	162.	240.	132.
3/16/79	215	14.6	8.8	9.6	162.	239.	132.
3/16/79	230	14.6	8.8	9.6	162.	240.	132.
3/16/79	245	14.6	8.8	9.6	162.	240.	132.
3/16/79	300	14.6	8.8	9.6	162.	240.	133.
3/16/79	315	14.6	8.8	9.7	163.	241.	133.
3/16/79	330	14.6	8.9	9.6	162.	241.	133.
3/16/79	345	14.6	8.8	9.7	163.	241.	133.
3/16/79	400	14.6	8.7	9.8	164.	241.	133.
3/16/79	415	14.4	8.8	9.7	163.	241.	133.
3/16/79	430	14.4	9.3	9.0	157.	243.	134.
3/16/79	445	14.4	8.8	9.7	161.	237.	131.
3/16/79	500	14.4	8.8	9.7	161.	239.	132.
3/16/79	515	15.8	8.8	9.7	163.	240.	132.
3/16/79	530	15.8	8.8	9.7	160.	238.	131.
3/16/79	545	15.8	8.9	9.7	159.	236.	130.
3/16/79	600	15.8	8.8	9.7	159.	236.	130.
3/16/79	615	15.8	8.8	9.7	159.	236.	130.
3/16/79	630	15.8	9.1	9.5	157.	238.	131.
3/16/79	645	15.8	9.0	9.5	157.	237.	131.
3/16/79	700	15.8	9.2	9.4	155.	239.	132.
3/16/79	715	15.7	9.2	9.3	155.	238.	131.
3/16/79	730	15.7	9.2	9.3	155.	238.	131.
3/16/79	745	15.7	9.1	9.4	157.	238.	131.
3/16/79	800	15.7	9.2	9.3	156.	239.	132.
3/16/79	815	15.7	9.1	9.3	158.	240.	132.
3/16/79	830	15.7	9.0	9.4	161.	243.	134.
3/16/79	845	15.7	8.9	9.5	162.	242.	133.
3/16/79	900	15.7	8.9	9.5	166.	246.	136.
3/16/79	915	16.0	8.8	9.6	168.	249.	137.
3/16/79	930	16.0	8.8	9.6	171.	253.	139.
3/16/79	945	16.0	8.8	9.7	172.	253.	140.
3/16/79	1000	16.0	8.8	9.7	174.	257.	142.
3/16/79	1015	16.1	-1.0	9.7	-1.	-1.	-1.
3/16/79	1030	16.1	9.1	9.7	182.	275.	152.
3/16/79	1045	16.1	9.0	9.7	183.	275.	152.
3/16/79	1100	16.1	9.0	9.7	183.	276.	152.
3/16/79	1115	16.0	9.2	9.6	-1.	-1.	-1.
3/16/79	1130	16.0	-1.0	.0	-1.	-1.	-1.
3/16/79	1145	16.0	8.2	12.0	161.	229.	126.
3/16/79	1200	16.0	8.2	12.0	161.	228.	126.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/16/79	1215	17.3	8.3	12.0	162.	230.	127.
3/16/79	1230	17.3	8.3	11.9	162.	230.	127.
3/16/79	1245	17.3	8.4	12.0	167.	239.	132.
3/16/79	1300	17.3	7.0	13.3	212.	274.	151.
3/16/79	1315	18.5	6.4	13.5	214.	266.	147.
3/16/79	1330	18.5	6.5	13.5	214.	267.	147.
3/16/79	1345	18.5	8.1	12.3	157.	221.	122.
3/16/79	1400	18.5	7.9	12.2	156.	216.	119.
3/16/79	1415	16.0	7.9	12.2	157.	217.	120.
3/16/79	1430	16.0	7.9	12.2	159.	219.	121.
3/16/79	1445	16.0	7.9	12.2	160.	220.	122.
3/16/79	1500	16.0	7.9	12.2	160.	221.	122.
3/16/79	1515	16.1	8.0	12.2	161.	223.	123.
3/16/79	1530	16.1	8.0	12.2	158.	220.	121.
3/16/79	1545	16.1	7.9	12.2	157.	217.	119.
3/16/79	1600	16.1	7.9	12.4	158.	217.	120.
3/16/79	1615	15.5	7.8	12.4	197.	269.	149.
3/16/79	1630	15.5	8.4	.0	156.	223.	123.
3/16/79	1645	15.5	8.5	11.8	149.	215.	119.
3/16/79	1700	15.5	8.4	11.8	149.	214.	118.
3/16/79	1715	14.8	8.5	11.7	151.	217.	120.
3/16/79	1730	14.8	8.5	11.8	150.	216.	119.
3/16/79	1745	14.8	8.5	11.7	150.	215.	119.
3/16/79	1800	14.8	8.5	11.7	150.	216.	119.
3/16/79	1815	14.8	8.5	11.7	148.	214.	118.
3/16/79	1830	14.8	8.5	11.7	146.	210.	116.
3/16/79	1845	14.8	8.4	11.7	146.	209.	115.
3/16/79	1900	14.8	8.4	11.7	148.	212.	117.
3/16/79	1915	14.6	8.3	11.7	150.	214.	118.
3/16/79	1930	14.6	9.9	10.2	156.	255.	141.
3/16/79	1945	14.6	8.1	11.8	151.	212.	117.
3/16/79	2000	14.6	8.2	11.8	153.	216.	119.
3/16/79	2015	14.8	8.2	11.8	154.	218.	120.
3/16/79	2030	14.8	8.2	11.8	156.	221.	122.
3/16/79	2045	14.8	8.2	11.9	159.	226.	124.
3/16/79	2100	14.8	8.2	11.9	162.	229.	126.
3/16/79	2115	14.8	8.2	11.9	163.	230.	127.
3/16/79	2130	14.8	8.2	11.9	163.	231.	127.
3/16/79	2145	14.8	8.2	11.8	164.	232.	128.
3/16/79	2200	14.8	8.3	11.8	165.	235.	129.
3/16/79	2215	14.8	8.3	11.8	166.	237.	130.
3/16/79	2230	14.8	8.3	11.9	167.	238.	131.
3/16/79	2245	14.8	8.3	11.9	167.	237.	131.
3/16/79	2300	14.8	8.3	11.8	167.	237.	131.
3/16/79	2315	14.8	8.3	11.8	165.	234.	129.
3/16/79	2330	14.8	8.3	11.8	165.	234.	129.
3/16/79	2345	14.8	8.3	11.8	165.	234.	129.
3/16/79	2400	14.8	8.3	11.8	166.	236.	130.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/17/79	15	14.5	8.3	11.8	165.	235.	130.
3/17/79	30	14.5	8.4	11.8	164.	234.	129.
3/17/79	45	14.5	8.3	11.8	164.	234.	129.
3/17/79	100	14.5	8.4	11.8	164.	234.	129.
3/17/79	115	17.6	8.4	11.8	163.	233.	129.
3/17/79	130	17.6	8.4	11.8	162.	232.	128.
3/17/79	145	17.6	8.3	11.8	163.	232.	128.
3/17/79	200	17.6	8.4	11.8	164.	234.	129.
3/17/79	215	17.7	8.4	11.9	164.	235.	129.
3/17/79	230	17.7	8.4	11.9	166.	237.	131.
3/17/79	245	17.7	8.4	11.9	165.	237.	131.
3/17/79	300	17.7	8.4	11.8	164.	234.	129.
3/17/79	315	17.7	8.4	11.8	164.	235.	130.
3/17/79	330	17.7	8.4	11.8	163.	233.	129.
3/17/79	345	17.7	8.4	11.8	162.	232.	128.
3/17/79	400	17.7	8.4	11.8	162.	231.	128.
3/17/79	415	19.6	8.4	11.8	162.	232.	128.
3/17/79	430	19.6	8.4	11.8	162.	232.	128.
3/17/79	445	19.6	9.1	11.2	164.	248.	137.
3/17/79	500	19.6	8.8	11.3	162.	240.	132.
3/17/79	515	16.4	8.5	11.8	159.	229.	126.
3/17/79	530	16.4	8.4	11.8	157.	224.	124.
3/17/79	545	16.4	8.4	11.8	158.	227.	125.
3/17/79	600	16.4	8.5	11.8	159.	229.	126.
3/17/79	615	14.5	8.5	11.8	160.	230.	127.
3/17/79	630	14.5	8.5	11.8	159.	229.	126.
3/17/79	645	14.5	8.4	11.8	158.	227.	125.
3/17/79	700	14.5	8.5	11.8	158.	228.	125.
3/17/79	715	14.6	8.5	11.8	157.	226.	125.
3/17/79	730	14.6	8.4	11.9	158.	227.	125.
3/17/79	745	14.6	8.4	11.9	157.	226.	124.
3/17/79	800	14.6	8.4	11.9	160.	229.	127.
3/17/79	815	14.6	8.4	11.8	163.	235.	129.
3/17/79	830	14.6	8.4	11.8	166.	239.	132.
3/17/79	845	14.6	8.4	11.8	168.	241.	133.
3/17/79	900	14.6	8.4	11.9	172.	248.	136.
3/17/79	915	14.5	8.4	11.9	178.	255.	141.
3/17/79	930	14.5	8.4	11.9	183.	262.	144.
3/17/79	945	14.5	8.4	12.0	190.	273.	151.
3/17/79	1000	14.5	8.8	11.9	195.	288.	159.
3/17/79	1015	14.6	9.1	11.9	161.	244.	135.
3/17/79	1030	14.6	-1.0	11.9	146.	124.	68.
3/17/79	1045	14.6	8.2	11.9	-1.	-1.	-1.
3/17/79	1100	14.6	8.1	11.9	150.	210.	116.
3/17/79	1115	14.8	8.0	11.9	150.	209.	115.
3/17/79	1130	14.8	8.0	11.9	150.	209.	115.
3/17/79	1145	14.8	8.0	11.9	150.	209.	115.
3/17/79	1200	14.8	8.0	12.0	149.	207.	114.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/17/79	1215	14.6	7.9	11.9	149.	207.	114.
3/17/79	1230	14.6	7.9	12.0	151.	208.	115.
3/17/79	1245	14.6	7.9	12.0	152.	209.	115.
3/17/79	1300	14.6	7.9	12.0	151.	209.	115.
3/17/79	1315	14.6	7.9	11.9	151.	208.	115.
3/17/79	1330	14.6	7.8	11.9	152.	208.	115.
3/17/79	1345	14.6	7.7	12.0	153.	209.	115.
3/17/79	1400	14.6	7.7	12.1	154.	209.	115.
3/17/79	1415	14.6	7.7	12.1	154.	209.	115.
3/17/79	1430	14.6	7.7	12.1	155.	212.	117.
3/17/79	1445	14.6	7.7	12.1	157.	213.	118.
3/17/79	1500	14.6	7.7	12.0	157.	214.	118.
3/17/79	1515	14.8	7.7	12.0	156.	212.	117.
3/17/79	1530	14.8	7.6	12.0	157.	213.	117.
3/17/79	1545	14.8	7.6	12.1	158.	212.	117.
3/17/79	1600	14.8	7.6	12.1	158.	213.	118.
3/17/79	1615	14.8	7.6	12.0	158.	213.	117.
3/17/79	1630	14.8	7.6	12.1	158.	213.	117.
3/17/79	1645	14.8	7.6	12.1	157.	212.	117.
3/17/79	1700	14.8	7.6	12.1	157.	211.	116.
3/17/79	1715	14.8	7.6	12.1	155.	208.	115.
3/17/79	1730	14.8	7.6	12.1	154.	208.	114.
3/17/79	1745	14.8	7.6	12.1	154.	207.	114.
3/17/79	1800	14.8	7.6	12.1	155.	209.	115.
3/17/79	1815	14.6	7.6	12.0	157.	211.	116.
3/17/79	1830	14.6	7.6	12.0	157.	211.	117.
3/17/79	1845	14.6	7.6	12.0	155.	209.	115.
3/17/79	1900	14.6	7.7	11.9	154.	208.	115.
3/17/79	1915	14.5	7.7	11.9	151.	205.	113.
3/17/79	1930	14.5	8.6	10.8	147.	215.	118.
3/17/79	1945	14.5	7.8	11.8	151.	207.	114.
3/17/79	2000	14.5	7.9	11.8	151.	208.	115.
3/17/79	2015	14.5	7.9	11.7	151.	209.	115.
3/17/79	2030	14.5	7.9	11.7	150.	206.	114.
3/17/79	2045	14.5	7.9	11.7	150.	206.	114.
3/17/79	2100	14.5	7.9	11.7	149.	205.	113.
3/17/79	2115	14.4	7.9	11.7	147.	203.	112.
3/17/79	2130	14.4	7.9	11.7	145.	200.	110.
3/17/79	2145	14.4	7.9	11.7	145.	199.	110.
3/17/79	2200	14.4	7.9	11.7	146.	200.	110.
3/17/79	2215	14.4	7.9	11.7	147.	201.	111.
3/17/79	2230	14.4	7.9	11.7	147.	202.	111.
3/17/79	2245	14.4	7.9	11.7	147.	202.	111.
3/17/79	2300	14.4	7.9	11.6	146.	202.	112.
3/17/79	2315	14.4	7.9	11.6	144.	199.	110.
3/17/79	2330	14.4	7.8	11.6	145.	198.	109.
3/17/79	2345	14.4	7.8	11.7	146.	200.	110.
3/17/79	2400	14.4	7.7	11.7	148.	200.	110.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/18/79	15	17.3	7.6	11.8	151.	204.	112.
3/18/79	30	17.3	7.6	11.8	154.	207.	114.
3/18/79	45	17.3	7.6	11.8	155.	209.	115.
3/18/79	100	17.3	7.6	11.8	156.	210.	116.
3/18/79	115	19.3	6.9	12.5	199.	253.	140.
3/18/79	130	19.3	6.7	12.7	201.	254.	140.
3/18/79	145	19.3	6.7	12.6	202.	255.	141.
3/18/79	200	19.3	6.7	12.6	202.	255.	141.
3/18/79	215	19.6	6.7	12.6	202.	255.	141.
3/18/79	230	19.6	6.7	12.6	202.	255.	141.
3/18/79	245	19.6	6.8	12.6	201.	255.	140.
3/18/79	300	19.6	6.8	12.6	201.	255.	140.
3/18/79	315	19.6	6.8	12.6	201.	255.	140.
3/18/79	330	19.6	6.7	12.6	201.	253.	140.
3/18/79	345	19.6	6.7	12.6	201.	253.	140.
3/18/79	400	19.6	6.7	12.6	199.	251.	138.
3/18/79	415	19.6	6.6	12.6	201.	252.	139.
3/18/79	430	19.6	7.1	12.2	208.	271.	149.
3/18/79	445	19.6	7.1	12.2	227.	294.	162.
3/18/79	500	19.6	6.9	12.4	232.	297.	164.
3/18/79	515	19.6	6.9	12.4	233.	298.	164.
3/18/79	530	19.6	6.9	12.4	237.	303.	167.
3/18/79	545	19.6	7.1	12.1	237.	307.	169.
3/18/79	600	19.6	7.2	12.2	236.	309.	170.
3/18/79	615	20.1	7.1	12.2	235.	306.	169.
3/18/79	630	20.1	7.2	12.2	233.	304.	167.
3/18/79	645	20.1	7.1	12.2	231.	301.	166.
3/18/79	700	20.1	7.2	12.2	232.	302.	167.
3/18/79	715	20.1	7.2	12.2	233.	305.	168.
3/18/79	730	20.1	7.2	12.2	235.	306.	170.
3/18/79	745	20.1	7.2	12.2	238.	311.	172.
3/18/79	800	20.1	7.1	12.2	239.	311.	171.
3/18/79	815	20.2	7.1	12.3	237.	308.	170.
3/18/79	830	20.2	7.1	12.3	237.	307.	169.
3/18/79	845	20.2	7.1	12.3	238.	308.	170.
3/18/79	900	20.2	7.1	12.4	239.	310.	171.
3/18/79	915	20.2	7.1	12.4	240.	310.	171.
3/18/79	930	20.2	7.1	12.3	243.	314.	173.
3/18/79	945	20.2	7.1	12.3	246.	320.	176.
3/18/79	1000	20.2	7.1	12.3	248.	322.	177.
3/18/79	1015	20.4	7.1	12.4	-1.	-1.	-1.
3/18/79	1030	20.4	7.1	10.1	205.	266.	147.
3/18/79	1045	20.4	7.2	10.1	209.	273.	151.
3/18/79	1100	20.4	7.3	10.1	207.	273.	151.
3/18/79	1115	20.4	7.3	10.1	208.	275.	151.
3/18/79	1130	20.4	7.3	10.0	208.	274.	151.
3/18/79	1145	20.4	7.1	10.1	211.	275.	152.
3/18/79	1200	20.4	7.0	10.1	216.	277.	153.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/18/79	1215	19.9	6.9	10.2	215.	276.	152.
3/18/79	1230	19.9	6.9	10.2	216.	276.	152.
3/18/79	1245	19.9	7.1	10.2	218.	282.	155.
3/18/79	1300	19.9	8.3	9.6	207.	295.	163.
3/18/79	1315	16.4	9.1	9.0	198.	301.	166.
3/18/79	1330	16.4	9.1	9.0	200.	303.	167.
3/18/79	1345	16.4	9.1	9.0	202.	308.	170.
3/18/79	1400	16.4	9.1	9.0	203.	309.	170.
3/18/79	1415	16.3	9.1	8.9	204.	310.	171.
3/18/79	1430	16.3	9.1	8.9	205.	313.	172.
3/18/79	1445	16.3	9.1	9.0	205.	313.	172.
3/18/79	1500	16.3	9.2	9.0	205.	314.	173.
3/18/79	1515	16.3	9.2	9.0	204.	312.	172.
3/18/79	1530	16.3	9.2	9.0	204.	312.	172.
3/18/79	1545	16.3	9.1	9.0	204.	310.	171.
3/18/79	1600	16.3	9.1	9.0	202.	307.	169.
3/18/79	1615	16.3	9.2	9.1	203.	310.	171.
3/18/79	1630	16.3	9.2	9.1	201.	307.	169.
3/18/79	1645	16.3	9.2	9.1	193.	297.	164.
3/18/79	1700	16.3	9.2	9.2	187.	286.	158.
3/18/79	1715	16.3	9.1	9.1	184.	280.	154.
3/18/79	1730	16.3	9.2	9.1	182.	279.	154.
3/18/79	1745	16.3	9.2	9.1	181.	278.	153.
3/18/79	1800	16.3	9.1	9.1	181.	275.	152.
3/18/79	1815	16.1	9.1	9.1	178.	271.	150.
3/18/79	1830	16.1	9.1	9.1	177.	268.	148.
3/18/79	1845	16.1	9.1	9.1	176.	268.	148.
3/18/79	1900	16.1	9.2	9.1	173.	265.	146.
3/18/79	1915	16.1	9.5	8.7	166.	262.	145.
3/18/79	1930	16.1	9.3	8.9	167.	257.	142.
3/18/79	1945	16.1	9.3	8.9	166.	256.	141.
3/18/79	2000	16.1	9.3	8.9	165.	255.	141.
3/18/79	2015	16.1	9.3	8.9	164.	254.	140.
3/18/79	2030	16.1	9.3	8.9	159.	246.	135.
3/18/79	2045	16.1	9.3	8.9	157.	242.	133.
3/18/79	2100	16.1	9.3	8.9	154.	238.	131.
3/18/79	2115	16.1	9.3	8.9	151.	233.	128.
3/18/79	2130	16.1	9.2	8.9	149.	230.	127.
3/18/79	2145	16.1	9.2	8.9	148.	228.	126.
3/18/79	2200	16.1	9.3	8.9	147.	226.	125.
3/18/79	2215	16.0	9.2	8.9	144.	221.	122.
3/18/79	2230	16.0	9.2	8.9	142.	218.	120.
3/18/79	2245	16.0	9.2	8.9	139.	214.	118.
3/18/79	2300	16.0	9.2	8.9	138.	212.	117.
3/18/79	2315	16.0	9.2	8.9	138.	211.	116.
3/18/79	2330	16.0	9.2	8.9	137.	210.	116.
3/18/79	2345	16.0	9.2	8.8	133.	203.	112.
3/18/79	2400	16.0	9.2	8.9	134.	205.	113.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/19/79	15	15.4	9.2	8.9	134.	205.	113.
3/19/79	30	15.4	8.2	10.1	138.	195.	107.
3/19/79	45	15.4	7.5	10.3	146.	195.	108.
3/19/79	100	15.4	7.5	10.3	146.	196.	108.
3/19/79	115	16.1	7.6	10.3	146.	196.	108.
3/19/79	130	16.1	7.3	10.5	145.	191.	105.
3/19/79	145	16.1	7.2	10.5	145.	190.	105.
3/19/79	200	16.1	7.2	10.6	144.	188.	104.
3/19/79	215	16.1	7.2	10.6	144.	188.	104.
3/19/79	230	16.1	7.2	10.6	145.	190.	105.
3/19/79	245	16.1	7.2	10.6	145.	189.	104.
3/19/79	300	16.1	7.2	10.6	145.	190.	105.
3/19/79	315	16.1	7.4	10.5	145.	192.	106.
3/19/79	330	16.1	7.2	10.5	145.	190.	105.
3/19/79	345	16.1	7.2	10.5	146.	191.	105.
3/19/79	400	16.1	7.2	10.5	145.	190.	105.
3/19/79	415	18.3	7.4	10.4	144.	191.	105.
3/19/79	430	18.3	7.2	10.4	159.	209.	115.
3/19/79	445	18.3	7.8	9.9	153.	209.	115.
3/19/79	500	18.3	7.6	10.2	149.	202.	111.
3/19/79	515	18.3	7.7	10.1	148.	201.	111.
3/19/79	530	18.3	7.7	10.1	147.	200.	110.
3/19/79	545	18.3	7.7	10.1	147.	200.	110.
3/19/79	600	18.3	7.6	10.2	148.	200.	110.
3/19/79	615	18.5	7.6	10.1	148.	200.	110.
3/19/79	630	18.5	7.6	10.1	147.	199.	109.
3/19/79	645	18.5	7.7	10.1	148.	201.	111.
3/19/79	700	18.5	7.7	10.1	77.	104.	57.
3/19/79	715	18.3	7.7	10.1	153.	208.	115.
3/19/79	730	18.3	7.7	10.1	153.	208.	115.
3/19/79	745	18.3	7.7	10.0	154.	209.	115.
3/19/79	800	18.3	7.7	10.0	155.	211.	116.
3/19/79	815	17.6	7.7	10.0	154.	210.	116.
3/19/79	830	17.6	7.8	10.0	154.	211.	116.
3/19/79	845	17.6	8.3	9.6	155.	221.	122.
3/19/79	900	17.6	7.7	10.0	-1.	-1.	-1.
3/19/79	915	16.3	7.8	10.0	-1.	-1.	-1.
3/19/79	930	16.3	7.8	10.0	-1.	-1.	-1.
3/19/79	945	16.3	7.7	10.1	162.	220.	121.
3/19/79	1000	16.3	7.7	10.1	162.	221.	122.
3/19/79	1015	16.4	7.7	12.3	163.	221.	122.
3/19/79	1030	16.4	7.6	12.5	164.	221.	122.
3/19/79	1045	16.4	7.7	12.4	163.	221.	122.
3/19/79	1100	16.4	7.7	12.4	162.	221.	122.
3/19/79	1115	16.3	7.7	12.4	164.	222.	122.
3/19/79	1130	16.3	7.6	12.4	165.	222.	122.
3/19/79	1145	16.3	7.6	12.4	164.	222.	123.
3/19/79	1200	16.3	7.8	12.4	166.	227.	125.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/19/79	1215	16.1	7.6	12.4	167.	225.	124.
3/19/79	1230	16.1	7.6	12.4	169.	227.	125.
3/19/79	1245	16.1	7.6	12.3	169.	228.	126.
3/19/79	1300	16.1	7.6	12.3	167.	225.	124.
3/19/79	1315	16.3	7.6	12.3	169.	228.	126.
3/19/79	1330	16.3	7.5	12.4	170.	227.	125.
3/19/79	1345	16.3	7.4	12.4	172.	228.	126.
3/19/79	1400	16.3	7.7	12.4	170.	231.	127.
3/19/79	1415	16.3	7.6	12.4	171.	230.	127.
3/19/79	1430	16.3	7.5	12.4	172.	231.	127.
3/19/79	1445	16.3	7.4	12.5	173.	230.	127.
3/19/79	1500	16.3	7.4	12.5	174.	231.	128.
3/19/79	1515	16.4	7.3	12.5	176.	232.	128.
3/19/79	1530	16.4	7.3	12.5	179.	235.	130.
3/19/79	1545	16.4	7.2	12.5	182.	237.	131.
3/19/79	1600	16.4	7.3	12.6	185.	243.	134.
3/19/79	1615	16.4	7.3	12.6	187.	247.	136.
3/19/79	1630	16.4	7.3	12.6	191.	252.	139.
3/19/79	1645	16.4	7.3	12.6	196.	258.	142.
3/19/79	1700	16.4	7.4	12.6	196.	261.	144.
3/19/79	1715	16.4	7.6	12.6	196.	264.	146.
3/19/79	1730	16.4	7.6	12.6	191.	257.	142.
3/19/79	1745	16.4	7.6	12.6	189.	254.	140.
3/19/79	1800	16.4	7.6	12.5	185.	249.	137.
3/19/79	1815	16.3	7.6	12.5	-1.	-1.	-1.
3/19/79	1830	16.3	7.6	12.5	169.	227.	125.
3/19/79	1845	16.3	7.6	12.5	167.	224.	124.
3/19/79	1900	16.3	7.6	12.5	166.	223.	123.
3/19/79	1915	15.8	7.6	12.5	166.	224.	124.
3/19/79	1930	15.8	7.7	12.5	167.	227.	125.
3/19/79	1945	15.8	9.1	11.3	164.	249.	137.
3/19/79	2000	15.8	8.6	11.1	167.	244.	134.
3/19/79	2015	15.4	8.3	11.7	167.	238.	131.
3/19/79	2030	15.4	8.3	11.7	167.	238.	131.
3/19/79	2045	15.4	8.3	11.7	166.	237.	131.
3/19/79	2100	15.4	8.3	11.7	167.	237.	131.
3/19/79	2115	15.4	8.3	11.7	167.	238.	131.
3/19/79	2130	15.4	8.3	11.7	167.	238.	131.
3/19/79	2145	15.4	8.3	11.7	167.	237.	131.
3/19/79	2200	15.4	8.3	11.7	165.	235.	129.
3/19/79	2215	15.4	8.3	11.7	166.	235.	130.
3/19/79	2230	15.4	8.3	11.7	166.	235.	130.
3/19/79	2245	15.4	8.3	11.7	166.	236.	130.
3/19/79	2300	15.4	8.3	11.7	165.	236.	130.
3/19/79	2315	15.4	8.3	11.7	164.	233.	129.
3/19/79	2330	15.4	8.3	11.7	165.	234.	129.
3/19/79	2345	15.4	8.3	11.7	164.	233.	128.
3/19/79	2400	15.4	8.3	11.7	163.	232.	128.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/20/79	15	16.6	8.3	11.7	162.	230.	127.
3/20/79	30	16.6	8.3	11.7	160.	228.	126.
3/20/79	45	16.6	8.3	11.7	159.	226.	125.
3/20/79	100	16.6	8.3	11.7	159.	226.	125.
3/20/79	115	16.6	8.3	11.7	161.	228.	126.
3/20/79	130	16.6	7.7	12.3	158.	215.	119.
3/20/79	145	16.6	7.7	12.3	158.	214.	118.
3/20/79	200	16.6	7.7	12.3	159.	215.	118.
3/20/79	215	16.4	7.7	12.3	158.	214.	118.
3/20/79	230	16.4	7.7	12.3	157.	213.	118.
3/20/79	245	16.4	7.6	12.3	157.	212.	117.
3/20/79	300	16.4	7.6	12.3	157.	212.	117.
3/20/79	315	17.0	7.6	12.3	157.	212.	117.
3/20/79	330	17.0	7.7	12.3	156.	211.	117.
3/20/79	345	17.0	7.7	12.3	156.	211.	117.
3/20/79	400	17.0	7.6	12.3	155.	210.	116.
3/20/79	415	16.6	7.6	12.3	154.	208.	115.
3/20/79	430	16.6	7.6	12.3	155.	209.	115.
3/20/79	445	16.6	7.5	12.5	161.	215.	119.
3/20/79	500	16.6	7.8	12.5	203.	278.	153.
3/20/79	515	16.4	7.9	12.3	218.	301.	166.
3/20/79	530	16.4	8.3	11.8	148.	210.	116.
3/20/79	545	16.4	7.4	12.5	141.	187.	103.
3/20/79	600	16.4	7.4	12.5	142.	189.	104.
3/20/79	615	16.4	7.4	12.5	142.	189.	104.
3/20/79	630	16.4	7.4	12.5	143.	190.	105.
3/20/79	645	16.4	7.4	12.5	142.	189.	104.
3/20/79	700	16.4	7.4	12.5	142.	189.	104.
3/20/79	715	16.4	7.4	12.5	143.	190.	105.
3/20/79	730	16.4	7.4	12.5	142.	189.	104.
3/20/79	745	16.4	7.4	12.5	144.	192.	106.
3/20/79	800	16.4	7.4	12.5	145.	193.	106.
3/20/79	815	16.4	7.4	12.5	145.	192.	106.
3/20/79	830	16.4	7.4	12.5	145.	193.	106.
3/20/79	845	16.4	7.4	12.5	147.	194.	107.
3/20/79	900	16.4	7.4	12.5	147.	194.	107.
3/20/79	915	16.4	7.3	12.5	147.	194.	107.
3/20/79	930	16.4	7.3	12.5	147.	194.	107.
3/20/79	945	16.4	9.2	11.0	125.	192.	106.
3/20/79	1000	16.4	8.1	11.7	138.	194.	107.
3/20/79	1015	16.4	8.0	11.8	141.	195.	107.
3/20/79	1030	16.4	8.0	.0	141.	196.	108.
3/20/79	1045	16.4	8.4	.0	143.	205.	113.
3/20/79	1100	16.4	8.3	12.0	144.	205.	113.
3/20/79	1115	16.4	8.2	12.1	147.	208.	114.
3/20/79	1130	16.4	8.1	12.1	149.	209.	115.
3/20/79	1145	16.4	7.9	12.3	149.	206.	114.
3/20/79	1200	16.4	7.7	12.6	152.	206.	114.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O$	NO NG/J
3/20/79	1215	16.7	7.5	12.8	154.	206.	113.
3/20/79	1230	16.7	7.3	12.9	156.	206.	113.
3/20/79	1245	16.7	7.1	13.1	162.	211.	116.
3/20/79	1300	16.7	7.1	13.0	163.	212.	117.
3/20/79	1315	16.7	7.2	13.0	166.	217.	120.
3/20/79	1330	16.7	7.2	12.9	168.	219.	121.
3/20/79	1345	16.7	7.2	13.0	159.	207.	114.
3/20/79	1400	16.7	7.1	12.9	152.	198.	109.
3/20/79	1415	16.6	7.2	12.9	151.	198.	109.
3/20/79	1430	16.6	7.2	12.9	150.	196.	108.
3/20/79	1445	16.6	7.2	12.9	149.	195.	108.
3/20/79	1500	16.6	7.2	12.9	149.	195.	108.
3/20/79	1515	16.6	7.2	12.9	148.	194.	107.
3/20/79	1530	16.6	7.2	12.9	149.	194.	107.
3/20/79	1545	16.6	7.2	12.9	149.	195.	107.
3/20/79	1600	16.6	7.1	12.9	152.	198.	109.
3/20/79	1615	16.7	7.1	13.0	153.	198.	109.
3/20/79	1630	16.7	7.1	13.0	154.	201.	111.
3/20/79	1645	16.7	7.1	13.0	156.	203.	112.
3/20/79	1700	16.7	7.3	12.9	154.	203.	112.
3/20/79	1715	16.7	7.3	12.9	151.	199.	110.
3/20/79	1730	16.7	7.4	12.9	150.	198.	109.
3/20/79	1745	16.7	7.4	12.9	148.	197.	108.
3/20/79	1800	16.7	7.4	12.9	148.	197.	108.
3/20/79	1815	16.8	7.1	13.4	171.	222.	123.
3/20/79	1830	16.8	7.6	12.9	198.	268.	148.
3/20/79	1845	16.8	7.8	12.5	180.	246.	136.
3/20/79	1900	16.8	7.6	12.7	146.	197.	109.
3/20/79	1915	18.2	7.6	12.7	145.	197.	108.
3/20/79	1930	18.2	7.7	12.7	144.	196.	108.
3/20/79	1945	18.2	7.7	12.7	144.	195.	108.
3/20/79	2000	18.2	7.7	12.7	143.	194.	107.
3/20/79	2015	16.8	7.6	12.7	143.	193.	107.
3/20/79	2030	16.8	7.6	12.8	143.	193.	106.
3/20/79	2045	16.8	7.6	12.8	143.	192.	106.
3/20/79	2100	16.8	7.6	12.7	143.	193.	106.
3/20/79	2115	16.8	7.6	12.7	144.	194.	107.
3/20/79	2130	16.8	7.6	12.8	144.	194.	107.
3/20/79	2145	16.8	7.6	12.8	146.	196.	108.
3/20/79	2200	16.8	7.5	12.9	146.	195.	107.
3/20/79	2215	16.8	7.6	12.8	143.	192.	106.
3/20/79	2230	16.8	7.6	12.7	140.	190.	105.
3/20/79	2245	16.8	7.7	12.7	140.	189.	104.
3/20/79	2300	16.8	7.6	12.7	140.	190.	105.
3/20/79	2315	16.7	7.6	12.8	141.	191.	105.
3/20/79	2330	16.7	7.7	12.8	140.	190.	105.
3/20/79	2345	16.7	7.6	12.8	139.	188.	104.
3/20/79	2400	16.7	7.7	12.8	139.	188.	104.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/21/79	15	16.6	7.7	12.8	139.	188.	104.
3/21/79	30	16.6	7.6	12.8	140.	190.	105.
3/21/79	45	16.6	7.7	12.8	142.	192.	106.
3/21/79	100	16.6	7.7	12.8	142.	192.	106.
3/21/79	115	16.6	7.7	12.8	142.	193.	106.
3/21/79	130	16.6	7.7	12.8	142.	193.	106.
3/21/79	145	16.6	7.7	12.7	142.	193.	106.
3/21/79	200	16.6	7.7	12.7	141.	192.	106.
3/21/79	215	16.6	7.7	12.7	141.	191.	105.
3/21/79	230	16.6	7.7	12.7	141.	191.	105.
3/21/79	245	16.6	7.7	12.7	141.	192.	106.
3/21/79	300	16.6	7.7	12.7	141.	192.	106.
3/21/79	315	16.6	7.7	12.7	142.	193.	106.
3/21/79	330	16.6	8.5	12.0	139.	201.	111.
3/21/79	345	16.6	7.7	12.7	140.	190.	105.
3/21/79	400	16.6	7.7	12.7	139.	190.	105.
3/21/79	415	16.4	7.7	12.7	137.	186.	103.
3/21/79	430	16.4	7.7	12.8	136.	184.	102.
3/21/79	445	16.4	7.7	12.8	135.	183.	101.
3/21/79	500	16.4	7.7	12.8	135.	183.	101.
3/21/79	515	16.4	7.7	12.8	134.	182.	100.
3/21/79	530	16.4	7.7	12.8	135.	183.	101.
3/21/79	545	16.4	7.7	12.8	134.	182.	100.
3/21/79	600	16.4	7.6	12.8	135.	183.	101.
3/21/79	615	16.4	7.7	12.8	137.	185.	102.
3/21/79	630	16.4	7.7	12.8	137.	185.	102.
3/21/79	645	16.4	7.7	12.8	135.	183.	101.
3/21/79	700	16.4	7.6	12.8	136.	184.	101.
3/21/79	715	16.4	7.7	12.8	137.	185.	102.
3/21/79	730	16.4	7.6	12.8	137.	186.	102.
3/21/79	745	16.4	7.6	12.8	139.	188.	104.
3/21/79	800	16.4	7.6	12.8	139.	187.	103.
3/21/79	815	16.4	7.6	12.8	139.	187.	103.
3/21/79	830	16.4	7.6	12.8	138.	186.	103.
3/21/79	845	16.4	7.6	12.8	139.	187.	103.
3/21/79	900	16.4	7.6	12.8	149.	200.	110.
3/21/79	915	16.4	7.6	12.7	151.	203.	112.
3/21/79	930	16.4	7.5	12.7	151.	202.	111.
3/21/79	945	16.4	7.6	12.6	152.	204.	113.
3/21/79	1000	16.4	7.6	12.6	153.	205.	113.
3/21/79	1015	16.6	7.6	12.6	148.	201.	111.
3/21/79	1030	16.6	7.6	12.5	146.	196.	108.
3/21/79	1045	16.6	7.4	12.6	149.	199.	110.
3/21/79	1100	16.6	7.3	10.2	127.	167.	92.
3/21/79	1115	16.6	7.3	10.3	128.	168.	93.
3/21/79	1130	16.6	7.2	10.3	127.	166.	92.
3/21/79	1145	16.6	7.2	10.3	123.	161.	89.
3/21/79	1200	16.6	7.2	10.3	122.	160.	88.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/21/79	1215	16.7	7.2	10.3	121.	158.	87.
3/21/79	1230	16.7	7.2	10.3	122.	159.	88.
3/21/79	1245	16.7	7.2	10.4	123.	160.	88.
3/21/79	1300	16.7	7.4	10.3	120.	159.	88.
3/21/79	1315	16.7	7.4	10.2	114.	151.	83.
3/21/79	1330	16.7	7.4	10.1	129.	172.	95.
3/21/79	1345	16.7	7.3	10.2	131.	173.	95.
3/21/79	1400	16.7	7.3	10.3	128.	168.	93.
3/21/79	1415	16.7	7.2	10.3	129.	169.	93.
3/21/79	1430	16.7	7.1	10.4	132.	170.	94.
3/21/79	1445	16.7	7.0	10.4	134.	173.	95.
3/21/79	1500	16.7	7.0	10.4	133.	172.	95.
3/21/79	1515	16.8	7.0	10.5	133.	172.	95.
3/21/79	1530	16.8	7.0	10.5	134.	173.	96.
3/21/79	1545	16.8	7.0	10.5	126.	163.	90.
3/21/79	1600	16.8	7.0	10.5	126.	163.	90.
3/21/79	1615	16.8	7.0	10.5	127.	164.	90.
3/21/79	1630	16.8	7.0	10.5	124.	160.	88.
3/21/79	1645	16.8	7.0	10.5	123.	158.	87.
3/21/79	1700	16.8	7.1	10.5	122.	158.	87.
3/21/79	1715	16.8	7.1	10.5	122.	158.	87.
3/21/79	1730	16.8	7.1	10.5	122.	158.	87.
3/21/79	1745	16.8	7.1	10.4	122.	158.	87.
3/21/79	1800	16.8	7.1	10.5	122.	158.	87.
3/21/79	1815	16.8	7.1	10.5	122.	158.	87.
3/21/79	1830	16.8	7.1	10.5	121.	157.	86.
3/21/79	1845	16.8	7.1	10.5	123.	160.	88.
3/21/79	1900	16.8	7.2	10.4	122.	161.	89.
3/21/79	1915	16.6	8.3	9.8	127.	180.	99.
3/21/79	1930	16.6	7.6	10.2	122.	164.	90.
3/21/79	1945	16.6	7.6	10.1	121.	163.	90.
3/21/79	2000	16.6	7.6	10.1	120.	162.	89.
3/21/79	2015	16.6	7.6	10.2	120.	162.	89.
3/21/79	2030	16.6	7.6	11.9	121.	163.	90.
3/21/79	2045	16.6	7.6	10.2	122.	164.	90.
3/21/79	2100	16.6	7.6	10.2	122.	164.	90.
3/21/79	2115	16.6	7.6	10.2	121.	163.	90.
3/21/79	2130	16.6	7.6	10.2	122.	164.	90.
3/21/79	2145	16.6	7.6	10.2	123.	166.	91.
3/21/79	2200	16.6	7.6	10.2	123.	165.	91.
3/21/79	2215	16.6	7.6	10.2	123.	165.	91.
3/21/79	2230	16.6	7.6	10.3	124.	166.	92.
3/21/79	2245	16.6	7.6	10.3	123.	166.	91.
3/21/79	2300	16.6	7.6	10.2	123.	166.	91.
3/21/79	2315	16.6	7.6	10.2	123.	166.	91.
3/21/79	2330	16.6	7.6	10.2	118.	160.	88.
3/21/79	2345	16.6	7.6	10.2	118.	159.	88.
3/21/79	2400	16.6	7.6	10.2	117.	157.	87.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/22/79	15	16.6	7.6	10.2	117.	157.	87.
3/22/79	30	16.6	7.6	10.2	118.	160.	88.
3/22/79	45	16.6	7.6	10.2	118.	160.	88.
3/22/79	100	16.6	7.6	10.3	117.	158.	87.
3/22/79	115	16.6	7.6	10.3	116.	156.	86.
3/22/79	130	16.6	7.6	10.3	115.	155.	86.
3/22/79	145	16.6	7.6	10.3	114.	153.	84.
3/22/79	200	16.6	7.6	10.3	113.	152.	84.
3/22/79	215	16.6	7.6	10.3	114.	153.	84.
3/22/79	230	16.6	7.6	10.3	114.	154.	85.
3/22/79	245	16.6	7.6	10.3	115.	155.	85.
3/22/79	300	16.6	7.6	10.3	115.	155.	86.
3/22/79	315	16.6	7.6	10.3	116.	157.	86.
3/22/79	330	16.6	7.6	10.2	117.	158.	87.
3/22/79	345	16.6	7.6	10.2	118.	159.	88.
3/22/79	400	16.6	7.6	10.2	117.	159.	88.
3/22/79	415	16.7	8.4	9.7	111.	160.	88.
3/22/79	430	16.7	7.9	10.0	113.	156.	86.
3/22/79	445	16.7	7.7	10.2	114.	155.	85.
3/22/79	500	16.7	7.6	10.2	114.	154.	85.
3/22/79	515	16.6	7.6	10.2	113.	153.	84.
3/22/79	530	16.6	7.7	10.2	113.	153.	84.
3/22/79	545	16.6	7.6	10.2	112.	151.	83.
3/22/79	600	16.6	7.6	10.2	111.	151.	83.
3/22/79	615	16.6	7.6	10.2	114.	154.	85.
3/22/79	630	16.6	7.6	10.2	115.	155.	86.
3/22/79	645	16.6	7.6	10.2	115.	155.	86.
3/22/79	700	16.6	7.6	10.2	115.	156.	86.
3/22/79	715	16.4	7.6	10.2	116.	156.	86.
3/22/79	730	16.4	7.6	10.2	115.	155.	86.
3/22/79	745	16.4	7.6	10.2	116.	156.	86.
3/22/79	800	16.4	7.6	10.3	117.	157.	87.
3/22/79	815	16.4	7.6	10.2	117.	158.	87.
3/22/79	830	16.4	7.6	10.2	116.	157.	87.
3/22/79	845	16.4	7.7	10.2	116.	157.	87.
3/22/79	900	16.4	7.7	10.1	127.	172.	95.
3/22/79	915	16.6	7.6	10.1	128.	173.	95.
3/22/79	930	16.6	7.6	10.1	129.	174.	96.
3/22/79	945	16.6	7.6	10.1	129.	174.	96.
3/22/79	1000	16.6	7.6	10.1	129.	174.	96.
3/22/79	1015	16.4	7.6	10.1	129.	174.	96.
3/22/79	1030	16.4	7.6	10.2	129.	173.	95.
3/22/79	1045	16.4	7.6	10.1	125.	168.	93.
3/22/79	1100	16.4	7.6	10.0	126.	169.	93.
3/22/79	1115	16.4	7.6	10.0	127.	171.	94.
3/22/79	1130	16.4	7.6	10.1	127.	171.	94.
3/22/79	1145	16.4	7.6	10.1	128.	174.	96.
3/22/79	1200	16.4	7.6	10.1	129.	173.	96.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/22/79	1215	16.4	7.6	10.0	129.	173.	96.
3/22/79	1230	16.4	7.6	10.0	129.	173.	96.
3/22/79	1245	16.4	7.6	10.0	124.	167.	92.
3/22/79	1300	16.4	7.6	10.1	125.	168.	93.
3/22/79	1315	16.6	7.6	10.1	127.	170.	94.
3/22/79	1330	16.6	7.6	10.1	127.	170.	94.
3/22/79	1345	16.6	7.5	10.1	127.	170.	94.
3/22/79	1400	16.6	7.5	10.1	127.	169.	93.
3/22/79	1415	16.6	7.5	10.1	128.	171.	94.
3/22/79	1430	16.6	7.5	10.1	128.	171.	94.
3/22/79	1445	16.6	7.4	10.2	125.	167.	92.
3/22/79	1500	16.6	7.4	10.1	122.	163.	90.
3/22/79	1515	16.6	7.4	10.1	122.	162.	90.
3/22/79	1530	16.6	7.4	10.1	122.	162.	89.
3/22/79	1545	16.6	7.4	10.1	122.	162.	89.
3/22/79	1600	16.6	7.4	10.1	122.	162.	89.
3/22/79	1615	16.6	7.4	10.1	122.	163.	90.
3/22/79	1630	16.6	7.4	10.2	123.	164.	90.
3/22/79	1645	16.6	7.5	10.2	124.	165.	91.
3/22/79	1700	16.6	7.5	10.2	124.	165.	91.
3/22/79	1715	16.6	7.5	10.2	124.	166.	91.
3/22/79	1730	16.6	7.5	10.1	126.	168.	93.
3/22/79	1745	16.6	7.5	10.1	128.	170.	94.
3/22/79	1800	16.6	7.5	10.1	129.	172.	95.
3/22/79	1815	16.6	7.5	10.1	130.	174.	96.
3/22/79	1830	16.6	7.5	10.2	129.	173.	95.
3/22/79	1845	16.6	7.5	10.2	128.	171.	94.
3/22/79	1900	16.6	7.5	10.2	128.	171.	94.
3/22/79	1915	17.0	7.5	10.2	126.	168.	93.
3/22/79	1930	17.0	8.2	9.6	130.	183.	101.
3/22/79	1945	17.0	7.7	10.1	123.	167.	92.
3/22/79	2000	17.0	7.7	10.1	121.	164.	91.
3/22/79	2015	16.6	7.7	10.1	121.	163.	90.
3/22/79	2030	16.6	7.7	10.1	120.	163.	90.
3/22/79	2045	16.6	7.7	10.1	121.	164.	90.
3/22/79	2100	16.6	7.7	10.1	121.	163.	90.
3/22/79	2115	16.6	7.7	10.1	120.	163.	90.
3/22/79	2130	16.6	7.7	10.1	119.	162.	89.
3/22/79	2145	16.6	7.7	10.1	120.	162.	89.
3/22/79	2200	16.6	7.7	10.1	119.	162.	89.
3/22/79	2215	16.6	7.7	10.1	119.	162.	90.
3/22/79	2230	16.6	7.7	10.1	119.	162.	89.
3/22/79	2245	16.6	7.7	10.1	119.	162.	90.
3/22/79	2300	16.6	7.7	10.1	119.	162.	89.
3/22/79	2315	16.6	7.7	10.1	119.	161.	89.
3/22/79	2330	16.6	7.7	10.1	116.	158.	87.
3/22/79	2345	16.6	7.7	10.1	116.	157.	86.
3/22/79	2400	16.6	7.7	10.1	116.	158.	87.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/23/79	15	16.4	7.7	10.1	115.	156.	86.
3/23/79	30	16.4	7.7	10.1	116.	157.	87.
3/23/79	45	16.4	7.7	10.1	115.	156.	86.
3/23/79	100	16.4	7.7	10.1	115.	156.	86.
3/23/79	115	16.4	7.7	10.1	115.	156.	86.
3/23/79	130	16.4	7.7	10.1	115.	156.	86.
3/23/79	145	16.4	7.7	10.1	115.	156.	86.
3/23/79	200	16.4	7.7	10.1	115.	157.	86.
3/23/79	215	16.4	7.7	10.1	115.	157.	86.
3/23/79	230	16.4	7.7	10.1	115.	157.	86.
3/23/79	245	16.4	7.7	10.1	114.	155.	86.
3/23/79	300	16.4	7.7	10.1	114.	155.	85.
3/23/79	315	16.4	7.7	10.1	113.	154.	85.
3/23/79	330	16.4	7.7	10.1	112.	152.	84.
3/23/79	345	16.4	7.7	10.1	111.	151.	83.
3/23/79	400	16.4	7.7	10.1	111.	150.	83.
3/23/79	415	16.3	8.8	9.3	101.	149.	82.
3/23/79	430	16.3	7.7	10.1	107.	145.	80.
3/23/79	445	16.3	7.6	10.2	107.	145.	80.
3/23/79	500	16.3	7.6	10.2	107.	144.	79.
3/23/79	515	16.4	7.6	10.2	106.	143.	79.
3/23/79	530	16.4	7.6	10.2	106.	143.	79.
3/23/79	545	16.4	7.6	10.2	106.	143.	79.
3/23/79	600	16.4	7.6	10.2	106.	143.	79.
3/23/79	615	16.4	7.7	10.1	108.	147.	81.
3/23/79	630	16.4	7.7	10.1	109.	147.	81.
3/23/79	645	16.4	7.7	10.1	108.	147.	81.
3/23/79	700	16.4	7.7	10.1	109.	148.	81.
3/23/79	715	16.4	7.7	10.1	109.	148.	81.
3/23/79	730	16.4	7.7	10.1	109.	147.	81.
3/23/79	745	16.4	7.7	10.1	109.	148.	82.
3/23/79	800	16.4	7.7	10.1	109.	148.	82.
3/23/79	815	16.3	7.7	10.1	110.	150.	83.
3/23/79	830	16.3	7.7	10.1	112.	152.	84.
3/23/79	845	16.3	7.7	10.1	112.	152.	84.
3/23/79	900	16.3	7.7	10.1	111.	151.	83.
3/23/79	915	16.3	7.7	10.1	112.	152.	84.
3/23/79	930	16.3	7.7	10.1	112.	152.	84.
3/23/79	945	16.3	7.7	10.1	115.	156.	86.
3/23/79	1000	16.3	7.7	10.1	115.	155.	86.
3/23/79	1015	16.3	7.6	10.1	116.	156.	86.
3/23/79	1030	16.3	7.6	10.1	114.	154.	85.
3/23/79	1045	16.3	7.6	10.1	115.	155.	86.
3/23/79	1100	16.3	7.4	10.2	126.	168.	92.
3/23/79	1115	16.1	7.4	10.1	128.	169.	93.
3/23/79	1130	16.1	7.2	10.2	129.	169.	93.
3/23/79	1145	16.1	7.1	10.3	131.	171.	94.
3/23/79	1200	16.1	7.2	10.3	134.	175.	97.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MNTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/23/79	1215	16.7	7.2	10.3	135.	177.	97.
3/23/79	1230	16.7	7.2	10.2	134.	176.	97.
3/23/79	1245	16.7	7.3	10.2	124.	163.	90.
3/23/79	1300	16.7	7.3	10.2	124.	163.	90.
3/23/79	1315	16.8	7.2	10.3	125.	164.	90.
3/23/79	1330	16.8	7.2	10.2	129.	169.	93.
3/23/79	1345	16.8	7.2	10.3	130.	170.	94.
3/23/79	1400	16.8	7.1	10.3	129.	168.	93.
3/23/79	1415	16.7	7.2	10.3	128.	168.	92.
3/23/79	1430	16.7	7.2	10.3	127.	166.	91.
3/23/79	1445	16.7	7.1	10.3	126.	164.	90.
3/23/79	1500	16.7	7.1	10.4	125.	163.	90.
3/23/79	1515	16.7	7.1	10.3	124.	162.	89.
3/23/79	1530	16.7	7.1	10.3	123.	160.	88.
3/23/79	1545	16.7	7.1	10.3	124.	161.	89.
3/23/79	1600	16.7	7.1	10.4	122.	159.	88.
3/23/79	1615	16.6	7.3	10.3	123.	162.	89.
3/23/79	1630	16.6	7.3	10.2	122.	162.	89.
3/23/79	1645	16.6	7.3	10.2	122.	162.	89.
3/23/79	1700	16.6	7.3	10.2	121.	159.	88.
3/23/79	1715	16.6	7.3	10.2	121.	160.	88.
3/23/79	1730	16.6	7.3	10.2	120.	158.	87.
3/23/79	1745	16.6	7.4	10.2	120.	159.	87.
3/23/79	1800	16.6	7.4	10.2	119.	157.	87.
3/23/79	1815	16.6	7.3	10.1	118.	156.	86.
3/23/79	1830	16.6	7.3	10.2	118.	156.	86.
3/23/79	1845	16.6	7.3	10.2	117.	154.	85.
3/23/79	1900	16.6	7.4	10.2	118.	156.	86.
3/23/79	1915	16.7	7.7	9.9	116.	158.	87.
3/23/79	1930	16.7	8.2	9.6	124.	174.	96.
3/23/79	1945	16.7	7.9	9.7	124.	172.	95.
3/23/79	2000	16.7	8.0	9.7	124.	172.	95.
3/23/79	2015	16.6	8.0	9.7	126.	174.	96.
3/23/79	2030	16.6	8.0	9.7	125.	173.	95.
3/23/79	2045	16.6	7.9	9.7	124.	171.	94.
3/23/79	2100	16.6	7.9	9.7	122.	169.	93.
3/23/79	2115	16.6	8.0	9.7	121.	168.	93.
3/23/79	2130	16.6	7.9	9.7	122.	169.	93.
3/23/79	2145	16.6	7.9	9.7	123.	170.	94.
3/23/79	2200	16.6	7.9	9.7	123.	170.	94.
3/23/79	2215	16.6	7.9	9.7	123.	170.	94.
3/23/79	2230	16.6	7.9	9.7	124.	171.	94.
3/23/79	2245	16.6	7.9	9.7	123.	170.	94.
3/23/79	2300	16.6	7.9	9.7	123.	169.	93.
3/23/79	2315	16.6	8.0	9.7	126.	174.	96.
3/23/79	2330	16.6	7.9	9.7	126.	174.	96.
3/23/79	2345	16.6	8.0	9.7	126.	174.	96.
3/23/79	2400	16.6	7.9	9.7	126.	173.	96.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/24/79	15	16.4	7.9	9.7	125.	173.	95.
3/24/79	30	16.4	7.9	9.7	124.	172.	95.
3/24/79	45	16.4	7.9	9.7	125.	173.	95.
3/24/79	100	16.4	7.9	9.7	125.	172.	95.
3/24/79	115	16.4	7.9	9.7	124.	170.	94.
3/24/79	130	16.4	7.9	9.7	124.	170.	94.
3/24/79	145	16.4	7.8	9.7	124.	170.	94.
3/24/79	200	16.4	7.9	9.9	124.	170.	94.
3/24/79	215	16.4	7.9	9.7	125.	171.	94.
3/24/79	230	16.4	7.9	9.7	125.	171.	95.
3/24/79	245	16.4	7.9	9.7	126.	174.	96.
3/24/79	300	16.4	7.8	9.7	127.	174.	96.
3/24/79	315	16.4	7.9	9.7	129.	178.	98.
3/24/79	330	16.4	7.9	9.7	129.	178.	98.
3/24/79	345	16.4	7.9	9.7	128.	177.	97.
3/24/79	400	16.4	7.9	9.7	128.	177.	98.
3/24/79	415	16.4	8.5	9.1	129.	187.	103.
3/24/79	430	16.4	7.9	9.6	127.	175.	97.
3/24/79	445	16.4	7.7	9.8	128.	173.	95.
3/24/79	500	16.4	7.7	9.9	128.	173.	95.
3/24/79	515	16.4	7.6	9.9	127.	172.	95.
3/24/79	530	16.4	7.7	9.9	126.	171.	94.
3/24/79	545	16.4	7.6	9.8	126.	171.	94.
3/24/79	600	16.4	7.7	9.8	126.	171.	94.
3/24/79	615	16.4	7.6	9.8	127.	171.	94.
3/24/79	630	16.4	7.7	9.8	127.	172.	95.
3/24/79	645	16.4	7.7	9.8	126.	171.	94.
3/24/79	700	16.4	7.7	9.8	126.	171.	94.
3/24/79	715	16.4	7.7	9.8	126.	172.	95.
3/24/79	730	16.4	7.7	9.8	127.	172.	95.
3/24/79	745	16.4	7.6	9.9	128.	173.	95.
3/24/79	800	16.4	7.6	9.9	128.	173.	95.
3/24/79	815	16.4	7.6	9.9	128.	173.	95.
3/24/79	830	16.4	7.6	9.9	127.	171.	94.
3/24/79	845	16.4	7.7	10.0	125.	169.	93.
3/24/79	900	16.4	7.7	9.9	121.	163.	90.
3/24/79	915	16.4	7.6	9.9	116.	156.	86.
3/24/79	930	16.4	7.6	10.0	116.	157.	87.
3/24/79	945	16.4	7.7	9.8	120.	163.	90.
3/24/79	1000	16.4	7.7	9.7	123.	167.	92.
3/24/79	1015	16.4	7.8	9.7	124.	169.	93.
3/24/79	1030	16.4	7.8	9.7	125.	171.	94.
3/24/79	1045	16.4	7.8	9.7	125.	171.	94.
3/24/79	1100	16.4	7.8	9.7	125.	171.	94.
3/24/79	1115	16.3	7.8	9.7	125.	172.	95.
3/24/79	1130	16.3	7.8	9.7	127.	174.	96.
3/24/79	1145	16.3	7.8	9.7	126.	173.	95.
3/24/79	1200	16.3	7.8	9.7	125.	171.	95.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/24/79	1215	16.3	7.8	9.7	127.	174.	96.
3/24/79	1230	16.3	7.9	9.7	127.	174.	96.
3/24/79	1245	16.3	7.8	9.7	126.	172.	95.
3/24/79	1300	16.3	7.8	9.7	127.	174.	96.
3/24/79	1315	16.1	7.9	9.7	133.	182.	101.
3/24/79	1330	16.1	7.9	9.8	132.	181.	100.
3/24/79	1345	16.1	7.9	9.8	131.	180.	99.
3/24/79	1400	16.1	7.8	9.9	130.	178.	98.
3/24/79	1415	16.1	7.8	9.9	132.	180.	99.
3/24/79	1430	16.1	7.8	9.9	132.	180.	99.
3/24/79	1445	16.1	7.7	9.9	132.	180.	99.
3/24/79	1500	16.1	7.7	9.9	134.	182.	101.
3/24/79	1515	16.1	7.8	9.9	135.	185.	102.
3/24/79	1530	16.1	7.8	9.9	135.	185.	102.
3/24/79	1545	16.1	7.8	9.9	135.	185.	102.
3/24/79	1600	16.1	7.8	9.9	135.	184.	102.
3/24/79	1615	16.1	7.8	9.9	136.	186.	103.
3/24/79	1630	16.1	7.8	9.9	136.	187.	103.
3/24/79	1645	16.1	7.9	9.9	138.	189.	104.
3/24/79	1700	16.1	7.9	9.9	138.	189.	104.
3/24/79	1715	16.3	7.8	9.9	138.	189.	104.
3/24/79	1730	16.3	7.8	9.9	137.	187.	103.
3/24/79	1745	16.3	7.9	9.9	136.	187.	103.
3/24/79	1800	16.3	7.9	9.9	137.	188.	104.
3/24/79	1815	16.3	7.9	9.9	135.	186.	103.
3/24/79	1830	16.3	7.9	9.9	135.	186.	103.
3/24/79	1845	16.3	7.9	9.9	134.	186.	102.
3/24/79	1900	16.3	7.9	9.9	132.	183.	101.
3/24/79	1915	18.2	7.8	10.0	158.	217.	119.
3/24/79	1930	18.2	8.6	9.3	181.	263.	145.
3/24/79	1945	18.2	8.6	9.3	181.	263.	145.
3/24/79	2000	18.2	8.6	9.3	182.	265.	146.
3/24/79	2015	16.4	8.2	9.7	147.	207.	114.
3/24/79	2030	16.4	8.2	9.6	136.	193.	106.
3/24/79	2045	16.4	8.2	9.6	136.	192.	106.
3/24/79	2100	16.4	8.2	9.6	136.	192.	106.
3/24/79	2115	16.4	8.2	9.6	135.	192.	106.
3/24/79	2130	16.4	8.2	9.6	135.	192.	106.
3/24/79	2145	16.4	8.2	9.6	137.	194.	107.
3/24/79	2200	16.4	8.2	9.6	137.	194.	107.
3/24/79	2215	16.4	8.2	9.7	137.	195.	107.
3/24/79	2230	16.4	8.3	9.7	139.	197.	109.
3/24/79	2245	16.4	8.3	9.6	139.	197.	109.
3/24/79	2300	16.4	8.3	9.6	141.	200.	110.
3/24/79	2315	16.4	8.3	9.7	142.	201.	111.
3/24/79	2330	16.4	8.2	9.7	140.	198.	109.
3/24/79	2345	16.4	8.2	9.6	141.	199.	110.
3/24/79	2400	16.4	8.3	9.6	141.	200.	110.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/25/79	15	16.4	8.3	9.6	140.	199.	110.
3/25/79	30	16.4	8.3	9.7	139.	198.	109.
3/25/79	45	16.4	8.3	9.7	139.	197.	109.
3/25/79	100	16.4	8.3	9.7	141.	200.	110.
3/25/79	115	16.4	8.4	9.7	141.	202.	111.
3/25/79	130	16.4	8.4	9.7	142.	203.	112.
3/25/79	145	16.4	8.4	9.6	141.	202.	112.
3/25/79	200	16.4	8.4	9.7	141.	201.	111.
3/25/79	215	16.4	8.4	9.7	140.	201.	111.
3/25/79	230	16.4	8.4	9.7	139.	198.	109.
3/25/79	245	16.4	8.4	9.7	138.	197.	109.
3/25/79	300	16.4	8.4	9.7	138.	198.	109.
3/25/79	315	16.4	8.4	9.7	138.	198.	109.
3/25/79	330	16.4	8.4	9.7	139.	198.	109.
3/25/79	345	16.4	8.4	9.7	139.	199.	110.
3/25/79	400	16.4	8.4	9.7	139.	198.	109.
3/25/79	415	16.3	9.3	9.1	134.	207.	114.
3/25/79	430	16.3	8.7	9.5	141.	207.	114.
3/25/79	445	16.3	8.7	9.5	142.	208.	114.
3/25/79	500	16.3	8.6	9.5	141.	206.	114.
3/25/79	515	16.4	8.6	9.5	141.	206.	114.
3/25/79	530	16.4	8.7	9.5	140.	205.	113.
3/25/79	545	16.4	8.6	9.5	138.	202.	111.
3/25/79	600	16.4	8.6	9.5	136.	199.	110.
3/25/79	615	16.4	8.6	9.5	136.	199.	110.
3/25/79	630	16.4	8.6	9.5	138.	202.	111.
3/25/79	645	16.4	8.6	9.5	139.	203.	112.
3/25/79	700	16.4	8.6	9.5	140.	205.	113.
3/25/79	715	16.4	8.5	9.5	138.	201.	111.
3/25/79	730	16.4	8.5	9.5	135.	195.	108.
3/25/79	745	16.4	8.5	9.5	134.	194.	107.
3/25/79	800	16.4	8.5	9.5	132.	192.	106.
3/25/79	815	16.3	8.6	9.5	131.	191.	106.
3/25/79	830	16.3	8.6	9.5	131.	191.	105.
3/25/79	845	16.3	8.6	9.5	130.	191.	105.
3/25/79	900	16.3	8.7	9.5	131.	192.	106.
3/25/79	915	16.3	8.7	9.5	131.	191.	106.
3/25/79	930	16.3	8.7	9.5	130.	190.	105.
3/25/79	945	16.3	8.7	9.5	129.	189.	104.
3/25/79	1000	16.3	8.6	9.5	129.	189.	104.
3/25/79	1015	16.3	8.6	9.5	128.	188.	104.
3/25/79	1030	16.3	8.6	9.5	129.	189.	104.
3/25/79	1045	16.3	8.6	9.5	130.	191.	105.
3/25/79	1100	16.3	8.7	9.5	130.	190.	105.
3/25/79	1115	16.1	8.7	9.5	131.	192.	106.
3/25/79	1130	16.1	8.7	9.5	131.	192.	106.
3/25/79	1145	16.1	8.7	9.5	132.	194.	107.
3/25/79	1200	16.1	8.7	9.5	133.	195.	108.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/25/79	1215	16.1	8.7	9.5	134.	197.	108.
3/25/79	1230	16.1	8.7	9.5	134.	197.	109.
3/25/79	1245	16.1	8.7	9.5	134.	197.	109.
3/25/79	1300	16.1	8.7	9.5	133.	195.	107.
3/25/79	1315	16.1	8.7	9.5	133.	195.	107.
3/25/79	1330	16.1	8.7	9.5	133.	195.	107.
3/25/79	1345	16.1	8.5	9.5	135.	196.	108.
3/25/79	1400	16.1	8.3	9.5	138.	196.	108.
3/25/79	1415	16.3	8.4	9.4	136.	196.	108.
3/25/79	1430	16.3	8.4	9.4	136.	196.	108.
3/25/79	1445	16.3	8.4	9.4	135.	194.	107.
3/25/79	1500	16.3	8.4	9.4	136.	196.	108.
3/25/79	1515	16.3	8.4	9.4	137.	197.	108.
3/25/79	1530	16.3	8.4	9.5	138.	198.	109.
3/25/79	1545	16.3	8.4	9.5	138.	197.	109.
3/25/79	1600	16.3	8.3	9.5	139.	198.	109.
3/25/79	1615	16.3	8.4	9.5	140.	199.	110.
3/25/79	1630	16.3	8.4	9.5	139.	199.	110.
3/25/79	1645	16.3	8.4	9.5	137.	197.	109.
3/25/79	1700	16.3	8.4	9.5	137.	197.	108.
3/25/79	1715	16.3	8.4	9.5	137.	196.	108.
3/25/79	1730	16.3	8.5	9.5	138.	199.	110.
3/25/79	1745	16.3	8.5	9.5	138.	198.	109.
3/25/79	1800	16.3	8.5	9.5	138.	198.	109.
3/25/79	1815	16.3	8.5	9.5	138.	198.	109.
3/25/79	1830	16.3	8.5	9.5	136.	196.	108.
3/25/79	1845	16.3	8.5	9.5	136.	195.	108.
3/25/79	1900	16.3	8.5	9.5	136.	195.	108.
3/25/79	1915	16.1	8.5	9.5	135.	194.	107.
3/25/79	1930	16.1	8.5	9.4	134.	194.	107.
3/25/79	1945	16.1	8.5	9.4	132.	192.	106.
3/25/79	2000	16.1	8.2	9.7	132.	186.	103.
3/25/79	2015	16.4	8.2	9.8	130.	184.	101.
3/25/79	2030	16.4	8.1	9.8	131.	183.	101.
3/25/79	2045	16.4	8.2	9.8	131.	185.	102.
3/25/79	2100	16.4	8.2	9.8	130.	184.	101.
3/25/79	2115	16.4	8.2	9.8	130.	183.	101.
3/25/79	2130	16.4	8.2	9.8	131.	184.	102.
3/25/79	2145	16.4	8.2	9.8	132.	186.	103.
3/25/79	2200	16.4	8.2	9.8	133.	187.	103.
3/25/79	2215	16.4	8.2	9.7	132.	187.	103.
3/25/79	2230	16.4	8.2	9.7	130.	183.	101.
3/25/79	2245	16.4	8.2	9.7	130.	183.	101.
3/25/79	2300	16.4	8.2	9.7	130.	184.	101.
3/25/79	2315	16.4	8.2	9.7	132.	186.	103.
3/25/79	2330	16.4	8.1	9.7	133.	187.	103.
3/25/79	2345	16.4	8.1	9.7	135.	189.	104.
3/25/79	2400	16.4	8.1	9.7	135.	189.	104.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/26/79	15	16.4	8.1	9.7	137.	192.	106.
3/26/79	30	16.4	8.1	9.7	137.	192.	106.
3/26/79	45	16.4	8.1	9.7	139.	195.	108.
3/26/79	100	16.4	8.1	9.7	140.	197.	109.
3/26/79	115	16.4	8.1	9.7	141.	198.	109.
3/26/79	130	16.4	8.1	9.7	141.	198.	109.
3/26/79	145	16.4	8.1	9.6	139.	195.	108.
3/26/79	200	16.4	8.1	9.6	139.	195.	108.
3/26/79	215	16.4	8.1	9.7	140.	196.	108.
3/26/79	230	16.4	8.1	9.7	140.	197.	108.
3/26/79	245	16.4	8.1	9.7	140.	196.	108.
3/26/79	300	16.4	8.1	9.7	140.	197.	109.
3/26/79	315	16.4	8.1	9.7	140.	196.	108.
3/26/79	330	16.4	8.1	9.7	140.	196.	108.
3/26/79	345	16.4	8.1	9.7	139.	195.	107.
3/26/79	400	16.4	8.1	9.7	139.	195.	108.
3/26/79	415	16.4	9.1	8.8	143.	217.	120.
3/26/79	430	16.4	8.7	9.3	143.	211.	116.
3/26/79	445	16.4	8.7	9.3	144.	212.	117.
3/26/79	500	16.4	8.7	9.3	146.	214.	118.
3/26/79	515	16.4	8.5	9.4	144.	209.	115.
3/26/79	530	16.4	8.5	9.5	144.	207.	114.
3/26/79	545	16.4	8.5	9.5	144.	208.	115.
3/26/79	600	16.4	8.5	9.5	144.	207.	114.
3/26/79	615	16.4	8.4	9.5	144.	206.	114.
3/26/79	630	16.4	8.3	9.7	141.	200.	110.
3/26/79	645	16.4	8.3	9.7	142.	202.	111.
3/26/79	700	16.4	8.3	9.7	142.	202.	112.
3/26/79	715	16.4	8.3	9.7	142.	201.	111.
3/26/79	730	16.4	8.3	9.7	142.	201.	111.
3/26/79	745	16.4	8.3	9.7	142.	202.	111.
3/26/79	800	16.4	8.2	9.7	143.	203.	112.
3/26/79	815	16.4	8.3	9.7	143.	203.	112.
3/26/79	830	16.4	8.3	9.7	142.	202.	111.
3/26/79	845	16.4	8.3	9.7	143.	203.	112.
3/26/79	900	16.4	8.3	9.7	144.	205.	113.
3/26/79	915	16.3	8.3	9.7	144.	205.	113.
3/26/79	930	16.3	8.2	9.7	139.	196.	108.
3/26/79	945	16.3	8.0	9.7	133.	185.	102.
3/26/79	1000	16.3	8.1	9.7	132.	184.	101.
3/26/79	1015	16.1	8.6	9.5	128.	186.	103.
3/26/79	1030	16.1	8.5	9.4	129.	186.	103.
3/26/79	1045	16.1	8.2	9.6	129.	181.	100.
3/26/79	1100	16.1	8.1	9.7	131.	183.	101.
3/26/79	1115	16.3	8.0	9.7	132.	183.	101.
3/26/79	1130	16.3	8.0	9.7	136.	189.	104.
3/26/79	1145	16.3	8.0	9.8	137.	190.	105.
3/26/79	1200	16.3	8.1	9.8	137.	192.	106.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/26/79	1215	16.4	8.0	9.6	137.	191.	105.
3/26/79	1230	16.4	8.0	9.8	137.	190.	105.
3/26/79	1245	16.4	8.0	9.8	137.	190.	105.
3/26/79	1300	16.4	8.0	9.9	128.	178.	98.
3/26/79	1315	16.4	8.0	9.9	121.	168.	93.
3/26/79	1330	16.4	8.1	9.8	128.	180.	99.
3/26/79	1345	16.4	8.0	9.7	135.	189.	104.
3/26/79	1400	16.4	8.0	9.7	139.	193.	106.
3/26/79	1415	16.4	7.6	9.9	133.	180.	99.
3/26/79	1430	16.4	7.5	10.1	127.	169.	93.
3/26/79	1445	16.4	7.5	10.1	127.	170.	94.
3/26/79	1500	16.4	7.5	10.1	128.	172.	95.
3/26/79	1515	16.6	7.6	10.1	127.	170.	94.
3/26/79	1530	16.6	7.5	10.1	128.	171.	94.
3/26/79	1545	16.6	7.6	10.1	129.	173.	96.
3/26/79	1600	16.6	7.6	10.1	129.	174.	96.
3/26/79	1615	16.6	7.5	10.1	127.	170.	94.
3/26/79	1630	16.6	7.5	10.1	126.	168.	92.
3/26/79	1645	16.6	7.5	10.1	123.	164.	91.
3/26/79	1700	16.6	7.5	10.1	126.	169.	93.
3/26/79	1715	16.6	7.5	10.2	125.	167.	92.
3/26/79	1730	16.6	7.5	10.2	125.	168.	92.
3/26/79	1745	16.6	7.5	10.2	126.	168.	93.
3/26/79	1800	16.6	7.5	10.2	125.	167.	92.
3/26/79	1815	16.6	7.5	10.2	124.	166.	91.
3/26/79	1830	16.6	7.5	10.2	123.	165.	91.
3/26/79	1845	16.6	7.6	10.2	121.	162.	89.
3/26/79	1900	16.6	7.6	10.2	118.	158.	87.
3/26/79	1915	16.6	7.5	10.2	120.	161.	89.
3/26/79	1930	16.6	7.6	10.2	123.	166.	91.
3/26/79	1945	16.6	8.7	9.4	125.	184.	101.
3/26/79	2000	16.6	7.9	10.0	123.	169.	93.
3/26/79	2015	16.6	7.8	10.1	123.	168.	93.
3/26/79	2030	16.6	7.7	10.2	122.	165.	91.
3/26/79	2045	16.6	7.6	10.3	120.	161.	89.
3/26/79	2100	16.6	7.4	10.4	118.	157.	87.
3/26/79	2115	16.6	7.6	10.5	119.	161.	89.
3/26/79	2130	16.6	7.8	10.1	121.	166.	91.
3/26/79	2145	16.6	7.8	10.1	121.	165.	91.
3/26/79	2200	16.6	7.9	10.1	120.	165.	91.
3/26/79	2215	16.7	7.6	10.3	119.	160.	88.
3/26/79	2230	16.7	7.5	10.4	120.	161.	89.
3/26/79	2245	16.7	7.5	10.4	118.	158.	87.
3/26/79	2300	16.7	7.6	10.4	118.	159.	88.
3/26/79	2315	16.4	7.7	10.4	119.	161.	89.
3/26/79	2330	16.4	7.7	10.3	120.	162.	90.
3/26/79	2345	16.4	7.7	10.3	119.	161.	89.
3/26/79	2400	16.4	7.7	10.3	119.	161.	89.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/27/79	15	16.7	7.7	10.3	119.	161.	89.
3/27/79	30	16.7	7.7	10.3	117.	158.	87.
3/27/79	45	16.7	7.6	10.3	117.	157.	87.
3/27/79	100	16.7	7.6	10.3	116.	157.	87.
3/27/79	115	16.7	7.7	10.3	117.	159.	88.
3/27/79	130	16.7	7.7	10.3	117.	158.	87.
3/27/79	145	16.7	7.7	10.3	115.	156.	86.
3/27/79	200	16.7	7.7	10.3	115.	156.	86.
3/27/79	215	16.7	7.8	10.3	112.	153.	84.
3/27/79	230	16.7	7.6	10.3	104.	140.	77.
3/27/79	245	16.7	7.3	10.6	99.	130.	72.
3/27/79	300	16.7	7.3	10.6	100.	132.	73.
3/27/79	315	16.7	7.3	10.6	101.	133.	73.
3/27/79	330	16.7	7.3	10.6	102.	135.	74.
3/27/79	345	16.7	7.3	10.7	103.	136.	75.
3/27/79	400	16.7	7.3	10.7	103.	135.	74.
3/27/79	415	16.6	8.6	9.8	108.	158.	87.
3/27/79	430	16.6	7.7	10.4	105.	143.	79.
3/27/79	445	16.6	7.6	10.4	105.	142.	78.
3/27/79	500	16.6	7.8	10.3	106.	146.	80.
3/27/79	515	16.6	7.9	10.3	107.	148.	82.
3/27/79	530	16.6	7.9	10.3	107.	147.	81.
3/27/79	545	16.6	7.9	10.3	106.	146.	81.
3/27/79	600	16.6	7.9	10.3	106.	146.	81.
3/27/79	615	16.6	7.9	10.3	106.	146.	81.
3/27/79	630	16.6	7.9	10.3	106.	146.	81.
3/27/79	645	16.6	7.9	10.3	107.	147.	81.
3/27/79	700	16.6	7.9	10.3	108.	149.	82.
3/27/79	715	16.6	7.9	10.3	109.	150.	83.
3/27/79	730	16.6	7.9	10.3	109.	150.	83.
3/27/79	745	16.6	7.9	10.3	112.	154.	85.
3/27/79	800	16.6	7.8	10.3	113.	155.	85.
3/27/79	815	16.6	7.9	10.3	112.	154.	85.
3/27/79	830	16.6	7.8	10.3	114.	157.	86.
3/27/79	845	16.6	7.8	10.3	117.	160.	88.
3/27/79	900	16.6	7.9	10.3	120.	165.	91.
3/27/79	915	16.6	7.8	10.3	123.	168.	93.
3/27/79	930	16.6	7.8	10.3	124.	170.	94.
3/27/79	945	16.6	7.9	10.3	125.	172.	95.
3/27/79	1000	16.6	7.9	10.3	124.	170.	94.
3/27/79	1015	16.6	7.9	10.3	124.	171.	94.
3/27/79	1030	16.6	7.9	10.3	122.	168.	93.
3/27/79	1045	16.6	7.9	10.3	119.	164.	90.
3/27/79	1100	16.6	7.9	10.3	118.	163.	90.
3/27/79	1115	16.6	7.9	10.3	118.	163.	90.
3/27/79	1130	16.6	7.9	10.3	117.	161.	89.
3/27/79	1145	16.6	7.9	10.3	119.	164.	91.
3/27/79	1200	16.6	7.9	10.3	119.	165.	91.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/27/79	1215	16.6	7.9	10.3	118.	163.	90.
3/27/79	1230	16.6	7.9	10.3	119.	163.	90.
3/27/79	1245	16.6	7.9	10.3	119.	164.	90.
3/27/79	1300	16.6	7.8	10.4	118.	162.	89.
3/27/79	1315	16.4	7.7	10.4	116.	158.	87.
3/27/79	1330	16.4	7.7	10.4	116.	158.	87.
3/27/79	1345	16.4	7.8	10.4	117.	160.	88.
3/27/79	1400	16.4	7.9	10.4	114.	158.	87.
3/27/79	1415	16.4	8.1	10.4	104.	146.	80.
3/27/79	1430	16.4	8.2	10.3	97.	136.	75.
3/27/79	1445	16.4	8.2	10.3	96.	135.	75.
3/27/79	1500	16.4	8.1	10.3	97.	136.	75.
3/27/79	1515	16.6	8.1	10.4	98.	137.	76.
3/27/79	1530	16.6	7.9	10.4	102.	141.	78.
3/27/79	1545	16.6	7.7	10.4	107.	145.	80.
3/27/79	1600	16.6	7.6	10.4	110.	148.	82.
3/27/79	1615	16.7	7.6	10.5	111.	149.	82.
3/27/79	1630	16.7	7.6	10.5	111.	150.	82.
3/27/79	1645	16.7	7.6	10.5	111.	150.	83.
3/27/79	1700	16.7	7.7	10.5	110.	150.	82.
3/27/79	1715	16.7	7.7	10.5	110.	150.	82.
3/27/79	1730	16.7	7.7	10.5	109.	148.	82.
3/27/79	1745	16.7	7.7	10.5	106.	144.	79.
3/27/79	1800	16.7	7.6	10.5	109.	147.	81.
3/27/79	1815	16.7	7.7	10.5	109.	148.	82.
3/27/79	1830	16.7	7.7	10.5	109.	148.	82.
3/27/79	1845	16.7	8.0	10.5	109.	151.	83.
3/27/79	1900	16.7	8.0	10.5	108.	150.	82.
3/27/79	1915	16.7	7.9	10.5	107.	148.	81.
3/27/79	1930	16.7	8.1	10.2	108.	151.	83.
3/27/79	1945	16.7	7.9	10.4	108.	149.	82.
3/27/79	2000	16.7	7.9	10.4	109.	150.	83.
3/27/79	2015	16.7	7.9	10.4	109.	150.	83.
3/27/79	2030	16.7	7.9	10.4	109.	150.	83.
3/27/79	2045	16.7	7.9	10.4	108.	149.	82.
3/27/79	2100	16.7	7.9	10.4	107.	148.	81.
3/27/79	2115	16.7	7.9	10.4	107.	148.	82.
3/27/79	2130	16.7	7.9	10.4	107.	148.	81.
3/27/79	2145	16.7	7.9	10.4	106.	146.	81.
3/27/79	2200	16.7	7.9	10.4	105.	144.	80.
3/27/79	2215	16.6	7.9	10.4	105.	145.	80.
3/27/79	2230	16.6	7.9	10.4	106.	146.	81.
3/27/79	2245	16.6	7.9	10.4	108.	149.	82.
3/27/79	2300	16.6	7.9	10.4	108.	149.	82.
3/27/79	2315	16.6	7.9	10.4	107.	148.	81.
3/27/79	2330	16.6	7.9	10.5	106.	147.	81.
3/27/79	2345	16.6	7.9	10.5	106.	147.	81.
3/27/79	2400	16.6	7.9	10.4	106.	147.	81.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/28/79	15	16.6	7.9	10.4	106.	146.	81.
3/28/79	30	16.6	7.9	10.5	105.	145.	80.
3/28/79	45	16.6	7.9	10.5	105.	145.	80.
3/28/79	100	16.6	7.9	10.5	106.	147.	81.
3/28/79	115	16.6	7.9	10.5	106.	147.	81.
3/28/79	130	16.6	7.9	10.5	104.	144.	79.
3/28/79	145	16.6	7.9	10.5	104.	144.	79.
3/28/79	200	16.6	7.9	10.5	104.	143.	79.
3/28/79	215	16.7	7.9	10.5	104.	143.	79.
3/28/79	230	16.7	7.9	10.5	104.	144.	79.
3/28/79	245	16.7	7.9	10.5	103.	143.	79.
3/28/79	300	16.7	7.9	10.5	102.	141.	78.
3/28/79	315	16.7	7.9	10.5	101.	140.	77.
3/28/79	330	16.7	7.9	10.5	101.	139.	77.
3/28/79	345	16.7	7.9	10.6	100.	139.	76.
3/28/79	400	16.7	7.9	10.6	99.	138.	76.
3/28/79	415	16.6	8.6	10.2	107.	156.	86.
3/28/79	430	16.6	8.1	10.5	102.	143.	79.
3/28/79	445	16.6	8.1	10.5	100.	140.	77.
3/28/79	500	16.6	8.1	10.5	101.	141.	78.
3/28/79	515	16.6	8.1	10.5	101.	141.	78.
3/28/79	530	16.6	8.1	10.5	101.	141.	78.
3/28/79	545	16.6	8.1	10.5	101.	141.	78.
3/28/79	600	16.6	8.1	10.5	100.	140.	77.
3/28/79	615	16.6	8.1	10.5	100.	140.	77.
3/28/79	630	16.6	8.1	10.5	99.	139.	77.
3/28/79	645	16.6	8.1	10.5	100.	141.	77.
3/28/79	700	16.6	8.1	10.5	101.	141.	78.
3/28/79	715	16.4	8.1	10.5	102.	142.	78.
3/28/79	730	16.4	8.1	10.5	103.	143.	79.
3/28/79	745	16.4	8.0	10.5	103.	144.	79.
3/28/79	800	16.4	8.0	10.5	104.	145.	80.
3/28/79	815	16.4	8.1	10.5	104.	145.	80.
3/28/79	830	16.4	8.1	10.5	104.	146.	80.
3/28/79	845	16.4	8.1	10.5	104.	146.	81.
3/28/79	900	16.4	8.1	10.5	105.	146.	81.
3/28/79	915	16.4	8.1	10.5	106.	148.	82.
3/28/79	930	16.4	7.9	10.4	130.	178.	98.
3/28/79	945	16.4	7.9	10.4	130.	179.	99.
3/28/79	1000	16.4	7.9	10.4	130.	180.	99.
3/28/79	1015	16.4	7.9	10.4	130.	180.	99.
3/28/79	1030	16.4	7.9	10.4	131.	181.	100.
3/28/79	1045	16.4	7.9	10.4	131.	181.	100.
3/28/79	1100	16.4	7.9	10.4	132.	183.	101.
3/28/79	1115	16.4	7.9	10.4	132.	183.	101.
3/28/79	1130	16.4	7.9	10.4	131.	181.	100.
3/28/79	1145	16.4	7.9	10.4	131.	180.	99.
3/28/79	1200	16.4	7.9	10.4	131.	181.	100.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/28/79	1215	16.6	7.9	10.4	132.	181.	100.
3/28/79	1230	16.6	7.9	10.4	131.	179.	99.
3/28/79	1245	16.6	7.9	10.4	130.	178.	98.
3/28/79	1300	16.6	7.7	10.4	131.	179.	99.
3/28/79	1315	16.6	7.7	10.4	132.	179.	99.
3/28/79	1330	16.6	7.7	10.5	133.	180.	99.
3/28/79	1345	16.6	7.7	10.4	133.	181.	100.
3/28/79	1400	16.6	7.7	10.4	134.	181.	100.
3/28/79	1415	16.6	7.7	10.4	132.	180.	99.
3/28/79	1430	16.6	7.7	10.4	132.	180.	99.
3/28/79	1445	16.6	7.7	10.4	132.	179.	99.
3/28/79	1500	16.6	7.7	10.4	182.	247.	136.
3/28/79	1515	16.6	7.7	10.4	177.	240.	132.
3/28/79	1530	16.6	7.7	10.4	178.	242.	133.
3/28/79	1545	16.6	7.7	10.4	176.	239.	132.
3/28/79	1600	16.6	7.7	10.4	177.	240.	132.
3/28/79	1615	16.6	7.5	10.2	-1.	-1.	-1.
3/28/79	1630	16.6	7.4	10.5	-1.	-1.	-1.
3/28/79	1645	16.6	7.6	10.3	-1.	-1.	-1.
3/28/79	1700	16.6	7.6	10.3	-1.	-1.	-1.
3/28/79	1715	16.6	7.7	10.3	-1.	-1.	-1.
3/28/79	1730	16.6	7.7	10.3	-1.	-1.	-1.
3/28/79	1745	16.6	7.7	10.3	-1.	-1.	-1.
3/28/79	1800	16.6	7.8	10.3	-1.	-1.	-1.
3/28/79	1815	16.6	7.8	10.3	-1.	-1.	-1.
3/28/79	1830	16.6	7.8	10.3	-1.	-1.	-1.
3/28/79	1845	16.6	7.8	10.3	-1.	-1.	-1.
3/28/79	1900	16.6	7.8	10.3	-1.	-1.	-1.
3/28/79	1915	16.6	7.8	10.3	-1.	-1.	-1.
3/28/79	1930	16.6	8.1	10.1	-1.	-1.	-1.
3/28/79	1945	16.6	7.9	10.1	-1.	-1.	-1.
3/28/79	2000	16.6	7.9	10.1	-1.	-1.	-1.
3/28/79	2015	16.7	7.9	10.1	-1.	-1.	-1.
3/28/79	2030	16.7	7.9	10.1	-1.	-1.	-1.
3/28/79	2045	16.7	7.9	10.1	-1.	-1.	-1.
3/28/79	2100	16.7	7.9	10.2	-1.	-1.	-1.
3/28/79	2115	16.7	7.9	10.2	-1.	-1.	-1.
3/28/79	2130	16.7	7.9	10.2	-1.	-1.	-1.
3/28/79	2145	16.7	7.9	10.2	-1.	-1.	-1.
3/28/79	2200	16.7	7.9	10.2	-1.	-1.	-1.
3/28/79	2215	16.6	8.0	10.1	-1.	-1.	-1.
3/28/79	2230	16.6	8.2	10.1	-1.	-1.	-1.
3/28/79	2245	16.6	8.2	10.1	-1.	-1.	-1.
3/28/79	2300	16.6	8.2	10.1	-1.	-1.	-1.
3/28/79	2315	16.7	8.2	10.1	-1.	-1.	-1.
3/28/79	2330	16.7	8.2	10.1	-1.	-1.	-1.
3/28/79	2345	16.7	8.1	10.1	-1.	-1.	-1.
3/28/79	2400	16.7	8.1	10.1	-1.	-1.	-1.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/29/79	15	9.8	8.1	10.1	-1.	-1.	-1.
3/29/79	30	9.8	8.1	10.1	-1.	-1.	-1.
3/29/79	45	9.8	8.1	10.1	-1.	-1.	-1.
3/29/79	100	9.8	8.1	10.1	-1.	-1.	-1.
3/29/79	115	9.7	-1.0	10.1	-1.	-1.	-1.
3/29/79	130	9.7	-1.0	10.1	-1.	-1.	-1.
3/29/79	145	9.7	-1.0	10.1	-1.	-1.	-1.
3/29/79	200	9.7	-1.0	10.1	-1.	-1.	-1.
3/29/79	215	11.1	-1.0	10.1	-1.	-1.	-1.
3/29/79	230	11.1	-1.0	10.1	-1.	-1.	-1.
3/29/79	245	11.1	-1.0	10.1	-1.	-1.	-1.
3/29/79	300	11.1	-1.0	10.1	-1.	-1.	-1.
3/29/79	315	12.0	-1.0	10.1	-1.	-1.	-1.
3/29/79	330	12.0	8.1	10.0	-1.	-1.	-1.
3/29/79	345	12.0	-1.0	10.0	-1.	-1.	-1.
3/29/79	400	12.0	-1.0	10.0	-1.	-1.	-1.
3/29/79	415	12.6	-1.0	10.1	-1.	-1.	-1.
3/29/79	430	12.6	-1.0	10.1	-1.	-1.	-1.
3/29/79	445	12.6	-1.0	10.1	-1.	-1.	-1.
3/29/79	500	12.6	-1.0	10.1	-1.	-1.	-1.
3/29/79	515	16.4	-1.0	10.1	-1.	-1.	-1.
3/29/79	530	16.4	-1.0	10.1	-1.	-1.	-1.
3/29/79	545	16.4	-1.0	10.1	-1.	-1.	-1.
3/29/79	600	16.4	-1.0	10.1	-1.	-1.	-1.
3/29/79	615	16.4	-1.0	10.0	-1.	-1.	-1.
3/29/79	630	16.4	8.1	10.1	-1.	-1.	-1.
3/29/79	645	16.4	8.1	10.1	-1.	-1.	-1.
3/29/79	700	16.4	-1.0	10.1	-1.	-1.	-1.
3/29/79	715	16.4	-1.0	10.0	-1.	-1.	-1.
3/29/79	730	16.4	8.1	10.0	-1.	-1.	-1.
3/29/79	745	16.4	8.1	10.0	-1.	-1.	-1.
3/29/79	800	16.4	9.5	10.0	-1.	-1.	-1.
3/29/79	815	15.8	10.7	7.7	-1.	-1.	-1.
3/29/79	830	15.8	10.4	8.0	-1.	-1.	-1.
3/29/79	845	15.8	11.0	7.7	-1.	-1.	-1.
3/29/79	900	15.8	11.0	7.5	-1.	-1.	-1.
3/29/79	915	10.5	10.7	7.5	-1.	-1.	-1.
3/29/79	930	10.5	10.6	7.5	-1.	-1.	-1.
3/29/79	945	10.5	10.7	7.5	-1.	-1.	-1.
3/29/79	1000	10.5	10.7	7.4	-1.	-1.	-1.
3/29/79	1015	9.7	10.6	7.4	-1.	-1.	-1.
3/29/79	1030	9.7	10.5	7.4	-1.	-1.	-1.
3/29/79	1045	9.7	10.4	7.4	-1.	-1.	-1.
3/29/79	1100	9.7	10.3	7.4	-1.	-1.	-1.
3/29/79	1115	9.7	10.2	7.4	-1.	-1.	-1.
3/29/79	1130	9.7	10.4	7.4	-1.	-1.	-1.
3/29/79	1145	9.7	10.7	.0	-1.	-1.	-1.
3/29/79	1200	9.7	-1.0	7.4	-1.	-1.	-1.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/29/79	1215	9.7	10.6	7.5	-1.	-1.	-1.
3/29/79	1230	9.7	10.6	7.5	-1.	-1.	-1.
3/29/79	1245	9.7	10.6	7.5	-1.	-1.	-1.
3/29/79	1300	9.7	10.6	.0	-1.	-1.	-1.
3/29/79	1315	9.8	10.6	.0	-1.	-1.	-1.
3/29/79	1330	9.8	10.6	.0	-1.	-1.	-1.
3/29/79	1345	9.8	10.6	.0	-1.	-1.	-1.
3/29/79	1400	9.8	10.7	7.5	-1.	-1.	-1.
3/29/79	1415	9.8	10.7	7.4	-1.	-1.	-1.
3/29/79	1430	9.8	10.7	7.4	-1.	-1.	-1.
3/29/79	1445	9.8	10.6	7.5	-1.	-1.	-1.
3/29/79	1500	9.8	10.5	7.5	-1.	-1.	-1.
3/29/79	1515	9.8	10.5	7.5	-1.	-1.	-1.
3/29/79	1530	9.8	10.6	7.5	-1.	-1.	-1.
3/29/79	1545	9.8	10.5	.0	-1.	-1.	-1.
3/29/79	1600	9.8	10.5	.0	-1.	-1.	-1.
3/29/79	1615	9.8	10.5	.0	-1.	-1.	-1.
3/29/79	1630	9.8	10.5	.0	-1.	-1.	-1.
3/29/79	1645	9.8	10.5	7.6	-1.	-1.	-1.
3/29/79	1700	9.8	10.5	7.6	-1.	-1.	-1.
3/29/79	1715	10.0	10.5	7.6	-1.	-1.	-1.
3/29/79	1730	10.0	10.5	7.6	-1.	-1.	-1.
3/29/79	1745	10.0	10.5	7.6	-1.	-1.	-1.
3/29/79	1800	10.0	10.5	7.6	-1.	-1.	-1.
3/29/79	1815	10.0	10.5	7.6	-1.	-1.	-1.
3/29/79	1830	10.0	10.5	7.6	-1.	-1.	-1.
3/29/79	1845	10.0	10.5	7.6	-1.	-1.	-1.
3/29/79	1900	10.0	10.5	7.6	-1.	-1.	-1.
3/29/79	1915	10.0	10.7	7.6	-1.	-1.	-1.
3/29/79	1930	10.0	11.1	7.1	-1.	-1.	-1.
3/29/79	1945	10.0	11.2	7.0	-1.	-1.	-1.
3/29/79	2000	10.0	11.2	7.0	-1.	-1.	-1.
3/29/79	2015	10.0	11.2	7.0	-1.	-1.	-1.
3/29/79	2030	10.0	11.2	7.0	-1.	-1.	-1.
3/29/79	2045	10.0	11.2	7.0	-1.	-1.	-1.
3/29/79	2100	10.0	11.3	7.0	-1.	-1.	-1.
3/29/79	2115	10.0	11.3	7.0	-1.	-1.	-1.
3/29/79	2130	10.0	11.2	7.0	-1.	-1.	-1.
3/29/79	2145	10.0	11.2	7.0	-1.	-1.	-1.
3/29/79	2200	10.0	11.2	7.0	-1.	-1.	-1.
3/29/79	2215	9.8	11.2	7.0	-1.	-1.	-1.
3/29/79	2230	9.8	11.4	7.0	-1.	-1.	-1.
3/29/79	2245	9.8	11.2	7.0	-1.	-1.	-1.
3/29/79	2300	9.8	11.2	7.0	-1.	-1.	-1.
3/29/79	2315	9.7	11.2	7.0	-1.	-1.	-1.
3/29/79	2330	9.7	11.3	7.0	-1.	-1.	-1.
3/29/79	2345	9.7	11.4	7.0	-1.	-1.	-1.
3/29/79	2400	9.7	11.4	7.0	-1.	-1.	-1.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/30/79	15	13.8	11.3	7.0	-1.	-1.	-1.
3/30/79	30	13.8	11.3	.0	-1.	-1.	-1.
3/30/79	45	13.8	11.3	.0	-1.	-1.	-1.
3/30/79	100	13.8	11.3	.0	-1.	-1.	-1.
3/30/79	115	13.9	10.2	.0	-1.	-1.	-1.
3/30/79	130	13.9	10.2	7.0	-1.	-1.	-1.
3/30/79	145	13.9	10.3	8.0	-1.	-1.	-1.
3/30/79	200	13.9	10.3	8.0	-1.	-1.	-1.
3/30/79	215	13.9	10.0	8.0	-1.	-1.	-1.
3/30/79	230	13.9	9.6	8.0	-1.	-1.	-1.
3/30/79	245	13.9	9.6	8.1	-1.	-1.	-1.
3/30/79	300	13.9	9.5	8.6	-1.	-1.	-1.
3/30/79	315	13.9	9.5	8.6	-1.	-1.	-1.
3/30/79	330	13.9	10.9	8.6	-1.	-1.	-1.
3/30/79	345	13.9	10.9	8.6	-1.	-1.	-1.
3/30/79	400	13.9	10.9	7.4	-1.	-1.	-1.
3/30/79	415	14.2	10.6	7.4	-1.	-1.	-1.
3/30/79	430	14.2	10.5	7.4	-1.	-1.	-1.
3/30/79	445	14.2	10.5	7.5	-1.	-1.	-1.
3/30/79	500	14.2	10.5	7.7	-1.	-1.	-1.
3/30/79	515	12.7	10.5	7.7	-1.	-1.	-1.
3/30/79	530	12.7	10.5	7.7	-1.	-1.	-1.
3/30/79	545	12.7	10.5	7.7	-1.	-1.	-1.
3/30/79	600	12.7	10.5	7.7	-1.	-1.	-1.
3/30/79	615	12.7	10.5	7.8	-1.	-1.	-1.
3/30/79	630	12.7	10.5	7.8	-1.	-1.	-1.
3/30/79	645	12.7	10.5	7.8	-1.	-1.	-1.
3/30/79	700	12.7	10.5	7.8	-1.	-1.	-1.
3/30/79	715	12.7	10.5	7.8	-1.	-1.	-1.
3/30/79	730	12.7	10.7	7.8	-1.	-1.	-1.
3/30/79	745	12.7	10.7	7.8	-1.	-1.	-1.
3/30/79	800	12.7	10.7	7.8	-1.	-1.	-1.
3/30/79	815	12.6	10.7	7.8	-1.	-1.	-1.
3/30/79	830	12.6	10.5	7.8	-1.	-1.	-1.
3/30/79	845	12.6	10.4	7.8	-1.	-1.	-1.
3/30/79	900	12.6	10.4	7.8	-1.	-1.	-1.
3/30/79	915	12.6	10.5	7.8	-1.	-1.	-1.
3/30/79	930	12.6	10.5	7.8	-1.	-1.	-1.
3/30/79	945	12.6	10.6	7.8	-1.	-1.	-1.
3/30/79	1000	12.6	11.0	7.8	-1.	-1.	-1.
3/30/79	1015	12.6	11.0	7.8	-1.	-1.	-1.
3/30/79	1030	12.6	11.1	7.8	-1.	-1.	-1.
3/30/79	1045	12.6	11.0	7.8	132.	240.	132.
3/30/79	1100	12.6	11.0	7.8	128.	232.	128.
3/30/79	1115	12.5	11.2	7.8	128.	236.	130.
3/30/79	1130	12.5	11.2	7.8	127.	234.	129.
3/30/79	1145	12.5	11.1	7.8	128.	234.	129.
3/30/79	1200	12.5	11.1	7.8	132.	242.	133.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/30/79	1215	12.5	11.2	7.8	126.	232.	128.
3/30/79	1230	12.5	10.3	7.8	126.	214.	118.
3/30/79	1245	12.5	10.3	7.7	128.	217.	119.
3/30/79	1300	12.5	10.3	7.7	124.	211.	116.
3/30/79	1315	12.5	10.4	7.7	123.	209.	115.
3/30/79	1330	12.5	10.7	7.7	124.	218.	120.
3/30/79	1345	12.5	10.7.	7.7	125.	220.	121.
3/30/79	1400	12.5	10.7	7.7	125.	220.	122.
3/30/79	1415	12.5	10.7	7.7	125.	219.	121.
3/30/79	1430	12.5	10.7	7.7	124.	218.	120.
3/30/79	1445	12.5	11.0	7.7	125.	226.	124.
3/30/79	1500	12.5	10.5	7.7	124.	214.	118.
3/30/79	1515	12.5	10.5	7.7	125.	215.	118.
3/30/79	1530	12.5	10.5	7.7	127.	217.	120.
3/30/79	1545	12.5	10.5	7.7	127.	218.	120.
3/30/79	1600	12.5	10.5	7.8	127.	218.	120.
3/30/79	1615	12.6	10.5	7.8	127.	221.	122.
3/30/79	1630	12.6	10.5	7.8	127.	221.	122.
3/30/79	1645	12.6	10.5	7.8	127.	221.	122.
3/30/79	1700	12.6	10.5	7.8	129.	224.	123.
3/30/79	1715	12.6	10.5	7.8	129.	223.	123.
3/30/79	1730	12.6	10.6	7.8	127.	221.	122.
3/30/79	1745	12.6	10.6	7.8	125.	217.	119.
3/30/79	1800	12.6	10.6	7.8	125.	217.	119.
3/30/79	1815	12.6	10.6	7.8	125.	217.	119.
3/30/79	1830	12.6	11.0	7.8	122.	221.	122.
3/30/79	1845	12.6	10.6	7.5	124.	215.	118.
3/30/79	1900	12.6	10.6	7.7	124.	215.	119.
3/30/79	1915	12.5	10.6	7.7	124.	215.	119.
3/30/79	1930	12.5	10.6	7.7	124.	216.	119.
3/30/79	1945	12.5	10.6	7.7	123.	214.	118.
3/30/79	2000	12.5	10.6	7.7	122.	212.	117.
3/30/79	2015	12.5	10.6	7.7	120.	209.	115.
3/30/79	2030	12.5	10.6	7.7	120.	209.	115.
3/30/79	2045	12.5	10.6	7.7	120.	209.	115.
3/30/79	2100	12.5	10.6	7.7	120.	209.	115.
3/30/79	2115	12.5	10.6	7.7	119.	208.	115.
3/30/79	2130	12.5	10.6	7.7	119.	208.	115.
3/30/79	2145	12.5	10.6	7.7	119.	208.	115.
3/30/79	2200	12.5	10.2	8.7	125.	210.	116.
3/30/79	2215	12.6	9.8	8.7	126.	203.	112.
3/30/79	2230	12.6	9.8	8.7	126.	203.	112.
3/30/79	2245	12.6	9.8	8.7	-1.	-1.	-1.
3/30/79	2300	12.6	9.8	8.7	124.	200.	110.
3/30/79	2315	13.8	9.8	8.7	124.	200.	110.
3/30/79	2330	13.8	9.8	8.7	124.	201.	111.
3/30/79	2345	13.8	9.8	8.7	125.	202.	111.
3/30/79	2400	13.8	9.8	8.8	126.	203.	112.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/31/79	15	13.8	9.8	8.6	126.	203.	112.
3/31/79	30	13.8	9.8	8.6	126.	204.	112.
3/31/79	45	13.8	9.8	8.6	126.	204.	112.
3/31/79	100	13.8	9.8	8.6	126.	204.	112.
3/31/79	115	13.8	9.8	8.6	126.	203.	112.
3/31/79	130	13.8	9.8	8.6	126.	204.	112.
3/31/79	145	13.8	9.8	8.6	126.	204.	112.
3/31/79	200	13.8	9.8	8.6	126.	204.	112.
3/31/79	215	13.8	9.8	8.6	126.	204.	112.
3/31/79	230	13.8	9.8	8.5	126.	204.	112.
3/31/79	245	13.8	9.8	8.5	126.	203.	112.
3/31/79	300	13.8	9.8	8.5	125.	202.	111.
3/31/79	315	13.8	10.0	8.3	125.	206.	114.
3/31/79	330	13.8	10.0	8.3	125.	206.	114.
3/31/79	345	13.8	10.0	8.3	-1.	-1.	-1.
3/31/79	400	13.8	10.1	8.3	-1.	-1.	-1.
3/31/79	415	13.8	10.2	8.1	125.	210.	116.
3/31/79	430	13.8	10.3	8.1	124.	210.	116.
3/31/79	445	13.8	10.3	.0	124.	209.	115.
3/31/79	500	13.8	10.3	.0	124.	209.	115.
3/31/79	515	13.8	10.2	.0	123.	208.	114.
3/31/79	530	13.8	10.2	.0	124.	209.	115.
3/31/79	545	13.8	10.2	.0	124.	208.	115.
3/31/79	600	13.8	10.2	.0	124.	208.	115.
3/31/79	615	13.8	10.2	.0	124.	208.	115.
3/31/79	630	13.8	10.2	.0	124.	208.	115.
3/31/79	645	13.8	10.2	.0	124.	208.	115.
3/31/79	700	13.8	10.2	8.1	124.	208.	115.
3/31/79	715	13.9	10.2	8.2	124.	208.	115.
3/31/79	730	13.9	10.2	.0	125.	210.	116.
3/31/79	745	13.9	10.2	.0	126.	210.	116.
3/31/79	800	13.9	10.1	.0	126.	209.	115.
3/31/79	815	13.9	10.1	.0	129.	213.	118.
3/31/79	830	13.9	10.1	.0	132.	218.	120.
3/31/79	845	13.9	10.0	.0	132.	218.	120.
3/31/79	900	13.9	10.0	.0	133.	218.	120.
3/31/79	915	13.8	10.0	.0	134.	220.	122.
3/31/79	930	13.8	10.0	.0	135.	222.	122.
3/31/79	945	13.8	10.0	.0	132.	218.	120.
3/31/79	1000	13.8	10.0	.0	132.	218.	120.
3/31/79	1015	13.8	10.0	.0	135.	223.	123.
3/31/79	1030	13.8	10.0	.0	137.	225.	124.
3/31/79	1045	13.8	10.0	.0	140.	230.	127.
3/31/79	1100	13.8	10.0	.0	141.	232.	128.
3/31/79	1115	13.8	10.0	.0	142.	233.	128.
3/31/79	1130	13.8	10.0	.0	143.	234.	129.
3/31/79	1145	13.8	10.0	.0	143.	234.	129.
3/31/79	1200	13.8	10.0	8.2	143.	234.	129.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
3/31/79	1215	13.9	10.0	8.2	143.	234.	129.
3/31/79	1230	13.9	10.0	8.2	143.	236.	130.
3/31/79	1245	13.9	10.0	8.2	143.	236.	130.
3/31/79	1300	13.9	10.0	8.2	143.	236.	130.
3/31/79	1315	13.9	10.0	8.2	144.	238.	131.
3/31/79	1330	13.9	10.0	8.2	145.	239.	132.
3/31/79	1345	13.9	10.0	8.2	146.	241.	133.
3/31/79	1400	13.9	10.0	8.2	146.	241.	133.
3/31/79	1415	14.1	10.0	8.2	146.	241.	133.
3/31/79	1430	14.1	10.0	8.2	146.	241.	133.
3/31/79	1445	14.1	10.0	8.2	145.	239.	132.
3/31/79	1500	14.1	10.0	8.3	144.	238.	131.
3/31/79	1515	14.1	10.0	8.3	143.	236.	130.
3/31/79	1530	14.1	10.0	8.3	142.	235.	130.
3/31/79	1545	14.1	10.0	8.3	141.	233.	128.
3/31/79	1600	14.1	10.0	8.3	139.	230.	127.
3/31/79	1615	14.1	10.1	8.3	139.	230.	127.
3/31/79	1630	14.1	10.1	8.3	140.	232.	128.
3/31/79	1645	14.1	10.1	8.2	140.	233.	128.
3/31/79	1700	14.1	10.1	8.2	140.	233.	129.
3/31/79	1715	14.1	10.1	8.2	140.	233.	129.
3/31/79	1730	14.1	10.1	8.2	141.	235.	129.
3/31/79	1745	14.1	10.2	8.2	140.	234.	129.
3/31/79	1800	14.1	10.2	8.2	139.	233.	128.
3/31/79	1815	14.1	10.2	8.2	138.	231.	127.
3/31/79	1830	14.1	10.2	8.2	137.	229.	126.
3/31/79	1845	14.1	10.5	8.1	134.	231.	128.
3/31/79	1900	14.1	10.1	8.3	133.	221.	122.
3/31/79	1915	13.8	10.1	8.3	131.	218.	120.
3/31/79	1930	13.8	10.1	8.3	131.	217.	120.
3/31/79	1945	13.8	10.1	8.3	130.	216.	119.
3/31/79	2000	13.8	10.1	8.3	130.	216.	119.
3/31/79	2015	14.1	10.1	8.3	130.	217.	120.
3/31/79	2030	14.1	10.1	8.3	130.	216.	119.
3/31/79	2045	14.1	10.1	8.3	129.	215.	119.
3/31/79	2100	14.1	10.1	8.3	129.	215.	118.
3/31/79	2115	14.1	10.1	8.3	129.	215.	118.
3/31/79	2130	14.1	10.1	8.3	129.	215.	119.
3/31/79	2145	14.1	10.1	8.3	129.	216.	119.
3/31/79	2200	14.1	10.1	8.3	129.	215.	119.
3/31/79	2215	14.1	10.1	8.3	129.	215.	119.
3/31/79	2230	14.1	10.2	8.3	128.	214.	118.
3/31/79	2245	14.1	10.2	8.3	128.	215.	119.
3/31/79	2300	14.1	10.2	8.3	128.	214.	118.
3/31/79	2315	13.9	10.2	8.3	124.	208.	115.
3/31/79	2330	13.9	10.2	8.3	123.	206.	114.
3/31/79	2345	13.9	10.2	8.3	124.	207.	114.
3/31/79	2400	13.9	10.2	8.3	124.	208.	115.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/ 1/79	15	13.3	10.2	8.3	124.	207.	114.
4/ 1/79	30	13.3	10.2	8.3	124.	208.	115.
4/ 1/79	45	13.3	10.2	8.3	125.	208.	115.
4/ 1/79	100	13.3	10.2	8.3	124.	208.	115.
4/ 1/79	115	13.3	10.2	8.3	124.	208.	115.
4/ 1/79	130	13.3	10.2	8.3	124.	208.	115.
4/ 1/79	145	13.3	10.2	8.3	124.	207.	114.
4/ 1/79	200	13.3	10.2	8.3	124.	207.	114.
4/ 1/79	215	13.3	10.2	8.3	125.	209.	115.
4/ 1/79	230	13.3	10.2	8.3	124.	208.	115.
4/ 1/79	245	13.3	10.2	8.3	124.	208.	115.
4/ 1/79	300	13.3	10.2	8.3	124.	208.	115.
4/ 1/79	315	13.3	10.2	8.2	124.	207.	114.
4/ 1/79	330	13.3	10.2	8.2	122.	204.	113.
4/ 1/79	345	13.3	10.2	8.2	121.	202.	112.
4/ 1/79	400	13.3	10.2	8.2	119.	200.	110.
4/ 1/79	415	13.3	10.5	8.2	119.	206.	113.
4/ 1/79	430	13.3	10.4	7.9	119.	202.	112.
4/ 1/79	445	13.3	10.3	8.1	119.	202.	111.
4/ 1/79	500	13.3	10.3	8.1	120.	203.	112.
4/ 1/79	515	13.5	10.2	8.1	120.	202.	111.
4/ 1/79	530	13.5	10.2	8.1	121.	203.	112.
4/ 1/79	545	13.5	10.2	8.1	122.	204.	113.
4/ 1/79	600	13.5	10.2	8.1	124.	207.	114.
4/ 1/79	615	13.6	10.2	8.1	124.	207.	114.
4/ 1/79	630	13.6	10.2	8.1	124.	208.	115.
4/ 1/79	645	13.6	10.2	8.1	124.	208.	115.
4/ 1/79	700	13.6	10.2	8.1	124.	208.	115.
4/ 1/79	715	13.6	10.2	8.1	124.	208.	115.
4/ 1/79	730	13.6	10.2	8.1	124.	208.	115.
4/ 1/79	745	13.6	10.2	8.1	125.	209.	115.
4/ 1/79	800	13.6	10.2	8.1	125.	209.	115.
4/ 1/79	815	13.6	10.2	8.1	125.	209.	115.
4/ 1/79	830	13.6	10.2	8.1	125.	209.	115.
4/ 1/79	845	13.6	10.2	8.1	125.	210.	116.
4/ 1/79	900	13.6	10.2	8.1	125.	210.	116.
4/ 1/79	915	13.6	10.2	8.1	126.	211.	116.
4/ 1/79	930	13.6	10.2	8.1	126.	211.	116.
4/ 1/79	945	13.6	10.2	8.1	126.	211.	116.
4/ 1/79	1000	13.6	10.2	8.1	126.	211.	116.
4/ 1/79	1015	13.6	10.2	8.1	126.	211.	116.
4/ 1/79	1030	13.6	10.2	8.1	126.	212.	117.
4/ 1/79	1045	13.6	10.2	8.1	129.	216.	119.
4/ 1/79	1100	13.6	10.2	8.1	129.	216.	119.
4/ 1/79	1115	13.6	10.2	8.1	128.	215.	119.
4/ 1/79	1130	13.6	10.2	8.1	128.	215.	118.
4/ 1/79	1145	13.6	10.2	8.1	128.	215.	118.
4/ 1/79	1200	13.6	10.2	8.1	128.	215.	118.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/ 1/79	1215	13.6	10.2	8.1	126.	215.	118.
4/ 1/79	1230	13.6	11.6	6.8	110.	212.	117.
4/ 1/79	1245	13.6	11.6	6.8	111.	214.	118.
4/ 1/79	1300	13.6	11.6	6.8	112.	215.	119.
4/ 1/79	1315	13.6	11.5	6.9	112.	214.	118.
4/ 1/79	1330	13.6	11.5	7.0	113.	214.	118.
4/ 1/79	1345	13.6	11.3	7.1	114.	213.	118.
4/ 1/79	1400	13.6	11.2	7.2	116.	215.	119.
4/ 1/79	1415	13.8	11.2	7.3	117.	216.	119.
4/ 1/79	1430	13.8	10.9	7.4	121.	218.	120.
4/ 1/79	1445	13.8	10.8	7.5	124.	221.	122.
4/ 1/79	1500	13.8	10.7	7.6	126.	222.	122.
4/ 1/79	1515	13.8	10.7	7.7	127.	224.	124.
4/ 1/79	1530	13.8	10.7	7.7	127.	224.	124.
4/ 1/79	1545	13.8	10.9	7.7	122.	217.	120.
4/ 1/79	1600	13.8	10.9	7.6	121.	217.	119.
4/ 1/79	1615	13.8	11.0	7.5	119.	215.	118.
4/ 1/79	1630	13.8	11.0	7.5	119.	214.	118.
4/ 1/79	1645	13.8	11.0	7.5	119.	214.	118.
4/ 1/79	1700	13.8	10.9	7.5	119.	214.	118.
4/ 1/79	1715	13.8	10.9	7.6	121.	217.	119.
4/ 1/79	1730	13.8	10.9	7.7	121.	216.	119.
4/ 1/79	1745	13.8	10.9	7.7	122.	217.	120.
4/ 1/79	1800	13.8	11.0	7.7	121.	218.	120.
4/ 1/79	1815	13.6	11.0	7.6	120.	218.	120.
4/ 1/79	1830	13.6	11.2	7.5	118.	217.	120.
4/ 1/79	1845	13.6	11.2	7.5	116.	215.	119.
4/ 1/79	1900	13.6	11.2	7.4	116.	215.	119.
4/ 1/79	1915	13.6	11.7	7.1	112.	220.	121.
4/ 1/79	1930	13.6	11.7	6.9	114.	223.	123.
4/ 1/79	1945	13.6	11.8	6.9	113.	223.	123.
4/ 1/79	2000	13.6	11.8	6.9	113.	222.	123.
4/ 1/79	2015	13.6	11.9	6.9	112.	223.	123.
4/ 1/79	2030	13.6	11.9	6.9	113.	224.	124.
4/ 1/79	2045	13.6	11.9	6.9	114.	225.	124.
4/ 1/79	2100	13.6	11.9	6.9	113.	224.	124.
4/ 1/79	2115	13.5	11.9	6.9	113.	226.	124.
4/ 1/79	2130	13.5	11.9	6.9	111.	222.	122.
4/ 1/79	2145	13.5	12.1	6.8	109.	221.	122.
4/ 1/79	2200	13.5	12.2	6.7	108.	222.	123.
4/ 1/79	2215	13.5	12.1	6.8	108.	222.	122.
4/ 1/79	2230	13.5	11.9	6.9	112.	223.	123.
4/ 1/79	2245	13.5	11.5	7.1	116.	223.	123.
4/ 1/79	2300	13.5	11.3	7.2	120.	224.	124.
4/ 1/79	2315	13.5	11.2	7.3	123.	229.	126.
4/ 1/79	2330	13.5	11.2	7.4	124.	230.	127.
4/ 1/79	2345	13.5	11.2	7.4	125.	230.	127.
4/ 1/79	2400	13.5	11.0	7.5	126.	229.	126.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/ 2/79	15	16.0	11.0	7.5	127.	230.	127.
4/ 2/79	30	16.0	11.0	7.5	127.	229.	126.
4/ 2/79	45	16.0	11.0	7.5	127.	231.	127.
4/ 2/79	100	16.0	11.0	7.5	132.	241.	133.
4/ 2/79	115	16.0	11.1	7.5	134.	245.	135.
4/ 2/79	130	16.0	11.1	7.5	134.	244.	134.
4/ 2/79	145	16.0	11.1	7.5	133.	243.	134.
4/ 2/79	200	16.0	11.1	7.5	134.	244.	135.
4/ 2/79	215	16.0	11.1	7.5	134.	244.	135.
4/ 2/79	230	16.0	11.1	7.5	132.	242.	133.
4/ 2/79	245	16.0	11.1	7.5	131.	240.	132.
4/ 2/79	300	16.0	11.1	7.5	132.	242.	133.
4/ 2/79	315	16.0	11.1	7.5	134.	244.	135.
4/ 2/79	330	16.0	11.1	7.5	134.	244.	135.
4/ 2/79	345	16.0	11.1	7.5	134.	244.	135.
4/ 2/79	400	16.0	11.1	7.5	135.	247.	136.
4/ 2/79	415	16.3	11.1	7.5	133.	243.	134.
4/ 2/79	430	16.3	11.1	7.5	134.	244.	135.
4/ 2/79	445	16.3	11.1	7.5	134.	244.	135.
4/ 2/79	500	16.3	11.1	7.5	133.	243.	134.
4/ 2/79	515	13.3	11.1	7.5	132.	242.	133.
4/ 2/79	530	13.3	11.1	7.5	131.	240.	132.
4/ 2/79	545	13.3	11.1	7.5	131.	239.	132.
4/ 2/79	600	13.3	11.1	7.5	134.	244.	135.
4/ 2/79	615	13.3	11.1	7.5	132.	242.	133.
4/ 2/79	630	13.3	11.1	7.5	132.	242.	133.
4/ 2/79	645	13.3	11.1	7.5	132.	242.	133.
4/ 2/79	700	13.3	11.1	7.6	132.	242.	133.
4/ 2/79	715	13.3	11.0	7.6	134.	243.	134.
4/ 2/79	730	13.3	11.0	7.6	135.	245.	135.
4/ 2/79	745	13.3	11.0	7.6	136.	246.	136.
4/ 2/79	800	13.3	10.9	7.6	138.	248.	137.
4/ 2/79	815	13.5	10.9	7.6	141.	252.	139.
4/ 2/79	830	13.5	10.9	7.6	145.	259.	143.
4/ 2/79	845	13.5	10.7	7.6	146.	258.	142.
4/ 2/79	900	13.5	10.7	7.6	127.	225.	124.
4/ 2/79	915	14.4	8.1	9.1	117.	165.	91.
4/ 2/79	930	14.4	8.0	9.9	114.	158.	87.
4/ 2/79	945	14.4	8.1	10.0	116.	162.	89.
4/ 2/79	1000	14.4	8.2	10.0	117.	165.	91.
4/ 2/79	1015	16.6	8.2	10.0	115.	163.	90.
4/ 2/79	1030	16.6	8.2	10.0	117.	166.	91.
4/ 2/79	1045	16.6	7.9	10.0	119.	164.	90.
4/ 2/79	1100	16.6	7.9	10.0	118.	163.	90.
4/ 2/79	1115	16.6	7.9	10.0	117.	161.	89.
4/ 2/79	1130	16.6	7.9	10.0	119.	163.	90.
4/ 2/79	1145	16.6	7.9	10.0	119.	163.	90.
4/ 2/79	1200	16.6	7.9	10.0	119.	163.	90.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/ 2/79	1215	16.6	7.8	10.0	120.	164.	91.
4/ 2/79	1230	16.6	7.8	10.0	120.	164.	91.
4/ 2/79	1245	16.6	7.8	10.0	120.	164.	91.
4/ 2/79	1300	16.6	7.8	10.0	120.	164.	90.
4/ 2/79	1315	16.7	7.7	10.0	119.	163.	90.
4/ 2/79	1330	16.7	7.7	10.0	119.	163.	90.
4/ 2/79	1345	16.7	7.7	10.0	119.	162.	89.
4/ 2/79	1400	16.7	7.7	10.1	119.	162.	89.
4/ 2/79	1415	16.7	7.7	10.1	116.	158.	87.
4/ 2/79	1430	16.7	7.7	10.1	116.	158.	87.
4/ 2/79	1445	16.7	7.7	10.1	117.	160.	88.
4/ 2/79	1500	16.7	7.7	10.1	119.	162.	89.
4/ 2/79	1515	16.8	7.7	10.1	119.	161.	89.
4/ 2/79	1530	16.8	7.7	10.1	117.	159.	88.
4/ 2/79	1545	16.8	7.7	10.1	119.	161.	89.
4/ 2/79	1600	16.8	7.6	10.1	117.	158.	87.
4/ 2/79	1615	17.0	8.1	9.8	125.	175.	97.
4/ 2/79	1630	17.0	8.2	9.7	127.	180.	99.
4/ 2/79	1645	17.0	8.2	9.7	129.	181.	100.
4/ 2/79	1700	17.0	8.2	9.7	130.	183.	101.
4/ 2/79	1715	16.4	8.2	9.7	129.	182.	100.
4/ 2/79	1730	16.4	8.2	9.7	127.	180.	99.
4/ 2/79	1745	16.4	8.2	9.7	127.	180.	99.
4/ 2/79	1800	16.4	8.2	9.7	127.	180.	99.
4/ 2/79	1815	16.3	8.2	9.7	127.	179.	99.
4/ 2/79	1830	16.3	8.2	9.7	127.	179.	99.
4/ 2/79	1845	16.3	8.2	9.7	127.	179.	99.
4/ 2/79	1900	16.3	8.2	9.7	126.	178.	98.
4/ 2/79	1915	16.1	8.6	9.2	127.	186.	103.
4/ 2/79	1930	16.1	8.6	9.3	130.	189.	104.
4/ 2/79	1945	16.1	8.6	9.3	130.	189.	104.
4/ 2/79	2000	16.1	8.6	9.3	131.	191.	105.
4/ 2/79	2015	16.1	8.6	9.3	132.	193.	106.
4/ 2/79	2030	16.1	8.6	9.3	132.	192.	106.
4/ 2/79	2045	16.1	8.6	9.3	132.	192.	106.
4/ 2/79	2100	16.1	8.6	9.3	132.	192.	106.
4/ 2/79	2115	16.1	8.6	9.3	132.	193.	106.
4/ 2/79	2130	16.1	8.6	9.3	132.	193.	106.
4/ 2/79	2145	16.1	8.6	9.3	131.	191.	105.
4/ 2/79	2200	16.1	8.6	9.3	131.	191.	105.
4/ 2/79	2215	16.0	8.6	9.3	131.	191.	105.
4/ 2/79	2230	16.0	8.6	9.3	131.	191.	105.
4/ 2/79	2245	16.0	8.6	9.3	130.	189.	104.
4/ 2/79	2300	16.0	8.6	9.3	129.	187.	103.
4/ 2/79	2315	16.0	8.5	9.3	126.	182.	100.
4/ 2/79	2330	16.0	8.5	9.3	125.	180.	99.
4/ 2/79	2345	16.0	8.5	9.3	122.	176.	97.
4/ 2/79	2400	16.0	8.4	9.3	122.	176.	97.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/ 3/79	15	16.1	8.5	9.4	121.	174.	96.
4/ 3/79	30	16.1	8.4	9.4	120.	171.	95.
4/ 3/79	45	16.1	8.4	9.4	120.	171.	94.
4/ 3/79	100	16.1	8.3	9.4	121.	172.	95.
4/ 3/79	115	16.1	8.3	9.4	120.	170.	94.
4/ 3/79	130	16.1	8.3	9.4	119.	170.	94.
4/ 3/79	145	16.1	8.4	9.4	120.	172.	95.
4/ 3/79	200	16.1	8.4	9.4	120.	171.	95.
4/ 3/79	215	16.1	8.0	9.7	115.	160.	88.
4/ 3/79	230	16.1	7.9	10.0	109.	150.	83.
4/ 3/79	245	16.1	7.9	10.0	109.	150.	83.
4/ 3/79	300	16.1	7.9	10.0	107.	149.	82.
4/ 3/79	315	16.1	7.7	10.0	106.	145.	80.
4/ 3/79	330	16.1	8.2	9.8	-1.	-1.	-1.
4/ 3/79	345	16.1	7.7	10.0	-1.	-1.	-1.
4/ 3/79	400	16.1	7.7	10.0	-1.	-1.	-1.
4/ 3/79	415	16.1	7.7	10.0	-1.	-1.	-1.
4/ 3/79	430	16.1	7.6	10.0	-1.	-1.	-1.
4/ 3/79	445	16.1	7.2	10.0	-1.	-1.	-1.
4/ 3/79	500	16.1	7.5	10.0	-1.	-1.	-1.
4/ 3/79	515	16.1	7.4	10.0	-1.	-1.	-1.
4/ 3/79	530	16.1	7.4	10.0	-1.	-1.	-1.
4/ 3/79	545	16.1	7.4	10.0	-1.	-1.	-1.
4/ 3/79	600	16.1	7.3	10.0	-1.	-1.	-1.
4/ 3/79	615	16.1	7.2	10.0	-1.	-1.	-1.
4/ 3/79	630	16.1	7.2	10.0	-1.	-1.	-1.
4/ 3/79	645	16.1	7.2	10.0	-1.	-1.	-1.
4/ 3/79	700	16.1	7.2	10.0	-1.	-1.	-1.
4/ 3/79	715	16.1	7.2	10.0	-1.	-1.	-1.
4/ 3/79	730	16.1	7.3	10.0	-1.	-1.	-1.
4/ 3/79	745	16.1	7.4	10.0	-1.	-1.	-1.
4/ 3/79	800	16.1	7.4	10.0	-1.	-1.	-1.
4/ 3/79	815	16.4	7.3	10.0	-1.	-1.	-1.
4/ 3/79	830	16.4	7.3	10.0	-1.	-1.	-1.
4/ 3/79	845	16.4	7.7	10.0	-1.	-1.	-1.
4/ 3/79	900	16.4	7.6	10.0	-1.	-1.	-1.
4/ 3/79	915	16.3	7.6	10.0	-1.	-1.	-1.
4/ 3/79	930	16.3	7.6	10.0	-1.	-1.	-1.
4/ 3/79	945	16.3	8.0	10.0	-1.	-1.	-1.
4/ 3/79	1000	16.3	8.2	10.0	-1.	-1.	-1.
4/ 3/79	1015	16.3	8.2	10.0	-1.	-1.	-1.
4/ 3/79	1030	16.3	8.2	10.0	-1.	-1.	-1.
4/ 3/79	1045	16.3	8.2	10.0	-1.	-1.	-1.
4/ 3/79	1100	16.3	8.3	9.9	-1.	-1.	-1.
4/ 3/79	1115	16.3	8.0	9.9	-1.	-1.	-1.
4/ 3/79	1130	16.3	7.9	9.9	-1.	-1.	-1.
4/ 3/79	1145	16.3	7.8	9.9	-1.	-1.	-1.
4/ 3/79	1200	16.3	7.8	9.9	-1.	-1.	-1.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/ 3/79	1215	16.3	7.8	9.9	-1.	-1.	-1.
4/ 3/79	1230	16.3	7.8	9.9	-1.	-1.	-1.
4/ 3/79	1245	16.3	7.9	9.9	-1.	-1.	-1.
4/ 3/79	1300	16.3	8.2	9.9	-1.	-1.	-1.
4/ 3/79	1315	16.1	8.3	9.9	-1.	-1.	-1.
4/ 3/79	1330	16.1	8.5	9.9	-1.	-1.	-1.
4/ 3/79	1345	16.1	8.0	9.9	-1.	-1.	-1.
4/ 3/79	1400	16.1	8.0	9.9	-1.	-1.	-1.
4/ 3/79	1415	16.1	8.0	9.9	-1.	-1.	-1.
4/ 3/79	1430	16.1	8.0	9.9	-1.	-1.	-1.
4/ 3/79	1445	16.1	8.0	9.9	-1.	-1.	-1.
4/ 3/79	1500	16.1	8.1	9.9	-1.	-1.	-1.
4/ 3/79	1515	16.0	7.6	9.9	-1.	-1.	-1.
4/ 3/79	1530	16.0	7.8	9.9	-1.	-1.	-1.
4/ 3/79	1545	16.0	7.7	9.9	-1.	-1.	-1.
4/ 3/79	1600	16.0	7.7	10.0	-1.	-1.	-1.
4/ 3/79	1615	16.1	7.7	10.0	-1.	-1.	-1.
4/ 3/79	1630	16.1	7.7	10.0	-1.	-1.	-1.
4/ 3/79	1645	16.1	7.7	10.0	-1.	-1.	-1.
4/ 3/79	1700	16.1	7.7	10.0	-1.	-1.	-1.
4/ 3/79	1715	16.0	7.8	10.0	-1.	-1.	-1.
4/ 3/79	1730	16.0	7.8	10.0	-1.	-1.	-1.
4/ 3/79	1745	16.0	7.8	10.0	-1.	-1.	-1.
4/ 3/79	1800	16.0	7.8	10.0	-1.	-1.	-1.
4/ 3/79	1815	16.0	7.9	10.0	-1.	-1.	-1.
4/ 3/79	1830	16.0	7.9	10.0	-1.	-1.	-1.
4/ 3/79	1845	16.0	8.4	10.0	-1.	-1.	-1.
4/ 3/79	1900	16.0	8.2	10.0	-1.	-1.	-1.
4/ 3/79	1915	15.8	8.1	10.0	-1.	-1.	-1.
4/ 3/79	1930	15.8	8.1	9.6	-1.	-1.	-1.
4/ 3/79	1945	15.8	8.5	9.9	-1.	-1.	-1.
4/ 3/79	2000	15.8	9.6	9.9	-1.	-1.	-1.
4/ 3/79	2015	16.0	9.6	9.9	-1.	-1.	-1.
4/ 3/79	2030	16.0	9.5	9.9	-1.	-1.	-1.
4/ 3/79	2045	16.0	9.5	9.9	-1.	-1.	-1.
4/ 3/79	2100	16.0	9.4	9.9	-1.	-1.	-1.
4/ 3/79	2115	16.0	9.4	9.9	-1.	-1.	-1.
4/ 3/79	2130	16.0	9.4	9.9	-1.	-1.	-1.
4/ 3/79	2145	16.0	9.4	9.9	-1.	-1.	-1.
4/ 3/79	2200	16.0	9.4	9.9	-1.	-1.	-1.
4/ 3/79	2215	15.8	9.4	9.9	-1.	-1.	-1.
4/ 3/79	2230	15.8	9.4	9.9	-1.	-1.	-1.
4/ 3/79	2245	15.8	9.4	10.0	-1.	-1.	-1.
4/ 3/79	2300	15.8	9.4	10.0	-1.	-1.	-1.
4/ 3/79	2315	16.0	8.1	10.0	-1.	-1.	-1.
4/ 3/79	2330	16.0	8.0	10.0	-1.	-1.	-1.
4/ 3/79	2345	16.0	7.9	10.0	-1.	-1.	-1.
4/ 3/79	2400	16.0	7.9	10.0	-1.	-1.	-1.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/ 4/79	15	16.0	9.5	10.0	-1.	-1.	-1.
4/ 4/79	30	16.0	9.5	10.0	-1.	-1.	-1.
4/ 4/79	45	16.0	9.5	10.0	-1.	-1.	-1.
4/ 4/79	100	16.0	9.5	10.0	-1.	-1.	-1.
4/ 4/79	115	16.0	9.5	10.0	-1.	-1.	-1.
4/ 4/79	130	16.0	9.5	10.0	-1.	-1.	-1.
4/ 4/79	145	16.0	9.5	10.0	-1.	-1.	-1.
4/ 4/79	200	16.0	9.4	10.0	-1.	-1.	-1.
4/ 4/79	215	16.0	9.1	10.0	-1.	-1.	-1.
4/ 4/79	230	16.0	9.1	10.0	-1.	-1.	-1.
4/ 4/79	245	16.0	9.1	10.0	-1.	-1.	-1.
4/ 4/79	300	16.0	9.0	10.0	-1.	-1.	-1.
4/ 4/79	315	16.0	8.8	10.0	-1.	-1.	-1.
4/ 4/79	330	16.0	8.8	10.0	-1.	-1.	-1.
4/ 4/79	345	16.0	9.4	10.0	-1.	-1.	-1.
4/ 4/79	400	16.0	9.1	10.0	-1.	-1.	-1.
4/ 4/79	415	15.8	9.2	10.0	-1.	-1.	-1.
4/ 4/79	430	15.8	9.1	10.0	-1.	-1.	-1.
4/ 4/79	445	15.8	9.1	9.7	-1.	-1.	-1.
4/ 4/79	500	15.8	9.1	9.8	-1.	-1.	-1.
4/ 4/79	515	15.8	9.4	9.8	-1.	-1.	-1.
4/ 4/79	530	15.8	9.3	9.8	-1.	-1.	-1.
4/ 4/79	545	15.8	9.3	9.8	-1.	-1.	-1.
4/ 4/79	600	15.8	9.3	9.9	-1.	-1.	-1.
4/ 4/79	615	16.0	9.3	9.9	-1.	-1.	-1.
4/ 4/79	630	16.0	8.8	9.9	-1.	-1.	-1.
4/ 4/79	645	16.0	8.9	9.9	-1.	-1.	-1.
4/ 4/79	700	16.0	8.9	9.9	-1.	-1.	-1.
4/ 4/79	715	16.0	8.9	9.9	-1.	-1.	-1.
4/ 4/79	730	16.0	9.1	10.0	-1.	-1.	-1.
4/ 4/79	745	16.0	9.4	10.1	-1.	-1.	-1.
4/ 4/79	800	16.0	9.5	10.1	-1.	-1.	-1.
4/ 4/79	815	16.0	9.4	10.1	-1.	-1.	-1.
4/ 4/79	830	16.0	9.3	10.1	-1.	-1.	-1.
4/ 4/79	845	16.0	9.3	10.1	-1.	-1.	-1.
4/ 4/79	900	16.0	9.4	10.1	-1.	-1.	-1.
4/ 4/79	915	16.0	9.3	10.1	-1.	-1.	-1.
4/ 4/79	930	16.0	9.2	10.1	-1.	-1.	-1.
4/ 4/79	945	16.0	9.2	10.1	-1.	-1.	-1.
4/ 4/79	1000	16.0	7.7	10.1	-1.	-1.	-1.
4/ 4/79	1015	16.0	7.7	10.1	-1.	-1.	-1.
4/ 4/79	1030	16.0	7.7	10.1	-1.	-1.	-1.
4/ 4/79	1045	16.0	7.3	10.1	-1.	-1.	-1.
4/ 4/79	1100	16.0	7.6	10.1	-1.	-1.	-1.
4/ 4/79	1115	16.0	7.6	10.2	-1.	-1.	-1.
4/ 4/79	1130	16.0	7.6	10.2	-1.	-1.	-1.
4/ 4/79	1145	16.0	7.6	10.2	-1.	-1.	-1.
4/ 4/79	1200	16.0	7.6	10.2	-1.	-1.	-1.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/ 4/79	1215	16.0	7.5	10.2	-1.	-1.	-1.
4/ 4/79	1230	16.0	7.5	10.2	-1.	-1.	-1.
4/ 4/79	1245	16.0	7.6	10.2	-1.	-1.	-1.
4/ 4/79	1300	16.0	7.6	10.3	-1.	-1.	-1.
4/ 4/79	1315	16.0	7.4	10.3	-1.	-1.	-1.
4/ 4/79	1330	16.0	7.4	10.3	-1.	-1.	-1.
4/ 4/79	1345	16.0	7.4	.0	-1.	-1.	-1.
4/ 4/79	1400	16.0	6.7	10.2	-1.	-1.	-1.
4/ 4/79	1415	16.0	7.6	10.1	125.	168.	92.
4/ 4/79	1430	16.0	7.6	10.2	127.	172.	95.
4/ 4/79	1445	16.0	8.5	10.2	127.	184.	101.
4/ 4/79	1500	16.0	8.6	10.2	131.	191.	105.
4/ 4/79	1515	16.0	8.7	10.2	130.	190.	105.
4/ 4/79	1530	16.0	7.9	10.2	122.	167.	92.
4/ 4/79	1545	16.0	7.9	10.2	122.	167.	92.
4/ 4/79	1600	16.0	7.2	10.2	122.	159.	88.
4/ 4/79	1615	16.0	7.2	10.2	122.	159.	88.
4/ 4/79	1630	16.0	7.2	10.2	122.	159.	88.
4/ 4/79	1645	16.0	7.2	10.2	122.	159.	88.
4/ 4/79	1700	16.0	7.1	10.2	121.	157.	86.
4/ 4/79	1715	16.0	7.0	10.1	122.	157.	87.
4/ 4/79	1730	16.0	.5	10.1	122.	107.	59.
4/ 4/79	1745	16.0	-1.0	10.1	123.	105.	58.
4/ 4/79	1800	16.0	-1.0	10.2	123.	104.	57.
4/ 4/79	1815	16.0	-1.0	10.2	123.	104.	58.
4/ 4/79	1830	16.0	-1.0	10.2	124.	105.	58.
4/ 4/79	1845	16.0	7.2	10.2	124.	162.	89.
4/ 4/79	1900	16.0	7.2	10.2	125.	163.	90.
4/ 4/79	1915	16.3	7.1	10.2	126.	164.	90.
4/ 4/79	1930	16.3	7.1	10.2	125.	163.	90.
4/ 4/79	1945	16.3	7.1	10.2	126.	163.	90.
4/ 4/79	2000	16.3	7.1	9.8	123.	160.	88.
4/ 4/79	2015	16.3	7.1	10.0	122.	158.	87.
4/ 4/79	2030	16.3	-1.0	10.1	122.	104.	57.
4/ 4/79	2045	16.3	-1.0	10.1	122.	104.	57.
4/ 4/79	2100	16.3	-1.0	10.1	123.	104.	57.
4/ 4/79	2115	16.3	-1.0	10.1	122.	104.	57.
4/ 4/79	2130	16.3	-1.0	10.1	124.	105.	58.
4/ 4/79	2145	16.3	-1.0	10.1	124.	105.	58.
4/ 4/79	2200	16.3	7.1	10.1	125.	162.	89.
4/ 4/79	2215	16.3	7.1	10.1	125.	162.	89.
4/ 4/79	2230	16.3	7.2	10.1	124.	163.	90.
4/ 4/79	2245	16.3	7.2	10.1	124.	162.	89.
4/ 4/79	2300	16.3	7.2	10.1	124.	162.	89.
4/ 4/79	2315	16.1	7.2	10.1	119.	156.	86.
4/ 4/79	2330	16.1	7.2	10.1	119.	155.	86.
4/ 4/79	2345	16.1	7.2	10.1	118.	155.	85.
4/ 4/79	2400	16.1	7.2	10.1	119.	155.	86.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/ 5/79	15	16.3	7.2	10.0	120.	157.	86.
4/ 5/79	30	16.3	7.2	10.0	121.	158.	87.
4/ 5/79	45	16.3	7.2	10.0	122.	160.	88.
4/ 5/79	100	16.3	7.2	10.0	122.	160.	88.
4/ 5/79	115	16.3	7.2	10.0	121.	158.	87.
4/ 5/79	130	16.3	7.2	10.0	121.	158.	87.
4/ 5/79	145	16.3	7.2	10.0	122.	159.	88.
4/ 5/79	200	16.3	7.2	10.0	122.	159.	88.
4/ 5/79	215	16.3	7.2	10.0	121.	158.	87.
4/ 5/79	230	16.3	7.2	10.0	121.	158.	87.
4/ 5/79	245	16.3	7.2	10.0	121.	158.	87.
4/ 5/79	300	16.3	7.2	10.0	121.	158.	87.
4/ 5/79	315	16.3	7.2	10.0	122.	160.	88.
4/ 5/79	330	16.3	7.7	10.0	122.	166.	92.
4/ 5/79	345	16.3	7.6	10.0	129.	174.	96.
4/ 5/79	400	16.3	7.6	10.0	129.	174.	96.
4/ 5/79	415	16.3	7.6	10.0	129.	174.	96.
4/ 5/79	430	16.3	7.6	10.0	130.	175.	96.
4/ 5/79	445	16.3	7.4	10.0	131.	174.	96.
4/ 5/79	500	16.3	7.4	9.5	130.	173.	95.
4/ 5/79	515	16.1	7.4	9.7	130.	173.	95.
4/ 5/79	530	16.1	7.4	9.7	131.	174.	96.
4/ 5/79	545	16.1	7.4	9.7	135.	180.	99.
4/ 5/79	600	16.1	7.4	9.7	136.	181.	100.
4/ 5/79	615	16.0	7.4	9.8	136.	181.	100.
4/ 5/79	630	16.0	7.1	9.8	135.	175.	97.
4/ 5/79	645	16.0	7.1	9.8	132.	172.	95.
4/ 5/79	700	16.0	7.1	9.8	134.	174.	96.
4/ 5/79	715	16.1	7.1	9.8	138.	179.	99.
4/ 5/79	730	16.1	7.1	9.8	139.	181.	100.
4/ 5/79	745	16.1	7.2	9.8	132.	173.	95.
4/ 5/79	800	16.1	7.2	10.1	131.	171.	94.
4/ 5/79	815	16.3	7.1	10.1	128.	167.	92.
4/ 5/79	830	16.3	7.1	10.1	132.	172.	95.
4/ 5/79	845	16.3	7.4	10.1	137.	183.	101.
4/ 5/79	900	16.3	7.4	10.1	127.	170.	94.
4/ 5/79	915	16.1	7.4	10.1	113.	150.	83.
4/ 5/79	930	16.1	7.4	10.1	113.	150.	83.
4/ 5/79	945	16.1	7.4	10.1	126.	168.	93.
4/ 5/79	1000	16.1	7.4	10.1	126.	168.	93.
4/ 5/79	1015	15.8	7.4	10.1	125.	167.	92.
4/ 5/79	1030	15.8	7.4	10.0	124.	165.	91.
4/ 5/79	1045	15.8	7.4	10.0	124.	165.	91.
4/ 5/79	1100	15.8	7.4	10.0	125.	167.	92.
4/ 5/79	1115	16.3	7.4	10.0	125.	167.	92.
4/ 5/79	1130	16.3	7.4	10.0	125.	166.	92.
4/ 5/79	1145	16.3	7.4	10.0	125.	166.	91.
4/ 5/79	1200	16.3	7.4	10.1	125.	167.	92.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/ 5/79	1215	16.1	7.4	10.1	126.	167.	92.
4/ 5/79	1230	16.1	7.4	10.0	126.	166.	92.
4/ 5/79	1245	16.1	7.2	10.0	126.	165.	91.
4/ 5/79	1300	16.1	7.2	10.0	130.	170.	94.
4/ 5/79	1315	16.1	7.1	10.1	132.	172.	95.
4/ 5/79	1330	16.1	7.1	10.1	125.	162.	89.
4/ 5/79	1345	16.1	7.1	10.1	126.	164.	90.
4/ 5/79	1400	16.1	7.1	10.1	127.	166.	91.
4/ 5/79	1415	16.1	7.1	10.2	124.	161.	89.
4/ 5/79	1430	16.1	7.1	10.2	122.	159.	88.
4/ 5/79	1445	16.1	7.1	10.2	122.	158.	87.
4/ 5/79	1500	16.1	7.1	10.2	123.	160.	88.
4/ 5/79	1515	16.1	7.1	10.2	123.	160.	88.
4/ 5/79	1530	16.1	7.1	10.2	123.	159.	88.
4/ 5/79	1545	16.1	7.1	10.2	122.	158.	87.
4/ 5/79	1600	16.1	7.1	10.2	122.	159.	87.
4/ 5/79	1615	16.1	7.2	10.2	123.	161.	89.
4/ 5/79	1630	16.1	7.2	10.2	124.	162.	89.
4/ 5/79	1645	16.1	7.2	10.2	123.	161.	89.
4/ 5/79	1700	16.1	7.2	10.2	124.	163.	90.
4/ 5/79	1715	16.1	7.2	10.2	124.	162.	90.
4/ 5/79	1730	16.1	7.2	10.1	124.	162.	89.
4/ 5/79	1745	16.1	7.1	10.1	121.	157.	86.
4/ 5/79	1800	16.1	7.1	10.1	120.	156.	86.
4/ 5/79	1815	16.1	7.2	10.1	120.	157.	86.
4/ 5/79	1830	16.1	7.2	10.2	119.	155.	85.
4/ 5/79	1845	16.1	7.2	10.2	119.	156.	86.
4/ 5/79	1900	16.1	7.2	10.2	119.	155.	85.
4/ 5/79	1915	18.2	7.2	10.2	118.	155.	85.
4/ 5/79	1930	18.2	6.9	10.2	174.	222.	122.
4/ 5/79	1945	18.2	6.6	10.2	172.	216.	119.
4/ 5/79	2000	18.2	6.7	10.2	176.	223.	123.
4/ 5/79	2015	18.2	7.2	10.2	172.	226.	125.
4/ 5/79	2030	18.2	7.3	10.5	172.	227.	125.
4/ 5/79	2045	18.2	7.3	10.6	115.	151.	83.
4/ 5/79	2100	18.2	7.3	10.5	114.	151.	83.
4/ 5/79	2115	16.3	7.3	10.2	114.	150.	83.
4/ 5/79	2130	16.3	7.3	10.2	113.	149.	82.
4/ 5/79	2145	16.3	7.4	10.2	112.	149.	82.
4/ 5/79	2200	16.3	7.4	10.2	112.	148.	82.
4/ 5/79	2215	16.3	7.4	10.2	111.	148.	81.
4/ 5/79	2230	16.3	7.3	10.2	111.	146.	81.
4/ 5/79	2245	16.3	7.4	10.1	109.	145.	80.
4/ 5/79	2300	16.3	7.4	10.1	110.	145.	80.
4/ 5/79	2315	16.3	7.4	10.1	111.	147.	81.
4/ 5/79	2330	16.3	7.3	10.1	110.	145.	80.
4/ 5/79	2345	16.3	7.3	10.1	107.	141.	78.
4/ 5/79	2400	16.3	7.2	10.1	107.	141.	78.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/ 6/79	15	17.9	7.2	10.2	108.	141.	78.
4/ 6/79	30	17.9	7.2	10.2	108.	142.	78.
4/ 6/79	45	17.9	7.2	10.2	109.	143.	79.
4/ 6/79	100	17.9	7.2	10.2	109.	142.	78.
4/ 6/79	115	19.3	7.2	10.2	109.	142.	78.
4/ 6/79	130	19.3	7.2	10.2	109.	142.	78.
4/ 6/79	145	19.3	7.2	10.2	107.	140.	77.
4/ 6/79	200	19.3	7.1	10.2	106.	137.	76.
4/ 6/79	215	19.6	7.1	10.2	106.	138.	76.
4/ 6/79	230	19.6	7.1	10.3	104.	134.	74.
4/ 6/79	245	19.6	7.1	10.3	107.	139.	76.
4/ 6/79	300	19.6	7.1	10.3	108.	140.	77.
4/ 6/79	315	19.3	7.1	10.3	110.	142.	79.
4/ 6/79	330	19.3	7.0	10.3	111.	144.	79.
4/ 6/79	345	19.3	7.0	10.2	112.	144.	80.
4/ 6/79	400	19.3	7.0	10.2	113.	146.	80.
4/ 6/79	415	18.2	7.0	10.2	115.	148.	82.
4/ 6/79	430	18.2	7.0	10.2	119.	153.	84.
4/ 6/79	445	18.2	6.9	10.2	118.	151.	83.
4/ 6/79	500	18.2	6.9	10.2	119.	153.	85.
4/ 6/79	515	16.1	7.0	10.2	122.	158.	87.
4/ 6/79	530	16.1	7.1	10.2	125.	162.	90.
4/ 6/79	545	16.1	7.2	10.2	126.	164.	91.
4/ 6/79	600	16.1	7.2	9.8	127.	167.	92.
4/ 6/79	615	16.1	7.2	10.1	130.	171.	94.
4/ 6/79	630	16.1	7.3	10.0	132.	174.	96.
4/ 6/79	645	16.1	7.2	10.0	129.	170.	94.
4/ 6/79	700	16.1	7.2	10.0	129.	170.	93.
4/ 6/79	715	16.1	7.2	10.0	130.	170.	94.
4/ 6/79	730	16.1	7.2	10.0	130.	171.	94.
4/ 6/79	745	16.1	7.2	10.0	134.	175.	97.
4/ 6/79	800	16.1	7.2	10.0	137.	179.	99.
4/ 6/79	815	16.1	7.1	10.0	138.	179.	99.
4/ 6/79	830	16.1	7.2	10.0	141.	184.	101.
4/ 6/79	845	16.1	7.2	10.0	141.	184.	101.
4/ 6/79	900	16.1	7.4	10.0	140.	185.	102.
4/ 6/79	915	16.1	7.4	10.0	135.	180.	99.
4/ 6/79	930	16.1	7.4	10.0	133.	177.	98.
4/ 6/79	945	16.1	7.4	10.0	134.	179.	99.
4/ 6/79	1000	16.1	7.4	10.0	125.	166.	92.
4/ 6/79	1015	16.1	7.2	10.0	123.	162.	89.
4/ 6/79	1030	16.1	7.3	10.1	124.	163.	90.
4/ 6/79	1045	16.1	7.3	10.0	124.	163.	90.
4/ 6/79	1100	16.1	7.2	9.9	123.	161.	89.
4/ 6/79	1115	16.1	7.2	9.9	123.	161.	89.
4/ 6/79	1130	16.1	7.2	9.9	125.	164.	90.
4/ 6/79	1145	16.1	7.3	10.0	122.	161.	89.
4/ 6/79	1200	16.1	7.2	10.0	121.	159.	87.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/ 6/79	1215	16.1	7.2	9.9	122.	160.	88.
4/ 6/79	1230	16.1	7.3	10.0	123.	162.	89.
4/ 6/79	1245	16.1	7.2	10.1	122.	161.	89.
4/ 6/79	1300	16.1	7.2	10.1	121.	158.	87.
4/ 6/79	1315	16.3	7.3	10.1	121.	159.	88.
4/ 6/79	1330	16.3	7.3	10.1	122.	161.	89.
4/ 6/79	1345	16.3	7.3	10.1	121.	160.	88.
4/ 6/79	1400	16.3	7.2	10.1	124.	163.	90.
4/ 6/79	1415	16.3	7.2	10.1	125.	164.	90.
4/ 6/79	1430	16.3	7.2	10.1	127.	166.	91.
4/ 6/79	1445	16.3	7.2	10.1	125.	164.	90.
4/ 6/79	1500	16.3	7.2	10.1	125.	164.	90.
4/ 6/79	1515	16.3	7.2	10.1	124.	162.	90.
4/ 6/79	1530	16.3	7.2	10.1	124.	162.	90.
4/ 6/79	1545	16.3	7.2	10.1	124.	162.	90.
4/ 6/79	1600	16.3	7.2	10.1	124.	162.	89.
4/ 6/79	1615	16.3	7.2	10.1	124.	163.	90.
4/ 6/79	1630	16.3	7.2	10.1	124.	163.	90.
4/ 6/79	1645	16.3	7.2	10.1	125.	163.	90.
4/ 6/79	1700	16.3	7.2	10.1	124.	162.	90.
4/ 6/79	1715	16.3	7.6	10.1	124.	167.	92.
4/ 6/79	1730	16.3	7.7	10.1	124.	167.	92.
4/ 6/79	1745	16.3	7.0	10.1	124.	160.	88.
4/ 6/79	1800	16.3	6.8	10.1	125.	159.	88.
4/ 6/79	1815	17.9	6.8	10.1	126.	160.	88.
4/ 6/79	1830	17.9	6.7	10.2	126.	159.	88.
4/ 6/79	1845	17.9	6.7	10.2	126.	160.	88.
4/ 6/79	1900	17.9	6.9	10.2	127.	162.	90.
4/ 6/79	1915	16.4	6.9	10.2	129.	165.	91.
4/ 6/79	1930	16.4	6.5	10.2	175.	218.	120.
4/ 6/79	1945	16.4	6.5	10.2	169.	210.	116.
4/ 6/79	2000	16.4	7.1	10.1	167.	217.	120.
4/ 6/79	2015	16.3	6.9	10.5	120.	153.	84.
4/ 6/79	2030	16.3	6.8	10.5	120.	153.	84.
4/ 6/79	2045	16.3	6.8	9.9	119.	151.	83.
4/ 6/79	2100	16.3	6.8	10.0	119.	151.	83.
4/ 6/79	2115	16.3	6.9	10.1	119.	152.	84.
4/ 6/79	2130	16.3	6.8	10.1	118.	150.	83.
4/ 6/79	2145	16.3	6.8	10.2	118.	150.	83.
4/ 6/79	2200	16.3	6.8	10.2	116.	148.	82.
4/ 6/79	2215	16.3	6.8	10.2	116.	148.	82.
4/ 6/79	2230	16.3	6.8	10.2	117.	149.	82.
4/ 6/79	2245	16.3	6.8	10.2	116.	148.	82.
4/ 6/79	2300	16.3	6.8	11.9	118.	150.	83.
4/ 6/79	2315	16.3	6.9	10.2	116.	149.	82.
4/ 6/79	2330	16.3	6.9	10.2	115.	147.	81.
4/ 6/79	2345	16.3	6.9	10.2	114.	147.	81.
4/ 6/79	2400	16.3	6.9	10.2	115.	147.	81.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/ 7/79	15	16.3	6.9	10.2	114.	146.	80.
4/ 7/79	30	16.3	6.9	10.2	112.	143.	79.
4/ 7/79	45	16.3	6.9	10.2	112.	143.	79.
4/ 7/79	100	16.3	6.9	10.2	114.	146.	80.
4/ 7/79	115	16.3	6.9	10.2	117.	149.	82.
4/ 7/79	130	16.3	6.9	10.2	150.	191.	105.
4/ 7/79	145	16.3	6.9	10.2	170.	218.	120.
4/ 7/79	200	16.3	6.5	10.3	172.	213.	118.
4/ 7/79	215	16.3	6.4	10.3	174.	215.	118.
4/ 7/79	230	16.3	6.4	10.2	170.	211.	116.
4/ 7/79	245	16.3	6.5	10.4	170.	211.	117.
4/ 7/79	300	16.3	6.6	10.6	171.	215.	118.
4/ 7/79	315	16.3	6.5	10.6	171.	213.	117.
4/ 7/79	330	16.3	6.4	10.6	172.	213.	117.
4/ 7/79	345	16.3	6.4	10.5	170.	211.	116.
4/ 7/79	400	16.3	6.4	10.5	171.	212.	117.
4/ 7/79	415	17.3	6.6	10.6	170.	213.	118.
4/ 7/79	430	17.3	6.5	10.6	170.	211.	117.
4/ 7/79	445	17.3	6.6	10.6	170.	212.	117.
4/ 7/79	500	17.3	6.6	10.6	168.	210.	116.
4/ 7/79	515	18.5	6.6	10.5	166.	208.	115.
4/ 7/79	530	18.5	6.9	10.5	167.	214.	118.
4/ 7/79	545	18.5	7.2	10.5	166.	217.	120.
4/ 7/79	600	18.5	6.9	10.6	165.	211.	116.
4/ 7/79	615	18.0	6.6	10.4	161.	202.	111.
4/ 7/79	630	18.0	7.1	10.1	161.	209.	115.
4/ 7/79	645	18.0	7.2	10.1	160.	209.	115.
4/ 7/79	700	18.0	7.1	10.4	160.	208.	115.
4/ 7/79	715	18.5	6.7	10.4	162.	206.	113.
4/ 7/79	730	18.5	6.4	10.0	162.	201.	111.
4/ 7/79	745	18.5	6.4	10.0	161.	200.	110.
4/ 7/79	800	18.5	6.4	10.2	161.	200.	110.
4/ 7/79	815	18.5	6.5	10.6	164.	204.	112.
4/ 7/79	830	18.5	6.5	10.7	165.	205.	113.
4/ 7/79	845	18.5	6.4	10.6	165.	204.	113.
4/ 7/79	900	18.5	6.4	10.6	166.	206.	114.
4/ 7/79	915	18.5	6.4	10.6	167.	207.	114.
4/ 7/79	930	18.5	6.4	10.6	167.	207.	114.
4/ 7/79	945	18.5	6.5	10.6	169.	211.	116.
4/ 7/79	1000	18.5	6.5	10.6	170.	211.	117.
4/ 7/79	1015	18.5	6.4	10.6	169.	210.	116.
4/ 7/79	1030	18.5	6.5	10.6	169.	211.	116.
4/ 7/79	1045	18.5	6.5	10.6	169.	210.	116.
4/ 7/79	1100	18.5	6.5	10.6	172.	213.	118.
4/ 7/79	1115	18.6	6.5	10.6	179.	222.	123.
4/ 7/79	1130	18.6	6.4	10.6	180.	223.	123.
4/ 7/79	1145	18.6	6.4	10.6	182.	226.	125.
4/ 7/79	1200	18.6	6.4	10.6	188.	232.	128.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/ 7/79	1215	18.8	6.4	10.6	189.	233.	129.
4/ 7/79	1230	18.8	6.4	10.6	189.	234.	129.
4/ 7/79	1245	18.8	6.4	10.6	188.	231.	128.
4/ 7/79	1300	18.8	6.4	10.6	188.	231.	127.
4/ 7/79	1315	18.2	6.4	10.6	191.	237.	130.
4/ 7/79	1330	18.2	6.7	10.6	191.	242.	133.
4/ 7/79	1345	18.2	6.7	10.6	191.	240.	133.
4/ 7/79	1400	18.2	6.8	10.6	190.	241.	133.
4/ 7/79	1415	17.6	6.6	10.5	174.	218.	120.
4/ 7/79	1430	17.6	6.5	10.5	175.	218.	120.
4/ 7/79	1445	17.6	6.5	10.5	177.	220.	121.
4/ 7/79	1500	17.6	6.5	10.6	177.	221.	122.
4/ 7/79	1515	16.4	6.7	10.3	172.	218.	120.
4/ 7/79	1530	16.4	6.9	10.2	129.	165.	91.
4/ 7/79	1545	16.4	6.9	10.2	130.	166.	91.
4/ 7/79	1600	16.4	6.9	10.2	130.	166.	91.
4/ 7/79	1615	16.4	6.9	10.2	132.	169.	93.
4/ 7/79	1630	16.4	6.9	10.2	134.	171.	94.
4/ 7/79	1645	16.4	6.9	10.2	135.	173.	95.
4/ 7/79	1700	16.4	6.9	10.2	135.	173.	96.
4/ 7/79	1715	16.4	6.9	10.2	135.	173.	95.
4/ 7/79	1730	16.4	6.9	10.2	132.	170.	94.
4/ 7/79	1745	16.4	6.9	10.2	132.	170.	94.
4/ 7/79	1800	16.4	6.9	10.2	132.	170.	94.
4/ 7/79	1815	16.4	7.0	10.2	132.	170.	94.
4/ 7/79	1830	16.4	7.0	10.2	132.	171.	94.
4/ 7/79	1845	16.4	7.0	10.2	132.	170.	94.
4/ 7/79	1900	16.4	7.0	10.2	132.	170.	94.
4/ 7/79	1915	16.7	7.0	10.2	132.	171.	94.
4/ 7/79	1930	16.7	7.2	10.2	132.	174.	96.
4/ 7/79	1945	16.7	7.2	10.2	132.	173.	95.
4/ 7/79	2000	16.7	7.2	10.2	132.	172.	95.
4/ 7/79	2015	16.4	7.1	10.2	131.	171.	94.
4/ 7/79	2030	16.4	7.2	10.2	130.	170.	93.
4/ 7/79	2045	16.4	7.2	10.2	127.	166.	92.
4/ 7/79	2100	16.4	7.2	10.2	124.	162.	90.
4/ 7/79	2115	16.4	7.2	10.2	122.	160.	88.
4/ 7/79	2130	16.4	7.2	10.2	122.	160.	88.
4/ 7/79	2145	16.4	7.2	10.2	122.	160.	88.
4/ 7/79	2200	16.4	7.2	10.2	124.	162.	89.
4/ 7/79	2215	16.4	7.2	10.2	122.	160.	88.
4/ 7/79	2230	16.4	7.2	10.2	121.	158.	87.
4/ 7/79	2245	16.4	7.2	10.2	122.	159.	88.
4/ 7/79	2300	16.4	7.2	10.2	120.	157.	86.
4/ 7/79	2315	16.1	7.2	10.2	121.	159.	88.
4/ 7/79	2330	16.1	7.2	10.2	121.	158.	87.
4/ 7/79	2345	16.1	7.2	10.2	121.	159.	88.
4/ 7/79	2400	16.1	7.2	10.2	120.	158.	87.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/ 8/79	15	21.1	7.2	10.2	120.	157.	87.
4/ 8/79	30	21.1	7.2	10.2	119.	156.	86.
4/ 8/79	45	21.1	7.2	10.2	117.	154.	85.
4/ 8/79	100	21.1	7.2	10.2	116.	152.	84.
4/ 8/79	115	21.1	7.3	10.2	119.	157.	86.
4/ 8/79	130	21.1	7.3	10.2	118.	156.	86.
4/ 8/79	145	21.1	7.3	10.2	117.	155.	85.
4/ 8/79	200	21.1	7.3	10.2	115.	151.	83.
4/ 8/79	215	21.1	7.3	10.2	114.	151.	83.
4/ 8/79	230	21.1	7.3	10.2	113.	149.	82.
4/ 8/79	245	21.1	7.3	10.1	114.	150.	83.
4/ 8/79	300	21.1	7.3	10.1	113.	149.	82.
4/ 8/79	315	21.1	7.3	10.1	112.	148.	82.
4/ 8/79	330	21.1	7.3	10.1	110.	145.	80.
4/ 8/79	345	21.1	7.3	10.1	109.	143.	79.
4/ 8/79	400	21.1	7.3	10.1	110.	145.	80.
4/ 8/79	415	21.1	7.3	10.1	110.	146.	80.
4/ 8/79	430	21.1	7.3	10.1	111.	146.	81.
4/ 8/79	445	21.1	7.3	10.1	111.	146.	81.
4/ 8/79	500	21.1	7.0	10.1	109.	141.	78.
4/ 8/79	515	20.5	6.6	10.6	159.	200.	110.
4/ 8/79	530	20.5	6.6	10.8	157.	196.	108.
4/ 8/79	545	20.5	6.6	10.8	158.	198.	109.
4/ 8/79	600	20.5	6.6	10.8	162.	203.	112.
4/ 8/79	615	20.5	6.5	10.8	160.	199.	109.
4/ 8/79	630	20.5	6.4	10.8	159.	197.	109.
4/ 8/79	645	20.5	6.5	10.8	159.	198.	109.
4/ 8/79	700	20.5	6.4	10.8	162.	201.	111.
4/ 8/79	715	20.5	6.4	10.9	161.	199.	110.
4/ 8/79	730	20.5	6.4	10.9	165.	204.	113.
4/ 8/79	745	20.5	6.4	10.9	164.	203.	112.
4/ 8/79	800	20.5	6.4	10.9	164.	203.	112.
4/ 8/79	815	20.5	6.4	10.9	164.	203.	112.
4/ 8/79	830	20.5	6.4	10.9	167.	206.	114.
4/ 8/79	845	20.5	6.4	10.9	167.	207.	114.
4/ 8/79	900	20.5	6.5	10.9	167.	208.	115.
4/ 8/79	915	20.4	6.7	10.8	171.	215.	119.
4/ 8/79	930	20.4	6.6	10.7	170.	213.	118.
4/ 8/79	945	20.4	6.6	10.7	169.	212.	117.
4/ 8/79	1000	20.4	6.7	10.7	169.	212.	117.
4/ 8/79	1015	19.9	6.6	10.7	170.	213.	118.
4/ 8/79	1030	19.9	6.6	10.7	171.	214.	118.
4/ 8/79	1045	19.9	6.7	10.7	174.	221.	122.
4/ 8/79	1100	19.9	7.0	10.6	172.	222.	122.
4/ 8/79	1115	19.6	7.1	10.3	172.	223.	123.
4/ 8/79	1130	19.6	6.9	10.3	175.	223.	123.
4/ 8/79	1145	19.6	6.7	10.5	182.	229.	126.
4/ 8/79	1200	19.6	6.6	10.6	182.	227.	125.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/ 8/79	1215	20.8	6.3	10.6	182.	222.	123.
4/ 8/79	1230	20.8	6.2	10.8	184.	225.	124.
4/ 8/79	1245	20.8	6.2	10.9	184.	224.	124.
4/ 8/79	1300	20.8	6.1	10.9	182.	221.	122.
4/ 8/79	1315	20.5	6.2	10.9	180.	219.	121.
4/ 8/79	1330	20.5	6.2	10.8	180.	219.	121.
4/ 8/79	1345	20.5	6.2	10.8	179.	219.	121.
4/ 8/79	1400	20.5	6.3	10.8	177.	217.	120.
4/ 8/79	1415	20.5	6.2	10.8	176.	215.	118.
4/ 8/79	1430	20.5	6.3	10.8	177.	217.	120.
4/ 8/79	1445	20.5	6.3	10.8	179.	219.	121.
4/ 8/79	1500	20.5	6.4	10.8	181.	223.	123.
4/ 8/79	1515	19.9	6.3	10.8	170.	208.	115.
4/ 8/79	1530	19.9	6.7	10.8	164.	206.	114.
4/ 8/79	1545	19.9	6.8	10.7	160.	203.	112.
4/ 8/79	1600	19.9	6.7	10.6	154.	194.	107.
4/ 8/79	1615	19.9	6.6	10.6	152.	191.	105.
4/ 8/79	1630	19.9	6.6	10.7	181.	227.	125.
4/ 8/79	1645	19.9	6.6	10.4	175.	218.	120.
4/ 8/79	1700	19.9	6.7	10.4	175.	221.	122.
4/ 8/79	1715	20.4	6.6	10.5	175.	219.	121.
4/ 8/79	1730	20.4	6.6	10.4	174.	217.	120.
4/ 8/79	1745	20.4	6.6	10.5	171.	214.	118.
4/ 8/79	1800	20.4	6.6	10.5	169.	211.	116.
4/ 8/79	1815	20.8	6.6	10.5	166.	208.	115.
4/ 8/79	1830	20.8	6.6	10.5	166.	207.	114.
4/ 8/79	1845	20.8	6.6	10.5	165.	206.	114.
4/ 8/79	1900	20.8	6.5	10.6	164.	204.	113.
4/ 8/79	1915	21.1	6.5	10.6	177.	221.	122.
4/ 8/79	1930	21.1	6.6	10.6	175.	219.	121.
4/ 8/79	1945	21.1	6.7	10.6	184.	232.	128.
4/ 8/79	2000	21.1	6.4	10.4	184.	228.	126.
4/ 8/79	2015	21.1	6.4	10.5	187.	232.	128.
4/ 8/79	2030	21.1	6.4	10.5	189.	234.	129.
4/ 8/79	2045	21.1	6.3	10.5	189.	232.	128.
4/ 8/79	2100	21.1	6.6	10.4	191.	240.	132.
4/ 8/79	2115	20.5	6.7	10.2	194.	245.	135.
4/ 8/79	2130	20.5	6.8	10.1	196.	250.	138.
4/ 8/79	2145	20.5	6.6	10.1	197.	246.	136.
4/ 8/79	2200	20.5	6.7	10.2	200.	253.	140.
4/ 8/79	2215	20.4	6.8	10.2	202.	257.	142.
4/ 8/79	2230	20.4	6.4	10.0	202.	250.	138.
4/ 8/79	2245	20.4	6.4	10.0	199.	245.	135.
4/ 8/79	2300	20.4	6.3	10.2	199.	244.	134.
4/ 8/79	2315	20.8	6.4	10.3	199.	246.	136.
4/ 8/79	2330	20.8	6.4	10.4	199.	245.	135.
4/ 8/79	2345	20.8	6.3	10.3	200.	244.	135.
4/ 8/79	2400	20.8	6.5	10.3	199.	247.	136.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/ 9/79	15	20.2	6.1	10.3	201.	244.	134.
4/ 9/79	30	20.2	6.1	10.1	201.	243.	134.
4/ 9/79	45	20.2	6.1	10.4	204.	247.	136.
4/ 9/79	100	20.2	6.1	10.4	204.	248.	137.
4/ 9/79	115	20.2	6.1	10.4	204.	247.	136.
4/ 9/79	130	20.2	6.1	10.4	204.	248.	137.
4/ 9/79	145	20.2	6.1	10.4	204.	248.	137.
4/ 9/79	200	20.2	6.1	10.4	205.	248.	137.
4/ 9/79	215	20.1	6.1	10.4	200.	242.	134.
4/ 9/79	230	20.1	6.1	10.4	200.	242.	134.
4/ 9/79	245	20.1	6.1	10.4	201.	243.	134.
4/ 9/79	300	20.1	6.1	10.4	200.	241.	133.
4/ 9/79	315	20.1	6.1	10.4	197.	239.	132.
4/ 9/79	330	20.1	6.1	10.4	199.	242.	134.
4/ 9/79	345	20.1	6.1	10.4	199.	240.	132.
4/ 9/79	400	20.1	6.0	10.4	197.	236.	130.
4/ 9/79	415	19.3	6.0	10.4	196.	236.	130.
4/ 9/79	430	19.3	6.1	10.4	195.	235.	130.
4/ 9/79	445	19.3	6.1	10.4	195.	236.	130.
4/ 9/79	500	19.3	6.2	10.4	196.	239.	132.
4/ 9/79	515	21.1	6.4	10.5	195.	241.	133.
4/ 9/79	530	21.1	6.1	10.5	195.	236.	130.
4/ 9/79	545	21.1	6.1	10.2	194.	235.	129.
4/ 9/79	600	21.1	6.0	10.2	192.	231.	127.
4/ 9/79	615	21.1	6.2	10.5	192.	234.	129.
4/ 9/79	630	21.1	6.1	10.5	195.	237.	130.
4/ 9/79	645	21.1	6.1	10.5	196.	238.	131.
4/ 9/79	700	21.1	6.1	10.3	196.	236.	130.
4/ 9/79	715	20.9	6.2	10.4	194.	237.	131.
4/ 9/79	730	20.9	6.1	10.3	195.	235.	130.
4/ 9/79	745	20.9	6.1	10.3	192.	233.	129.
4/ 9/79	800	20.9	6.1	10.3	192.	233.	129.
4/ 9/79	815	20.8	6.1	10.3	193.	234.	129.
4/ 9/79	830	20.8	6.2	10.5	194.	237.	131.
4/ 9/79	845	20.8	6.1	10.2	195.	235.	130.
4/ 9/79	900	20.8	6.1	10.2	194.	234.	129.
4/ 9/79	915	20.8	6.1	10.3	195.	235.	130.
4/ 9/79	930	20.8	6.3	10.3	197.	241.	133.
4/ 9/79	945	20.8	6.1	10.3	194.	234.	129.
4/ 9/79	1000	20.8	6.3	10.1	177.	217.	120.
4/ 9/79	1015	20.9	6.4	10.4	179.	221.	122.
4/ 9/79	1030	20.9	6.3	10.8	176.	215.	119.
4/ 9/79	1045	20.9	6.3	10.8	175.	215.	119.
4/ 9/79	1100	20.9	6.4	10.7	174.	216.	119.
4/ 9/79	1115	21.1	6.4	10.8	174.	214.	118.
4/ 9/79	1130	21.1	6.3	10.8	172.	210.	116.
4/ 9/79	1145	21.1	6.3	10.8	172.	211.	116.
4/ 9/79	1200	21.1	6.3	10.8	175.	214.	118.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/ 9/79	1215	21.1	6.3	10.8	179.	218.	120.
4/ 9/79	1230	21.1	6.3	10.8	179.	220.	121.
4/ 9/79	1245	21.1	6.4	10.8	179.	221.	122.
4/ 9/79	1300	21.1	6.4	10.8	179.	222.	122.
4/ 9/79	1315	21.1	6.3	10.7	180.	221.	122.
4/ 9/79	1330	21.1	6.3	10.7	180.	221.	122.
4/ 9/79	1345	21.1	6.3	10.7	181.	221.	122.
4/ 9/79	1400	21.1	6.3	10.7	180.	220.	121.
4/ 9/79	1415	21.1	6.2	10.7	182.	222.	122.
4/ 9/79	1430	21.1	6.2	10.8	182.	222.	123.
4/ 9/79	1445	21.1	6.3	10.8	181.	221.	122.
4/ 9/79	1500	21.1	6.3	10.8	181.	221.	122.
4/ 9/79	1515	21.1	6.3	10.8	184.	225.	124.
4/ 9/79	1530	21.1	6.3	10.8	180.	221.	122.
4/ 9/79	1545	21.1	6.3	10.8	179.	219.	121.
4/ 9/79	1600	21.1	6.3	10.8	180.	221.	122.
4/ 9/79	1615	21.5	6.3	10.8	181.	223.	123.
4/ 9/79	1630	21.5	6.3	10.8	184.	226.	124.
4/ 9/79	1645	21.5	6.3	10.8	182.	224.	124.
4/ 9/79	1700	21.5	6.3	10.8	185.	227.	125.
4/ 9/79	1715	21.5	6.3	10.8	185.	227.	125.
4/ 9/79	1730	21.5	6.3	10.8	185.	228.	126.
4/ 9/79	1745	21.5	6.3	10.8	187.	230.	127.
4/ 9/79	1800	21.5	6.3	10.8	188.	231.	127.
4/ 9/79	1815	21.5	6.4	10.8	188.	231.	128.
4/ 9/79	1830	21.5	6.4	10.8	188.	232.	128.
4/ 9/79	1845	21.5	6.4	10.8	188.	232.	128.
4/ 9/79	1900	21.5	6.5	10.8	188.	234.	129.
4/ 9/79	1915	21.1	6.7	10.8	190.	240.	133.
4/ 9/79	1930	21.1	6.7	10.8	189.	238.	131.
4/ 9/79	1945	21.1	6.4	10.8	175.	216.	119.
4/ 9/79	2000	21.1	6.4	10.7	181.	224.	123.
4/ 9/79	2015	20.9	6.4	10.6	181.	224.	123.
4/ 9/79	2030	20.9	6.4	10.9	179.	222.	122.
4/ 9/79	2045	20.9	6.6	10.9	176.	221.	122.
4/ 9/79	2100	20.9	6.5	10.9	175.	218.	120.
4/ 9/79	2115	19.9	6.9	10.8	174.	222.	122.
4/ 9/79	2130	19.9	7.0	10.8	172.	222.	122.
4/ 9/79	2145	19.9	6.6	10.8	170.	213.	118.
4/ 9/79	2200	19.9	6.7	10.6	170.	214.	118.
4/ 9/79	2215	19.9	6.6	10.6	170.	212.	117.
4/ 9/79	2230	19.9	6.6	10.8	177.	221.	122.
4/ 9/79	2245	19.9	6.6	10.9	177.	222.	122.
4/ 9/79	2300	19.9	6.7	10.9	177.	223.	123.
4/ 9/79	2315	20.2	6.6	10.9	178.	223.	123.
4/ 9/79	2330	20.2	6.6	10.8	179.	225.	124.
4/ 9/79	2345	20.2	6.6	10.8	179.	225.	124.
4/ 9/79	2400	20.2	6.6	10.8	181.	227.	125.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/10/79	15	18.5	6.5	10.8	181.	225.	124.
4/10/79	30	18.5	6.5	10.8	183.	228.	126.
4/10/79	45	18.5	6.4	10.8	183.	227.	125.
4/10/79	100	18.5	6.5	10.8	184.	228.	126.
4/10/79	115	17.6	6.3	10.9	182.	222.	122.
4/10/79	130	17.6	6.2	10.9	181.	221.	122.
4/10/79	145	17.6	6.3	10.9	180.	221.	122.
4/10/79	200	17.6	6.3	11.0	177.	218.	120.
4/10/79	215	17.3	6.3	10.9	177.	217.	120.
4/10/79	230	17.3	6.4	11.0	174.	214.	118.
4/10/79	245	17.3	6.5	10.9	175.	218.	120.
4/10/79	300	17.3	6.7	10.9	172.	216.	119.
4/10/79	315	-.3	6.5	10.8	172.	214.	118.
4/10/79	330	-.3	6.5	10.8	171.	212.	117.
4/10/79	345	-.3	6.3	10.9	174.	214.	118.
4/10/79	400	-.3	6.5	10.9	174.	216.	119.
4/10/79	415	-.3	6.6	10.9	174.	217.	120.
4/10/79	430	-.3	6.9	10.9	175.	225.	124.
4/10/79	445	-.3	6.9	10.4	177.	228.	126.
4/10/79	500	-.3	7.2	10.4	178.	232.	128.
4/10/79	515	19.3	7.2	10.5	189.	247.	136.
4/10/79	530	19.3	7.4	10.7	189.	251.	139.
4/10/79	545	19.3	7.0	10.5	189.	243.	134.
4/10/79	600	19.3	7.0	10.3	189.	243.	134.
4/10/79	615	19.6	6.9	10.5	191.	245.	135.
4/10/79	630	19.6	6.9	10.5	190.	244.	135.
4/10/79	645	19.6	7.0	10.6	188.	241.	133.
4/10/79	700	19.6	6.9	10.7	188.	241.	133.
4/10/79	715	19.6	6.8	10.6	188.	238.	131.
4/10/79	730	19.6	6.9	10.6	190.	242.	134.
4/10/79	745	19.6	6.9	10.8	190.	242.	134.
4/10/79	800	19.6	6.9	10.8	190.	242.	134.
4/10/79	815	19.6	6.9	10.7	191.	244.	135.
4/10/79	830	19.6	6.9	10.7	194.	247.	136.
4/10/79	845	19.6	6.9	10.7	197.	253.	140.
4/10/79	900	19.6	6.9	10.7	201.	257.	142.
4/10/79	915	19.9	7.0	10.7	205.	264.	145.
4/10/79	930	19.9	6.9	10.7	207.	265.	146.
4/10/79	945	19.9	6.9	10.7	188.	240.	132.
4/10/79	1000	19.9	6.9	10.7	182.	233.	128.
4/10/79	1015	20.1	6.9	10.4	185.	236.	130.
4/10/79	1030	20.1	6.7	10.2	187.	235.	130.
4/10/79	1045	20.1	6.7	10.2	184.	233.	129.
4/10/79	1100	20.1	6.9	10.3	185.	236.	130.
4/10/79	1115	20.1	6.9	10.3	183.	235.	129.
4/10/79	1130	20.1	6.5	10.3	180.	224.	123.
4/10/79	1145	20.1	6.3	10.2	182.	222.	122.
4/10/79	1200	20.1	6.3	10.4	182.	223.	123.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/10/79	1215	20.1	6.3	10.4	181.	221.	122.
4/10/79	1230	20.1	6.2	10.5	181.	221.	122.
4/10/79	1245	20.1	6.2	10.5	182.	222.	122.
4/10/79	1300	20.1	6.2	10.5	180.	220.	121.
4/10/79	1315	19.9	-1.0	10.5	184.	156.	86.
4/10/79	1330	19.9	6.3	10.5	185.	228.	126.
4/10/79	1345	19.9	6.9	10.5	186.	239.	132.
4/10/79	1400	19.9	6.4	10.5	188.	232.	128.
4/10/79	1415	20.1	6.4	10.5	188.	232.	128.
4/10/79	1430	20.1	6.4	10.5	188.	232.	128.
4/10/79	1445	20.1	6.4	10.2	191.	236.	130.
4/10/79	1500	20.1	6.4	10.2	192.	237.	131.
4/10/79	1515	20.1	6.7	10.2	187.	237.	131.
4/10/79	1530	20.1	6.8	10.2	186.	236.	130.
4/10/79	1545	20.1	6.9	10.2	187.	238.	131.
4/10/79	1600	20.1	6.8	10.2	187.	237.	131.
4/10/79	1615	20.1	6.8	10.3	186.	236.	130.
4/10/79	1630	20.1	6.8	10.3	184.	234.	129.
4/10/79	1645	20.1	6.9	10.4	184.	236.	130.
4/10/79	1700	20.1	6.9	10.5	183.	235.	130.
4/10/79	1715	19.3	7.1	10.4	183.	237.	130.
4/10/79	1730	19.3	7.1	10.4	179.	232.	128.
4/10/79	1745	19.3	7.1	10.3	177.	229.	126.
4/10/79	1800	19.3	6.9	10.3	179.	229.	126.
4/10/79	1815	19.3	6.9	10.2	177.	227.	125.
4/10/79	1830	19.3	7.2	10.3	176.	230.	127.
4/10/79	1845	19.3	7.1	10.5	176.	228.	126.
4/10/79	1900	19.3	6.9	10.4	174.	222.	122.
4/10/79	1915	19.8	7.0	10.3	175.	225.	124.
4/10/79	1930	19.8	7.0	10.3	173.	223.	123.
4/10/79	1945	19.8	7.0	10.5	170.	219.	121.
4/10/79	2000	19.8	7.1	10.5	170.	221.	122.
4/10/79	2015	19.6	7.3	10.3	171.	225.	124.
4/10/79	2030	19.6	7.4	10.4	170.	226.	125.
4/10/79	2045	19.6	7.4	10.4	167.	223.	123.
4/10/79	2100	19.6	7.4	10.4	167.	223.	123.
4/10/79	2115	19.3	7.4	10.3	167.	222.	123.
4/10/79	2130	19.3	7.5	10.2	167.	222.	123.
4/10/79	2145	19.3	7.5	10.3	167.	223.	123.
4/10/79	2200	19.3	7.2	10.3	165.	216.	119.
4/10/79	2215	19.5	7.2	10.3	165.	217.	120.
4/10/79	2230	19.5	7.4	10.2	165.	219.	121.
4/10/79	2245	19.5	7.2	10.3	166.	218.	120.
4/10/79	2300	19.5	7.1	10.5	165.	215.	119.
4/10/79	2315	19.6	7.1	10.4	166.	215.	118.
4/10/79	2330	19.6	7.1	10.4	170.	221.	122.
4/10/79	2345	19.6	7.3	10.6	174.	229.	126.
4/10/79	2400	19.6	7.3	10.6	172.	227.	125.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/11/79	15	13.2	7.4	10.6	170.	226.	125.
4/11/79	30	13.2	7.4	10.5	170.	226.	125.
4/11/79	45	13.2	7.4	10.4	171.	227.	125.
4/11/79	100	13.2	7.3	10.3	169.	223.	123.
4/11/79	115	13.8	7.6	10.4	167.	224.	123.
4/11/79	130	13.8	7.6	10.1	164.	221.	122.
4/11/79	145	13.8	7.4	10.2	161.	213.	118.
4/11/79	200	13.8	7.3	10.4	171.	225.	124.
4/11/79	215	14.6	7.2	10.5	171.	223.	123.
4/11/79	230	14.6	7.1	10.6	170.	221.	122.
4/11/79	245	14.6	7.1	10.6	171.	222.	123.
4/11/79	300	14.6	7.2	10.6	155.	202.	111.
4/11/79	315	16.4	7.2	10.5	147.	193.	107.
4/11/79	330	16.4	11.0	10.6	75.	136.	75.
4/11/79	345	16.4	10.5	7.9	130.	224.	123.
4/11/79	400	16.4	9.5	7.9	157.	247.	136.
4/11/79	415	18.8	9.2	8.5	140.	215.	119.
4/11/79	430	18.8	10.0	8.9	139.	228.	126.
4/11/79	445	18.8	11.0	8.5	131.	237.	131.
4/11/79	500	18.8	10.9	7.4	132.	238.	131.
4/11/79	515	16.4	10.9	7.4	132.	238.	131.
4/11/79	530	16.4	10.5	7.5	132.	228.	126.
4/11/79	545	16.4	10.1	7.5	136.	225.	124.
4/11/79	600	16.4	10.1	8.2	127.	211.	117.
4/11/79	615	16.1	10.0	8.3	120.	198.	109.
4/11/79	630	16.1	10.0	8.3	115.	190.	105.
4/11/79	645	16.1	10.0	8.3	117.	193.	106.
4/11/79	700	16.1	9.4	8.3	124.	194.	107.
4/11/79	715	15.8	9.4	8.8	125.	196.	108.
4/11/79	730	15.8	9.7	8.9	122.	197.	108.
4/11/79	745	15.8	10.2	8.9	117.	197.	108.
4/11/79	800	15.8	10.4	8.4	115.	196.	108.
4/11/79	815	14.4	10.4	8.3	114.	195.	107.
4/11/79	830	14.4	10.5	8.2	105.	181.	100.
4/11/79	845	14.4	10.3	8.1	102.	172.	95.
4/11/79	900	14.4	10.1	8.1	105.	174.	96.
4/11/79	915	14.4	10.6	8.4	106.	184.	102.
4/11/79	930	14.4	11.0	8.5	135.	244.	135.
4/11/79	945	14.4	11.0	7.9	137.	247.	136.
4/11/79	1000	14.4	10.5	7.6	145.	250.	138.
4/11/79	1015	13.8	9.8	7.5	148.	239.	132.
4/11/79	1030	13.8	10.0	7.8	148.	245.	135.
4/11/79	1045	13.8	10.3	8.3	141.	239.	132.
4/11/79	1100	13.8	10.2	8.1	143.	241.	133.
4/11/79	1115	13.8	10.2	7.9	143.	240.	133.
4/11/79	1130	13.8	10.5	7.8	138.	240.	132.
4/11/79	1145	13.8	10.6	7.9	135.	234.	129.
4/11/79	1200	13.8	10.4	7.6	135.	231.	127.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/11/79	1215	14.5	10.4	7.6	135.	229.	126.
4/11/79	1230	14.5	10.3	7.6	134.	226.	125.
4/11/79	1245	14.5	10.4	7.6	134.	227.	125.
4/11/79	1300	14.5	10.5	7.5	134.	231.	127.
4/11/79	1315	13.5	10.7	7.6	131.	231.	128.
4/11/79	1330	13.5	10.7	7.5	131.	230.	127.
4/11/79	1345	13.5	10.7	7.4	140.	247.	136.
4/11/79	1400	13.5	11.3	7.7	125.	233.	129.
4/11/79	1415	11.7	11.7	7.7	120.	235.	129.
4/11/79	1430	11.7	11.3	7.0	122.	228.	126.
4/11/79	1445	11.7	11.2	6.9	124.	230.	127.
4/11/79	1500	11.7	12.0	7.0	119.	237.	131.
4/11/79	1515	12.3	11.3	7.0	120.	224.	124.
4/11/79	1530	12.3	10.7	6.7	125.	220.	122.
4/11/79	1545	12.3	10.7	6.8	130.	229.	126.
4/11/79	1600	12.3	11.7	7.5	115.	225.	124.
4/11/79	1615	12.9	11.4	7.1	117.	221.	122.
4/11/79	1630	12.9	11.0	6.6	124.	225.	124.
4/11/79	1645	12.9	11.5	7.1	119.	226.	125.
4/11/79	1700	12.9	9.5	7.2	137.	216.	119.
4/11/79	1715	13.2	10.2	6.9	137.	231.	127.
4/11/79	1730	13.2	10.6	8.1	135.	235.	130.
4/11/79	1745	13.2	10.6	7.7	136.	237.	131.
4/11/79	1800	13.2	10.6	7.6	136.	238.	131.
4/11/79	1815	12.7	10.7	7.6	137.	240.	132.
4/11/79	1830	12.7	10.7	7.6	137.	239.	132.
4/11/79	1845	12.7	10.6	7.6	136.	237.	131.
4/11/79	1900	12.7	10.9	7.6	136.	243.	134.
4/11/79	1915	12.9	11.2	7.6	125.	232.	128.
4/11/79	1930	12.9	10.7	7.5	132.	233.	128.
4/11/79	1945	12.9	10.5	7.3	134.	231.	128.
4/11/79	2000	12.9	11.0	7.6	129.	233.	128.
4/11/79	2015	14.1	10.9	7.7	126.	227.	125.
4/11/79	2030	14.1	10.2	7.4	132.	221.	122.
4/11/79	2045	14.1	9.8	7.5	142.	229.	126.
4/11/79	2100	14.1	9.8	7.9	141.	228.	126.
4/11/79	2115	11.4	9.8	8.4	142.	229.	126.
4/11/79	2130	11.4	13.8	8.4	89.	224.	123.
4/11/79	2145	11.4	11.2	8.4	120.	223.	123.
4/11/79	2200	11.4	10.5	6.9	130.	224.	123.
4/11/79	2215	10.5	10.0	7.0	120.	197.	109.
4/11/79	2230	10.5	9.5	7.7	85.	133.	74.
4/11/79	2245	10.5	9.5	9.1	82.	130.	71.
4/11/79	2300	10.5	10.7	8.3	77.	137.	75.
4/11/79	2315	11.4	10.0	9.6	117.	193.	106.
4/11/79	2330	11.4	9.0	8.9	120.	180.	99.
4/11/79	2345	11.4	9.2	8.5	119.	182.	100.
4/11/79	2400	11.4	9.5	8.9	125.	196.	108.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/12/79	15	16.4	9.7	9.1	131.	211.	116.
4/12/79	30	16.4	9.9	9.1	135.	219.	121.
4/12/79	45	16.4	10.1	9.0	140.	233.	128.
4/12/79	100	16.4	10.0	8.7	145.	237.	131.
4/12/79	115	16.3	10.1	8.5	149.	246.	136.
4/12/79	130	16.3	12.2	8.3	146.	300.	165.
4/12/79	145	16.3	10.0	8.3	146.	240.	133.
4/12/79	200	16.3	9.8	8.2	146.	236.	130.
4/12/79	215	16.3	10.0	8.2	147.	243.	134.
4/12/79	230	16.3	10.2	8.2	152.	255.	140.
4/12/79	245	16.3	10.1	8.2	156.	260.	143.
4/12/79	300	16.3	10.0	8.3	160.	263.	145.
4/12/79	315	18.3	9.9	8.2	158.	258.	142.
4/12/79	330	18.3	10.2	8.1	160.	268.	148.
4/12/79	345	18.3	9.2	8.2	165.	254.	140.
4/12/79	400	18.3	8.5	8.2	182.	263.	145.
4/12/79	415	19.3	8.6	8.2	181.	264.	146.
4/12/79	430	19.3	8.6	8.0	182.	267.	147.
4/12/79	445	19.3	8.7	8.7	182.	267.	147.
4/12/79	500	19.3	8.7	9.4	182.	267.	147.
4/12/79	515	19.0	8.6	9.3	180.	263.	145.
4/12/79	530	19.0	8.7	9.3	176.	258.	142.
4/12/79	545	19.0	8.6	9.3	180.	262.	145.
4/12/79	600	19.0	8.7	9.3	182.	266.	147.
4/12/79	615	19.0	8.7	9.3	182.	266.	147.
4/12/79	630	19.0	8.7	9.3	181.	265.	146.
4/12/79	645	19.0	8.6	9.4	182.	265.	146.
4/12/79	700	19.0	8.6	9.4	182.	266.	146.
4/12/79	715	19.6	7.9	9.4	185.	255.	141.
4/12/79	730	19.6	7.7	9.4	186.	253.	139.
4/12/79	745	19.6	7.7	9.4	186.	253.	139.
4/12/79	800	19.6	7.7	9.4	186.	252.	139.
4/12/79	815	19.3	7.7	9.9	188.	256.	141.
4/12/79	830	19.3	7.7	10.0	185.	251.	139.
4/12/79	845	19.3	7.9	10.0	179.	245.	135.
4/12/79	900	19.3	8.0	10.0	179.	248.	137.
4/12/79	915	19.3	7.9	10.0	180.	249.	137.
4/12/79	930	19.3	8.0	10.1	181.	250.	138.
4/12/79	945	19.3	7.8	10.0	181.	248.	137.
4/12/79	1000	19.3	10.0	10.0	189.	311.	171.
4/12/79	1015	19.6	7.6	10.0	188.	251.	139.
4/12/79	1030	19.6	7.7	9.9	188.	255.	141.
4/12/79	1045	19.6	7.6	10.0	188.	252.	139.
4/12/79	1100	19.6	7.5	10.0	189.	252.	139.
4/12/79	1115	17.6	7.2	10.2	192.	252.	139.
4/12/79	1130	17.6	7.2	10.1	191.	250.	138.
4/12/79	1145	17.6	8.4	10.2	188.	269.	148.
4/12/79	1200	17.6	8.4	10.1	167.	240.	133.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/12/79	1215	15.8	8.4	10.3	153.	220.	121.
4/12/79	1230	15.8	8.5	10.3	150.	217.	119.
4/12/79	1245	15.8	8.2	9.6	160.	226.	125.
4/12/79	1300	15.8	7.7	9.3	163.	222.	123.
4/12/79	1315	16.3	7.6	9.2	165.	222.	122.
4/12/79	1330	16.3	7.6	9.2	172.	231.	127.
4/12/79	1345	16.3	7.6	9.6	159.	213.	117.
4/12/79	1400	16.3	7.6	9.8	156.	210.	116.
4/12/79	1415	16.3	7.6	9.9	154.	207.	114.
4/12/79	1430	16.3	7.5	9.9	154.	206.	113.
4/12/79	1445	16.3	7.5	10.0	152.	203.	112.
4/12/79	1500	16.3	7.5	10.0	160.	214.	118.
4/12/79	1515	16.3	7.5	10.0	162.	216.	119.
4/12/79	1530	16.3	7.5	10.0	162.	217.	119.
4/12/79	1545	16.3	7.6	10.0	152.	205.	113.
4/12/79	1600	16.3	7.5	10.0	151.	201.	111.
4/12/79	1615	16.3	7.2	10.0	152.	200.	110.
4/12/79	1630	16.3	7.4	10.0	158.	210.	116.
4/12/79	1645	16.3	7.4	10.0	155.	206.	114.
4/12/79	1700	16.3	7.4	10.0	149.	197.	109.
4/12/79	1715	16.4	7.3	10.0	152.	201.	111.
4/12/79	1730	16.4	7.2	10.0	154.	202.	111.
4/12/79	1745	16.4	7.1	10.0	154.	200.	110.
4/12/79	1800	16.4	7.1	10.0	159.	206.	114.
4/12/79	1815	16.4	7.1	10.0	157.	203.	112.
4/12/79	1830	16.4	7.1	10.0	157.	203.	112.
4/12/79	1845	16.4	7.1	10.1	157.	203.	112.
4/12/79	1900	16.4	7.0	10.1	156.	201.	111.
4/12/79	1915	16.4	7.0	10.1	154.	199.	110.
4/12/79	1930	16.4	7.0	10.1	153.	197.	109.
4/12/79	1945	16.4	7.1	10.1	153.	199.	110.
4/12/79	2000	16.4	7.6	10.1	162.	217.	120.
4/12/79	2015	16.3	7.3	10.1	157.	207.	114.
4/12/79	2030	16.3	7.5	10.1	157.	210.	116.
4/12/79	2045	16.3	7.5	10.2	158.	211.	117.
4/12/79	2100	16.3	7.5	9.8	157.	210.	116.
4/12/79	2115	16.3	7.5	9.9	157.	210.	116.
4/12/79	2130	16.3	7.5	9.9	158.	211.	116.
4/12/79	2145	16.3	7.5	9.9	157.	210.	116.
4/12/79	2200	16.3	7.5	9.8	159.	212.	117.
4/12/79	2215	16.3	7.5	9.8	159.	213.	117.
4/12/79	2230	16.3	7.5	9.8	159.	212.	117.
4/12/79	2245	16.3	7.5	9.8	158.	212.	117.
4/12/79	2300	16.3	7.5	9.9	158.	212.	117.
4/12/79	2315	16.3	7.5	9.9	157.	210.	116.
4/12/79	2330	16.3	7.5	9.9	157.	210.	116.
4/12/79	2345	16.3	7.5	9.9	160.	214.	118.
4/12/79	2400	16.3	7.5	9.9	159.	213.	117.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/13/79	15	18.5	7.6	9.9	160.	216.	119.
4/13/79	30	18.5	7.6	9.9	161.	216.	119.
4/13/79	45	18.5	7.5	9.9	161.	215.	119.
4/13/79	100	18.5	7.6	9.9	160.	215.	119.
4/13/79	115	18.8	7.6	9.9	159.	214.	118.
4/13/79	130	18.8	7.6	9.9	158.	212.	117.
4/13/79	145	18.8	7.6	9.9	159.	214.	118.
4/13/79	200	18.8	7.6	9.9	159.	214.	118.
4/13/79	215	18.8	7.6	9.9	159.	213.	117.
4/13/79	230	18.8	7.6	9.9	157.	211.	116.
4/13/79	245	18.8	7.6	9.9	157.	211.	117.
4/13/79	300	18.8	7.6	9.9	157.	212.	117.
4/13/79	315	18.8	7.7	9.9	157.	214.	118.
4/13/79	330	18.8	7.9	9.9	165.	228.	126.
4/13/79	345	18.8	7.6	9.9	177.	238.	131.
4/13/79	400	18.8	7.6	9.9	176.	238.	131.
4/13/79	415	19.0	7.6	9.9	175.	237.	130.
4/13/79	430	19.0	7.6	9.8	174.	235.	130.
4/13/79	445	19.0	7.6	9.8	177.	240.	132.
4/13/79	500	19.0	7.9	9.9	181.	249.	137.
4/13/79	515	19.3	7.9	9.9	180.	249.	138.
4/13/79	530	19.3	8.0	9.9	180.	250.	138.
4/13/79	545	19.3	8.0	9.9	179.	249.	137.
4/13/79	600	19.3	7.7	10.0	180.	245.	135.
4/13/79	615	19.8	7.9	10.0	180.	249.	137.
4/13/79	630	19.8	7.9	9.9	180.	247.	136.
4/13/79	645	19.8	7.7	9.9	177.	239.	132.
4/13/79	700	19.8	7.7	9.9	179.	244.	135.
4/13/79	715	19.9	7.7	10.1	177.	240.	132.
4/13/79	730	19.9	7.7	10.0	177.	240.	132.
4/13/79	745	19.9	7.7	10.1	179.	244.	134.
4/13/79	800	19.9	7.7	10.1	181.	245.	135.
4/13/79	815	19.9	7.6	10.2	183.	247.	136.
4/13/79	830	19.9	7.6	10.2	185.	251.	138.
4/13/79	845	19.9	7.6	10.2	187.	252.	139.
4/13/79	900	19.9	7.7	10.2	188.	254.	140.
4/13/79	915	19.8	7.7	10.1	191.	259.	143.
4/13/79	930	19.8	7.6	10.2	182.	246.	135.
4/13/79	945	19.8	7.7	10.2	179.	243.	134.
4/13/79	1000	19.8	7.6	10.2	177.	237.	131.
4/13/79	1015	19.3	7.6	10.2	179.	241.	133.
4/13/79	1030	19.3	13.3	10.2	137.	324.	179.
4/13/79	1045	19.3	13.3	10.2	97.	229.	126.
4/13/79	1100	19.3	13.4	10.1	97.	231.	127.
4/13/79	1115	19.3	13.4	10.1	97.	232.	128.
4/13/79	1130	19.3	13.3	10.1	96.	228.	126.
4/13/79	1145	19.3	7.8	5.9	166.	227.	125.
4/13/79	1200	19.3	7.6	5.8	179.	242.	133.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/13/79	1215	19.8	7.7	5.7	177.	241.	133.
4/13/79	1230	19.8	7.6	5.9	177.	238.	131.
4/13/79	1245	19.8	7.5	7.9	179.	239.	132.
4/13/79	1300	19.8	7.5	10.3	179.	240.	132.
4/13/79	1315	19.9	7.5	10.0	180.	241.	133.
4/13/79	1330	19.9	7.4	9.9	182.	241.	133.
4/13/79	1345	19.9	7.5	9.9	183.	244.	135.
4/13/79	1400	19.9	7.4	10.0	183.	244.	134.
4/13/79	1415	19.3	7.4	10.0	184.	245.	135.
4/13/79	1430	19.3	7.4	9.6	183.	244.	134.
4/13/79	1445	19.3	7.4	10.2	183.	243.	134.
4/13/79	1500	19.3	7.7	10.1	179.	243.	134.
4/13/79	1515	19.0	7.7	10.2	178.	242.	133.
4/13/79	1530	19.0	7.5	10.2	179.	240.	132.
4/13/79	1545	19.0	7.6	10.2	178.	240.	133.
4/13/79	1600	19.0	7.4	10.2	179.	238.	131.
4/13/79	1615	19.3	7.4	10.0	179.	237.	131.
4/13/79	1630	19.3	7.4	10.0	178.	236.	130.
4/13/79	1645	19.3	7.4	10.1	177.	236.	130.
4/13/79	1700	19.3	7.4	10.0	178.	237.	131.
4/13/79	1715	19.5	7.4	10.2	178.	238.	131.
4/13/79	1730	19.5	7.4	10.2	179.	238.	131.
4/13/79	1745	19.5	7.4	10.3	179.	239.	132.
4/13/79	1800	19.5	7.4	10.3	178.	237.	131.
4/13/79	1815	19.0	8.0	10.2	175.	243.	134.
4/13/79	1830	19.0	11.6	10.2	145.	280.	154.
4/13/79	1845	19.0	11.5	10.2	116.	221.	122.
4/13/79	1900	19.0	11.5	10.2	116.	221.	122.
4/13/79	1915	19.2	11.2	10.2	117.	218.	120.
4/13/79	1930	19.2	11.2	10.2	118.	219.	121.
4/13/79	1945	19.2	11.2	9.6	120.	223.	123.
4/13/79	2000	19.2	11.2	6.8	120.	222.	122.
4/13/79	2015	19.0	11.2	6.8	119.	221.	122.
4/13/79	2030	19.0	11.2	6.9	119.	221.	122.
4/13/79	2045	19.0	11.2	6.9	119.	221.	122.
4/13/79	2100	19.0	11.2	6.9	119.	222.	122.
4/13/79	2115	18.5	11.2	7.0	119.	220.	121.
4/13/79	2130	18.5	11.2	6.9	116.	216.	119.
4/13/79	2145	18.5	11.2	6.9	114.	211.	116.
4/13/79	2200	18.5	11.2	6.9	114.	211.	116.
4/13/79	2215	18.5	11.2	6.9	114.	212.	117.
4/13/79	2230	18.5	11.2	6.9	116.	214.	118.
4/13/79	2245	18.5	11.2	6.9	115.	213.	117.
4/13/79	2300	18.5	11.2	6.8	114.	211.	116.
4/13/79	2315	18.5	11.2	6.9	114.	211.	117.
4/13/79	2330	18.5	11.2	6.9	114.	211.	116.
4/13/79	2345	18.5	11.2	6.9	115.	212.	117.
4/13/79	2400	18.5	11.2	6.9	115.	212.	117.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/14/79	15	-.3	-1.0	.0	-1.	-1.	-1.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
4/14/79	1745	19.0	7.0	10.1	177.	229.	126.
4/14/79	1800	19.0	6.8	10.1	178.	226.	125.
4/14/79	1815	19.0	6.8	10.2	175.	222.	123.
4/14/79	1830	19.0	6.7	10.1	180.	227.	125.
4/14/79	1845	19.0	6.6	10.1	184.	231.	128.
4/14/79	1900	19.0	6.6	10.1	186.	233.	128.
4/14/79	1915	19.3	6.6	10.1	187.	235.	130.
4/14/79	1930	19.3	6.6	10.1	195.	243.	134.
4/14/79	1945	19.3	6.6	10.1	192.	239.	132.
4/14/79	2000	19.3	6.6	10.1	190.	238.	131.
4/14/79	2015	19.5	6.6	10.1	189.	236.	130.
4/14/79	2030	19.5	6.7	10.1	188.	238.	131.
4/14/79	2045	19.5	6.6	10.1	186.	234.	129.
4/14/79	2100	19.5	6.5	10.1	184.	228.	126.
4/14/79	2115	19.3	6.6	10.2	182.	227.	125.
4/14/79	2130	19.3	6.6	10.1	183.	230.	127.
4/14/79	2145	19.3	6.6	10.1	185.	231.	127.
4/14/79	2200	19.3	6.6	10.1	186.	233.	128.
4/14/79	2215	19.3	6.6	10.1	186.	233.	129.
4/14/79	2230	19.3	6.6	10.1	188.	235.	130.
4/14/79	2245	19.3	6.7	10.1	183.	232.	128.
4/14/79	2300	19.3	6.9	10.1	172.	221.	122.
4/14/79	2315	19.0	7.0	10.1	169.	218.	120.
4/14/79	2330	19.0	7.1	10.1	162.	212.	117.
4/14/79	2345	19.0	7.3	10.0	159.	210.	116.
4/14/79	2400	19.0	7.2	10.0	159.	208.	115.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O^c	NO NG/J
4/15/79	15	18.2	7.2	10.0	159.	207.	114.
4/15/79	30	18.2	7.2	10.0	158.	207.	114.
4/15/79	45	18.2	7.2	9.9	157.	206.	113.
4/15/79	100	18.2	7.2	9.9	156.	204.	113.
4/15/79	115	18.8	7.3	10.0	152.	201.	111.
4/15/79	130	18.8	7.2	9.9	152.	199.	110.
4/15/79	145	18.8	7.1	10.0	152.	198.	109.
4/15/79	200	18.8	7.2	10.0	152.	199.	110.
4/15/79	215	18.9	7.2	9.9	154.	201.	111.
4/15/79	230	18.9	7.2	10.0	154.	201.	111.
4/15/79	245	18.9	7.2	10.0	155.	202.	111.
4/15/79	300	18.9	7.2	10.0	156.	204.	112.
4/15/79	315	19.3	7.2	10.0	155.	202.	111.
4/15/79	330	19.3	7.2	10.0	155.	202.	111.
4/15/79	345	19.3	7.2	10.0	152.	199.	110.
4/15/79	400	19.3	7.2	10.0	152.	199.	110.
4/15/79	415	19.6	7.2	9.9	147.	192.	106.
4/15/79	430	19.6	7.1	10.0	149.	194.	107.
4/15/79	445	19.6	7.1	10.0	149.	193.	106.
4/15/79	500	19.6	7.1	10.0	150.	194.	107.
4/15/79	515	18.8	7.1	10.0	153.	199.	110.
4/15/79	530	18.8	7.1	10.0	155.	200.	110.
4/15/79	545	18.8	7.1	10.0	155.	200.	110.
4/15/79	600	18.8	7.1	10.0	155.	200.	110.
4/15/79	615	18.8	7.1	10.0	155.	200.	110.
4/15/79	630	18.8	7.1	10.0	155.	200.	110.
4/15/79	645	18.8	7.1	9.9	155.	200.	110.
4/15/79	700	18.8	7.1	9.9	155.	201.	111.
4/15/79	715	18.8	7.1	9.9	154.	200.	110.
4/15/79	730	18.8	7.1	9.9	156.	202.	111.
4/15/79	745	18.8	7.1	9.9	156.	202.	111.
4/15/79	800	18.8	7.1	9.9	158.	205.	113.
4/15/79	815	18.9	7.1	10.0	158.	205.	113.
4/15/79	830	18.9	7.0	9.9	160.	206.	114.
4/15/79	845	18.9	7.0	9.9	164.	211.	116.
4/15/79	900	18.9	7.0	10.0	165.	212.	117.
4/15/79	915	18.9	7.0	10.0	167.	216.	119.
4/15/79	930	18.9	7.0	10.0	169.	217.	120.
4/15/79	945	18.9	6.9	9.9	170.	218.	120.
4/15/79	1000	18.9	6.9	9.9	169.	217.	120.
4/15/79	1015	18.8	7.0	10.0	169.	217.	120.
4/15/79	1030	18.8	7.0	10.0	167.	215.	119.
4/15/79	1045	18.8	6.9	9.9	169.	217.	120.
4/15/79	1100	18.8	6.9	9.9	170.	218.	120.
4/15/79	1115	18.8	6.9	10.0	172.	221.	122.
4/15/79	1130	18.8	6.9	10.0	174.	224.	123.
4/15/79	1145	18.8	6.9	10.0	177.	227.	125.
4/15/79	1200	18.8	6.9	10.0	177.	227.	125.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/15/79	1215	19.0	6.9	10.0	172.	221.	122.
4/15/79	1230	19.0	6.9	10.0	172.	220.	121.
4/15/79	1245	19.0	7.1	10.0	172.	223.	123.
4/15/79	1300	19.0	7.3	10.0	177.	234.	129.
4/15/79	1315	18.8	7.4	10.1	179.	237.	131.
4/15/79	1330	18.8	7.4	10.0	179.	239.	132.
4/15/79	1345	18.8	7.5	10.0	175.	234.	129.
4/15/79	1400	18.8	7.4	9.9	175.	233.	128.
4/15/79	1415	18.9	7.0	9.9	175.	225.	124.
4/15/79	1430	18.9	7.2	10.2	179.	234.	129.
4/15/79	1445	18.9	7.2	10.2	181.	236.	130.
4/15/79	1500	18.9	7.2	10.2	181.	236.	130.
4/15/79	1515	19.0	7.2	10.2	180.	235.	129.
4/15/79	1530	19.0	7.2	10.2	180.	235.	129.
4/15/79	1545	19.0	7.2	10.2	182.	238.	131.
4/15/79	1600	19.0	7.2	10.2	183.	240.	132.
4/15/79	1615	19.0	7.2	10.2	182.	239.	132.
4/15/79	1630	19.0	7.2	10.2	182.	239.	132.
4/15/79	1645	19.0	7.3	10.2	180.	236.	130.
4/15/79	1700	19.0	7.3	10.2	180.	237.	131.
4/15/79	1715	19.0	7.3	10.2	177.	234.	129.
4/15/79	1730	19.0	7.4	10.2	175.	231.	127.
4/15/79	1745	19.0	7.4	10.2	175.	231.	127.
4/15/79	1800	19.0	7.4	10.2	175.	231.	127.
4/15/79	1815	19.2	7.3	10.2	175.	230.	127.
4/15/79	1830	19.2	7.3	10.2	174.	229.	126.
4/15/79	1845	19.2	7.4	10.2	173.	229.	126.
4/15/79	1900	19.2	7.4	10.2	174.	230.	127.
4/15/79	1915	19.5	7.4	10.2	170.	226.	125.
4/15/79	1930	19.5	7.5	10.2	170.	228.	126.
4/15/79	1945	19.5	7.6	10.1	169.	227.	125.
4/15/79	2000	19.5	7.6	10.0	169.	228.	126.
4/15/79	2015	19.0	7.6	10.0	168.	227.	125.
4/15/79	2030	19.0	7.6	10.0	167.	225.	124.
4/15/79	2045	19.0	7.5	10.0	167.	224.	124.
4/15/79	2100	19.0	7.6	10.0	167.	225.	124.
4/15/79	2115	19.0	7.5	10.1	167.	224.	123.
4/15/79	2130	19.0	7.6	10.1	167.	225.	124.
4/15/79	2145	19.0	7.7	10.1	169.	228.	126.
4/15/79	2200	19.0	7.7	10.1	170.	230.	127.
4/15/79	2215	18.8	7.6	10.0	167.	226.	125.
4/15/79	2230	18.8	7.6	10.0	169.	228.	126.
4/15/79	2245	18.8	7.5	10.0	167.	224.	123.
4/15/79	2300	18.8	7.5	9.9	168.	225.	124.
4/15/79	2315	18.9	7.5	10.1	170.	227.	125.
4/15/79	2330	18.9	7.6	10.1	169.	228.	125.
4/15/79	2345	18.9	7.7	10.1	167.	227.	125.
4/15/79	2400	18.9	7.9	10.0	162.	223.	123.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/16/79	15	18.9	7.7	9.9	162.	220.	121.
4/16/79	30	18.9	7.3	9.9	162.	214.	118.
4/16/79	45	18.9	7.4	10.2	162.	216.	119.
4/16/79	100	18.9	7.4	10.3	162.	216.	119.
4/16/79	115	19.0	7.5	10.2	164.	218.	120.
4/16/79	130	19.0	7.5	10.1	167.	223.	123.
4/16/79	145	19.0	7.5	10.1	167.	224.	124.
4/16/79	200	19.0	7.4	10.2	164.	218.	120.
4/16/79	215	18.8	7.4	10.1	162.	214.	118.
4/16/79	230	18.8	7.4	10.2	165.	220.	121.
4/16/79	245	18.8	7.4	10.1	165.	219.	121.
4/16/79	300	18.8	7.4	10.1	164.	219.	121.
4/16/79	315	19.0	7.4	10.1	165.	220.	121.
4/16/79	330	19.0	7.4	10.1	165.	220.	121.
4/16/79	345	19.0	7.4	10.1	167.	223.	123.
4/16/79	400	19.0	7.4	10.1	167.	223.	123.
4/16/79	415	19.3	7.4	10.1	167.	223.	123.
4/16/79	430	19.3	7.5	10.1	167.	223.	123.
4/16/79	445	19.3	7.4	10.3	160.	213.	117.
4/16/79	500	19.3	7.4	10.0	162.	214.	118.
4/16/79	515	19.3	7.4	10.3	161.	215.	118.
4/16/79	530	19.3	7.4	10.2	160.	212.	117.
4/16/79	545	19.3	7.4	10.2	159.	212.	117.
4/16/79	600	19.3	7.4	10.2	159.	211.	116.
4/16/79	615	19.5	7.4	10.2	160.	213.	118.
4/16/79	630	19.5	7.4	10.2	161.	214.	118.
4/16/79	645	19.5	7.4	10.2	162.	216.	119.
4/16/79	700	19.5	7.4	10.2	165.	219.	121.
4/16/79	715	19.5	7.4	10.2	166.	220.	121.
4/16/79	730	19.5	7.2	10.2	167.	219.	121.
4/16/79	745	19.5	7.3	10.2	167.	219.	121.
4/16/79	800	19.5	7.3	10.2	167.	220.	122.
4/16/79	815	19.6	7.3	10.2	167.	220.	121.
4/16/79	830	19.6	7.3	10.2	167.	220.	122.
4/16/79	845	19.6	7.3	10.2	166.	218.	120.
4/16/79	900	19.6	7.3	10.2	180.	237.	131.
4/16/79	915	19.5	7.3	10.2	180.	237.	131.
4/16/79	930	19.5	7.3	10.2	182.	240.	132.
4/16/79	945	19.5	7.3	10.2	182.	240.	132.
4/16/79	1000	19.5	7.3	10.2	182.	240.	132.
4/16/79	1015	19.6	7.4	10.2	178.	236.	130.
4/16/79	1030	19.6	7.4	10.2	176.	233.	128.
4/16/79	1045	19.6	7.4	10.2	175.	232.	128.
4/16/79	1100	19.6	7.4	10.2	176.	234.	129.
4/16/79	1115	19.9	7.4	10.2	177.	235.	130.
4/16/79	1130	19.9	7.4	10.2	181.	239.	132.
4/16/79	1145	19.9	7.4	10.3	185.	245.	135.
4/16/79	1200	19.9	7.4	10.2	184.	244.	135.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/16/79	1215	19.9	7.4	10.2	184.	245.	135.
4/16/79	1230	19.9	7.4	10.1	184.	245.	135.
4/16/79	1245	19.9	7.4	10.2	185.	246.	136.
4/16/79	1300	19.9	7.4	10.1	186.	246.	135.
4/16/79	1315	19.9	7.4	10.1	185.	245.	135.
4/16/79	1330	19.9	7.3	10.2	184.	243.	134.
4/16/79	1345	19.9	7.7	9.9	185.	252.	139.
4/16/79	1400	19.9	7.6	10.0	185.	249.	137.
4/16/79	1415	19.9	7.3	10.1	186.	246.	135.
4/16/79	1430	19.9	7.3	10.2	186.	246.	135.
4/16/79	1445	19.9	7.3	10.2	186.	245.	135.
4/16/79	1500	19.9	7.3	10.1	187.	247.	136.
4/16/79	1515	19.9	7.3	10.1	186.	245.	135.
4/16/79	1530	19.9	7.3	10.1	186.	245.	135.
4/16/79	1545	19.9	7.3	10.1	185.	245.	135.
4/16/79	1600	19.9	7.3	10.1	185.	245.	135.
4/16/79	1615	19.9	7.3	10.1	187.	247.	136.
4/16/79	1630	19.9	7.3	10.1	188.	248.	137.
4/16/79	1645	19.9	7.3	10.1	187.	247.	136.
4/16/79	1700	19.9	7.3	10.1	184.	242.	134.
4/16/79	1715	19.8	7.3	10.1	184.	242.	134.
4/16/79	1730	19.8	7.3	10.1	183.	241.	133.
4/16/79	1745	19.8	7.3	10.1	182.	241.	133.
4/16/79	1800	19.8	7.3	10.0	182.	240.	132.
4/16/79	1815	19.6	7.4	10.0	180.	239.	132.
4/16/79	1830	19.6	7.4	10.1	180.	239.	132.
4/16/79	1845	19.6	7.4	10.1	180.	239.	132.
4/16/79	1900	19.6	7.4	10.1	180.	238.	131.
4/16/79	1915	19.6	7.4	10.1	180.	240.	132.
4/16/79	1930	19.6	7.4	10.1	179.	237.	131.
4/16/79	1945	19.6	7.4	10.1	175.	232.	128.
4/16/79	2000	19.6	7.6	9.9	173.	233.	129.
4/16/79	2015	19.0	7.4	10.0	167.	223.	123.
4/16/79	2030	19.0	7.7	9.9	167.	227.	125.
4/16/79	2045	19.0	7.7	10.0	165.	223.	123.
4/16/79	2100	19.0	7.9	9.9	168.	230.	127.
4/16/79	2115	19.0	7.5	9.9	168.	224.	124.
4/16/79	2130	19.0	7.6	10.0	167.	224.	123.
4/16/79	2145	19.0	7.6	10.0	167.	225.	124.
4/16/79	2200	19.0	7.6	10.0	167.	224.	124.
4/16/79	2215	19.0	7.7	10.0	168.	228.	126.
4/16/79	2230	19.0	7.6	10.0	167.	226.	125.
4/16/79	2245	19.0	7.5	10.1	167.	224.	123.
4/16/79	2300	19.0	7.5	10.1	165.	220.	122.
4/16/79	2315	19.0	7.5	10.1	163.	218.	120.
4/16/79	2330	19.0	7.4	10.1	163.	217.	120.
4/16/79	2345	19.0	7.6	10.1	163.	219.	121.
4/16/79	2400	19.0	7.6	10.1	162.	217.	120.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/17/79	15	17.6	7.7	10.0	162.	220.	121.
4/17/79	30	17.6	7.6	10.0	163.	219.	121.
4/17/79	45	17.6	7.6	10.1	162.	218.	120.
4/17/79	100	17.6	7.6	10.1	159.	214.	118.
4/17/79	115	18.5	7.6	10.0	156.	211.	116.
4/17/79	130	18.5	7.6	10.1	157.	210.	116.
4/17/79	145	18.5	7.6	10.1	156.	210.	116.
4/17/79	200	18.5	7.5	10.1	154.	206.	114.
4/17/79	215	18.2	7.6	10.1	153.	206.	114.
4/17/79	230	18.2	7.8	10.0	154.	210.	116.
4/17/79	245	18.2	7.5	10.1	154.	206.	114.
4/17/79	300	18.2	7.4	10.2	154.	205.	113.
4/17/79	315	17.9	7.7	10.1	154.	208.	115.
4/17/79	330	17.9	7.6	10.1	155.	210.	116.
4/17/79	345	17.9	7.6	10.2	155.	208.	115.
4/17/79	400	17.9	7.6	10.2	155.	208.	115.
4/17/79	415	18.8	7.6	10.2	154.	208.	114.
4/17/79	430	18.8	7.7	10.2	150.	204.	113.
4/17/79	445	18.8	7.9	9.9	154.	214.	118.
4/17/79	500	18.8	7.6	10.0	155.	208.	115.
4/17/79	515	18.8	7.8	10.0	153.	210.	116.
4/17/79	530	18.8	7.9	10.0	153.	211.	116.
4/17/79	545	18.8	7.7	10.0	152.	208.	114.
4/17/79	600	18.8	7.7	10.0	151.	206.	114.
4/17/79	615	18.8	7.8	10.0	150.	205.	113.
4/17/79	630	18.8	7.7	10.0	150.	204.	113.
4/17/79	645	18.8	7.5	10.3	152.	204.	113.
4/17/79	700	18.8	7.6	10.2	152.	204.	113.
4/17/79	715	18.5	7.6	10.2	154.	208.	115.
4/17/79	730	18.5	7.6	10.2	155.	208.	115.
4/17/79	745	18.5	7.7	10.2	151.	206.	114.
4/17/79	800	18.5	7.5	10.1	147.	197.	109.
4/17/79	815	17.6	7.4	10.2	147.	196.	108.
4/17/79	830	17.6	7.3	10.3	167.	220.	122.
4/17/79	845	17.6	7.3	10.3	167.	220.	122.
4/17/79	900	17.6	7.2	10.2	167.	218.	120.
4/17/79	915	16.1	7.0	10.3	167.	216.	119.
4/17/79	930	16.1	7.9	10.4	160.	220.	121.
4/17/79	945	16.1	8.1	9.8	160.	225.	124.
4/17/79	1000	16.1	8.4	9.6	160.	230.	127.
4/17/79	1015	16.0	8.6	9.3	159.	231.	127.
4/17/79	1030	16.0	8.7	9.2	157.	231.	127.
4/17/79	1045	16.0	8.7	9.2	157.	231.	127.
4/17/79	1100	16.0	8.6	9.2	157.	229.	126.
4/17/79	1115	16.0	8.5	9.2	157.	228.	125.
4/17/79	1130	16.0	8.5	9.2	157.	227.	125.
4/17/79	1145	16.0	8.5	9.2	157.	227.	125.
4/17/79	1200	16.0	8.5	9.2	157.	227.	125.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/17/79	1215	16.0	8.7	9.2	159.	232.	128.
4/17/79	1230	16.0	8.7	9.1	159.	232.	128.
4/17/79	1245	16.0	8.6	9.1	159.	231.	128.
4/17/79	1300	16.0	8.6	9.1	159.	232.	128.
4/17/79	1315	16.0	8.7	9.1	159.	233.	129.
4/17/79	1330	16.0	8.7	9.1	159.	233.	129.
4/17/79	1345	16.0	8.7	9.1	159.	232.	128.
4/17/79	1400	16.0	8.7	9.1	159.	234.	129.
4/17/79	1415	15.8	8.6	9.1	159.	233.	128.
4/17/79	1430	15.8	8.7	9.1	158.	232.	128.
4/17/79	1445	15.8	8.6	9.1	157.	229.	126.
4/17/79	1500	15.8	8.7	9.1	157.	230.	127.
4/17/79	1515	16.3	8.7	9.2	157.	230.	127.
4/17/79	1530	16.3	7.2	9.6	154.	201.	111.
4/17/79	1545	16.3	7.1	10.3	153.	199.	110.
4/17/79	1600	16.3	7.2	10.4	153.	200.	110.
4/17/79	1615	17.0	7.2	10.3	154.	202.	111.
4/17/79	1630	17.0	7.0	10.3	166.	214.	118.
4/17/79	1645	17.0	6.7	10.5	165.	209.	115.
4/17/79	1700	17.0	6.8	10.6	165.	210.	116.
4/17/79	1715	17.1	6.9	10.6	166.	211.	116.
4/17/79	1730	17.1	7.0	10.6	165.	213.	117.
4/17/79	1745	17.1	6.9	10.5	163.	208.	115.
4/17/79	1800	17.1	6.9	10.6	164.	210.	116.
4/17/79	1815	16.1	6.9	10.6	164.	210.	116.
4/17/79	1830	16.1	7.0	10.6	163.	211.	116.
4/17/79	1845	16.1	7.1	10.5	165.	213.	118.
4/17/79	1900	16.1	7.1	10.5	167.	216.	119.
4/17/79	1915	15.8	7.0	10.5	168.	217.	120.
4/17/79	1930	15.8	7.1	10.5	171.	221.	122.
4/17/79	1945	15.8	7.1	10.5	175.	227.	125.
4/17/79	2000	15.8	6.9	10.5	162.	207.	114.
4/17/79	2015	17.0	7.3	10.6	174.	229.	126.
4/17/79	2030	17.0	7.4	10.3	172.	229.	126.
4/17/79	2045	17.0	7.3	10.3	177.	234.	129.
4/17/79	2100	17.0	7.3	10.4	177.	233.	129.
4/17/79	2115	17.0	7.3	10.4	177.	234.	129.
4/17/79	2130	17.0	7.4	10.4	177.	234.	129.
4/17/79	2145	17.0	7.4	10.3	175.	231.	127.
4/17/79	2200	17.0	7.4	10.4	175.	233.	128.
4/17/79	2215	16.4	7.4	10.4	174.	232.	128.
4/17/79	2230	16.4	7.4	10.4	176.	233.	129.
4/17/79	2245	16.4	7.4	10.4	170.	225.	124.
4/17/79	2300	16.4	7.4	10.4	171.	227.	125.
4/17/79	2315	16.3	7.5	10.4	166.	222.	122.
4/17/79	2330	16.3	7.7	10.2	170.	231.	127.
4/17/79	2345	16.3	7.6	10.2	173.	233.	128.
4/17/79	2400	16.3	7.7	10.2	170.	230.	127.

15 MIN. DATA
DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/18/79	15	17.6	7.6	10.2	169.	226.	125.
4/18/79	30	17.6	7.6	10.2	170.	228.	126.
4/18/79	45	17.6	7.6	10.2	169.	228.	125.
4/18/79	100	17.6	7.6	10.2	172.	232.	128.
4/18/79	115	17.4	7.7	10.3	170.	230.	127.
4/18/79	130	17.4	7.7	10.3	173.	234.	129.
4/18/79	145	17.4	7.6	10.2	167.	226.	125.
4/18/79	200	17.4	7.7	10.2	170.	230.	127.
4/18/79	215	17.3	7.7	10.2	168.	227.	125.
4/18/79	230	17.3	7.7	10.2	170.	231.	127.
4/18/79	245	17.3	7.7	10.2	162.	220.	121.
4/18/79	300	17.3	7.8	10.1	160.	219.	121.
4/18/79	315	17.4	7.8	10.1	162.	222.	122.
4/18/79	330	17.4	7.8	10.1	157.	215.	119.
4/18/79	345	17.4	7.8	10.1	158.	216.	119.
4/18/79	400	17.4	7.9	10.1	158.	218.	120.
4/18/79	415	17.4	7.9	10.1	160.	221.	122.
4/18/79	430	17.4	7.9	10.0	156.	216.	119.
4/18/79	445	17.4	7.9	10.0	162.	223.	123.
4/18/79	500	17.4	7.9	10.0	164.	226.	125.
4/18/79	515	16.4	7.9	10.0	162.	224.	124.
4/18/79	530	16.4	7.9	10.0	163.	225.	124.
4/18/79	545	16.4	7.9	10.0	161.	223.	123.
4/18/79	600	16.4	7.8	10.0	167.	229.	126.
4/18/79	615	16.4	7.7	10.1	178.	242.	134.
4/18/79	630	16.4	7.9	10.3	181.	250.	138.
4/18/79	645	16.4	7.9	10.3	183.	253.	139.
4/18/79	700	16.4	7.9	10.4	157.	217.	120.
4/18/79	715	16.4	7.9	10.4	155.	215.	119.
4/18/79	730	16.4	8.8	10.4	155.	230.	127.
4/18/79	745	16.4	8.8	10.3	154.	228.	126.
4/18/79	800	16.4	8.8	9.4	158.	234.	129.
4/18/79	815	16.4	8.7	9.4	156.	229.	126.
4/18/79	830	16.4	8.7	9.5	157.	231.	127.
4/18/79	845	16.4	8.7	9.5	130.	190.	105.
4/18/79	900	16.4	8.0	9.5	122.	170.	94.
4/18/79	915	16.4	7.9	9.6	132.	183.	101.
4/18/79	930	16.4	7.9	9.8	119.	164.	90.
4/18/79	945	16.4	7.9	9.8	121.	166.	92.
4/18/79	1000	16.4	7.9	9.9	121.	167.	92.
4/18/79	1015	16.4	7.8	9.9	120.	164.	90.
4/18/79	1030	16.4	7.7	9.9	125.	170.	93.
4/18/79	1045	16.4	7.7	9.9	122.	165.	91.
4/18/79	1100	16.4	7.7	9.9	121.	164.	91.
4/18/79	1115	16.7	7.7	9.9	125.	170.	93.
4/18/79	1130	16.7	7.7	9.9	127.	174.	96.
4/18/79	1145	16.7	7.7	9.9	125.	170.	94.
4/18/79	1200	16.7	7.7	9.9	124.	168.	93.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/18/79	1215	16.7	8.5	9.9	125.	180.	99.
4/18/79	1230	16.7	8.0	10.0	122.	170.	94.
4/18/79	1245	16.7	7.3	10.0	122.	161.	89.
4/18/79	1300	16.7	7.2	10.0	123.	161.	89.
4/18/79	1315	17.0	7.2	10.0	122.	161.	89.
4/18/79	1330	17.0	7.4	10.0	123.	163.	90.
4/18/79	1345	17.0	7.9	10.1	122.	169.	93.
4/18/79	1400	17.0	7.7	10.1	122.	166.	92.
4/18/79	1415	17.0	7.2	10.1	121.	159.	88.
4/18/79	1430	17.0	7.2	10.1	120.	157.	87.
4/18/79	1445	17.0	7.2	10.1	121.	159.	88.
4/18/79	1500	17.0	7.5	10.1	122.	164.	90.
4/18/79	1515	17.0	7.8	10.1	125.	171.	94.
4/18/79	1530	17.0	7.8	10.0	125.	171.	94.
4/18/79	1545	17.0	7.7	9.9	124.	169.	93.
4/18/79	1600	17.0	7.7	9.9	124.	168.	93.
4/18/79	1615	17.0	7.7	9.9	124.	168.	93.
4/18/79	1630	17.0	8.0	9.9	125.	173.	96.
4/18/79	1645	17.0	8.7	9.9	121.	178.	98.
4/18/79	1700	17.0	8.2	9.9	121.	172.	95.
4/18/79	1715	17.1	8.1	10.0	121.	169.	93.
4/18/79	1730	17.1	8.2	10.0	120.	169.	93.
4/18/79	1745	17.1	6.9	10.0	120.	154.	85.
4/18/79	1800	17.1	-1.0	10.1	-1.	-1.	-1.
4/18/79	1815	16.1	7.9	10.1	130.	180.	99.
4/18/79	1830	16.1	7.9	.0	129.	179.	99.
4/18/79	1845	16.1	8.5	9.5	130.	187.	103.
4/18/79	1900	16.1	8.5	9.5	132.	191.	105.
4/18/79	1915	15.8	8.7	9.5	131.	192.	106.
4/18/79	1930	15.8	8.2	9.5	120.	169.	93.
4/18/79	1945	15.8	8.2	9.7	120.	169.	93.
4/18/79	2000	15.8	8.2	9.7	120.	169.	93.
4/18/79	2015	17.0	8.2	9.7	119.	168.	93.
4/18/79	2030	17.0	8.1	9.7	120.	168.	93.
4/18/79	2045	17.0	8.1	9.7	118.	166.	91.
4/18/79	2100	17.0	8.2	9.7	118.	166.	92.
4/18/79	2115	17.0	8.1	9.7	117.	164.	91.
4/18/79	2130	17.0	8.1	9.7	116.	162.	89.
4/18/79	2145	17.0	8.1	9.7	115.	161.	89.
4/18/79	2200	17.0	8.1	9.7	115.	161.	89.
4/18/79	2215	16.4	8.0	9.8	114.	159.	88.
4/18/79	2230	16.4	8.0	9.8	123.	171.	94.
4/18/79	2245	16.4	8.0	9.8	123.	171.	94.
4/18/79	2300	16.4	8.1	9.6	122.	172.	95.
4/18/79	2315	16.3	8.2	9.6	123.	173.	96.
4/18/79	2330	16.3	8.2	9.6	124.	175.	96.
4/18/79	2345	16.3	8.2	9.5	123.	173.	96.
4/18/79	2400	16.3	8.2	9.5	123.	174.	96.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/19/79	15	17.6	8.2	9.5	123.	173.	95.
4/19/79	30	17.6	8.2	9.5	123.	173.	95.
4/19/79	45	17.6	8.1	9.5	122.	172.	95.
4/19/79	100	17.6	8.1	9.5	122.	172.	95.
4/19/79	115	17.4	8.1	9.5	122.	172.	95.
4/19/79	130	17.4	8.1	9.5	121.	169.	93.
4/19/79	145	17.4	8.1	9.5	121.	169.	93.
4/19/79	200	17.4	8.2	9.5	122.	173.	96.
4/19/79	215	17.3	8.4	9.5	126.	180.	99.
4/19/79	230	17.3	8.4	9.4	129.	184.	101.
4/19/79	245	17.3	8.3	9.3	130.	185.	102.
4/19/79	300	17.3	8.3	9.3	130.	185.	102.
4/19/79	315	17.4	8.2	9.4	78.	111.	61.
4/19/79	330	17.4	8.2	9.4	79.	112.	62.
4/19/79	345	17.4	8.2	9.4	79.	112.	62.
4/19/79	400	17.4	8.2	9.4	79.	112.	62.
4/19/79	415	17.4	8.3	9.4	122.	174.	96.
4/19/79	430	17.4	8.3	9.4	127.	180.	99.
4/19/79	445	17.4	8.1	9.3	125.	175.	97.
4/19/79	500	17.4	8.0	9.4	125.	173.	96.
4/19/79	515	16.4	8.0	9.5	124.	173.	95.
4/19/79	530	16.4	8.0	9.6	125.	174.	96.
4/19/79	545	16.4	8.0	9.6	125.	174.	96.
4/19/79	600	16.4	8.0	9.5	125.	174.	96.
4/19/79	615	16.4	8.0	9.6	126.	174.	96.
4/19/79	630	16.4	7.9	9.6	125.	173.	95.
4/19/79	645	16.4	7.9	9.6	126.	174.	96.
4/19/79	700	16.4	7.9	9.6	127.	175.	97.
4/19/79	715	16.4	7.9	9.7	126.	174.	96.
4/19/79	730	16.4	7.8	9.7	126.	173.	95.
4/19/79	745	16.4	7.7	9.7	126.	172.	95.
4/19/79	800	16.4	7.7	9.7	125.	171.	94.
4/19/79	815	16.4	8.2	9.7	134.	189.	104.
4/19/79	830	16.4	8.2	9.7	128.	181.	100.
4/19/79	845	16.4	8.3	9.4	129.	184.	101.
4/19/79	900	16.4	8.0	9.4	130.	180.	99.
4/19/79	915	16.0	7.8	9.4	122.	167.	92.
4/19/79	930	16.0	7.8	9.4	119.	162.	89.
4/19/79	945	16.0	7.8	9.9	116.	159.	88.
4/19/79	1000	16.0	7.8	9.8	116.	159.	88.
4/19/79	1015	16.4	7.7	9.9	115.	156.	86.
4/19/79	1030	16.4	7.7	9.9	114.	156.	86.
4/19/79	1045	16.4	7.7	.0	119.	161.	89.
4/19/79	1100	16.4	7.7	9.9	118.	160.	88.
4/19/79	1115	16.7	7.7	10.0	116.	157.	87.
4/19/79	1130	16.7	7.6	10.0	117.	157.	87.
4/19/79	1145	16.7	7.6	.0	118.	159.	88.
4/19/79	1200	16.7	7.7	10.0	118.	161.	89.

15 MIN. DATA

DRY STACK GAS CONCENTRATION

DATE	TIME	LOAD MWTH	O2 VOL% MEAS	CO2 VOL% MEAS	NO PPMV MEAS	NO PPMV 3%O2	NO NG/J
4/19/79	1215	16.7	7.8	10.0	121.	166.	91.
4/19/79	1230	16.7	7.8	10.0	121.	165.	91.
4/19/79	1245	16.7	7.7	.0	118.	161.	89.
4/19/79	1300	16.7	7.7	9.9	119.	162.	89.
4/19/79	1315	16.8	7.7	9.9	118.	160.	88.
4/19/79	1330	16.8	7.7	9.9	119.	162.	89.
4/19/79	1345	16.8	-1.0	9.9	119.	101.	55.
4/19/79	1400	16.8	-1.0	10.0	147.	124.	69.
4/19/79	1415	16.6	11.2	.0	105.	195.	107.
4/19/79	1430	16.6	-1.0	.0	-1.	-1.	-1.
4/19/79	1445	16.6	12.4	.0	-1.	-1.	-1.
4/19/79	1500	16.6	12.4	9.2	124.	262.	145.
4/19/79	1515	16.4	12.5	12.0	124.	265.	146.
4/19/79	1530	16.4	12.7	.0	123.	268.	148.
4/19/79	1545	16.4	12.8	9.7	125.	277.	153.
4/19/79	1600	16.4	12.9	9.7	127.	285.	157.
4/19/79	1615	16.4	12.5	9.7	128.	272.	150.
4/19/79	1630	16.4	12.5	9.7	127.	270.	149.
4/19/79	1645	16.4	12.3	.0	124.	259.	143.
4/19/79	1700	16.4	12.0	9.6	123.	248.	137.
4/19/79	1715	16.4	12.0	9.7	122.	246.	136.
4/19/79	1730	16.4	12.0	9.7	119.	240.	133.
4/19/79	1745	16.4	12.0	.0	121.	244.	135.
4/19/79	1800	16.4	12.0	9.7	119.	240.	133.
4/19/79	1815	16.4	11.7	9.7	120.	235.	129.
4/19/79	1830	16.4	11.7	9.7	119.	234.	129.
4/19/79	1845	16.4	11.5	.0	115.	219.	121.
4/19/79	1900	16.4	12.5	9.7	122.	260.	143.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.
0/ 0/79	0	.0	.0	.0	0.	0.	0.

TECHNICAL REPORT DATA (Please read Instructions on the reverse before completing)		
1. REPORT NO. EPA-600/7-80-085b	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE Thirty-day Field Tests of Industrial Boilers: Site 2--Residual-oil-fired Boiler		5. REPORT DATE April 1980 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) W.A. Carter and R.J. Tidona		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS KVB, Inc. P.O. Box 19618 Irvine, California 92714		10. PROGRAM ELEMENT NO. EHE624 11. CONTRACT/GRANT NO. 68-02-2645, Task 4
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16. ABSTRACT This report is a final one for a test program to evaluate the long-term effectiveness of combustion modifications on industrial boilers. Previous short-term tests had been performed on industrial boilers to determine the effect of combustion modifications on such air pollutant emissions as NOx, SOx, CO, HC, and particulate. The objective of this program was to determine if the combustion modification techniques which were effective for the short-term tests are feasible for longer periods. The report gives results of a 30-day field test of a 26.4 MW output (90,000 lb steam/hr) residual-oil-fired boiler using staged combustion air and low excess air to control NOx emissions. Results indicate that these combustion modifications are effective long-term NOx controls for this type of residual-oil-fired boiler. The as-found NOx concentration was 158 ng/J (281 ppm at 3% O2, dry). With staged combustion and low excess air firing, the mean NOx emission level was 110 ng/J (196 ppm at 3% O2, dry). Boiler efficiency increased by 0.7% under low NOx firing conditions.

17. KEY WORDS AND DOCUMENT ANALYSIS			
a. DESCRIPTORS		b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Pollution Boilers Residual Oils Combustion Field Tests Sulfur Oxides Nitrogen Oxides	Carbon Monoxide Hydrocarbons Dust	Pollution Control Stationary Sources Industrial Boilers Combustion Modification Staged Combustion Low Excess Air Particulate	13B 13A 07C 21D 11G 21B 14B 07B

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