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VOC Emissions from Hemlock Lumber

Report to

Hampton Affiliates, Cowlitz Division
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Report by

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VOC Emissions from ~~Sitka~~ Hemlock spruce Lumber

I. Results Summary

Two charges each containing 73.3 board feet of 2x4 hemlock lumber were dried in a small-scale kiln at Oregon State University. The kiln dry- and wet-bulb temperatures were provided by Hampton Lumber. One schedule was at a conventional temperature, with a maximum temperature of 180°F (82°C) and a wet-bulb temperature of 150°F (65°C). The other was at a high temperature, with a maximum temperature of 215°F (103°C) and a wet-bulb temperature between 150F (65°C) and 165 °F (74 C). The air velocity was 750 feet per minute (3.8 m/s). The kiln was indirectly heated with steam. There was no humidification. Regulating the amount of air entering the kiln controlled venting and the humidity.

A JUM 3-200 total hydrocarbon analyzer was used to measure organic emissions following EPA Method 25A. It has been demonstrated through past studies (Lavery and Milota, 2000, Forest Products Journal, NCASI/Georgia-Pacific SEP project) that this method in this small-scale kiln gives results similar to a large-scale kiln. The data for the test is summarized in the Table 1.

TABLE 1. Summary of results.

Charge	Schedule	Initial MC	VOC[a]	Time[b]
		%	lb/mbf	hrs
1	Conv.	115.7	0.40	52.9
2	High	112.9	0.34	32.7

[a] VOC value reported at 15% moisture content. This can be adjusted to a different final moisture contents using data in report.
[b] to 15% moisture content

II. Lumber Source and Handling

Three charges of lumber were delivered to Oregon State University on March 16, 2004, two to be dried and one as a backup. The wood was wrapped in plastic at the mill to prevent predying and loss of organic compounds.

The wood for two charges was was rewrapped in plastic and stored at 2°C until they could be dried. The first charge was put in the kiln immediately; however, there was a problem with the kiln control and it was aborted. The conventional charge described in this report was started on March 24 and the high-temperature charge on March 29.

III. Kiln Description and Operation

A schematic of the kiln is shown in Figure 1. The kiln box is approximately 4' by 4' by 4'. It is indirectly heated by steam. Four dry-bulb thermocouples and two wet-bulb thermocouples are located on the entering-air side of the load. The dry-bulb thermocouples are spaced in a grid. The two wet-bulb thermocouples are under a single sock at the center of the entering-air side of the load.

Humidity control

A 200 L/min MKS mass flow meter controlled and measured the amount of air entering the kiln. It was factory calibrated and checked using a bubble meter. The amount of air entering the kiln is based on the wet-bulb temperature - if it is above setpoint, the airflow is increased and if it is below setpoint the airflow is decreased. This is analogous to venting for a commercial kiln. A minimum of 4 L/min entered the kiln at all times, more than removed by the analyzer (< 2.6 L/min). Putting air into the kiln at a rate of 100 L/min causes the pressure in the kiln to be 60 to 130 Pa above ambient, depending on location in the kiln (high-pressure or low-pressure side). Thus, any fugitive leakage should be out of the kiln. Two additional flow meters can be manually set to provide additional airflow. The steam spray line is disabled, so no water vapor is added to the kiln atmosphere.

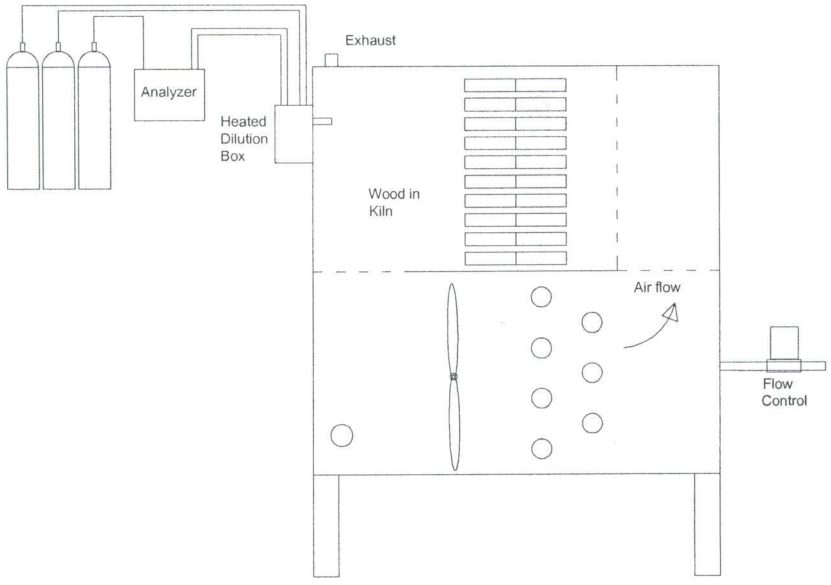


FIGURE 1. Schematic of kiln and sampling system.

Temperature

Temperature in the kiln is controlled by indirect steam heating. When the average of the four dry-bulb thermocouples is below setpoint, the steam pressure in the coil is increased. When it is above setpoint, steam flow to the coil is reduced.

Schedules

The drying schedule supplied by the mill is shown in Tables 2a and 2b. The values in Table 2b are base on the entering-air temperature. This represents the highest temperature the wood would experience in the kiln. The actual temperatures in the lab kiln are presented in Figure 2a and 2b.

TABLE 2a. Drying schedule for the conventional-temperature charge.

Step time, hours	Ramp time, hours	Run time, hours	Dry-bulb, °F	Wet-bulb, °F
0	0	0	80	70
12	12	12	165	150
4	16	16 to dry	180	150

TABLE 2b. Drying schedule for the high-temperature charge.

Step time, hours	Ramp time, hours	Run time, hours	Dry-bulb, °F	Wet-bulb, °F
0	0	0	155	120
12	12	12	200	175
4	4	16	210	170
8	0	24	215	160
16	0	40	215	150
10	0	50 to dry	215	140

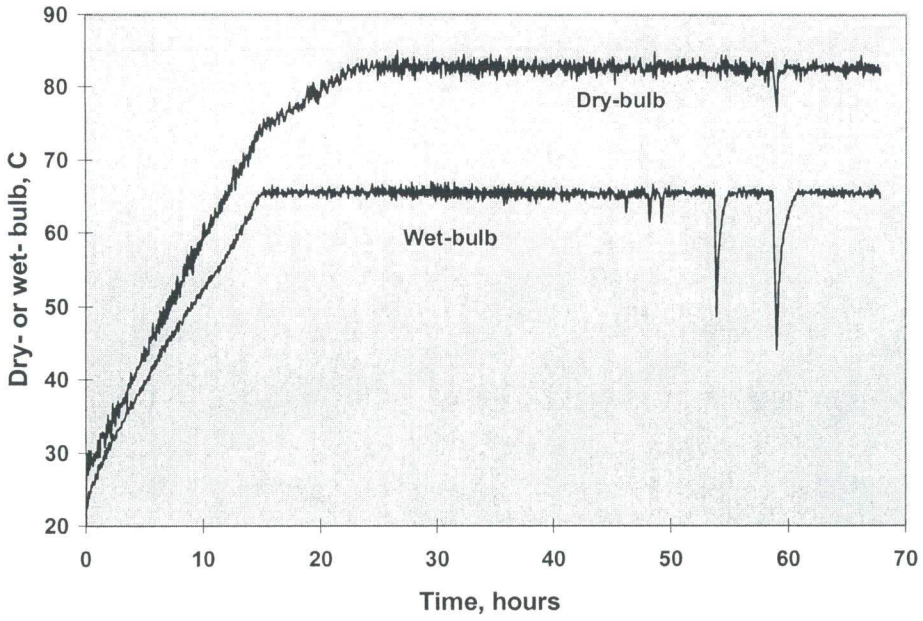


FIGURE 2a. Dry- and wet-bulb temperatures during the conventional-temperature drying cycle.

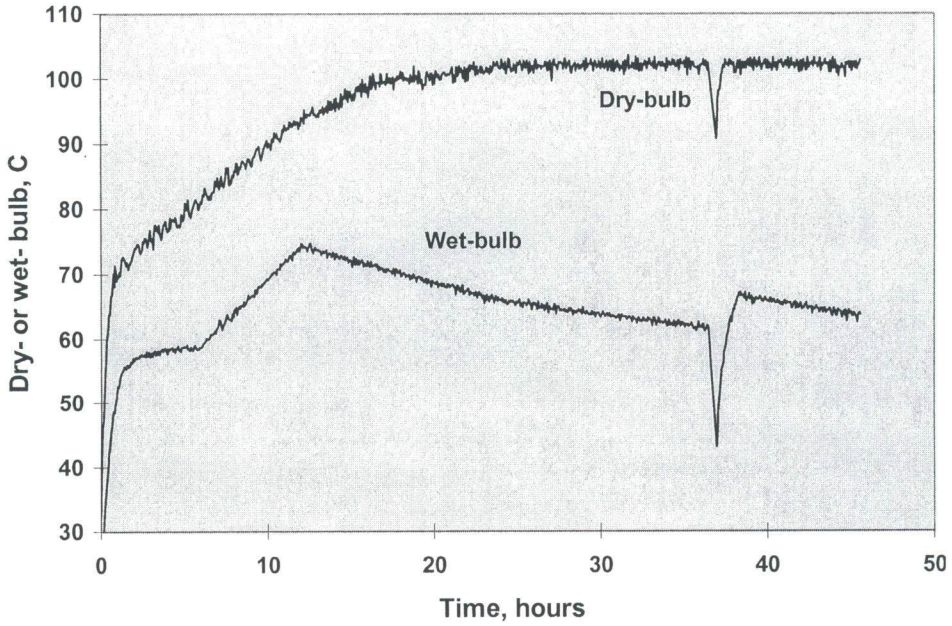


FIGURE 2b. Dry- and wet-bulb temperatures during the high-temperature drying cycle.

Charge Sequence

After warming to room temperature , 2" were trimmed from each end of each board to give 44" samples. These were then weighed, placed in the kiln, and dried according to the schedules in Tables 2a and 2b. Sampling for hydrocarbon was done as described in section IV. At the end of drying the wood was weighed, oven dried, and reweighed so initial and final moisture contents could be determined by ASTM D4442.

IV. Sampling Systems and Methodologies

Figures 3a and 3b show the hydrocarbon sampling system. Unlike stack testing, all necessary equipment is mounted on the kiln and flows are controlled with valves and switches. The THC sample was drawn from the kiln directly into a dilution/filter box mounted on the side of the kiln. The box was heated to 125°C. It is assumed that the gas in the kiln is well-mixed and that the composition in the kiln near the exhaust is the same at the composition of the exhaust. The sample line from the box to the analyzer was heated to 133°C. The valve at the back of the analyzer was heated to 145°C. Heated dilution gas can be added to the hydrocarbon sample gas to lower the gas moisture content to the detector.

The fuel gas was hydrogen. The span gas was EPA Protocol 905 ppm propane in air, the mid-gas was certified 412 ppm propane. The zero gas was Grade 5 air. Detailed sampling procedures are in Appendix 1 and a summary is presented below.

Leak checks were conducted before and after the charge was dried. Valves are closed and all components from just behind the probe tip to the valve at the back of the analyzer are placed under a 18-20 inHg vacuum. Less than one inHg pressure change during two minutes is acceptable and this was met.

Total flow and sample flow to the analyzer were checked using an NIST-traceable flow meter. This was done at the beginning and end of each sampling interval. The meter was attached to the system near the probe tip within the heated box. The valves were repositioned so that the sample came from the flow meter rather than the kiln. Readings of flow were made with the dilution gas off. The flow readings were verified by observing the change in the analyzer reading for span gas before and after the dilution gas was turned on. The dilution ratio calculated based on the analyzer readings was within 1 to 2% of that determined by the flow meter. Dilution was used when the gas moisture content in the kiln was greater than 15%.

Calibration of the zero and span of the detector was done at the beginning of each run (about every three hours with one five- and one seven-hour interval each night). The calibration gas was introduced by setting the valves so the calibration gas entered the system near the probe tip at ambient pressure. The calibration was checked at the end of

each run with no adjustments made to the zero or span during the run. The span drift was always less than two percent of full scale for a run and generally less than one percent. The zero drift was minimal during entire drying cycle.

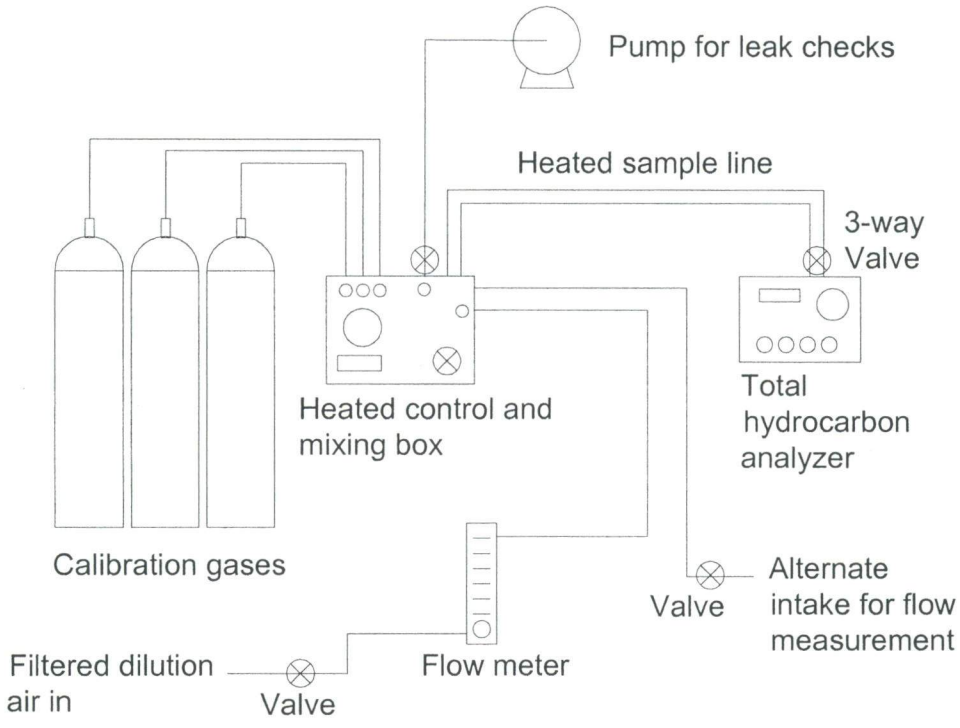


FIGURE 3A. Schematic of heated filter box with air dilution system, heated sample line, and analyzer. Sample enters heated box from back of drawing (box is attached to kiln).

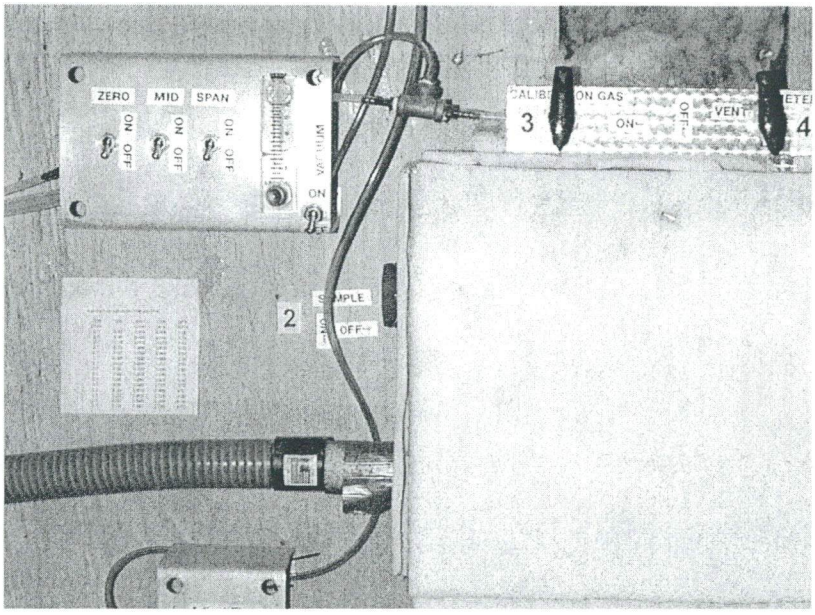


FIGURE 3B. Photo of VOC sampling system showing heated sample box (with white insulation), toggle valves and flow meter for calibration gases (upper left), on/off valve for calibration gas (3 at upper center right), heated sample line to analyzer (green tube, lower left), valve for sample (2 at center), toggle valve to vacuum pump (near calibration gas valves), and vent/flowmeter valve (4 at upper right).

V Data Reduction and Treatment

The "FlowCalc" page in the files "Hampton, Kiln.XLS" in Appendix 2 show the calculations for each 3-minute interval during the charge. Column A is a reading number. Columns B and C are the clock and charge times, respectively. Columns D and E are the average dry- and wet-bulb temperatures. Column F is the vapor pressure at the wet-bulb temperature. The absolute humidity is shown in column G and the molal humidity in column H.

Flow calculations

The volumetric dry gas flow rate in column I (files "Hampton, Kiln.XLS" in Appendix 2) is the flowmeter reading adjusted for the meter calibrations and the molar humidity of the entering gas. This is in standard (at 0°C) liters per minute. In column J this has been converted to a mass flow rate in kg/min and in column K is the same information is expressed as a molal flow rate.

Moisture calculations

The water removal rate in g/min (column L) (files "Hampton, Kiln.XLS" in Appendix 2) is calculated from the humidity and the gas flow rate and the total water (column M) is an integration of column L over time.

The moisture content of the wood at each interval in the event (column N) was determined by reducing the MC of the wood based on the amount of water leaving the kiln during the previous 3-minute interval.

Total hydrocarbon calculations

The original total hydrocarbon analyzer reading is shown in column O (files "Hampton, Kiln.XLS" in Appendix 2). In column P this has been corrected to compensate for the range setting switch on the analyzer and scaling between the analyzer reading and the computer reading. Also in column P, the THA data between sampling runs has been adjusted to the average of the data during the 12-minute periods before and/or after the analyzer testing and calibration time. The dilution THA (column Q) is the corrected THA reading divided by the dilution ratio (from column Y). In column R we have the opportunity to compensate for the effect of moisture on the JUM detector. This was not done so column R equals column Q. Finally in column S, the hydrocarbon concentration is converted to a dry gas basis concentration.

In column T the hydrocarbon flow rate in g/min as carbon is calculated in a manner analogous to the water flow rate using the dry gas flow rate and the hydrocarbon concentration. Column U is the integral of column T over time, the cumulative hydrocarbon release up to that point in the schedule. Column V is the cumulative unit emissions, that is, column U divided by the oven-dry weight of the wood in the kiln.

Column X indicates the hydrocarbon sampling run and column Y is the dilution ratio during that run. The next two columns, Z and AA, are the cumulative dry gas and water during the kiln cycle. These are used obtain the average gas moisture contents. The corrected wood moisture content, as discussed in section VI, is shown in column AC. The kiln air and analyzer air moisture contents are shown in columns AD and AE.

At the end (bottom) of the FlowCalc spreadsheet are summaries by run of the flow data for the total hydrocarbon run intervals.

The other pages in the files "Hampton, Kiln.XLS" are graphs of the data in the FlowCalc page. Moisture content and board weight data are in the files named "Hampton, Board.XLS."

VI. Sampling Results

The hydrocarbon emissions are summarized graphically here. All emission data is presented in detail in Appendix 2. The graphs show the full drying cycle; however, 15% moisture content was reached at approximately 33 and 52 hours, respectively, for the conventional- and high-temperature schedules.

Figures 4a and 4b show total hydrocarbon concentration and vent rate versus time. The vent rate is high first 10 hours, and then decreases. The high vent rate is due to the low wet-bulb temperature and low humidity. The concentration remains low while the vent rate is high, then increases to a maximum. The concentration then continues to increase for the conventional-temperature schedule and decreases for the high-temperature schedule. This difference is probably due to the venting differences which result from maintaining the respective drying schedule. Note that the left ordinate in Figure 4b is on a different scale that in 4a. During the higher temperature schedule, there is a greater concentration, but the venting is less and for a shorter duration (33 vs. 52 hours).

Figures 5a and 5b show the cumulative hydrocarbon emissions and the rate of emissions versus time. The cumulative emissions is the emissions up to any point in time in the schedule. The rate of emissions is how much is coming out per unit time. The maximum occurs at approximately 15 to 20 hours in each schedule.

Figures 6a and 6b show the wood moisture content versus time. The estimated moisture content should most accurately represent the MC-time relationship because the initial and final moisture contents match the oven-dry test. The initial moisture contents were over 110%. The final moisture content was 10.7% for the wood dried using the conventional-schedule and 7.2% for the wood dried using the high-temperature schedule (at 33 and 52 hours, respectively). We also opened the kiln and weighed the wood at approximately 60 hours and 37 hours. The moisture contents at these times were 13.3 and 11.3%.

Figures 7a and 7b show the cumulative hydrocarbon emissions versus moisture content. The emissions for drying to any moisture content can be read from this graph. If, for example, a mill wanted to dry to 18% instead of 15%, the total hydrocarbon emissions could be estimated at 0.38 and 0.32 for the conventional- and high-temperature schedules.

TABLE 3. Estimated VOC release at different final moisture contents (read from data file).

	VOC release	
Moisture content	Conventional	High
%	lb/mbf	lb/mbf
12	0.416	0.351
13	0.410	0.346
14	0.405	0.341
15	0.400	0.335
16	0.395	0.330
17	0.391	0.325
18	0.386	0.320

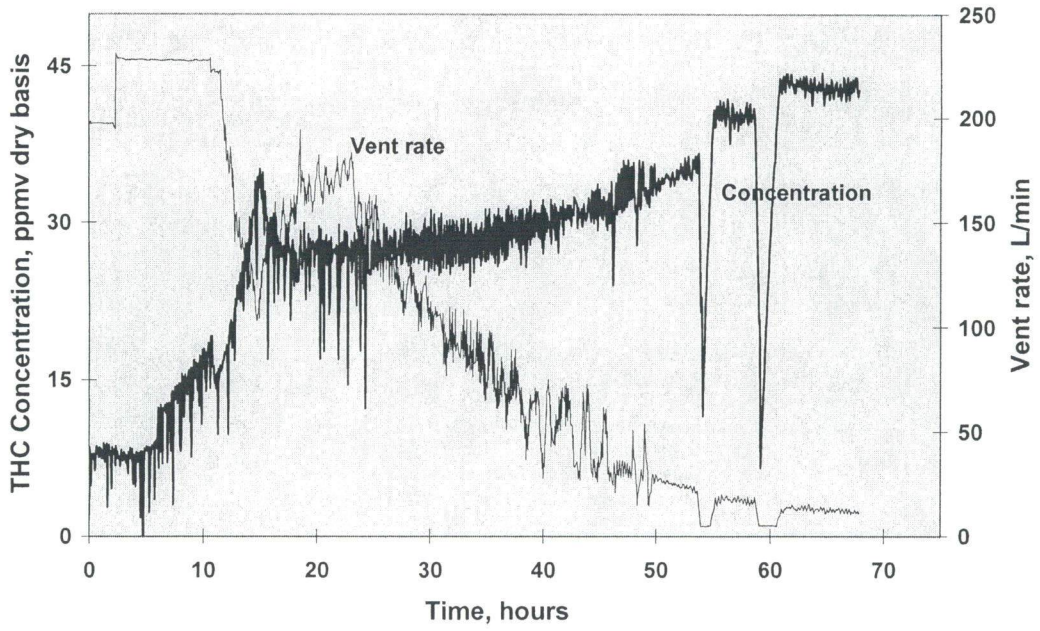


FIGURE 4a. Hydrocarbon concentration and vent rate versus time for the conventional-temperature charge.

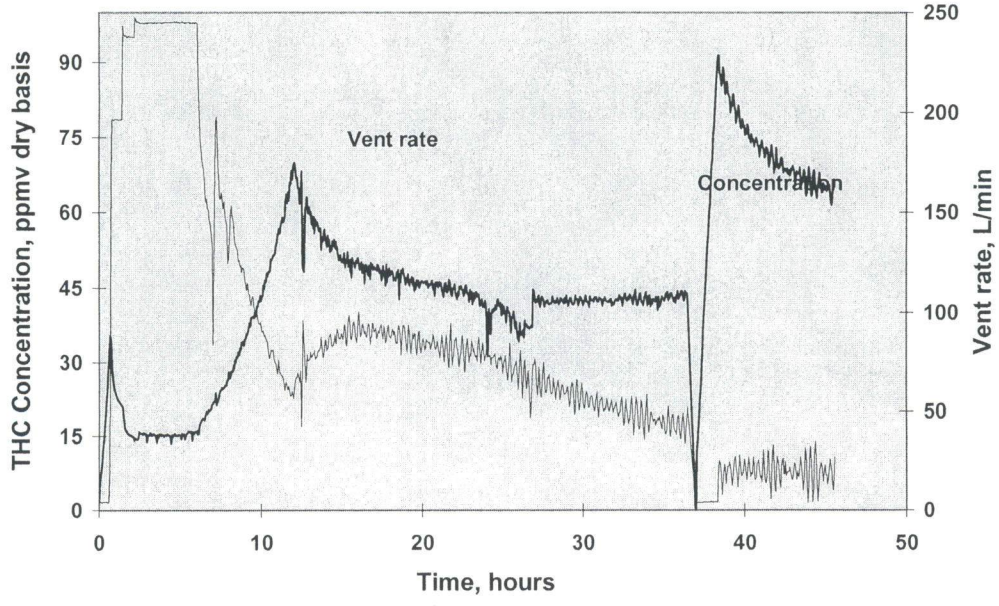


FIGURE 4b. Hydrocarbon concentration and vent rate versus time for the high-temperature charge.

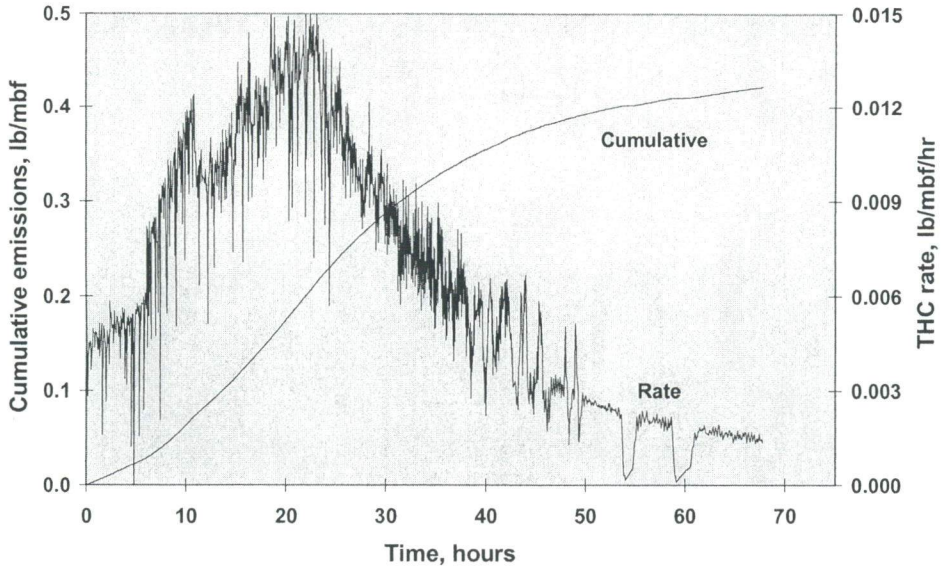


FIGURE 5a. Cumulative emissions and rate of emissions versus time for conventional-temperature drying.

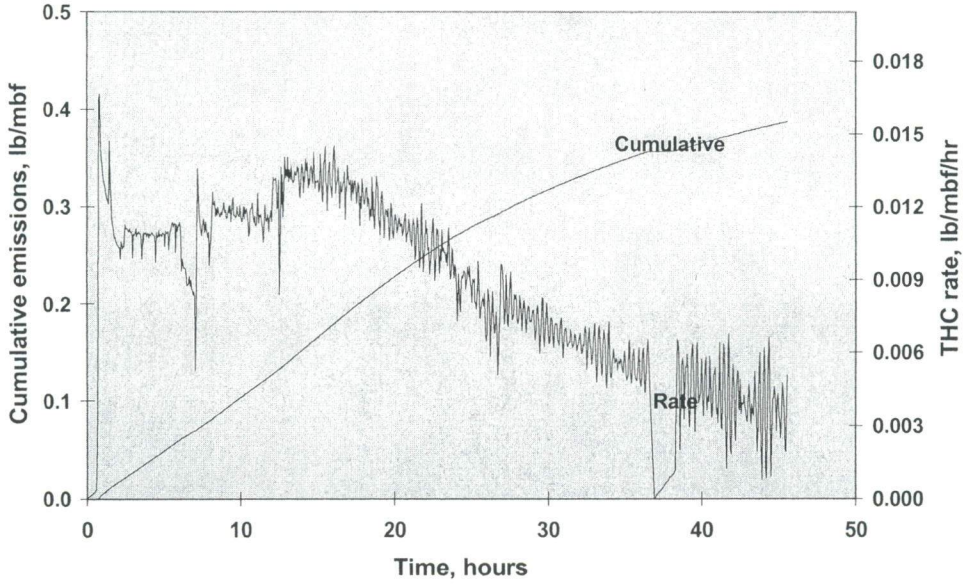


FIGURE 5b. Cumulative emissions and rate of emissions versus time for high-temperature drying.

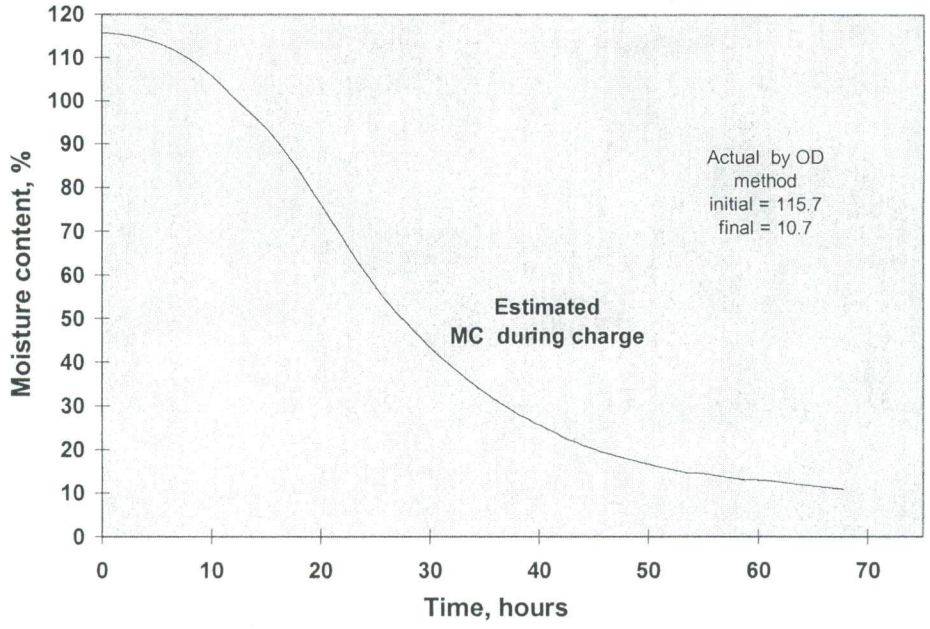


FIGURE 6a. Moisture content versus time for the conventional-temperature charge.

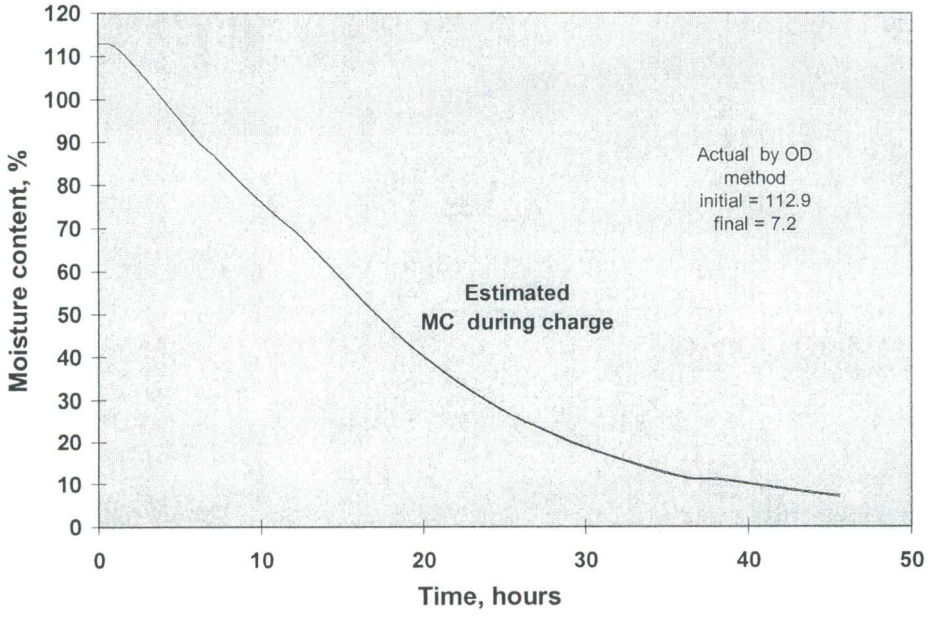


FIGURE 6b. Moisture content versus time for the high-temperature charge.

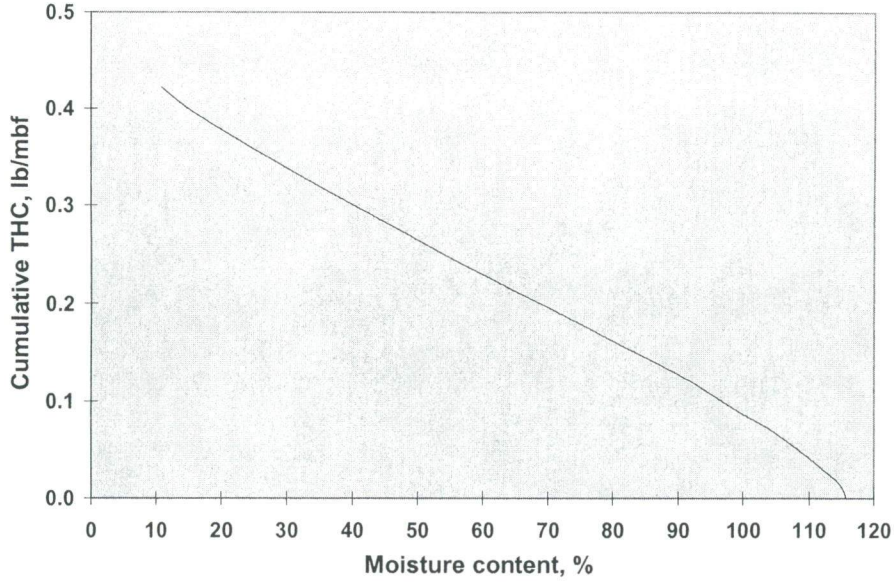


FIGURE 7a. Cumulative emissions versus moisture content of the conventional-temperature charge.

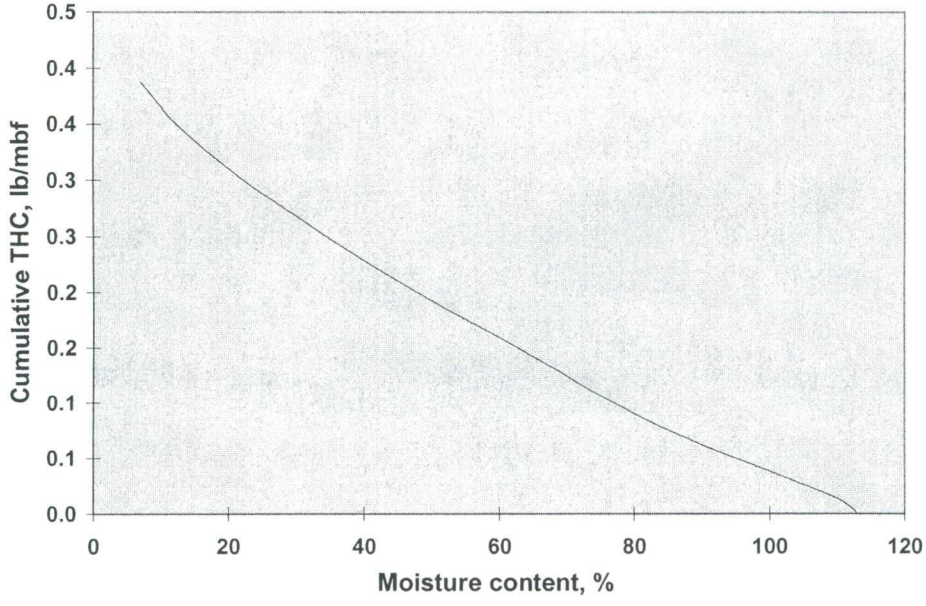


FIGURE 7b. Cumulative emissions versus moisture content of the high-temperature charge.

Table 4 shows the VOC results by run for the charges. The interval time periods shown in the table include the times between sampling and mass calculations are adjusted to account for these. Sampling occurred for approximately 95% of the drying time to 15% MC. Copies of all field sampling sheets, including dilution system and heated component data, in Appendix 3.

TABLE 4a. Summary of sample runs for the conventional-temperature charge.

Sample Run	Time hrs	Dry Flow Rate @68 l/min	Wet Flow Rate @68 l/min	THC wet conc ppmv	THC mass as C lbs/mbf	THC rate as C lb/hr/mbf	Average Wood MC %	Average Air MC %	Average Anal. MC %
1	3.00	219.6	225.7	7.3	0.014	0.0046	115.4	2.7	2.7
2	3.00	244.8	258.7	6.9	0.015	0.0049	113.7	5.4	5.4
3	4.80	244.3	272.2	12.2	0.044	0.0092	108.6	10.2	7.7
4	7.55	165.6	208.7	19.2	0.081	0.0107	94.0	20.7	15.5
5	3.10	180.6	238.5	19.9	0.040	0.0130	76.5	24.3	15.0
6	2.75	179.4	236.8	19.9	0.035	0.0129	65.3	24.2	15.0
7	3.14	150.1	198.3	20.0	0.034	0.0110	59.9	24.3	15.1
8	2.25	125.3	165.3	20.9	0.021	0.0095	47.5	24.2	15.0
9	5.10	102.0	134.5	21.0	0.039	0.0077	38.8	24.1	15.0
10	7.90	69.2	91.0	22.3	0.044	0.0056	27.6	24.0	14.6
11	3.46	44.5	58.5	23.6	0.013	0.0038	20.7	23.8	14.5
12	3.15	34.3	44.9	24.7	0.010	0.0030	18.2	23.6	14.4
13	3.70	27.2	35.8	25.8	0.009	0.0025	16.0	24.0	14.7
Sum	52.90				**0.400**				
Ave.		137.5	166.8	18.7		0.008			

TABLE 4b. Summary of sample runs for the high-temperature charge.

Sample Run	Time hrs	Dry Flow Rate @68 l/min	Wet Flow Rate @68 l/min	THC wet conc ppmv	THC mass as C lbs/mbf	THC rate as C lb/hr/mbf	Average Wood MC %	Average Air MC %	Average Anal. MC %
1	3.00	189.7	222.0	15.8	0.028	0.0092	110.0	14.6	14.6
2	3.00	262.7	315.1	12.6	0.033	0.0109	97.6	16.6	8.5
3	4.80	140.2	182.1	23.2	0.053	0.0110	81.9	23.0	11.5
4	7.55	88.0	130.5	35.9	0.096	0.0127	59.6	32.6	12.4
5	3.10	91.3	126.3	33.0	0.035	0.0114	40.4	27.7	7.7
6	2.75	86.4	115.1	32.0	0.028	0.0101	32.4	25.0	11.0
7	3.05	76.2	99.2	30.9	0.025	0.0081	28.9	23.2	10.2
8	2.25	66.1	84.7	32.7	0.017	0.0076	21.0	22.0	10.8
9	3.20	57.8	73.1	33.3	0.021	0.0067	17.0	20.9	10.3
Sum	32.70				**0.335**				
Ave.		117.6	149.8	27.7		0.0097			

VII. Quality Assurance

Leak checks

Leak checks were performed on the VOC system before and after drying.

Calibration

Data for the calibration gases are given in Appendix 4. The mid gas was not named because the analyzer was within tolerance without naming. The calibration sheet for the flow meter is also included is also included in Appendix 4 as is the thermocouple calibration check.

VIII Discussion

There were no anomalies during the conventional- or high-temperature schedules that would affect the data. Data from the first charge, during which there was a data collection problem, is not reported here.

The VOC emission value was greater at the conventional temperature than at the high-temperature. This is inconsistent with what is generally expected; however, in the published literature one can occasionally find where this occurs. There is some variability in this type of data due to the wood. For "identical" replicates we have seen ranges in the past from 1.29 to 1.54 lb/mbf for ponderosa pine and 0.87 to 1.19 for lodgepole pine, 0.46 to 0.51 for Douglas-fir and 0.22 to 0.27 for white fir. Hemlock tends to be at least, if not more variable in wood properties that these other species. Therefore, it is possible that the wood in the kiln varied enough to give these results. We have observed values for hemlock during past studies from 0.07 to about 0.5 lb/mbf. We have seen the emissions from hemlock wood from the same source vary by a factor of two. Therefore, the results are not surprising.

Appendix 1. Detailed Sampling Procedures

INSTRUCTIONS FOR CHECKS OF EMISSIONS KILN

Purpose: Ensure kiln is operating correctly

Clock time: Record from computer

Run time: Record from computer. Check the box if the computer screen being refreshed and time is advancing.

Box temperature: Read from metal electrical box under desk, left controller. The top and bottom numbers should be similar on the box should be similar, about 126 C..

Valve temperature: Read from metal electrical box under desk, right controller. The top and bottom numbers should be similar on the box should be similar, about 154 C..

Dry-bulb temperature: Read from computer screen. Compare to graph to be sure it's correct. If it's not within a degree or two of the chart, check again in a few minutes. During startup (the first 3 or so hours), it may not be able to track. If it's too high, the heat valve should be closed, too low and the heat valve should be open. If it does not appear to be working correctly, call Mike or Mark.

Wet-bulb temperature: Read from computer screen. Compare to graph to be sure it's correct.

If it is too low, it means that the kiln atmosphere is too dry. Check the flow meters. If Flow1 is about 10 L/min (its lower limit), make sure that Flow2 and Flow3 are turned off

I*f it's too high,* then either the kiln atmosphere is too humid or the sock is not being wetted. If Flow 1 is near 200 L/min (its upper limit) add venting by opening Flow2 and/or Flow 3. The maximum for Flow2 is 50 L/min, if it reads over this value for several readings, reduce it to about 45 L/min. Don't change Flow3 often, rather set it and leave it for several hours if possible. Keep the Flow 3 reading constant by small adjustments. As Flow1 decreases or Flow2 turned down, there is more pressure behind Flow3 and the flow increased. Check for water in the wet-bulb reservoir (push the float down and make sure it's getting water).

Check both Wet-bulb1 and Wet-bulb2 and make sure they are reading about the same. If they differ by more than 2 C, call Mike or Mark.

If both wet-bulbs are reading the same as the dry-bulb, check the wet-bulb water.

If these procedures do not correct the wet-bulb temperature within 30 minutes, call Mike or Mark.

Line temperature: Read from gray box on wall above analyzer. It should read about 275°F.

Chiller temperature: Read the chiller temperature. It should be about -1°C.

Flow 1: Read from computer. The value of Flow1 changes depending on the wet-bulb. If Flow 1 is 10 L/min and the wet-bulb is too low, there's probably nothing we can do. If it's 200 L/min and the wet-bulb is too high, Flow2 and/or Flow3 can be opened. Flow2 and Flow3 should be adjusted so that Flow1 stays below 175 to 200 L/min.

Flow 2: Read from computer. The value of Flow2 is set by you. It will vary a little - as flow 1 goes down, flow 2 will go up. Do not set it to < 40 L/min if you think Flow1 is going to decrease or it will go off scale and not be read by the computer

Flow 3: Read from meter. The value of Flow3 is set by you. It will vary a little - as flow 1 goes down, flow 2 will go up. Be sure to clearly record this value and when you change it

Dilution flow: Read dilution flow meter. It should read the same setting as the red flag. Do not adjust. If significantly different, investigate.

F/M Flow: Read from rotometer. This should be about 400 to 500 cc/min.

Line vacuum: Read from the vacuum gauge. This should be about 20"Hg.

INSTRUCTIONS - FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER PRE-SAMPLE PROCEDURE

BACKGROUND INFORMATION

Get the dry- and wet-bulb temperatures from the kiln schedule or off the computer. Use the highest expected values for the run.

Read absolute humidity off the psychrometric chart or table.
Calculate or read from tables -

Percent moisture = 100 / [1 + 1 / 1.61*AbHum]
Target Dilution Ratio (TDR) = 15 / Percent Moisture

Event = the name of the drying cycle.
Run = the number of the 3-hour interval.
Operator, that's you.
Date and time are now, as you start the data collection process.

AMBIENT DATA

Call 9-754-0081 and get altimeter setting.
Read the laboratory temperature from the thermometer.

ANALYZER CALIBRATION

Set valves so that 1, 2 = off; 3=on; 4=vent. This allows gas to flow out of the vents from the calibration tanks and shuts off all other sources. Only calibration gas should go through the detector.

Open the zero gas tank valve

- zero toggle switch up (on), others down (off)
- set flow to 3.5 L/min using regulator on tank
- wait for a stable reading (about 30 to 60 seconds)
- use the zero dial (pot) on THA to get a zero reading
- read the analyzer
- read computer
- note pot setting
- close valve on zero gas tank

Open span gas tank valve

- span toggle switch up (on), others down (off)
- set flow to 3.5 L/min using regulator on tank
- set analyzer to range 3
- wait for a stable reading (about 30 to 60 seconds)

use the span dial (pot) on THA to get a reading of 905 ppm
read the analyzer, record, for example, 9.05 or 900
read computer (should read about 905)
note pot setting

Open mid gas tank valve
mid toggle switch up (on), others down (off)
set flow to 3.5 L/min using regulator on tank
wait for a stable reading (about 30 to 60 seconds)
read analyzer (do not adjust pot settings), record, for example, 4.12 or 412
read computer (should about 412)
check for within tolerance
turn off mid gas
all toggle switches off

SET DILUTION FLOW BEFORE RUN

Set valves so that 1, 2, 3 = off; 4=meter. This allows gas to flow only from the meter to the detector.

Use the Gilibrator to take 4 readings of the total flow rate (TFR). This is the total flow drawn by the analyzer and should be about 2.6 L/min
Make sure the average does not include any "bad" readings
Record the average, L/min = cc/min / 1000
Write the Event, Run, and "Pre-TFR" on the Gilibrator printout.

Calculate the next two values -
Target dilution flow rate (TDFR) is the TFR x (1 - DR)
Target sample flow rate (TSFR) is the TFR x DR
Check that the sum of these is the Total Flow Rate

Set dilution flow
Set red pointer to desired dilution flow (on meter with valve 1)
Slowly open lower valve on dilution flow meter (1=on; 2, 3=off; 4=meter)
Use upper valve on dilution flow meter to adjust flow
Do not adjust this meter after this point
Read the meter that you just set and record the value

Use the Gilibrator to take 4 readings of the sample flow rate (SFR). This is the flow through the analyzer after dilution is set. It will vary, depending on the dilution setting.
Make sure the average does not include any "bad" readings
Record the average, L/min = cc/min / 1000
Write "Pre-SFR" on the Gilibrator printout.

CHECK DILUTION FLOW BEFORE RUN

Set valves so that 1, 3 = on; 2=off; 4=vent. This allows gas to flow out of the vent from the calibration tank and shuts off all other sources. Calibration gas and dilution air will go through the detector.

Open span gas tank valve
- span toggle switch up (on), others down (off)
- set flow to 3.5 L/min using regulator on tank
- set analyzer to range 3
- wait for a stable reading (about 30 to 60 seconds) record
- turn off all calibration gas tank valves
- all toggle switches off

Calculate the dilution ratio based on gas flow by dividing the Sample Flow Rate by the Total Flow Rate.

Calculate the dilution ratio based on span gas by dividing the Diluted span by the undiluted span.

If the Dilution ratios do not agree within 5% - DO NOT PROCEED****. Use $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$ to calculate the % difference.

**** check calculations, check that values for ppm and flows make sense, remeasure everything. If it still does not agree, call Mike or Mark

START RUN

Set valve so that 1, 2, 5 = on; 3, 4=off; all calibration tank valves off

Record the start time. Use the computer clock for all times or set your watch to the computer time.

Make sure analyzer is on appropriate range, usually range 3, to keep THC reading on computer between 60 and 750.

Monitor system, as needed. Record system condition at least hourly.

End time should be no more than 3 hours from start time.

POST-SAMPLE PROCEDURE

AT END OF RUN

Record your name as the operator.
Event = the drying cycle. Run = the 3-hour interval.
Operator, that's you. Date and time are now, as you start the data collection process.

AMBIENT DATA

Call 9-754-0081 and get temperature and altimeter
Local pressure = (Altimeter - 0.23) x 3.3867
Read the laboratory temperature from the thermometer.

Fill out appropriate information on Pre-sample side of data sheet for next run. This will save time in between runs.

END TIME

Record computer time.
DO NOT adjust dilution gas yet.

CHECK DILUTION FLOW AFTER RUN

Set valves so that 1, 3 = on; 2=off; 4=vent. This allows gas to flow out of the vent from the calibration tank and shuts off all other sources. Calibration gas and dilution air will go through the detector.

Open span gas tank valve
- span toggle switch up (on), others down (off)
- set flow to 3.5 L/min using regulator on tank
- wait for a stable reading (about 30 -60 seconds)
- record
- all toggle switches off

Sample flow rate. Set valves so that 1=on; 2, 3 = off; 4=meter. This allows gas to flow only from the meter and the dilution to the detector.

- Use the Gilibrator to take 5 readings of the sample flow rate (SFR). This is the flow through the analyzer with dilution on.
- Make sure the average does not include any "bad" readings
- Record the average, L/min = cc/min / 1000
- Write "Post-SFR" on the Gilibrator printout.

Read dilution flow meter
To calculate the L/min, divide scfh by 2.12
Turn off dilution flow meter using valve 1

Total flow rate. Set valves so that 1, 2, 3 = off; 4=meter. This allows gas to flow only from the meter to the detector.

Use the Gilibrator to take 5 readings of the total flow rate (TFR). This is the total flow drawn by the analyzer and should be about 2.6 L/min
Make sure the average does not include any "bad" readings
Record the average, L/min = cc/min / 1000
Write "Post-TFR" on the Gilibrator printout.

CHECK CALIBRATION OF ANALYZER

Set valves so that 1, 2 = off; 3=on; 4=vent. This allows gas to flow out of the vents from the calibration tanks and shuts off all other sources. Only calibration gas should go through the detector.

Span gas tank valve should be open
span toggle switch up (on), others down (off)
set flow to 3.5 L/min using regulator on tank
set analyzer to range 4
wait for a stable reading (about 30 -60 seconds)
read analyzer (do not adjust pot settings), record, for example, 1.50 as 1500
read computer (should read about 152 due to range 4 setting)
note pot setting
check for within tolerance - between 1483 and 1573

Open mid gas tank valve
mid toggle switch up (on), others down (off)
set flow to 3.5 L/min using regulator on tank
set analyzer to range 3
wait for a stable reading (about 30 -60 seconds)
read analyzer (do not adjust pot settings), record, for example, 8.50 as 850
read computer (should read same as analyzer)
check for within tolerance

Open the zero gas tank valve
zero toggle switch up (on), others down (off)
set flow to 3.5 L/min using regulator on tank
wait for a stable reading (about 30 -60 seconds)
read analyzer (do not adjust pot settings)
read computer

note pot setting

Calculate the dilution ratio based on gas flow by dividing the Sample Flow Rate by the Total Flow Rate.

Calculate the dilution ratio based on gas flow by dividing the Sample Flow Rate by the Total Flow Rate.

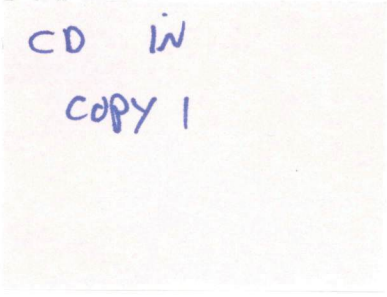
Calculate % difference as 100 * {Absolute Value (DR_{Span}-DR_{Flow})} / DR_{Flow}

Record the time now as the end time for check.

Tear off the four sets of Gilibrator readings (Pre-TFR, Pre-SFR, Post-SFR, Post-TFR) and staple to paper with other records.

Start Pre-Sample procedure for next run.

Appendix 2. Data in Electronic Form



Appendix 3. Field data sheets.

Charge: ~~3~~ 2

Hampton Affiliates

Page: 2

	Date		Time
Start:	3-24-04		11:06
End:			

Clock time	Run since reset time	✓	Run #	Temperatures: Box °C	Valve °C	Dry-bulb °C	✓	Wet-bulb °C	✓	Line °F	Anlz °C	Chiller °C	Flows: 1 L/min	2 L/min	3 SCFH	✓	Dilution SCFM	F/M ml/min	Line Vac. inHg
	hrs		#	°C	°C	°C		°C		°F	°C	°C	L/min	L/min	SCFH		SCFM	ml/min	inHg
11:40	0:02		6	125	144	83		67		274			200	0	0		2		
1:42	2:06		7	124	145	83		66		272			190	0	0		2		
2:58	3:22		8	126	145	82		66		274			200	0	0		2		
5:03	5:27		8	125	145	83		66		273			47	0	0		2		
9:44	10:09		9	125	145	83		66		274			4	0	0		2		
3-26-04 5:56	18:21		11	125	145	83		66		274			37	0	0		2		
7:11	1:06		11	125	145	83		66		274			4	0	0		2		
9:23	0:05		12	125	145	83		63		273			4	0	0		2		
11:16	0:00		12	124	145	83		64		273			200	0	0		2		
12:17	0:00		12	125	145	83		63		273			180	0	0		2		
1:14	0:59		13	125	144	83		66		273			23	0	0		2		
2:01	1:46		13	125	144	83		66		273			29	0	0		2		
3:10	2:55		13	125	145	82		66		273			19	0	0		2		
500	Stopped kiln		Checke			MC		+ Restarted (at					10	A	50)				
10:16	0:07		~~15~~ 14	125	145	82		50		273			~~14~~						

Charge: #2
Hampton Affiliates

Page: 1

	Date		Time
Start:	3-24-04		11:06 AM
End:			

Clock time	Run time	✓	Run	Temperatures													Flows				Line
				Box	Valve	Dry-bulb	✓	Wet-bulb	✓	Line	Anlz	Chiller	1	2	3	✓	Dilution	F/M	Vac.
	hrs		#	°C	°C	°C		°C		°F	°C	°C	L/min	L/min	SCFH		SCFM	ml/min	inHg
11:03	Pre		1	125	144	—		—		273	180		—	—	—		—		
11:09	3min 14sec		1	126	144	25	✓	20	✓	273	181		4	0	0		0		
11:35	0:29	✓	1	124	145	29	✓	25	✓	273	180		200	0	0		0		
1:28	2:22	✓	1	125	145	35		31		273	180		200	0→38	0		0		
2:04	2:58	✓	1	125	145	36		34		273	180		194	38	0		0		
2:47	3:41	✓	2	125	144	39		36		274	180		194	38	0		0		
5:06	6:01	✓	2	125	145	47		43		274	180		194	37	0		0		
9:47	10:41	✓	3	124	144	62		54		274	—		194	36→30	0		0		
10:13	11:04		4	125	145	62		55		274	—		196	29	0		1.3		
3:25 5:18	18:02		4	125	145	78		65		274	—		197	32	0		1.3+		
5:39	18:34		5	125	145	78		65		274	—		126	32→0	0		2.0		
7:42	20:36		5	125	145	80		65		274	—		153	0	0		2.0		
8:43	21:37		6	126	145	81		66		273	—		154	0	0		2.0		
10:06	23:00		6	125	144	82		66		274	—		183	6	0		2		
11:31	24:25		6	125	146	83		66		274			132	0	0		2		
Reset program + saved								First set of data											

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: ~100

Wet-bulb temperature: ~90

Absolute humidity: <0.03

Percent moisture: <4

Target Dilution Ratio (TDR): 0

Event (kiln charge): Hampton #2

Run (sample): 1

Operator: Milota

Date: 3-24-04

Time now: 10:50a

H_2 press = 2250psi

AMBIENT DATA

Altimeter setting: 29.99 inHg

Laboratory temperature: 24 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	—	does not apply	482
span	905 (1527)	—	does not apply	203
mid	413	—	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2.575 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) _____ L/min [TFR x (1 - DR)]

sample flow rate (TSFR) _____ L/min [TFR x DR]

Set and read dilution meter: _____ scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): _____ L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}/Span$]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	—	—	—	—

START TIME: 11:06 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 3 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Mike

Event (kiln charge): Hampton 1 & 2

Time now: 2:06

Run (sample): 1

AMBIENT DATA

Airport pressure: 29.99 inHg

Laboratory temperature: 24 °C

END TIME: 2:06

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$		

Sample flow rate (SFR) : _____ L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: _____ scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): _____ L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): _____ [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	905	905	875 to 935	
mid	412	413	379 to 437	none
zero	0	1	-45 to +45	

Dilution ratio (DR_{Span}): _____ [$Span_{Diluted}$ / Span]

Dilution ratio difference: _____ % [$100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}$]

End time for check: _____

Comments: SPAN EPA Protocol 905 PPM CH_3 in air
Mid Certified 412 ppm
Leak check @ 10:53 18.5 in Hg VAC → 17.9 10:56

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: Lo

Wet-bulb temperature: Lo

Absolute humidity: Lo

Percent moisture: <5%

Target Dilution Ratio (TDR): —

Event (kiln charge): Hampton ~~3~~ 2

Run (sample): 2

Operator: Milota

Date: 3-24-04

Time now : 2:00

AMBIENT DATA

Altimeter setting: 29.99 inHg

Laboratory temperature: 24 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	1	does not apply	482
span	905 (1527)	905	does not apply	203
mid	412	413	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2.582 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) _____ L/min [TFR x (1 - DR)]

sample flow rate (TSFR) _____ L/min [TFR x DR]

Set and read dilution meter: _____ scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): _____ L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}/Span$]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$				

START TIME: 2:10 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 3 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Miles Event (kiln charge): Hampton # 2

Time now: 5:06 p Run (sample): 2

AMBIENT DATA

Airport pressure: 29.99 inHg Laboratory temperature: 24 °C

END TIME: 5:06

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$		

Sample flow rate (SFR) : _____ L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: _____ scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): _____ L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): _____ [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	9023	903	875 to 935	203
mid	413	414	379 to 437	none
zero	0	1	-45 to +45	487

Dilution ratio (DR_{Span}): _____ [$Span_{Diluted}$ / Span]

Dilution ratio difference: _____ % [$100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}$]

End time for check: _____

Comments:

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: M. Data

Event (kiln charge): Hampton 1

Time now: 9:50

Run (sample): #3

AMBIENT DATA

Airport pressure: 29.97 inHg

Laboratory temperature: 25 °C

END TIME: 10:00

CHECK DILUTION FLOW AFTER RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$		

Sample flow rate (SFR) : _____ L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: _____ scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): _____ L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): _____ [SFR / TFR]

CHECK OF ANALYZER CALIBRATION

[1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	902	903	875 to 935	202
mid	412	413	379 to 437	none
zero	0	0.5	-45 to +45	482

Dilution ratio (DR_{Span}): _____ [$Span_{Diluted}$ / Span]

Dilution ratio difference: _____ % [$100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}$]

End time for check: 10:02

Comments: Analyzer internal T is spastic, but analyzer is stable

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 40-50C

Wet-bulb temperature: 35- 40 C

Absolute humidity: 70-

Percent moisture: 10-15

Target Dilution Ratio (TDR): ←

Event (kiln charge): Hampton 1

Run (sample): 3

Operator: Milota

Date: 3-24-07

Time now : 5:05

AMBIENT DATA

Altimeter setting: 29.99 inHg

Laboratory temperature: 24 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	0 1	does not apply	482
span	903 (1527)	903	does not apply	203
mid	0 413	414	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2,600 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR): _____ L/min [TFR x (1 - DR)]

sample flow rate (TSFR): _____ L/min [TFR x DR]

Set and read dilution meter: _____ scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): _____ L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}/Span$]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$				

START TIME: 5:10 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 3 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 60 - 70 °C

Wet-bulb temperature: 53 - 60 °C

Absolute humidity: ~ 0.1

Percent moisture: ~15

Target Dilution Ratio (TDR): 0.8

Event (kiln charge): Hampton # 2

Run (sample): 4

Operator: Milota

Date: 3-24-04

Time now : 9:45

AMBIENT DATA

Altimeter setting: 29.97 inHg

Laboratory temperature: 25 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	1	does not apply	482
span	905 (1527)	906	does not apply	204
mid	413	413	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2.605 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) 0.47 L/min [TFR x (1 - DR)]

sample flow rate (TSFR) 2.13 L/min [TFR x DR]

Set and read dilution meter: 1.3 ~~0996~~ scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): 1.945 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer 677 ppm	DR_{Span} [$Span_{Diluted}/Span$]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	~~0748~~	0.748	0.747	0.13

START TIME: 10:10 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 3 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: M. Lota

Event (kiln charge): Hampton #2

Time now: 5:19a

Run (sample): 4

AMBIENT DATA

Airport pressure: 29.75 inHg

Laboratory temperature: 26 °C

END TIME: 5:19

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	666	666

Sample flow rate (SFR) : 1.965 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 1.33 scfh 0.628 L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2.598 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0.756 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	891	892	875 to 935	204
mid	407	407	379 to 437	none
zero	0	1.5	-45 to +45	482

Dilution ratio (DR_{Span}): 0.747 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 1.2 % [$100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}$]

End time for check: 5:26a

Comments:

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 77

Wet-bulb temperature: 66

Absolute humidity: 0.2

Percent moisture: 27

Target Dilution Ratio (TDR): 0.63

Event (kiln charge): Hampton ~~4~~ 2

Run (sample): 5

Operator: Milota

Date: 3-25-04

Time now : 5:27

AMBIENT DATA

Altimeter setting: 29.75 inHg

Laboratory temperature: 26 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	1	does not apply	480
span	905 (1527)	905	does not apply	212
mid	412	412	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2.606 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) 1.641 L/min [TFR x (1 - DR)]

sample flow rate (TSFR) 0.964 L/min [TFR x DR]

Set and read dilution meter: 2.~~0~~ scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): 1.611 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}/Span$]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	559	0.617	0.618	0.16%

START TIME: 5:33 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 3 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Milota

Event (kiln charge): Hampton # 2

Time now: 8:33a 3-25-04

Run (sample): 5

AMBIENT DATA

Airport pressure: 29.70 inHg

Laboratory temperature: 25 °C

END TIME: 8:33

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	555	556

Sample flow rate (SFR) : 1.607 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 2 scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2.583 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0.622 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	902	903	875 to 935	210
mid	412	413	379 to 437	none
zero	0	2	-45 to +45	480

Dilution ratio (DR_{Span}): 0615 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 1.12 % [$100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}$]

End time for check: 8:37

Comments:

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 82
Wet-bulb temperature: 66
Absolute humidity: 0.2
Percent moisture: 26
Target Dilution Ratio (TDR): 0.6

Event (kiln charge): Hampton ~~1~~ 2
Run (sample): 6
Operator: Milota
Date: ~~3~~-25-04
Time now : 8:33

AMBIENT DATA

Altimeter setting: 29.70 inHg
Laboratory temperature: 25 °C

Hydrogen 2020 PSI

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	0	does not apply	480
span	905 (1527)	905	does not apply	212
mid	413	412	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2.589 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) _____ L/min [TFR x (1 - DR)]
sample flow rate (TSFR) ~~2~~ L/min [TFR x DR]

Set and read dilution meter: 2 scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): 1.606 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}/Span$]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	560	0.619	0.620	0.16%

START TIME: 842 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 3 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Milota

Event (kiln charge): Hampton #2

Time now: 11:38

Run (sample): 2 6

AMBIENT DATA

Airport pressure: 29.64 inHg

Laboratory temperature: 24 °C

8:42A **END TIME:** 11:40

CHECK DILUTION FLOW AFTER RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	558	559

Sample flow rate (SFR) : 1.608 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 2 scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2.586 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0.622 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION

[1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	901	902	875 to 935	212
mid	412	411	379 to 437	none
zero	0	1.5	-45 to +45	480

Dilution ratio (DR_{Span}): 0.618 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 0.55 % [$100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}$]

End time for check: 11:44

Comments:

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 82

Wet-bulb temperature: 66

Absolute humidity: _____

Percent moisture: _____

Target Dilution Ratio (TDR): 0.6

Event (kiln charge): Hampton ~~1~~ 2

Run (sample): 7

Operator: Milota

Date: 3-25-04

Time now : 11:38

AMBIENT DATA

H_2 at 2000 psi

Altimeter setting: 29.64 inHg

Laboratory temperature: 24 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	1.5	does not apply	480
span	905 (1527)	906	does not apply	215
mid	414	45	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2.587 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) _____ L/min [TFR x (1 - DR)]

sample flow rate (TSFR) _____ L/min [TFR x DR]

Set and read dilution meter: 2 scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): 1.612 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}/Span$]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	561	0.612	0.623	~~0.524~~ 1.8%

START TIME: 11:48 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 3 → 2 @ 11:52 **[60 < computer reading < 750]**

Vent or Meter open until 11:54

BAD DATA 11:48 → 11:54

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: M. Iota

Event (kiln charge): Hampton 1

Time now: 2:48

Run (sample): 7

AMBIENT DATA

Airport pressure: 29.70 inHg

Laboratory temperature: 24 °C

END TIME: 2:48

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	557	557

Sample flow rate (SFR) : 1,589 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 2 scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2,573 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0.618 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	905	905	875 to 935	215
mid	415	416	379 to 437	none
zero	0	0	-45 to +45	480

Dilution ratio (DR_{Span}): 0.616 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 0.32 % [$100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}$]

End time for check: 2:51

Comments:

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 82

Wet-bulb temperature: 66

Absolute humidity: _____

Percent moisture: _____

Target Dilution Ratio (TDR): 0.6

Event (kiln charge): Hampton ~~1~~ 2

Run (sample): 8

Operator: Milota

Date: 3-25-04

Time now : 2:38

AMBIENT DATA

Altimeter setting: 29.70 inHg

Laboratory temperature: 24 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	0	does not apply	486
span	905 (1527)	905	does not apply	215
mid	415	416	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2.573 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) _____ L/min [TFR x (1 - DR)]

sample flow rate (TSFR) _____ L/min [TFR x DR]

Set and read dilution meter: 2 scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): 1.593 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}/Span$]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	561	0.612	0.619	1.1 %

START TIME: 2:54 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 2 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Milota

Event (kiln charge): Hampton # 2

Time now: 5:03 p

Run (sample): 8

AMBIENT DATA

Airport pressure: 29.76 inHg

Laboratory temperature: 24 °C

END TIME: 5:04

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	560	560

Sample flow rate (SFR) : 1,589 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 2 scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2,572 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0.618 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	906	907	875 to 935	215
mid	414	416	379 to 437	none
zero	0	1	-45 to +45	480

Dilution ratio (DR_{Span}): 0.618 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 0 % [100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}]

End time for check: 5:08

Comments:

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Milota

Event (kiln charge): Hampton #2

Time now: 9:43

Run (sample): 9

AMBIENT DATA

Airport pressure: 29.82 inHg

Laboratory temperature: 23 °C

END TIME: 9:46 pm

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	562	562

Sample flow rate (SFR) : 1,602 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 2 scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2,580 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0,621 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	909	909	875 to 935	214
mid	418	418	379 to 437	none
zero	0	0	-45 to +45	480

Dilution ratio (DR_{Span}): 0618 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 0,64% [100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}]

End time for check: 9:50

Comments:

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 82

Wet-bulb temperature: 66

Absolute humidity: 4

Percent moisture: _____

Target Dilution Ratio (TDR): 0.6

Event (kiln charge): Hampton 4 2

Run (sample): 9

Operator: Milota

Date: 3-25

Time now : 5:03

AMBIENT DATA

Altimeter setting: 29.76 inHg

Laboratory temperature: 23 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	1	does not apply	480
span	905 (1527)	906	does not apply	214
mid	415	414	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2.578 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) _____ L/min [TFR x (1 - DR)]

sample flow rate (TSFR) _____ L/min [TFR x DR]

Set and read dilution meter: 2 scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): 1.578 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}$/Span]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	559	0.618	0.612	0.9

START TIME: 5:13 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 2 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 82

Wet-bulb temperature: 66

Absolute humidity: _____

Percent moisture: _____

Target Dilution Ratio (TDR): 0.6

Event (kiln charge): Hampton 1 2

Run (sample): 10

Operator: Milota

Date: 3-25-04

Time now : 9:43

AMBIENT DATA

Altimeter setting: 29.82 inHg

Laboratory temperature: 23 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	0	does not apply	480
span	905 (1527)	905	does not apply	211
mid	43	414	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2.575 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) _____ L/min [TFR x (1 - DR)]

sample flow rate (TSFR) _____ L/min [TFR x DR]

Set and read dilution meter: 2 scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): 1.594 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}$/Span]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	553	0.611	0.619	1.13

START TIME: 9:54 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 2 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Mi|oTG

Event (kiln charge): Hampton 1 2

Time now: 5:39a 3-26-04

Run (sample): 10

AMBIENT DATA

Airport pressure: ~~5.89~~ 29.93 inHg

Laboratory temperature: 23 °C

END TIME: 5:39

CHECK DILUTION FLOW AFTER RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	556	557

Sample flow rate (SFR) : 1,586 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 2 scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2,579 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0.615 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION

[1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	907	908	875 to 935	211
mid	415	416	379 to 437	none
zero	0	1	-45 to +45	480

Dilution ratio (DR_{Span}): 0.614 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 0.16 % [$100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}$]

End time for check: 5:48

Comments:

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 82

Wet-bulb temperature: 66

Absolute humidity: 5

Percent moisture: 5

Target Dilution Ratio (TDR): 0.6

Event (kiln charge): Hampton 1

Run (sample): 12

Operator: Milota

Date: 3-26-04

Time now : 5:40

AMBIENT DATA

Altimeter setting: 29.93 inHg

Laboratory temperature: 23 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	1	does not apply	480
span	905 (1527)	906	does not apply	408
mid	414	416	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2.571 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR): 1 L/min [TFR x (1 - DR)]

sample flow rate (TSFR): 2 L/min [TFR x DR]

Set and read dilution meter: 2 scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): 1.58 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}/Span$]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	555	0.613	0.616	0.5

START TIME: 5:53 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 2 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Mike TG

Event (kiln charge): Hampton 1

Time now: 9:02

Run (sample): ~~2~~ 11

AMBIENT DATA

Airport pressure: 29.96 inHg

Laboratory temperature: 22 °C

END TIME: 9:02

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	556	557

Sample flow rate (SFR) : 1,573 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 2 scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2,562 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0.614 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	904	904	875 to 935	208
mid	414	416	379 to 437	none
zero	0	0.5	-45 to +45	480

Dilution ratio (DR_{Span}): 0.615 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 0.16 % [$100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}$]

End time for check: 9:05

Comments:

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 82

Wet-bulb temperature: 66

Absolute humidity: _____

Percent moisture: _____

Target Dilution Ratio (TDR): 0.6

Event (kiln charge): Hampton 1 & 2

Run (sample): 12

Operator: Milota

Date: 3-26-04

Time now : 9:06

AMBIENT DATA

Altimeter setting: 29.96 inHg

Laboratory temperature: 22 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	0.5	does not apply	480
span	905 (1527)	906	does not apply	206
mid	414	414	379 to 437	none

4 = 1650 PSI

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2.561 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) _____ L/min [TFR x (1 - DR)]

sample flow rate (TSFR) _____ L/min [TFR x DR]

Set and read dilution meter: 2 scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): 1.586 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}/Span$]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	555		0.613	

START TIME: 9:12 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 2 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Milora

Event (kiln charge): Hampton #2

Time now: 12

Run (sample): 12

AMBIENT DATA

Airport pressure: 29.93 inHg

Laboratory temperature: 21 °C

END TIME: 12:18

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	552	553

Sample flow rate (SFR) : 1.576 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 2 scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2.560 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0.615 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	903	906	875 to 935	206
mid	413	413	379 to 437	none
zero	0	0	-45 to +45	480

Dilution ratio (DR_{Span}): 0.611 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 0.65 % [$100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}$]

End time for check: 12:25

Comments:

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 82

Wet-bulb temperature: 66

Absolute humidity: _____

Percent moisture: _____

Target Dilution Ratio (TDR): 0.6

Event (kiln charge): Hampton 1 & 2

Run (sample): 13

Operator: Milota

Date: 3-26-04

Time now : 12:25

AMBIENT DATA

Altimeter setting: 29.93 inHg

Laboratory temperature: 21 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	0	does not apply	480
span	905 (1527)	~~894~~ 905	does not apply	207
mid	414	414	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2,551 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) _____ L/min [TFR x (1 - DR)]

sample flow rate (TSFR) _____ L/min [TFR x DR]

Set and read dilution meter: 2 scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): 1,590 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}/Span$]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	561	0620	0.623	0.48

START TIME: 12:30 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 2 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Milora

Event (kiln charge): Hampton #2

Time now: 5:00

Run (sample): 13

AMBIENT DATA

Airport pressure: 29.98 inHg

Laboratory temperature: 21 °C

END TIME: 5:00

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	552	555

Sample flow rate (SFR) : 1,584 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: _____ scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2,558 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0.619 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	900	901	875 to 935	
mid	411	412	379 to 437	none
zero	0	1	-45 to +45	

Dilution ratio (DR_{Span}): 0.613 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 0.98 % [$100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}$]

End time for check: 5:05

Comments:

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 82

Wet-bulb temperature: 61

Absolute humidity: _____

Percent moisture: _____

Target Dilution Ratio (TDR): 0.6

Event (kiln charge): Hampton 1 & 2

Run (sample): 14

Operator: Milota

Date: 3-26-04

Time now : 5:00

AMBIENT DATA

Altimeter setting: 29.98 inHg

Laboratory temperature: 21 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	1	does not apply	480
span	905 (1527)	905	does not apply	212
mid	414	415	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2.551 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) _____ L/min [TFR x (1 - DR)]

sample flow rate (TSFR) _____ L/min [TFR x DR]

Set and read dilution meter: 2 scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): 1.561 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}$/Span]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	552	0.611	0.612	0.16

START TIME: 5:09 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 2 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Milora

Event (kiln charge): Hampton #2

Time now: 9:47p

Run (sample): 14

AMBIENT DATA

Airport pressure: 29.90 inHg

Laboratory temperature: 21 °C

END TIME: 10:00 → weighed boards & restarted

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	551	552

Sample flow rate (SFR): 1.569 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 2 scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2.564 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0.612 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	905	906	875 to 935	212
mid	414	414	379 to 437	none
zero	0	1	-45 to +45	480

Dilution ratio (DR_{Span}): 0.609 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 0.5 % [$100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}$]

End time for check: 10:12

Comments:

Charge:	3
Hampton Affiliates	
Page:	1

	Date		Time
Start:	3-29-04		9:15a
End:			

Clock time	Run time	✓	Run	Temperatures									Flows						Lir
				Box	Valve	Dry-bulb	✓	Wet-bulb	✓	Line	Analzr	Chiller	Flow 1	Flow 2	Flow 3	✓	Dilution	F/M	Va
	hrs		#	°C	°C	°C		°C		°F	°C	°C	L/min	L/min	SCFH		SCFM	mL/min	inH
9:13	Pre		—	126	145	—		—		273	—	—	0	0	0		—	—	
9:30	0:15	✓	1	125	145	52		36		273	—	—	5	0	0		—		
10:44	1:29	✓	1	125	145	71		61		273	—	—	200	0	0				
10:46	1:34	✓	1	125	145	71		61		273	—	—	167	27	100		—	—	
11:33	2:18	✓	1	125	145	75		62		273	—	—	166	26	100		2.6		
11:34	2:19		2	125	145	73		63		273	—	—	149	43	120		2.7		
1:40	4:25	✓	2	125	145	77		63		273			150	41	120		2.7		
2:36	5:21	✓	2	125	145	81		64		273			151	40	120		2.7		
4:21	7:04		3	125	145	83		66		273			25	50	160		2.7		
4:22	7:05		3	125	145	84		67		273			25	41	56		2.7		
5:16	8:01		3	125	145	85		69		273			85	39	40		2.7		
5:17	8:02		3	125	145	86		70		273			86	40	0		2.7		
9:44	12:30		4	125	145	95		80		273			35	41	0		2.7		
5:18A	20:05		5	125	145	101		74		273			80	0	0		3.9		
5:40	20:22		6	125	145	101		74		273	—	—	87	0	0		3.2		
7:36	22:02		6	125	145	101		72		273	—	—	86	0	6		3.2		
8:52	23:36		7	125	145	102		71		273			81	0	0		3		

0 ↑ 100 ↓ 100 ↕ 120 ↓ 160 ↑ 50 ↓ 40 ↑ 0 ↓

3-30-04

AT 6:00 run time Flow 1 began to decrease

Charge:	3
Hampton Affiliates	
Page:	2

	Date		Time
Start:	3-29-04		
End:			

Clock time	Run time	✓	Run	Temperatures									Flows						Lir
				Box	Valve	Dry-bulb	✓	Wet-bulb	✓	Line	Analzr	Chiller	Flow 1	Flow 2	Flow 3	✓	Dilution	F/M	Va
	hrs		#	°C	°C	°C		°C		°F	°C	°C	L/min	L/min	SCFH		SCFM	mL/min	inl
10:36	25:18		7	125	144	103		70		273			67	0	0		3,0		
1 39	2823		8	125	145	103		69		273			62	0	0		2,8		
5 25	31:52		9	125	145	102		68		273			54	0	0		2,7		
9:44	36:29		10	124	145	102		67		273			49	0	0		27		

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 155-160

Wet-bulb temperature: 120-150

Absolute humidity: _____

Percent moisture: 11-12%

Target Dilution Ratio (TDR): ~~11-12~~ 1

Event (kiln charge): Hampton 3

Run (sample): 1

Operator: Milota

Date: 3-29-04

Time now : 9:08

AMBIENT DATA

Altimeter setting: 29.86 inHg

Laboratory temperature: 23 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	—	does not apply	482
span	905 (1527)	—	does not apply	211
mid	415	—	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): _____ L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) _____ L/min [TFR x (1 - DR)]

sample flow rate (TSFR) _____ L/min [TFR x DR]

Set and read dilution meter: _____ scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): _____ L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}/Span$]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$				

START TIME: 9:15 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 2 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Milota Event (kiln charge): Hampton 3

Time now: ~~9:08~~ 11:37 Run (sample): 1

AMBIENT DATA

Airport pressure: 29.85 inHg Laboratory temperature: 23 °C

END TIME: 11:38

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$		

Sample flow rate (SFR) : _____ L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: _____ scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): _____ L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): _____ [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	905	906	875 to 935	21'
mid	414	413	379 to 437	none
zero	0	1	-45 to +45	482

Dilution ratio (DR_{Span}): _____ [$Span_{Diluted}$ / Span]

Dilution ratio difference: _____ % [$100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}$]

End time for check: _____

Comments: 3-29-04 8:54 Leak Check 19.2" H_g → 18.6" Hg @ 9:02

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 70+

Wet-bulb temperature: 60+

Absolute humidity: _____

Percent moisture: _____

Target Dilution Ratio (TDR): 0,65

Event (kiln charge): Hampton 3

Run (sample): 2

Operator: Milota

Date: 3-29-04

Time now : 11:38

AMBIENT DATA

Altimeter setting: 29,85 inHg

Laboratory temperature: _____ °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	1	does not apply	482
span	905 (1527)	906	does not apply	211
mid	414	413	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2,582 L/min [1, 2, 3 = off; 4=meter]

Target

dilution flow rate (TDFR) 1,291 L/min [TFR x (1 - DR)]

sample flow rate (TSFR) 1,291 L/min [TFR x DR]

Set and read dilution meter: 2,7 scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): 1,316 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}$/Span]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	462	0,511	0510	0,2

START TIME: 11:43 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 2 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Milota Event (kiln charge): Hampton 3

Time now: 2,35 Run (sample): 2

AMBIENT DATA

Airport pressure: 29,80 inHg Laboratory temperature: 30 °C

END TIME: 2:37 p

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	452	453

Sample flow rate (SFR) : 1,324 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 1,7+ scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2,612 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0,507 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	901	901	875 to 935	
mid	413	412	379 to 437	none
zero	0	0	-45 to +45	

Dilution ratio (DR_{Span}): 0,502 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 1% % [100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}]

End time for check: 2:43

Comments:

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 82 →
Wet-bulb temperature: 64 →
Absolute humidity: _____
Percent moisture: _____
Target Dilution Ratio (TDR): 0.5

Event (kiln charge): Hampton 3
Run (sample): 3
Operator: Milota
Date: 3-29-04
Time now : 2:38

AMBIENT DATA

Altimeter setting: 29.61 inHg
Laboratory temperature: 30 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	0	does not apply	482
span	905 (1527)	904	does not apply	213
mid	413	414	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2.628 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) _____ L/min [TFR x (1 - DR)]
sample flow rate (TSFR) _____ L/min [TFR x DR]

Set and read dilution meter: 2.7 scfh [scfh = L/min * 2.12]
Sample flow rate (SFR): 1.324 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}$/Span]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	454	0.502	0.504	0.4

START TIME: 2:47 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 2 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Milota

Event (kiln charge): Hampton 3

Time now: 5:16

Run (sample): 3

AMBIENT DATA

Airport pressure: 29.93 inHg

Laboratory temperature: 26 °C

END TIME: 5:18

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	4.61	4.60

Sample flow rate (SFR) : 1.336 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 2.7 scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2.619 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0.510 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	906	907	875 to 935	213
mid	445	446	379 to 437	none
zero	0	1	-45 to +45	482

Dilution ratio (DR_{Span}): 0.501 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 0.2 % [$100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}$]

End time for check: 5:22

Comments:

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Milota Event (kiln charge): Hampton 3

Time now: _____ Run (sample): 11

AMBIENT DATA

Airport pressure: 3020 inHg Laboratory temperature: 21 °C

END TIME: 6:55a

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	491	—

Sample flow rate (SFR): 1,408 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 27 scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2.678 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0.546 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	905	—	875 to 935	208
mid	414	—	379 to 437	none
zero	0	—	-45 to +45	482

Dilution ratio (DR_{Span}): 0.543 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 0.5 % [100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}]

End time for check: 7:03

Comments:

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: _____

Wet-bulb temperature: _____

Absolute humidity: _____

Percent moisture: _____

Target Dilution Ratio (TDR): 0.55

Event (kiln charge): Hampton 3

Run (sample): 11

Operator: Milota

Date: 3-30-04

Time now : 9:50

AMBIENT DATA

Altimeter setting: 30.22 inHg

Laboratory temperature: 22 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	1	does not apply	
span	905 (1527)	906	does not apply	
mid	414	416	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2.594 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) 1.19 L/min [TFR x (1 - DR)]

sample flow rate (TSFR) 1.4 L/min [TFR x DR]

Set and read dilution meter: 2.53 scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): 1.390 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}/Span$]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	490	0.541	0.536	1.03

START TIME: 10:22 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 2 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Milota

Event (kiln charge): Hampton 3

Time now: 9:40

Run (sample): 10

AMBIENT DATA

Airport pressure: 30.22 inHg

Laboratory temperature: 22 °C

END TIME: 9:45

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	446	445

Sample flow rate (SFR): 1,289 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 375 scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): ~~3~~ 2,585 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0499 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	905	905	875 to 935	208
mid	415	446	379 to 437	none
zero	0	1	-45 to +45	482

Dilution ratio (DR_{Span}): 0,493 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 1,2 % [$100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}$]

End time for check: 10:16 p

Comments:

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: _____

Wet-bulb temperature: 68↓

Absolute humidity: _____

Percent moisture: _____

Target Dilution Ratio (TDR): 0.5

Event (kiln charge): Hampton 3

Run (sample): 10

Operator: Milota

Date: 3-30-04

Time now: 5:00

AMBIENT DATA

Altimeter setting: 30.~~18~~ inHg

Laboratory temperature: 22 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	1	does not apply	482
span	905 (1527)	906	does not apply	208
mid	415	414	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2.573 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) _____ L/min [TFR x (1 - DR)]

sample flow rate (TSFR) _____ L/min [TFR x DR]

Set and read dilution meter: 2.7 scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): 1.269 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}$/Span]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	448	0.495	0.493	0.~~3~~%

START TIME: 514 P **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 2 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Milota

Event (kiln charge): Hampton 3

Time now: _____

Run (sample): ~~8~~ 9

AMBIENT DATA

Airport pressure: 30.18 inHg

Laboratory temperature: 22 °C

END TIME: _____

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	446	446

Sample flow rate (SFR) : 1.267 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 2.7 scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2.567 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0.494 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	~~12~~ 904	903	875 to 935	
mid	413	413	379 to 437	none
zero	0	1	-45 to +45	

Dilution ratio (DR_{Span}): 0.493 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 0.04 % [$100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}$]

End time for check: 5:12

Comments:

_____

_____

_____

_____

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: _____

Wet-bulb temperature: _____

Absolute humidity: _____

Percent moisture: _____

Target Dilution Ratio (TDR): _____

Event (kiln charge): Hampton 3

Run (sample): 8 9

Operator: Milota

Date: _____

Time now : _____

AMBIENT DATA

Altimeter setting: 30.13 inHg

Laboratory temperature: 23 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	0	does not apply	482
span	905 (1527)	906	does not apply	206
mid	412	413	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2.578 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) _____ L/min [TFR x (1 - DR)]

sample flow rate (TSFR) _____ L/min [TFR x DR]

Set and read dilution meter: 2.7 scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): 1.291 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}$/Span]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	452	0.499	0.501	

START TIME: 3pm **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 2 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Milota Event (kiln charge): Hampton 3

Time now: _____ Run (sample): 8

AMBIENT DATA

Airport pressure: _____ inHg Laboratory temperature: _____ °C

END TIME: _____

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	435	436

Sample flow rate (SFR) : 1245 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 2.8 scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2,571 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0.48 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	903	904	875 to 935	205
mid	413	414	379 to 437	none
zero	0	1	-45 to +45	481

Dilution ratio (DR_{Span}): 0.48 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 0 % [$100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}$]

End time for check: 2:57

Comments:

_____

_____

_____

_____

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 102

Wet-bulb temperature: 70

Absolute humidity: _____

Percent moisture: _____

Target Dilution Ratio (TDR): 0.5

Event (kiln charge): Hampton 3

Run (sample): 8

Operator: Milota

Date: 3-30-04

Time now : 11:45

AMBIENT DATA

Altimeter setting: 30.13 inHg

Laboratory temperature: 23 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	0.5	does not apply	281
span	905 (1527)	906	does not apply	205
mid	415	415	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2,565 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) 1,283 L/min [TFR x (1 - DR)]

sample flow rate (TSFR) 1,283 L/min [TFR x DR]

Set and read dilution meter: 2.7 scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): 1,255 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}$/Span]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	443	049	0.49	0

START TIME: 12:10 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 2 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Milota

Event (kiln charge): Hampton 3

Time now: 11:48

Run (sample): 7

AMBIENT DATA

Airport pressure: 3013 inHg

Laboratory temperature: 23 °C

12:05

END TIME: 11:48

CHECK DILUTION FLOW AFTER RUN 396 [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	~~400~~	~~401~~ 399

Sample flow rate (SFR): 1,135 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 3 scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2,563 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0,443 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	911	911	875 to 935	210
mid	417	417	379 to 437	none
zero	0	0,5	-45 to +45	282

Dilution ratio (DR_{Span}): 0,435 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 1,8 % [100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}]

End time for check: 12:05

Comments: Maybe some unreliable data in this run Computer did not agree with analyzer & initially during post check

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 105

Wet-bulb temperature: 72 ↓

Absolute humidity: 0.31

Percent moisture: 33

Target Dilution Ratio (TDR): 0.45

Event (kiln charge): Hampton 3

Run (sample): 7

Operator: Milota

Date: 8:30

Time now: 3-30-04

AMBIENT DATA

Altimeter setting: 30.04 inHg

Laboratory temperature: 23 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	1	does not apply	482
span	905 (1527)	906	does not apply	210
mid	415	416	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2,570 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) 1,413 L/min [TFR x (1 - DR)]

sample flow rate (TSFR) 1,156 L/min [TFR x DR]

Set and read dilution meter: 3 scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): 1,131 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}/Span$]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	400	0.44	0.44	0

START TIME: 8:47 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 2 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Milota Event (kiln charge): Hampton 3

Time now: 8:30 Run (sample): 6

AMBIENT DATA

Airport pressure: 30.08 inHg Laboratory temperature: 23 °C

END TIME: 8:40

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	~~343~~ 342	343

Sample flow rate (SFR): 0.975 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 3.3 scfh 1.558 L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2.571 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0.379 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	903	904	875 to 935	210
mid	413	414	379 to 437	none
zero	0	1	-45 to +45	482

Dilution ratio (DR_{Span}): 0.379 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 0 % [100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}]

End time for check: 8:44

Comments:

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 100 - 105

Wet-bulb temperature: 74 ↓

Absolute humidity: 0.37

Percent moisture: 37

Target Dilution Ratio (TDR): 0.4

Event (kiln charge): Hampton 3

Run (sample): 6

Operator: Milota

Date: 3-30-04

Time now : 5:19a

AMBIENT DATA

Altimeter setting: 30.01 inHg

Laboratory temperature: 25 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	1	does not apply	~~0~~ 82
span	905 (1527)	901	does not apply	210
mid	414	413	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2,589 L/min [1, 2, 3 = off; 4=meter]

Target dilution flow rate (TDFR): ~~1.0~~ L/min 1.51 [TFR x (1 - DR)]

sample flow rate (TSFR): _____ L/min [TFR x DR]

Set and read dilution meter: ~~2.2~~ scfh 3.2 [scfh = L/min * 2.12]

Sample flow rate (SFR): ~~1.504~~ L/min 1.005 [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}$/Span]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	352	0.389	0.388	0.2

START TIME: 5:34A **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 2 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Milota

Event (kiln charge): Hampton 3

Time now: 5:18 9

Run (sample): ~~4~~ 5

AMBIENT DATA

Airport pressure: 30.01 inHg

Laboratory temperature: 25 °C

END TIME: 5:21a 3-30-04

CHECK DILUTION FLOW AFTER RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	239	238

Sample flow rate (SFR) : 707 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 39 scfh 1.84 L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2,588 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0.273 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION

[1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	904	904	875 to 935	208
mid	413	412	379 to 437	none
zero	0	1	-45 to +45	482

Dilution ratio (DR_{Span}): 0.264 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 34 % [$100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}$]

End time for check: 5:27

Comments:

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 206-210 F
Wet-bulb temperature: 80 c
Absolute humidity: 0.65
Percent moisture: 46
Target Dilution Ratio (TDR): 0.32

Event (kiln charge): Hampton 3
Run (sample): 5
Operator: Milota
Date: 3-29-04
Time now: 9:45

AMBIENT DATA

Altimeter setting: 29.96 inHg
Laboratory temperature: _____ °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	1	does not apply	482
span	905 (1527)	906	does not apply	208
mid	415	416	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2.620 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) 1.78 L/min [TFR x (1 - DR)]
sample flow rate (TSFR) 0.838 L/min [TFR x DR]

Set and read dilution meter: 3.8 scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): 7423 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}/Span$]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	258	0.285	0.283	

START TIME: 9:58 PM **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 2 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Milota

Event (kiln charge): Hampton 3

Time now: 9:46 P

Run (sample): 4

AMBIENT DATA

Airport pressure: 29.96 inHg

Laboratory temperature: 27 °C

END TIME: 9:48

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	338	342

Sample flow rate (SFR): 0.980 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 3.9 scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2.614 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): 0.375 [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	912	912	875 to 935	212
mid	416	415	379 to 437	none
zero	0		-45 to +45	482

Dilution ratio (DR_{Span}): 0.371 [$Span_{Diluted}$ / Span]

Dilution ratio difference: 1.1 % [$100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}$]

End time for check: 9:55 P

Comments:

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 87→

Wet-bulb temperature: 70→

Absolute humidity: _____

Percent moisture: _____

Target Dilution Ratio (TDR): 0.4

Event (kiln charge): Hampton 3

Run (sample): 4

Operator: Milota

Date: 3-29

Time now : 5:15p

AMBIENT DATA

Altimeter setting: 29.93 inHg

Laboratory temperature: 26 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	1	does not apply	482
span	905 (1527)	906	does not apply	212
mid	415	415	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2.617 L/min [1, 2, 3 = off; 4=meter]

Target dilution flow rate (TDFR) 1.5702 L/min [TFR x (1 - DR)]

sample flow rate (TSFR) _____ L/min [TFR x DR]

Set and read dilution meter: 3.3 scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): 1.016 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}/Span$]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	348	0.385	0.388	0.8

START TIME: 5:25 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 2 **[60 < computer reading < 750]**

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - POST

Operator: Milora Event (kiln charge): Hampton #2

Time now: 10:10 Run (sample): _____

AMBIENT DATA

Airport pressure: 29.1 inHg Laboratory temperature: _____ °C

END TIME: 2 7AM

CHECK DILUTION FLOW AFTER RUN [1, 3=on; 2=off; 4=vent]

	Analyzer	Computer
$Span_{Diluted}$	557	—

Sample flow rate (SFR): 1,582 L/min [1= on, 2, 3 = off, 4=meter]

Read dilution meter: 2 scfh _____ L/min [L/min = scfh*0.472]

Total flow rate (TFR): 2,575 L/min [1, 2, 3 = off; 4=meter]
(attach print out with all four sets of data)

Dilution ratio (DR_{Flow}): _____ [SFR / TFR]

CHECK OF ANALYZER CALIBRATION [1, 2=off; 3=on, 4=vent]

	Analyzer	Computer	Within range	Pot settings
span	920		875 to 935	
mid	423		379 to 437	none
zero			-45 to +45	

Dilution ratio (DR_{Span}): _____ [$Span_{Diluted}$ / Span]

Dilution ratio difference: _____ % [$100*(Abs(DR_{Span} - DR_{Flow}))/DR_{Flow}$]

End time for check: _____

Comments:

_____

_____

_____

_____

FIELD DATA SHEET FOR TOTAL HYDROCARBON ANALYZER - PRE

BACKGROUND INFORMATION

Dry-bulb temperature: 82

Wet-bulb temperature: 66

Absolute humidity: _____

Percent moisture: _____

Target Dilution Ratio (TDR): 0.6

Event (kiln charge): Hampton ~~1~~ 2

Run (sample): 15

Operator: Milota

Date: 3-26-04

Time now : 10:16

AMBIENT DATA

Altimeter setting: 29.90 inHg

Laboratory temperature: 21 °C

ANALYZER CALIBRATION

[1, 2 = off; 3=on; 4=vent]

	Analyzer, ppm	Computer	Within range	Pot settings
zero	0 (0)	0	does not apply	480
span	905 (1527)	906	does not apply	212
mid	414	415	379 to 437	none

SET DILUTION FLOW BEFORE RUN

Total flow rate (TFR): 2.565 L/min [1, 2, 3 = off; 4=meter]

Target
dilution flow rate (TDFR) _____ L/min [TFR x (1 - DR)]

sample flow rate (TSFR) _____ L/min [TFR x DR]

Set and read dilution meter: 2 scfh [scfh = L/min * 2.12]

Sample flow rate (SFR): 1.570 L/min [1 = on; 2, 3 = off; 4=meter]

CHECK DILUTION FLOW BEFORE RUN

[1, 3=on; 2=off; 4=vent]

	Analyzer	DR_{Span} [$Span_{Diluted}$/Span]	DR_{Flow} [SFR / TFR]	Difference, % $100*(DR_{Span} - DR_{Flow})/DR_{Flow}$
$Span_{Diluted}$	555	0.613	0.612	0.16

START TIME: 10:15 **[1, 2, 5 = on; 3, 4 = off; tank valves off]**

ANALYZER RANGE: 2 **[60 < computer reading < 750]**

Appendix 4. Calibration Data

BOC GASES

Assay Laboratory
BOC GASES
600 Union Landing Road
Riverton,NJ 08077
(856) 829 7878

CERTIFICATE OF ANALYSIS
EPA Protocol Gas

CUSTOMER
INDUSTRIAL WELDING SUPPLY
3415 S PACIFIC BLVD
ALBANY, OR 973210000

CUSTOMER PO NO: 40734

Previous Certification Date(s):

CYLINDER NO	:	CC62620
EXPIRATION DATE	:	11-Jan-2007
CERTIFICATION DATE	:	12-Jan-2004
CYLINDER PRESSURE	:	2000 psig
PRODUCT ID NO	:	24011968
LOT NUMBER	:	592976

ANALYTICAL INFORMATION

This calibration standard has been certified per the 1997 EPA Traceability Protocol, Document EPA-600/97/121, Using Procedure G1. All Values certified to be +/-1% NIST Traceable.

Do Not Use This Cylinder below 150 psig. i.e. 1.0 Megapascal

Analytical Results

Components	Requested Mixture	Certified Concentration	Analytical Uncertainty	Assay Dates
PROPANE	900.00 ppm	905 ppm	+/-1.00% NIST Traceable	01/12/04
IR	BALANCE GAS			

CALIBRATION STANDARDS USED IN ASSAY

Type	LOT ID	Cylinder No	Concentration	Expiration
NTRM 81669	99060605	XC003606B	453.00 +/- 4.00 ppm C3H8/AIR	06/01/07

ANALYTICAL INSTRUMENTS USED IN ASSAY

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
H-P 5890 3022A29265	Gas Chromatography	01/12/04

QA Approved

BOC GASES

BOC GASES
1075 CINCLARE DRIVE
PORT ALLEN,LA 70767
Phone : (225) 388 0900

CERTIFICATE OF ANALYSIS

To :
INDUSTRIAL WELDING SUPPLY
3415 PACIFIC BLVD SW
ALBANY, OR 973217725

Material Submitted : C3H8 400M (AIR) CERT 152
Specification No. : 24017070

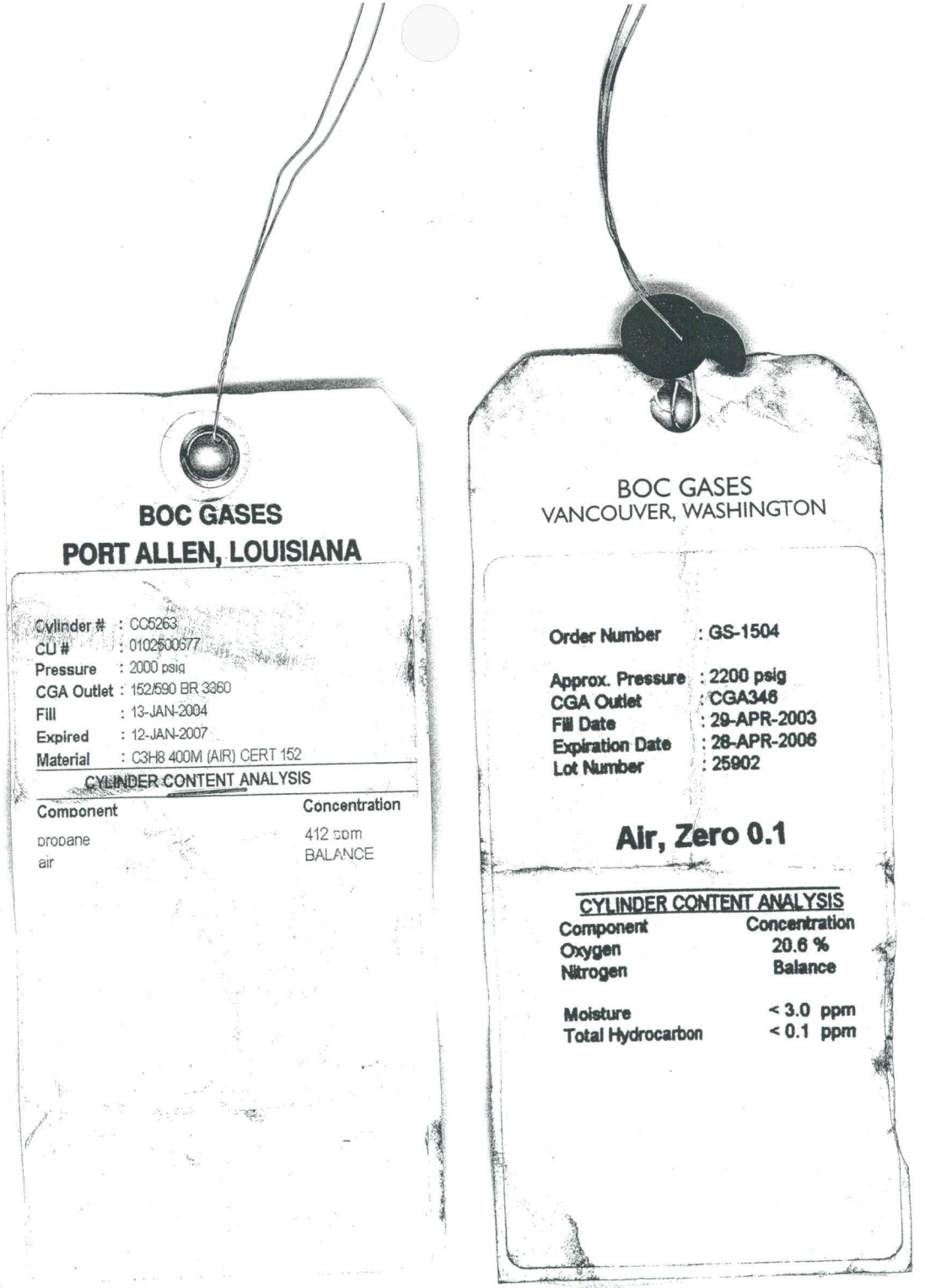
Cylinder Number : CC5263
Cyl.Size/Valve : 152/590 BR 3360

Customer P.O. : 40734
Order Number : 0102500677
Date Reported : 13-JAN-2004
Fill Date : 13-JAN-2004
Expired Date : 12-JAN-2007
Lot Number : 593083

Pressure : 2000 psig

Component	Specifications	Min	Max	Concentration
PROPANE	400 ppm	360	440	412 ppm
AIR				BALANCE

QA Approved



BOC GASES
PORT ALLEN, LOUISIANA

Cylinder # : CC5263
CU # : 0102500577
Pressure : 2000 psig
CGA Outlet : 152/590 BR 3360
Fill : 13-JAN-2004
Expired : 12-JAN-2007
Material : C3H8 400M (AIR) CERT 152

CYLINDER CONTENT ANALYSIS

Component	Concentration
propane	412 ppm
air	BALANCE

BOC GASES
VANCOUVER, WASHINGTON

Order Number : GS-1504

Approx. Pressure : 2200 psig
CGA Outlet : CGA346
Fill Date : 29-APR-2003
Expiration Date : 28-APR-2006
Lot Number : 25902

Air, Zero 0.1

CYLINDER CONTENT ANALYSIS

Component	Concentration
Oxygen	20.6 %
Nitrogen	Balance
Moisture	< 3.0 ppm
Total Hydrocarbon	< 0.1 ppm

TC Calibration	
6/10/2002	
Omega Calibrator C	PC Readout C
30.0	30.0
50.0	50.1
70.0	70.1
90.0	90.1
110.0	110.0

MKS INSTRUMENTS

Flow
Calibration Record Sheet
(200 SLM)

ERA #: 128989W

Customer: OREGON STATE UNIVERSITY

MKS Transfer Standard Type: 1559A-200L-SV

Serial Number: WS 136

MKS Primary Standard Type: A-200-1

Serial Number: 14952-1-1

Standard Flow Rate (SLM)	UUT Flow Rate (SLM)	UUT Error (SLM)	Percent of full scale Error
0.00	0.000	0.000	0.000%
50.000	50.880	0.880	0.440%
100.000	99.880	-0.120	-0.060%
150.000	150.040	0.040	0.020%
200.000	200.000	0.000	0.000%

UUT Model: 1559A-200L-SV

UUT Serial #: 000317785

UUT Process Gas: N2

UUT Range: 200 SLM

Process Gas used: N2

Calibrated by: DP

Date of Calibration: 05/10/00

Verified by:

Notes:

1. All units must be operated on regulated heat (Power on) for a minimum of of one hour before any adjustment is made.
2. Flowmeters and/or Controllers are Calibrated at atmospheric pressure.
3. This Calibration is referenced to 0 Degrees Centigrade and 760 Torr.

3350 Scott Blvd., Bldg. #4, Santa Clara, CA 95054