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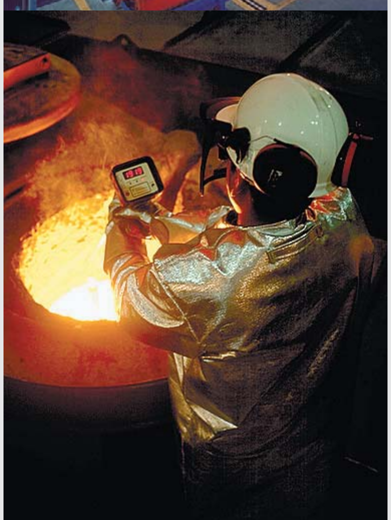

Operated by
Technikon
5301 Price Avenue
McClellan, CA 95652
916-929-8001
www.technikonllc.com

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A No-Bake Phenolic Urethane System with Two Variations Compared to Test FL for PCS Emissions in Iron using the Irregular Gear Mold

1413-111 HJ

March 2007
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A No-Bake Phenolic Urethane System with Two Variations Compared to Test FL for PCS Emissions in Iron using the Irregular Gear Mold

1413-111 HJ

This report has been reviewed for completeness and accuracy and approved for release by the following:

Director of Measurement Technologies	*//Original Signed//* Sue Anne Sheya, PhD	Date
V.ice President	*//Original Signed//* George Crandell	Date

The data contained in this report were developed to assess the relative emissions profile of the product or process being evaluated. You may not obtain the same results in your facility. Data were not collected to assess cost or producibility.

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EXECUTIVE SUMMARY

This report contains the results of Test HJ, an evaluation of the relative pouring, cooling and shakeout airborne emissions and relative surface casting quality comparisons from an iron no-bake phenolic urethane mold binder system (Techniset®, HA International) with two variations of binder to lower phenol emissions. Castings were made in greensand molds with no seacoal using a 4-on irregular gear pattern.

Three subtests were run as part of this test. Six molds were poured for the first subtest using the F6000/6478 Binder System. The next two subtests used low phenol binder systems. Three molds were poured using the 6000/6478 Binder System, and three molds were poured using the F6000/6435 Binder System, for a total of 12 runs. The no-bake mold binder for each system consisted of 1.1% total binder based on sand (BOS) in a 55/45 ratio of part I/part II with 17-727 part III activator concentration of 10% of part I.

Emission and casting quality results of this test were compared to the no-bake baseline, Test FL (Report numbered 1410-123 FL, completed in December 2003). Test FL was a baseline test which used the Techniset®, HA International 6000/6433/17-727 phenolic urethane Binder System at 1.1% total binder (BOS) in 55/45 ratio of part I/part II with the activator at 10% of part I.

Molds were poured with iron at 2630 ± 10°F, followed by 45 minutes of cooling, 15 minutes of shakeout, and a post shakeout cooling period of an additional 15 minutes. Emission samples were continuously collected for the total 75 minute period.

The emissions results are reported in both pounds of analyte per pound of binder (lb/lb) and pounds of analyte per ton of metal poured (lb/ton). The average emission factors for all three binder systems were very similar to each other. The relative percent difference for these products for the Emission Indicators (presented in Tables 1a and 1b) averaged from 14 to 16% lower for TGOC as Propane and 7 to 18% lower for the Sum of Target Analytes when compared to Test FL on a pound of emissions per ton of metal basis (lb/tn). The Sum of Target HAPs ranged from 5% lower to 9% higher, while the Sum of Target POMS

ranged from 45 to 66% higher when compared in pounds per ton of metal. The 6000/6478 binder combination had the lowest phenol emissions. TGOC as Propane results include all exempted compounds, including methane. A complete table of target analyte comparison results, including individual hazardous air pollutants, between the reference test and all three subtests under Test HJ can be found in Appendix B of this report.

Table 1a Average Emission Indicators Summary Table – Lb/Tn Metal

Analyte Name	Test FL	Test HJ F6000/6748	Test HJ 6000/6478	Test HJ 6000/6435
Emission Indicators				
TGOC as Propane	1.28E+01	1.11E+01	1.07E+01	1.10E+01
HC as Hexane	3.73E+00	9.10E+00	8.86E+00	8.85E+00
Sum of Target Analytes	3.15E+00	2.81E+00	2.60E+00	2.93E+00
Sum of Target HAPs	1.79E+00	1.95E+00	1.70E+00	1.92E+00
Sum of Target POMs	4.47E-02	7.41E-02	6.48E-02	7.25E-02

Table 1b Average Emission Indicators Summary Table – Lb/Lb Binder

Analyte Name	Test FL	Test HJ F6000/6478	Test HJ 6000/6478	Test HJ F6000/6435
Emission Indicators				
TGOC as Propane	2.11E-01	1.88E-01	1.85E-01	1.93E-01
HC as Hexane	6.37E-02	1.57E-01	1.57E-01	1.61E-01
Sum of Target Analytes	5.25E-02	4.86E-02	4.60E-02	5.33E-02
Sum of Target HAPs	3.01E-02	3.39E-02	3.01E-02	3.49E-02
Sum of Target POMs	7.45E-04	1.26E-03	1.15E-03	1.31E-03

The body of this report will address the comparison between the baseline Test FL versus the standard HA International binder Techniset® F6000/6478. The detailed results of the two binder variations are located in Appendix B.

Beginning with this report, data which has been determined to be below the practical quantitation limit (PQL) after data validation and verification is substituted with the PQL value rather than with zero. This change was implemented to more closely follow the recommendations of the US EPA for data handling.

A photographic record was made of the twelve castings produced from the F6000/6748 binder of Test HJ. Pictures of best, median and worst casting quality are shown in Appendix C. A qualitative assessment was made between the surface quality of castings from Test FL cavity 3 and Test HJ runs 001-006, cavity number 3. The castings were then compared to and ranked with those from Test FL. The quality of the castings were considerably better than baseline Test FL castings.

Emission results from the testing performed and described herein are not suitable for use as emission factors or for purposes other than evaluating the relative emission reductions associated with the use of alternative materials, equipment, or processes. The emissions measurements are unique to the specific castings produced, materials used, and testing methodology associated with these tests. These measurements should not be used as the basis for estimating emissions from actual commercial foundry applications.

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1.0 INTRODUCTION

1.1. Background

Technikon LLC is a privately held contract research organization located in McClellan, California, a suburb of Sacramento. Technikon offers emissions research services to industrial and government clients specializing in the metal casting and point source emissions areas. Technikon operates the Casting Emission Reduction Program (CERP). CERP is a cooperative initiative between the Department of Defense (US Army) and the United States Council for Automotive Research (USCAR). The parties to the CERP Cooperative Research and Development Agreement (CRADA) include The Environmental Leadership Council of USCAR, a Michigan partnership of DaimlerChrysler Corporation, Ford Motor Company, and General Motors Corporation; the U.S. Army Research, Development, and Engineering Command (RDECOM-ARDEC); the American Foundry Society (AFS); and the Casting Industry Suppliers Association (CISA). The US Environmental Protection Agency (US EPA) and the California Air Resources Board (CARB) also have been participants in the CERP program and rely on CERP published reports for regulatory compliance data. All published reports are available on the CERP web site at www.cerp-us.org.

1.2. CERP/Technikon Objectives

The primary objective of CERP is to evaluate materials, equipment, and processes used in the production of metal castings. Technikon's facility was designed to evaluate alternate materials and production processes designed to achieve significant air emission reductions. The facility's principal testing arena is designed to measure airborne emissions from individually poured molds. This testing facility enables the repeatable collection and evaluation of airborne emissions and associated process data.

1.3. Report Organization

This report has been written to document the methodology and results of a specific test plan that was used to evaluate the pouring, cooling and shakeout emissions from a series of Techniset® F6000/6478 no-bake mold binders and two variations that the manufacturer designed to reduce phenol emissions (6000/6478 and F6000/6435) in a greensand mold with no seacoal and poured with iron. Emission results were then compared to Test FL, an iron no-bake mold reference test. Test FL evaluated emissions from Techniset® 6000/6433 a phenolic urethane no-bake mold binder system. Binder amounts were at 1.1% BOS for all tests.

Section 2.0 of this report includes a summary of the methodologies used for data collection and analysis, procedures for emission calculations, QA/QC procedures, and data management and reduction methods. Specific data collected during this test is summarized in Section 3.0 and detailed data which include the variations appear in the appendices of this report. Section 4.0 of this report contains a discussion of the results.

The raw data for this test series are archived at the Technikon facility.

1.4. Specific Test Plan and Objectives

Test HJ was comprised of evaluating airborne emissions from F6000/6478 and two variations against a baseline no-bake mold phenolic urethane binder. The standard Binder, F6000/6478, used 1.1% BOS HA International Techniset® binder composed of number F6000 part I resin (55%), 6478 part II co-reactant (45%), and 17-727 part III activator at 10% of part 1 for 6 molds.

The first variation used 1.1% BOS HA International Techniset ® binder composed of number 6000 part I resin (55%), 6478 part II co-reactant (45%), and 17-727 part III activator@ 10% of part 1 for 3 molds, and the second variation used 1.1% BOS HA International Techniset® F6000 part I resin (55%), 6435 part II co-reactant (45%), and 17-727 part III activator at 10% of part 1 for 3 molds. Twelve total molds were poured.

Table 1-1 provides a summary of the test plan. The details of the approved test plan are included in Appendix A.

Table 1-1 Test Plan Summary

Test Plan Number	1410-123 FL	1413-111 HJ
Type of Process Tested	Pouring, cooling, shakeout baseline, no-bake phenolic urethane mold binder in greensand.	Pouring, cooling, shakeout no-bake phenolic urethane mold binder in greensand, three variations.
Metal Poured	Class 30 gray iron	Class 30 gray Iron
Mold Type	4-on gear in greensand with no seacoal.	4-on gear in greensand with no seacoal
Sand System	Wexford 450 sand	Wexford 450 sand
Casting Type	4-on Gear	4-on Gear
Binder System	1.1% (BOS) HA International Techniset® binder, 6000/6433	1.1% (BOS) HA International Techniset® binders-- Standard System: F6000/6478, 1st Variation: 6000/6478, and 2nd Variation: F6000/6435
Number of Molds Poured	3 engineering/conditioning + 9 Sampling	6 Sampling Standard System, 3 Sampling each for 1st and 2nd Variations
Test Dates	October 6, 2003 through October 8, 2003	July 25, 2006 through July 28, 2006
Emissions Measured	75 target analytes and TGOC as propane, HC as hexane, CO, CO_2, CH_4	76 target analytes and TGOC as propane, HC as hexane, CO, CO_2, NO_x, SO_x
Process Parameters Measured	Total casting, mold, and binder weights; metallurgical data, % LOI, sand temperature; stack temperature, moisture content, pressure, and volumetric flow rate	Total casting, mold, and binder weights; metallurgical data, % LOI, sand temperature; stack temperature, moisture content, pressure, and volumetric flow rate

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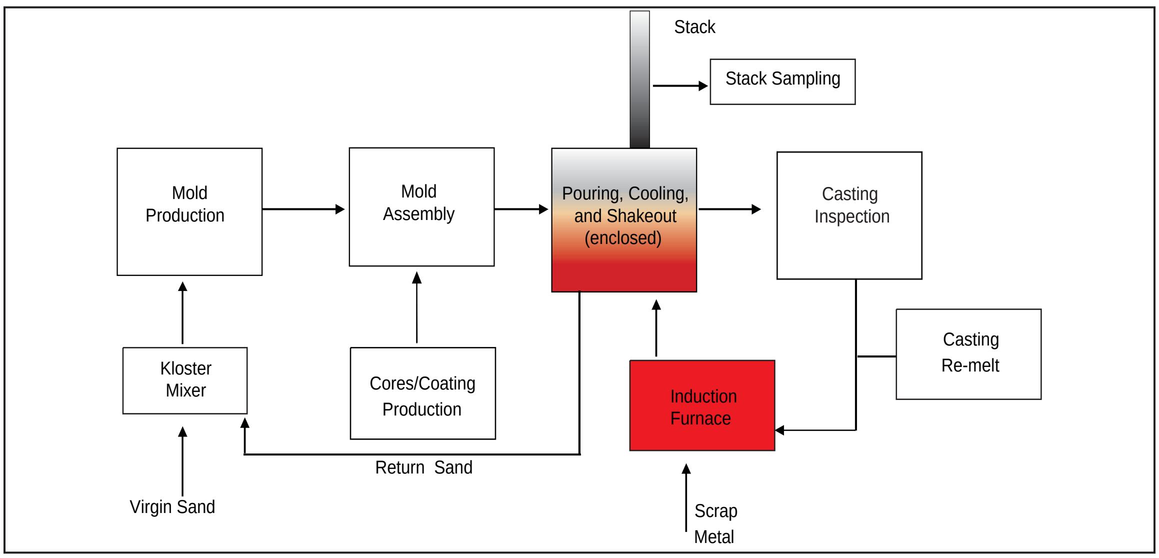
2.0 TEST METHODS, ASSUMPTIONS AND PROCEDURES

2.1. Description of Process and Testing Equipment

Figure 2-1 is a diagram of the Research Foundry test process.

Figure 2-1 No Bake Mold Making and Testing Process Diagram



2.2. Description of Testing Program

The testing program encompasses the foundry process and emissions testing, both of which are rigorously controlled. Parameters are monitored and recorded prior to and during the emission tests. Process measurements included the weights of the casting and mold sand, loss on ignition (LOI) values for the mold and core prior to the test, and relevant metallurgical data. Measured source parameters included stack temperature, pressure, volumetric flow rate, and moisture content. All parameters were maintained within prescribed ranges to ensure the reproducibility of the test runs.

Emission testing for organic hydrocarbons included several methods. Method 18 is one of the US Environmental Protection Agency (EPA) reference methods for volatile organic compound (VOC) analysis. The method is a guideline and a system of quality assurance (QA) checks for VOC analysis rather than a rigorous, explicit manual for sampling or analysis. Method 18 is generally used to identify and/or measure as many compounds as possible in order to calculate actual VOC emissions from other measurements (e.g., US EPA Method 25 or 25A).

As described in the method, sampling can be conducted using a Volatile Organic Sampling Train (VOST), which was the technique used for sampling for the tests described in these reports. A sample gas stream was extracted from the source and then routed using the train through tubes containing adsorbents, which are the collection materials upon which the organic analytes are deposited. Adsorption tube samples were collected and analyzed for seventy-six (76) target organic compounds using procedures based on approved federal methods, including those of the EPA.

Two methods were employed to measure undifferentiated hydrocarbon emissions as Emission Indicators: TGOC as Propane, performed in accordance with US EPA Method 25A, and HC as Hexane.

Method 25A is an instrumental based method in which the stack gas is introduced directly to a flame ionization detector (FID) without first separating the components. In Method 25A, sampling is accomplished by extracting a gas stream from the stack effluent and transferring it via heated non-reactive tubing to the FID analyzer under very controlled temperature and pressure conditions. The FID measures the quantity of carbon containing molecules, and is calibrated by a gas standard, which in this case is the three carbon alkane, propane (C_3H_8). The FID will give a response relative to the calibration standard and results are expressed in terms of the gas used for calibration.

Because the FID responds to all carbon containing compounds, methane (CH_4) and other exempt compounds are included in the results. For this test, these compounds have not been determined or removed from the averaged results.

The HC as Hexane method uses NIOSH methods 1500-1550, and represents the sum of all detected hydrocarbon compounds in the carbon range between C_6 and C_{16}, expressed in terms of the calibration compound, which in this case is the six-carbon alkane, hexane

(C_6H_{14}). Results are determined by the summation of all chromatographic peak areas which fall between the elution time of hexane through the elution time of hexadecane ($C_{16}H_{34}$) on the chromatogram. The quantity of hydrocarbons (HC) is determined by dividing the total summed area count by the area of hexane calculated from the initial calibration curve that is derived from a five point calibration.

Continuous on-line monitoring of select criteria pollutant and greenhouse gases such as carbon dioxide (CO_2), carbon monoxide (CO), and nitrogen oxide (NOx) was conducted according to US US EPA Methods, 3A, 10, and 7E, respectively.

Mass emission rates for all analytes were calculated using continuous monitoring or laboratory analytical results, measured source data and appropriate process data. Detailed emission results are presented in Appendix B. Individual analyte emissions were calculated in addition to five "Emission Indicators": TGOC as Propane, HC as Hexane, Sum of Target Analytes, Sum of Target Hazardous Air Pollutants (HAPs), and the Sum of Target Polycyclic Organic Matter (POMs). Full descriptions of these indicators can be found in Section 3.0 of this report.

The specific steps used in this sampling program are summarized below.

2.2.1. Test Plan Review and Approval

The proposed test plan was reviewed and approved by the Technikon staff and by CERP Working Group Chairs as appropriate.

2.2.2. Mold and Metal Preparation

In Technikon's Research foundry, castings were produced individually in discrete manually constructed mold packages, each of which consists of four cavities. The 4-on gear pattern built to evaluate emissions from no-bake molds was used. The molds (Figure 2-2 and 2-3) were prepared to a standard composition by the Technikon production team. Relevant process data were collected and recorded. The total amount of metal melted was determined from the expected poured weight of the castings and the number of molds to be poured. The weight of metal poured into each mold was recorded.

Figure 2-2 No-Bake Gear Drag Pattern

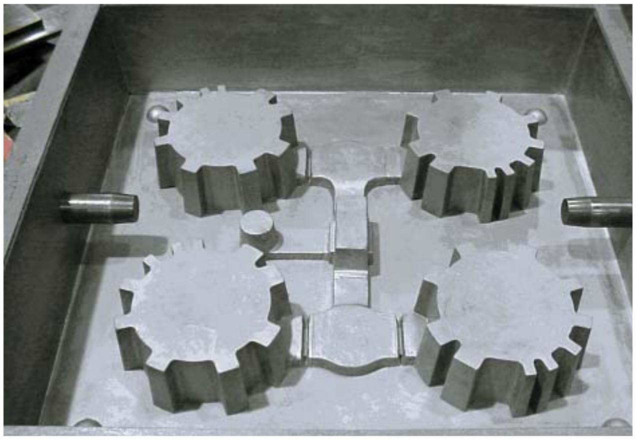


Figure 2-3 Gear Castings

2.2.3. Individual Sampling Events

Three subtests to evaluate emissions from three no-bake phenolic urethane binder systems were run separately. The standard binder F6000/6478 consisted of six (6) replicate runs. The first and second variations consisted of three (3) replicate runs each. Prior to pouring and emission sampling for each run, a single mold package was placed onto a shake-out table contained within a hooded enclosure designed to meet the requirements of US EPA Method 204 for a total temporary enclosure. The enclosed test stand was preheated to approximately 85°F. The flow rate of the emission capture air was nominally 600 scfm. Iron at approximately 2630°F was then poured through an opening in the top of the emission enclosure, after which the opening was closed (Figure 2-4).

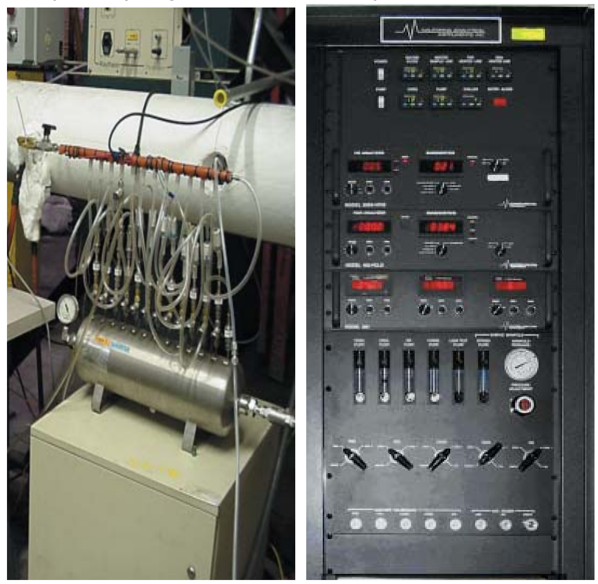
Figure 2-4 Pouring Iron into Mold inside Total Enclosure Hood

The emissions generated were transported through an insulated six (6) inch duct (stack) located at the top of the enclosure. Heated sample probes inserted into the stack at relevant locations determined by US EPA

Method 1 enabled collection of total emissions from all phases of the casting process. One probe provided gases for the VOST (Figure 2-5a). Another probe in the stack was used to continuously draw effluent samples and transport them via a forty-seven (47) ft heated sample line to an emissions console (Figure 2-5b) located in Technikon's laboratory, which contains a battery of gas analyzers. This bench consists of a total hydrocarbon analyzer for TGOC analysis, two infra-red analyzers (for CO and CO_2) and a chemiluminescence analyzer for NOx.

Figure 2-5 Stack Sampling Equipment

a) Sampling Train *b)E-Bench*



Continuous air samples were collected during the forty-five minute pouring and cooling phase, during the fifteen minute shakeout of the mold, and for an additional fifteen minute cooling period following shakeout. The total sampling time was seventy-five minutes.

2.2.4. Process Parameter Measurements

Table 2-1 lists the process parameters that are monitored during each test. The analytical equipment and methods used are also listed.

Table 2-1 Process Equipment and Methods

Process Parameters	Equipment and Method(s)
Mold Weight	Cardinal 748E Platform Scale (Gravimetric)
Casting Weight	Ohaus MP2 Scale
Binder Weight	Mettler SB12001 Digital Scale (Gravimetric)
Core Weight	Mettler SB12001 Digital Scale (Gravimetric)
Volatiles	Mettler PB302 Scale (AFS Procedure 2213-00-S)
LOI, % at Mold	Denver Instruments XE-100 Analytical Scale (AFS procedure 5100-00-S)
Metallurgical Parameters	
Pouring Temperature	Electro-Nite DT 260 (T/C Immersion Pyrometer)
Mold Compactability	Dietert 319A Sand Squeezer (AFS Procedure 2221-00-S)
Carbon/Silicon Fusion Temperature	Electro-nite DataCast 2000 (Thermal Arrest)
Alloy Weights	Ohaus MP2 Scale (Gravimetric)

2.2.5. Air Emissions Analysis

The specific sampling and analytical methods used in the Research Foundry tests are based on federal reference methods shown in Table 2-2. The details of the specific testing procedures and their variance from the reference methods are included in the Technikon Standard Operating Procedures.

Table 2-2 Emission Sampling and Analytical Methods

Measurement Parameter	Test Method(s)
Port Location	US EPA Method 1
Number of Traverse Points	US EPA Method 1
Gas Velocity and Temperature	US EPA Method 2
Gas Density and Molecular Weight	US EPA Method 3a
Gas Moisture	US EPA Method 4 (Gravimetric)
Target VOCs and HAPs	US EPA Methods TO17, TO11; NIOSH Methods 1500, 2002
TGOC	US EPA Method 25A
CO	US EPA Method 10
CO_2	US EPA Method 3A
NOx	US EPA Method 7E
SO_2	OSHA ID 200

Some methods modified to meet specific CERP test objectives.

2.2.6. Data Reduction, Tabulation and Preliminary Report Preparation

Data calculations for determining emission concentrations resulting from the specific test plans outlined in Appendix A are based on process and emission parameters. The analytical results of the emissions tests provide the mass of each analyte in the sample. The total mass of the analyte emitted is calculated by multiplying the mass of analyte in the sample by the ratio of total stack gas volume to sample volume. The total stack gas volume is calculated from the measured stack gas velocity and duct diameter and corrected to dry standard conditions using the measured stack pressures, temperatures, gas molecular weight and moisture content. The total mass of analyte is then divided by the weight of the casting poured or weight of binder to provide emissions data in pounds of analyte per ton of metal (lb/tn) or pounds of analyte per pound of binder (lb/lb).

Individual concentration and reporting limit results for each analyte for all sampling runs are included in Appendix B of this report. Average results for the standard F6000/6478 binder are given in Section 3.0, Table 3-1a and 3-1b.

2.2.7. Report Preparation and Review

The Preliminary Draft Report is created and reviewed by Process Team and Emissions Team members to ensure its completeness, consistency with the test plan, and adherence to QA/QC procedures. Appropriate observations, conclusions and recommendations are added to the report to produce a Draft Report. The Draft Report is then reviewed by senior management and comments are incorporated into a draft Final Report prior to final signature approval and distribution.

2.3. Quality Assurance and Quality Control (QA/QC) Procedures

Detailed QA/QC and data validation procedures for the process parameters, stack measurements, and laboratory analytical procedures are included in the "Technikon Emissions Testing and Analytical Testing Standard Operating Procedures" publication. In order to ensure the timely review of critical quality control parameters, the following procedures are followed:

- Immediately following the individual sampling events performed for each test, specific process parameters are reviewed by the Process Engineer to ensure that the parameters are maintained within the prescribed control ranges. Where data are not within the prescribed ranges, the Manager of Process Engineering and the Vice President of Operations determine whether the individual test samples should be invalidated or flagged for further analysis following review of the laboratory data.

- The source (stack) and sampling parameters, analytical results and corresponding laboratory QA/QC data are reviewed by the Emissions Measurement Team to confirm the validity of the data. Senior management of Analytical Measurement Technologies reviews and approves the recommendation, if any, that individual sample data should be invalidated. Invalidated data are not used in subsequent calculations.

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3.0 TEST RESULTS

The results of Test HJ, an evaluation of the relative pouring, cooling and shakeout airborne emissions and internal surface casting quality comparisons of iron no-bake phenolic urethane mold binder systems from HA International, was completed on a standard binder system and two variations. The first six molds poured used the standard F6000/6478 Binder System formulation. The first variation consisted of three molds poured using the 6000/6478 Binder System, and the second variation consisted of three molds poured using the F6000/6435 Binder System, for a total of 12 runs. All three binder system tests compared emission results to baseline Test FL (Report numbered 1410-123 FL, completed in December 2003). Results of the two variations are not reported the Results Section but are included in detail in Appendix B.

Compounds which were chosen for analysis based on chemical and operational parameters are termed “target analytes”. The emissions indicator called the “Sum of Target Analytes” is the sum of all individual analytes targeted for collection and analysis that were detected at a level above the practical quantitation limit. This sum includes compounds which may also be defined as HAPs and POMs. By definition, HAPs are specific compounds listed in the Clean Air Act Amendments of 1990. The term POM defines not one compound, but a broad class of compounds based on chemical structure and boiling point. POMs as a class are a listed HAP. A subset of organic compounds from the current list of US EPA HAPs was targeted for collection and analysis. These individual target HAPs (which may also be POMs by nature of their chemical properties) detected in the samples are summed together and defined as the “Sum of Target HAPs”, while the “Sum of Target POMs” only sums those organic HAPs that are also defined as POMs.

Individual target compounds are included in the tables, as well as the “Sum of Target Analytes”, the “Sum of Target HAPs”, and the “Sum of Target POMs”. These three analyte sums are part of the group termed “Emission Indicators.” Also included in this group and reported in the tables is “TGOC as Propane.” In addition, the average values for selected criteria and greenhouse gases such as carbon monoxide, carbon dioxide, sulfur dioxide, and nitrogen oxides are given. The tables also include the relative percent change in emissions from Test FL (the reference test) to Test HJ. The relative percent change in this case is defined as the difference in concentrations between the current test and reference test, divided by the reference test concentration and expressed as a percentage.

The average reported values for those gases measured continuously on-line in real time at Technikon during Test HJ presented in the tables have not been background corrected with the exception of CO_2. These continuously monitored compounds are select criteria and greenhouse gases, and include CO, CO_2, and NOx. A criteria pollutant (SO_2) was measured via adsorption tube sampling. Integrated adsorption tube samples have not been background corrected.

Beginning with this report, data which has been determined to be below the PQL after data validation and verification is substituted with the numerical value used for the PQL, rather than with the value of zero. This change was implemented to more closely follow the recommendations of the US EPA for data handling. If an analyte has values above the PQL for some runs, but falls below the PQL for other runs in a test, the PQL value is used when calculating averages and sums. However, if an analyte has a concentration that is below the PQL for all runs in a test, the test average is indicated by ≤ PQL in the Tables and Figures of this report, and no runs are included in any summations or averages. Omitting these less than reporting limit analytes in calculations ensures that only those targeted compounds which contribute to emissions are included in emission sums.

An additional change commencing with this report is keeping individual isomers in the tables, rather than summing them and reporting isomers as a group. This change was implemented because not all isomers have been targeted for every test. In those situations, using the term “Sum of Isomers” can be misleading. If the reader chooses, isomers which have been targeted and analyzed may be summed by group using the information located in the tables in Section 3.0 or Appendix B.

To make thorough comparisons of targeted analyte airborne emissions to Test FL, all subtests for Test HJ sampled and analyzed for the same target individual chemical compounds as those in Test FL, with the addition of acetophenone. This compound was added for collection and analysis based on the chemistry of the binder. A total of 75 target analytes were collected by adsorption tubes and analyzed for Test FL. Selected gases that are categorized as criteria pollutants or greenhouse gases were also collected and analyzed. These were collected by Tedlar bags for Test FL, but were analyzed on-line in real time during Test HJ using gas analyzers, which are described in Section 2.2. Results from these bags are thought to be less accurate than those from the gas analyzers. The average emission results for select individual target analytes and emission indicators for Test HJ and their comparison to Test FL F6000/6478 are presented in Tables 3-1a and 3-1b.

Table 3-1a Summary of Baseline Standard Binder Comparison Average Emissions Results - Lb/Tn Metal

Analyte Name	Test FL Average	Test HJ Average F6000/6748	% Change from Test FL
Emission Indicators			
TGOC as Propane	1.28E+01	1.11E+01	**-14**
HC as Hexane	3.73E+00	9.10E+00	**144**
Sum of Target Analytes	3.15E+00	2.81E+00	-11
Sum of Target HAPs	1.79E+00	1.95E+00	9
Sum of Target POMs	4.47E-02	7.41E-02	**66**
Selected Target HAPs and POMs			
Cresol, mp-	8.32E-01	≤PQL	NA
Phenol	5.10E-01	8.51E-01	**67**
Benzene	2.49E-01	2.55E-01	2
Toluene	5.69E-02	5.99E-02	5
Xylene, mp-	3.43E-02	3.77E-02	**10**
Cresol, o-	2.94E-02	3.42E-02	**16**
Naphthalene	2.24E-02	3.67E-02	**63**
Formaldehyde	1.28E-02	2.32E-02	**81**
Methylnaphthalene, 2-	1.14E-02	8.90E-03	-22
Xylene, o-	1.05E-02	1.13E-02	**8**
Styrene	5.83E-03	5.38E-03	-8
Methylnaphthalene, 1-	4.82E-03	1.22E-02	153
Acetaldehyde	3.62E-03	6.46E-03	**78**
Ethylbenzene	2.42E-03	2.94E-03	22
Dimethylnaphthalene, 1,8-	2.16E-03	≤PQL	NA
Biphenyl	≤PQL	4.31E-03	NA
Dimethylnaphthalene, 2,3-	≤PQL	4.11E-03	NA
Acetophenone	NT	5.88E-01	NA
Additional Selected Target Analytes			
Dodecane	3.81E-01	≤PQL	NA
Diethylbenzene, 1,4-	2.84E-01	2.70E-01	-5
Trimethylbenzene, 1,2,3-	1.22E-01	1.70E-01	**39**
Diethylbenzene, 1,3-	8.24E-02	≤PQL	NA
Trimethylbenzene, 1,2,4-	6.88E-02	1.14E-01	**65**
Dimethylphenol, 2,5-	6.31E-02	≤PQL	NA
Dimethylphenol, 3,5-	5.36E-02	≤PQL	NA
Dimethylphenol, 3,4-	5.35E-02	≤PQL	NA
Dimethylphenol, 2,6-	5.18E-02	≤PQL	NA
Indan	4.75E-02	8.92E-02	**88**
Diethylbenzene, 1,2-	2.62E-02	2.93E-02	**12**
Undecane	9.22E-03	1.27E-02	**37**
Tridecane	5.72E-03	1.29E-02	**126**
Butylbenzene, sec-	5.63E-03	1.13E-02	**101**
Ethyltoluene, 2-	4.27E-03	3.22E-02	**655**
Crotonaldehyde	≤PQL	3.40E-02	NA
Criteria Pollutants and Greenhouse Gases			
Carbon Dioxide	1.43E-01	1.36E+01	**9409**
Methane	6.28E-02	NT	NA
Carbon Monoxide	≤PQL	5.81E+00	NA
Nitrogen Oxides	NT	4.06E-02	NA
Sulfur Dioxide	NT	3.80E-03	NA

Bold numbers indicate those compounds whose calculated t-statistic is significant at alpha=0.05

NA=Not Applicable

NT = Not Tested

≤PQL = Less than or equal to the Practical Quantitation Limit

All gas samples were taken by tedlar bag sampling for Test FL

Table 3-1b Summary of Baseline Standard Binder Comparison Average Emissions Results - Lb/Lb Binder

Analyte Name	Test FL Average	Test HJ Average F6000/6478	% Change from Test FL
Emission Indicators			
TGOC as Propane	2.11E-01	1.88E-01	**-11**
HC as Hexane	6.37E-02	1.57E-01	**147**
Sum of Target Analytes	5.25E-02	4.86E-02	-8
Sum of Target HAPs	3.01E-02	3.39E-02	13
Sum of Target POMs	7.45E-04	1.26E-03	**69**
Selected Target HAPs and POMs			
Cresol, mp-	1.39E-02	≤PQL	NA
Phenol	8.53E-03	1.48E-02	**74**
Benzene	4.21E-03	4.44E-03	5
Toluene	9.61E-04	1.04E-03	**8**
Xylene, mp-	5.79E-04	6.56E-04	**13**
Cresol, o-	4.96E-04	5.96E-04	**20**
Naphthalene	3.70E-04	6.38E-04	**72**
Formaldehyde	2.18E-04	4.01E-04	**84**
Methylnaphthalene, 2-	1.85E-04	1.53E-04	-17
Xylene, o-	1.77E-04	1.96E-04	**11**
Styrene	9.81E-05	9.36E-05	-5
Methylnaphthalene, 1-	7.84E-05	2.15E-04	174
Acetaldehyde	6.12E-05	1.12E-04	**83**
Ethylbenzene	4.06E-05	5.13E-05	26
Dimethylnaphthalene, 1,8-	3.60E-05	≤PQL	NA
Biphenyl	≤PQL	7.50E-05	NA
Dimethylnaphthalene, 2,3-	≤PQL	7.15E-05	NA
Acetophenone	NT	1.02E-02	NA
Additional Selected Target Analytes			
Dodecane	6.28E-03	≤PQL	NA
Diethylbenzene, 1,4-	4.72E-03	4.76E-03	1
Trimethylbenzene, 1,2,3-	2.05E-03	2.96E-03	**44**
Diethylbenzene, 1,3-	1.39E-03	≤PQL	NA
Trimethylbenzene, 1,2,4-	1.15E-03	1.98E-03	**71**
Dimethylphenol, 2,5-	1.04E-03	≤PQL	NA
Dimethylphenol, 3,5-	8.86E-04	≤PQL	NA
Dimethylphenol, 2,6-	8.63E-04	≤PQL	NA
Indan	7.94E-04	1.56E-03	**96**
Dimethylphenol, 3,4-	7.93E-04	≤PQL	NA
Diethylbenzene, 1,2-	4.38E-04	5.10E-04	**16**
Undecane	1.53E-04	2.20E-04	**44**
Butylbenzene, sec-	9.45E-05	1.97E-04	**109**
Tridecane	9.36E-05	2.25E-04	**141**
Ethyltoluene, 2-	7.13E-05	5.63E-04	**690**
Crotonaldehyde	≤PQL	5.89E-04	NA
Criteria Pollutants and Greenhouse Gases			
Carbon Dioxide	3.46E-03	2.31E-01	**6581**
Methane	1.04E-03	NT	NA
Carbon Monoxide	≤PQL	9.88E-02	NA
Nitrogen Oxides	NT	6.88E-04	NA
Sulfur Dioxide	NT	5.51E-05	NA

Bold numbers indicate those compounds whose calculated t-statistic is significant at alpha=0.05

NA=Not Applicable

NT = Not Tested

≤PQL = Less than or equal to the Practical Quantitation Limit

All gas samples were taken by tedlar bag sampling for Test FL

Examination of measured process parameters indicated that both tests were run within acceptable ranges and limits. In each individual run, the principal causes and secondary influences of the emissions are fixed between the reference test and the comparative test so that for pouring, cooling, and shakeout, the emissions reflect only the difference in the materials being tested. A statistical determination of whether the means of emissions of the baseline test and the current test were different was made by calculating a T-test at a 95% significance level (α=0.05). Results at this significance level indicate that there is a 95% probability that the mean values for HJ are not equivalent to those of Test FL. Therefore, it may be said that the differences in the average emission values are real differences, and not due to test, sampling, or analysis methodologies. This difference is indicated in Tables 3-1a and 3-1b in the column labeled "Percent Change from Test FL". Values in this column presented in **bold font** indicate a greater than 95% probability that the two tests are statistically different.

3.1. Techniset® F6000/6478/17-727

Emission Indicators for both lb/ton metal and lb/lb binder for the standard binder system shows a slight decrease of around 10% in TGOC as Propane and the Sum of Target Analytes for Test HJ compared to Test FL. However, the sum of Target POMs increased by over 60% and the Sum of Target HAP emissions increased slightly by 9% on a lb/tn metal basis. Increases for selected Target HAPs and POMs were also found, ranging from a 2% increase in benzene, to 88% for propionaldehyde.

Phenol, acetophenone, benzene, toluene and m,p-xylene were the top 5 HAP and POM contributors for Test HJ at 0.851, 0.588, 0.255, 0.0599 and 0.0377 lb/ton, respectively. M,p-cresol was the highest individual Target HAP and POM emitted for Test FL at 0.832 lb/ton metal, but was less than the PQL for Test HJ. 1,4-diethylbenzene, 1,2,3-trimethylbenzene, 1,2,4-trimethylbenzene, indan, and crotonaldehyde were the top five non air-toxic contributors at 0.2701, 0.1699, 0.1137, 0.08921, and 0.03401 lb/ton, respectively. The top five non-air toxic contributors for Test FL were dodecane, two of the diethylbenzenes, and two trimethylbenzenes.

Figures 3-1a to 3-3b graphically present the data from Test HJ for the five emissions indicators as well as selected individual HAP, target analyte, and criteria pollutant and greenhouse gas emissions data relative to Test FL, as both lb/ton of metal and lb/lb of binder.

Figure 3-1a Comparison of Emissions Indicators of Test HJ to Test FL, Average Results – Lb/Tn Metal

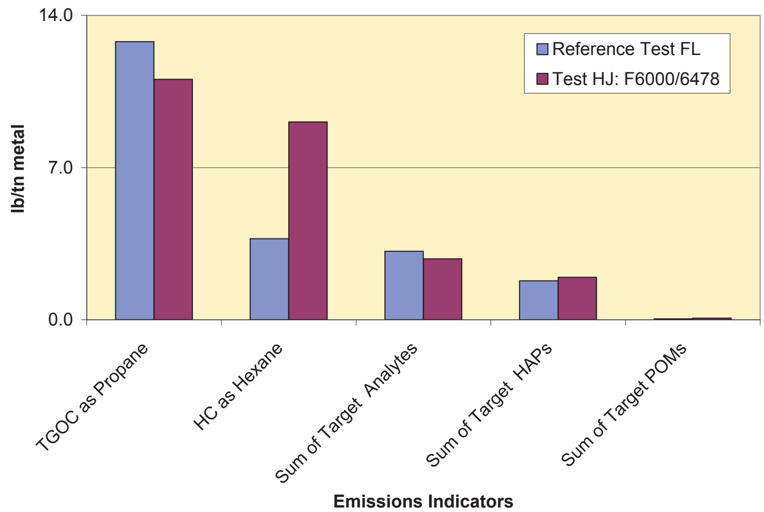


Figure 3-1b Comparison of Emissions Indicators of Test HJ to Test FL, Average Results – Lb/Lb Binder

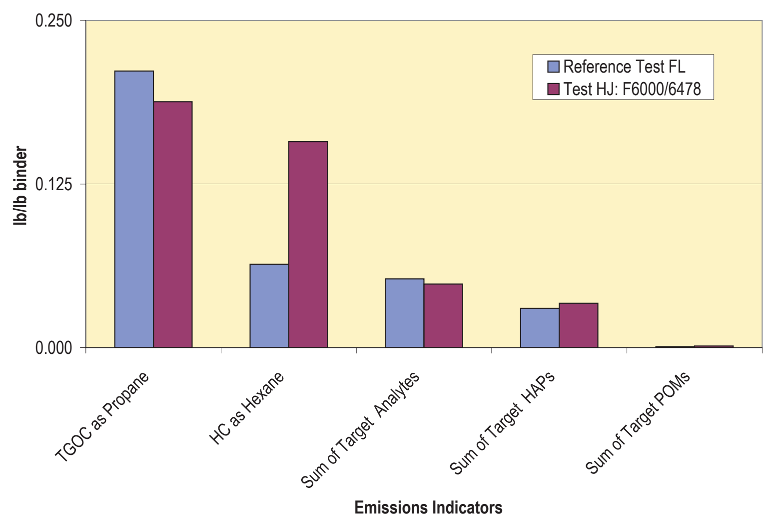


Figure 3-2a Comparison of Selected HAP and POM Emissions of Test HJ to Test FL, Average Results – Lb/Tn Metal

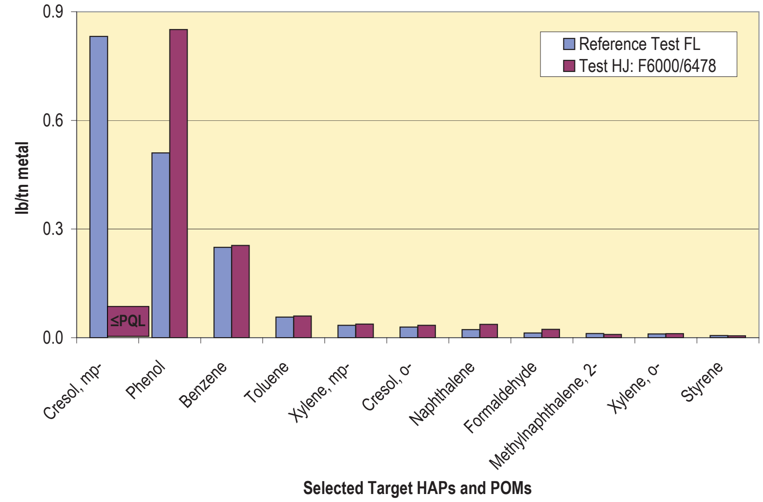


Figure 3-2b Comparison of Selected HAP and POM Emissions of Test HJ to Test FL, Average Results – Lb/Lb Binder

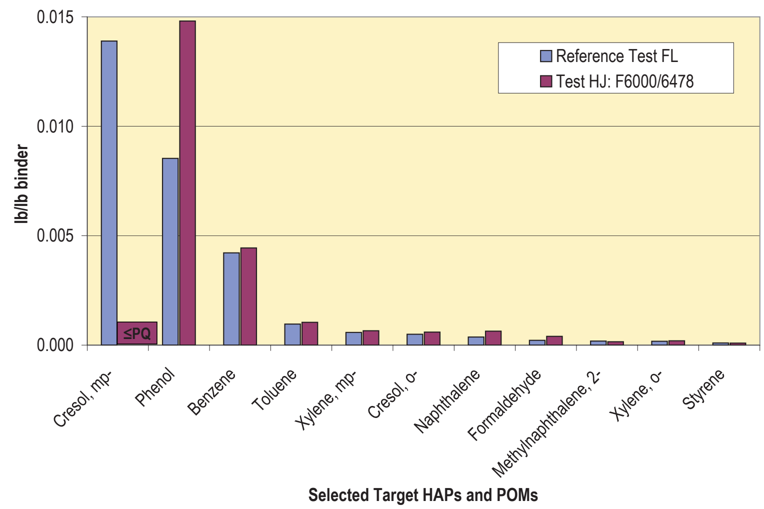


Figure 3-3a Comparison of Select Criteria Pollutants and Greenhouse Gases of Test HJ to Test FL, Average Results – Lb/Tn Metal

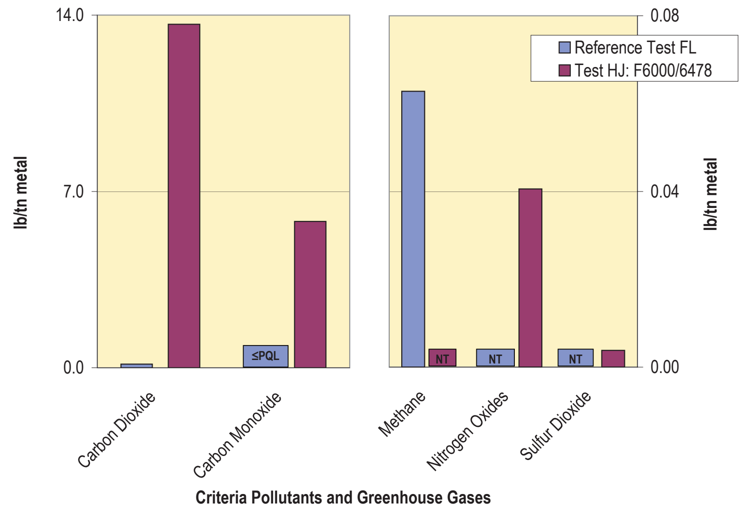
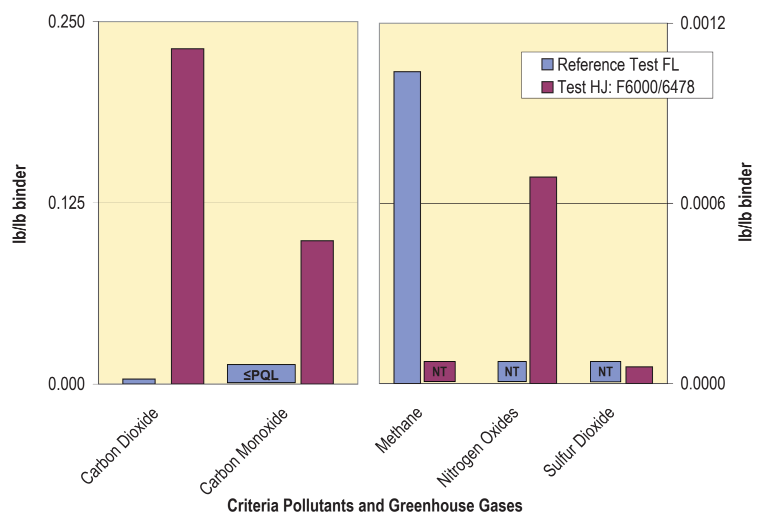


Figure 3-3b Comparison of Select Criteria Pollutants and Greenhouse Gases of Test HJ to Test FL, Average Results – Lb/Lb Binder



3.2. Process Data Comparisons

A comparison was made between the surface quality of the castings from Test FL and Test HJ runs 001 through 006, cavity number 3. The comparison consisted initially of a visual examination of major and minor surface defects such as burn-in and veining. Castings were first ranked according to those defects. To further differentiate surface quality among castings, the finish was tested by touch for smoothness. The smoothest casting with the fewest visual surface defects received the highest ranking.

The comparative rankings of casting appearance for each casting for Test HJ runs 1 through 6, cavity 3 and the emission runs for Test FL are shown in Table 3-2. Three benchmark visual casting quality rankings consisting of the best, the median, and the worst casting are assigned to three of the castings from each test. The "best" designation means that the internal surface of a casting is the best appearing of the lot of 12 in the case of test FL, and is given an in-series rank of "1". The "median" designation, given an in-series rank of "6," means that five castings are better in appearance and six are worse. The "worst" designation is assigned to that casting which is of the poorest quality, and is assigned an in-series rank of "12". The remaining castings are then compared to these three benchmarks and ranked accordingly. For Test HJ runs 001 through 006 the castings were ranked on a scale of 1 through 6 with "1" being the "best", "3" the "median", and "6" the "worst." The three-benchmark castings from Test FL were then compared to and collated with the castings from Test HJ.

Table 3-2 Comparison of Casting Quality

Rank Order	Emissions Mold Number	Test FL Baseline	Test HJ Comparative
Rank 1	HJ005		Best
Rank 2	HJ004		
Rank 3	HJ001		Median
Rank 4	HJ003		
Rank 5	HJ006		
Rank 6	HJ002		Worst
Rank 7	FL002	Best	
Rank 8	FL004	Median	
Rank 9	FL007	Worst	
Rank Order of Appearance Overall Best Casting to Overall Worst Casting			

The castings from Test HJ runs 001 through 006 were rated better overall compared to the castings from Test FL. The castings from Test HJ runs 001 through 006 showed significantly less veining than even the best casting from Test FL. The castings from Test HJ runs 001 through 006 had a smoother surface than those from Test FL. In ranking the castings between the two tests, even the worst casting from Test HJ runs 001 through 006 was better than the best casting from Test FL.

The average process parameters are reported in Table 3-4 and Appendix C.

Table 3-3 Summary of Test Plan Average Process Parameters

No-Bake Mix/Make/Cure				
Test Dates	**10/6/2003 - 10/8/2003**	**7/24-7/25/06**	**7/26/06**	**7/27/2006**
	FL Average	**HJ Part I Average**	**HJ Part II Average**	**HJ Part III Average**
Sand Dispensing Rate, lbs/15 sec	30	32.23	32.15	32.15
Binder Part 1 + Part 3 Dispensing Rate, gms/15 se	84.9	88.7	89.00	88.60
Binder Part 2 Dispensing Rate, gms/15 sec	63.5	72.4	73.10	72.80
Calculated Standard % Binder	1.08	1.09	1.09	1.09
Calculated % Binder (BOS)	1.09	1.10	1.10	1.10
Mold Weight, lbs	331.1	339.52	342.18	345.35
Calculated Total Binder Weight, lbs	3.57	3.69	3.74	3.76
Sand Temperature, °F	82	93	96	90
Dogbone Core 2 hr. Tensile Strength, psi	42	94	26	113
Dogbone Core 24 hr. Tensile Strength, psi	ND	ND	136.43	ND

No-Bake PCS				
Test Dates	**10/7/2003 - 10/9/2003**	**7/25-7/26/06**	**7/27/06**	**7/28/2006**
	FL Average	**HJ Part I Average**	**HJ Part II Average**	**HJ Part III Average**
Pouring Temp, °F	2632	2629	2633	2636
Pouring Time, sec.	33	36	39	37
Cast Weight (all metal inside mold), lbs.	117.92	125.40	128.90	131.78
Process Air Temperature in Hood, °F	87	94	88	88
Mold Temperature when placed in hood, °F	79	91	88	84
Ambient Temperature, °F	75	92	81	77
1800°F LOI, %	1.10	1.02	0.97	1.09
Mold Age When Poured, hr	23.8	25.2	24.8	26.7

The four appendices in this report contain detailed information regarding testing, sampling, data collection and results for each sampling event. Appendix A contains test plans, instructions and the sampling plan for Test HJ and Test FL. Appendix B contains detailed emissions data and average results for all targeted analytes. Target analyte practical quantitation reporting limits expressed in both lb/lb binder and lb/ton metal are also shown in Appendix B. Appendix C contains detailed process data and the pictorial casting record.

Appendix D contains continuous monitor charts. The charts are presented to show TGOC, carbon monoxide, carbon dioxide, and oxides of nitrogen time-dependent emissions profiles for each individual emissions test pour. Charts have not been background corrected. Appendix E contains acronyms and abbreviations.

4.0 DISCUSSION OF RESULTS/CONCLUSIONS

The individual chemical compounds from airborne emissions targeted for collection and analyses for this test were chosen based on the chemistry of the binder under investigation as well as analytes historically targeted. The analyte lists were identical for Test HJ and the baseline reference Test FL except for the addition of acetophenone for Test HJ.

The average emission factors for all three binder systems under Test HJ were very similar to each other and, in general, emissions for all three subtests of Test HJ with Test FL were comparable.

The analyte m,p-cresol contributed over 26% to emissions from all the targeted analytes for Test FL as both lb/ton of metal and lb/lb of binder, but was under the PQL for Test HJ. Phenol accounted for 16% of emissions, and benzene 8%. Variation one (6000/6478) had the lowest phenol emissions of the three HJ binder combinations.

4.1. Standard Binder

Eighteen analytes accounted for more than 95% of the concentration of all emitted targeted analytes detected from standard binder F6000/6478 of Test HJ using the Techniset® F6000/6478 binder system. Phenol and acetophenone accounted for 31% and 21% of emissions, respectively. 1,4- diethylbenzene and benzene contributed approximately 9% each, while 1,2,3- trimethylbenzene, and 1,2,4- trimethylbenzene, contributed 6% and 4%. The remaining twelve analytes contributed 3% and less.

The castings from test HJ runs 001-006 were rated better overall compared to the castings from test FL. The castings from test HJ runs 001-006 showed significantly less veining than even the best casting from test FL. The castings from test HJ runs 001-006 had a smoother surface than those from FL. In ranking the castings between the 2 tests, even the worst casting from test runs test HJ runs 001-006 was better than the best casting from test FL.

4.2. First Variation

Seventeen analytes accounted for more than 95% of the concentration of all emitted targeted analytes detected from variation one of Test HJ using the lower phenol Techniset® 6000/6478 binder system. This variation phenol emissions were approximately 25% lower than the standard F6000/6478 binder system. For this variation, as for the standard binder, phenol and acetophenone were the top targeted emitters, although their contributions were more equal at 25% and 21%, respectively. The contribution from 1,4-diethylbenzene increased to 15%, while benzene remained the same at approximately 9%, as did the contributions from 1,2,3- trimethylbenzene, and 1,2,4- trimethylbenzene. The remaining eleven analytes were all under 3% each.

4.3. Second Variation

For the second variation using the lower phenol Techniset® F6000/6435, sixteen analytes contributed 95% of airborne emissions from all the targeted compounds. The contribution of the top two contributors, phenol and acetophenone, were similar to those from the standard binder at 30% and 19%, respectively. This variation produced phenol emissions that were statistically the same as the standard F6000/6478 binder system. The contributions of 1,4-diethylbenzene and benzene to emissions was also similar to those from first variation at 15% and 7%, respectively. While 1,2,3- trimethylbenzene, and 1,2,4- trimethylbenzene contributions were the same for all three subtest. All remaining analytes contributed less than 2% each.

APPENDIX A TEST & SAMPLE PLANS AND PROCESS INSTRUCTIONS

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TECHNIKON TEST PLAN

- CONTRACT NUMBER: 1410 TASK NUMBER: 1.2.3 Series: FL
- SITE: Pre-production No-bake molding and pour, cool, shakeout enclosure.
- TEST TYPE: Baseline: Iron no-bake pouring, cooling, & shakeout.
- METAL TYPE: Class-30 gray iron.
- MOLD TYPE: 4-on no-bake gear; HA 6000, 6433, 17-727 binder
- NUMBER OF MOLDS: 9
- CORE TYPE: None
- SAMPLE Runs: 9
- TEST DATE: START: 29 Sep 2003
  FINISHED: 11 Oct 2003

TEST OBJECTIVES: Measure selected HAP and VOC emissions using absorption tubes and TGOC using THC for pouring, cooling, and shakeout for a total of 75 minutes to update the iron no-bake baseline in the revised facility. Measure the emissions for the standard iron phenolic urethane no-bake HA 6000/6433/17-727 binder system.

VARIABLES: The pattern shall be the 4-on gear. The mold shall be made with Wexford W450 sand. The no-bake mold binder will be 1.1% total binder (BOS) in 55/45 ratio of part I/part II and the activator is 10% of part 1. Molds will be poured with iron at 2630 +/- 10^{o}F. Mold cooling will be 45 minutes followed by 15 minutes of shakeout, or until no more material remains to be shaken out. The emission sampling shall be a total of 75 minutes.

BRIEF OVERVIEW: The emission collection procedure has been updated with a new emission collection system that provides independence from reasonable daily and seasonal ambient temperature changes with improved exhaust homogenization and real time data collection.

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SPECIAL CONDITIONS: The initial sand temperature into the emission collection hood shall be maintained at 80-90°F. The initial process air temperature shall be 85-90°F.

PRE-PRODUCTION FL - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments
10/7/2003											
RUN 1											
THC	FL001	X									TOTAL
M-18	FL00101		1						30	1	Carbopak charcoal
M-18 MS	FL00102		1						30	2	Carbopak charcoal
M-18 MS	FL00103			1					30	3	Carbopak charcoal
Gas, CO, CO2	FL00104		1						60	4	Tedlar Bag
Gas, CO, CO2	FL00105				1				0		Tedlar Bag
NIOSH 1500	FL00106		1						200	5	100/50 mg Charcoal (SKC 226-01)
NIOSH 1500	FL00107				1				0		100/50 mg Charcoal (SKC 226-01)
NIOSH 2002	FL00108		1						200	6	100/50 mg Silica Gel (SKC 226-10)
NIOSH 2002	FL00109				1				0		100/50 mg Silica Gel (SKC 226-10)
	Excess								200	7	Excess
	Excess								200	8	Excess
TO11	FL00110		1						675	9	DNPH Silica Gel (SKC 226-119)
TO11	FL00111				1				0		DNPH Silica Gel (SKC 226-119)
	Excess								675	10	Excess
	Excess								1000	11	Excess
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

PRE-PRODUCTION FL - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments
10/7/2003											
RUN 2											
THC	FL002	X									TOTAL
M-18	FL00201		1						30	1	Carbopak charcoal
M-18	FL00202			1					30	2	Carbopak charcoal
M-18	FL00203				1				0		Carbopak charcoal
	Excess								30	3	Excess
Gas, CO, CO2	FL00204		1						60	4	Tedlar Bag
NIOSH 1500	FL00205		1						200	5	100/50 mg Charcoal (SKC 226-01)
NIOSH 1500	FL00206			1					200	6	100/50 mg Charcoal (SKC 226-01)
NIOSH 2002	FL00207		1						200	7	100/50 mg Silica Gel (SKC 226-10)
	Excess								200	8	Excess
TO11	FL00208		1						675	9	DNPH Silica Gel (SKC 226-119)
TO11	FL00209			1					675	10	DNPH Silica Gel (SKC 226-119)
	Excess								1000	11	Excess
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

PRE-PRODUCTION FL - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments
10/7/2003											
RUN 3											
THC	FL003	X									TOTAL
M-18	FL00301		1						30	1	Carbopak charcoal
M-18	FL00302					1			30	1	Carbopak charcoal
	Excess								30	2	Excess
	Excess								30	3	Excess
Gas, CO, CO2	FL00303		1						60	4	Tedlar Bag
NIOSH 1500	FL00304		1						200	5	100/50 mg Charcoal (SKC 226-01)
NIOSH 2002	FL00305		1						200	6	100/50 mg Silica Gel (SKC 226-10)
NIOSH 2002	FL00306			1					200	7	100/50 mg Silica Gel (SKC 226-10)
	Excess								200	8	Excess
TO11	FL00307		1						675	9	DNPH Silica Gel (SKC 226-119)
	Excess								675	10	Excess
	Excess								1000	11	Excess
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

PRE-PRODUCTION FL - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments
10/8/2003											
RUN 4											
THC	FL004	X									TOTAL
M-18	FL00401		1						30	1	Carbopak charcoal
	Excess								30	2	Excess
	Excess								30	3	Excess
Gas, CO, CO2	FL00402		1						60	4	Tedlar Bag
NIOSH 1500	FL00403		1						200	5	100/50 mg Charcoal (SKC 226-01)
NIOSH 2002	FL00404		1						200	6	100/50 mg Silica Gel (SKC 226-10)
	Excess								200	7	Excess
	Excess								200	8	Excess
TO11	FL00405		1						675	9	DNPH Silica Gel (SKC 226-119)
	Excess								675	10	Excess
	Excess								1000	11	Excess
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

PRE-PRODUCTION FL - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments
10/8/2003											
RUN 5											
THC	FL005	X									TOTAL
M-18	FL00501		1						30	1	Carbopak charcoal
	Excess								30	2	Excess
	Excess								30	3	Excess
Gas, CO, CO2	FL00502		1						60	4	Tedlar Bag
NIOSH 1500	FL00503		1						200	5	100/50 mg Charcoal (SKC 226-01)
NIOSH 2002	FL00504		1						200	6	100/50 mg Silica Gel (SKC 226-10)
	Excess								200	7	Excess
	Excess								200	8	Excess
TO11	FL00505		1						675	9	DNPH Silica Gel (SKC 226-119)
	Excess								675	10	Excess
	Excess								1000	11	Excess
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

PRE-PRODUCTION FL - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments
10/8/2003											
RUN 6											
THC	FL006	X									TOTAL
M-18	FL00601		1						30	1	Carbopak charcoal
	Excess								30	2	Excess
	Excess								30	3	Excess
Gas, CO, CO2	FL00602		1						60	4	Tedlar Bag
NIOSH 1500	FL00603		1						200	5	100/50 mg Charcoal (SKC 226-01)
NIOSH 2002	FL00604		1						200	6	100/50 mg Silica Gel (SKC 226-10)
	Excess								200	7	Excess
	Excess								200	8	Excess
TO11	FL00605		1						675	9	DNPH Silica Gel (SKC 226-119)
	Excess								675	10	Excess
	Excess								1000	11	Excess
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

PRE-PRODUCTION FL - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments
10/9/2003											
RUN 7											
THC	FL007	X									TOTAL
M-18	FL00701		1						30	1	Carbopak charcoal
	Excess								30	2	Excess
	Excess								30	3	Excess
Gas, CO, CO2	FL00702		1						60	4	Tedlar Bag
NIOSH 1500	FL00703		1						200	5	100/50 mg Charcoal (SKC 226-01)
NIOSH 2002	FL00704		1						200	6	100/50 mg Silica Gel (SKC 226-10)
	Excess								200	7	Excess
	Excess								200	8	Excess
TO11	FL00705		1						675	9	DNPH Silica Gel (SKC 226-119)
	Excess								675	10	Excess
	Excess								1000	11	Excess
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

PRE-PRODUCTION FL - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments
10/9/2003											
RUN 8											
THC	FL008	X									TOTAL
M-18	FL00801		1						30	1	Carbopak charcoal
	Excess								30	2	Excess
	Excess								30	3	Excess
Gas, CO, CO2	FL00802		1						60	4	Tedlar Bag
NIOSH 1500	FL00803		1						200	5	100/50 mg Charcoal (SKC 226-01)
NIOSH 2002	FL00804		1						200	6	100/50 mg Silica Gel (SKC 226-10)
	Excess								200	7	Excess
	Excess								200	8	Excess
TO11	FL00805		1						675	9	DNPH Silica Gel (SKC 226-119)
	Excess								675	10	Excess
	Excess								1000	11	Excess
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

PRE-PRODUCTION FL - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments
10/9/2003											
RUN 9											
THC	FL009	X									TOTAL
M-18	FL00901		1						30	1	Carbopak charcoal
	Excess								30	2	Excess
	Excess								30	3	Excess
Gas, CO, CO2	FL00902		1						60	4	Tedlar Bag
NIOSH 1500	FL00903		1						200	5	100/50 mg Charcoal (SKC 226-01)
NIOSH 2002	FL00904		1						200	6	100/50 mg Silica Gel (SKC 226-10)
	Excess								200	7	Excess
	Excess								200	8	Excess
TO11	FL00905		1						675	9	DNPH Silica Gel (SKC 226-119)
	Excess								675	10	Excess
	Excess								1000	11	Excess
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

1410-1.2.3-FL

Iron No-bake Baseline 2003
Process Instructions

A. Experiment:
  1. Measure emissions from an Iron No-Bake Phenolic Urethane binder to update the iron no-bake baseline in the revised facilities.

B. Materials:
  1. No-bake molds: Wexford W450 Lakesand and
  2. 1.1% HA International Techniset® No-bake Phenolic-Urethane core binder composed of number 6000 part I resin (55%), 6433 part II co-reactant (45%), & 17-727 part III activator@ 7% of part 1. This binder is designed for iron applications.

  3. Metal:
    a) Class-30 Gray cast iron.

Caution
Observe all safety precautions attendant to these operations as delineated in the Pre-production operating and safety instruction manual.

C. Mold requirements
  1. Make nine (9) molds according to standards determined in test series CW & CP capability studies.

D. Phenolic Urethane No-bake Core Sand preparation:
  1. Load the Kloster core sand mixer with 80-90 0F Wexford sand.
  2. The phenolic urethane no-bake sand shall be 1.1 % total resin (BOS), Part I/Part II ratio 55/45, Part III at 5% of Part I.
  3. Calibrate the Kloster no-bake sand mixer to dispense 240 pounds of sand /min more or less.
  4. Calibrate the resin pumps:
    a) Premix Part I resin and Part III activator in a 20:1 weight ratio.
    b) Part I +Part III: Based on the actual measured sand dispensing rate calibrate the Part I resin + Part III activator to be 56.20% of 1.1 % (0.618% BOS) total binder.
    c) Part II: Based on the actual measured sand dispensing rate calibrate the Part II co-reactant to be 43.80 % of 1.1 % (0.482 % BOS) total binder.
    d) All calibrations to have a tolerance of +/- 1% of the calculated value.

E. Dog bones:
  1. Make 12 dogbones for each mold according to the protocol establish in capability study CW.
  2. Place the core box on the vibrating compaction table.

3. Start the Kloster mixer and waste a few pounds of sand.
4. Flood the core box with sand then stop the mixer.
5. Strike off the core box to ½ inch deep
6. Turn on the vibrating compaction table for 10 seconds.
7. Screed off most of the excess sand.
8. Screed the core box a second time moving very slowly in a back and forth manner to remove all excess sand.

Note: It is important to neither gouge the sand nor leave excess sand in center neck portion of the dogbone or the test results will be affected

9. Set aside for about 6-7 minutes or until hard to the touch.
10. Carefully remove the cores from the core box by separating the corebox components.
11. Perform tensile tests on 12 bones at 2 hours after the dogbone manufacture.
12. Report the average and standard deviation for each set of twelve (12) for each mold.
13. Weigh each dogbone and record the weight to the nearest 0.1 grams using the PJ 4000 electronic scale at the time it is tensile tested.

Note: maintain the correlation between the reported weight of a dogbone and its tensile strength and scratch hardness.

14. Bag three (3) dogbones, after tensile testing, from each mold for running 1800°F core LOI. Report the average value for each mold.

F. No-bake mold making: 4 on gear core box.

1. Inspect the box for cracks and other damage. Repair before use.
2. Prepare the core box halves with a light coating of Ashland Zipslip ® IP 78. Allow to fully dry.
3. Place the drag core box on the vibrating compaction table.
4. Begin filling the box.
5. When the box is about half full start the table vibration.
6. Manually spread the sand around the box as it is filling.
7. Strike off the box until it is full.
8. Allow the vibrator to run an additional 10 seconds after the box is full.
9. Strike off the core box so that the core mold is 5-1/2 inches thick.
10. Set the core box aside for 5 to 6 minutes or until it is hard to the touch.
11. Invert the box and place on a transport pallet. The pallet itself being on steel tie straps and in turn on a piece of polyethylene film big enough to wrap it up.
12. Remove the pivot whole pins.
13. Remove the core mold half by tapping lightly on the box with a soft hammer.
14. Set the drag core box aside.
15. Immediately roll the drag mold half parting line up and return to the transport pallet.
16. Place the cope core box on the vibrating compaction table.

17. Follow steps F3-F13 except that the cope mold is 5 inches thick.
18. Rotate the unboxed core to set it on edge.
19. Drill vent-holes as per template.
20. Blow out both mold halves.
21. Apply a 1/4-3/8 inch glue bead of Foseco Core Fix 8 one inch (1) in from the outer edge of the mold.
22. Immediately close cope onto drag. Visually check for closure.
23. Install two (2) steel straps, one on either side of the pouring cup, with 4 metal corner protectors each to hold the mold tightly closed.
24. Prior to pouring, glue a pouring basin over the sprue hole with Foseco CoreFix 8 or equivalent no emission water base refractory adhesive
25. Weigh and record the weight of the sand only from the closed mold and pour basin.
26. Wrap and seal the mold with polyethylene film until time to load the mold into the emission hood.
27. Store the mold for next day use at 80-90°F.

G. Emission hood:

1. Loading.

a) Hoist the mold onto the shakeout deck fixture within the emission hood with the pouring cup side toward the furnace.
b) Install ½ rerod hanger in each riser vent and hand over shakeout supports.
c) Close and seal the emission hood and lock the ducts together.
d) Attach the heated ambient air duct to plenum
e) Wait to pour until the process air thermocouple is in the range 85-90 oF.
f) Record the ambient & process ambient air temperature.

2. Shakeout.

a) After 45 minutes of cooling time has elapsed turn on the shakeout unit and **run for a full 15 minutes** as prescribed in the emission test plan.
b) Turn off the shakeout. The emission sampling will continue for an additional 15 minutes or a total of 75 minutes
c) Wait for the emission team to signal that they are finished sampling.
d) Open the hood, remove the castings
e) Clean core sand out of the waste sand box, off the shakeout, and the floor.
f) Weigh and record cast metal weight adjusted for the re-rod hanger weight.
g) **Immediately load the next prepared mold** and close the hood.

H. Melting:

1. Initial charge:

a) Charge the furnace according to the Generic Start up Charge for Pre-production heat recipe bearing effectivity date 18 Mar 1999.
b) Place part of the steel scrap on the bottom, followed by carbon alloys, and the balance of the steel.
c) Place a pig on top on top.

d) Bring the furnace contents to the point of beginning to melt over a period of 1 hour at reduced power.
e) Add the balance of the metallics under full power until all is melted and the temperature has reached 2600 to 2700°F.
f) Slag the furnace and add the balance of the alloys.
g) Raise the temperature of the melt to 2700°F and take a DataCast 2000 sample. The temperature of the primary liquidus (TPL) must be in the range of 2200-2350°F.
h) Hold the furnace at 2500-2550°F until near ready to tap.
i) When ready to tap raise the temperature to 2700°F and slag the furnace.
j) Record all metallic and alloy additions to the furnace & tap temperature. Record all furnace activities with an associated time. Record Data Cast TPL, TPS, CE, C, & Si.

2. Back charging.
a) If additional iron is desired back charge according to the **Generic Pre-production Last Melt** heat recipe dated 18 Mar 1999.
b) Charge a few pieces of steel first to make a splash barrier, followed by the carbon alloys.
c) Follow the above steps beginning with H.1.e

3. Emptying the furnace.
a) Pig the extra metal only after the last emission measurement is complete to avoid contaminating the air sample.
b) Cover the empty furnace with ceramic blanket to cool.

I. Pouring:
1. Preheat the ladle.
a) Tap 400 pounds more or less of 2700°F metal into the cold ladle.
b) Casually pour the metal back to the furnace.
c) Cover the ladle.
d) Reheat the metal to 2780 +/- 20°F.
e) Tap 450 pounds more or less of iron into the ladle while pouring inoculating alloys onto the metal stream near its base.
f) Cover the ladle to conserve heat.
g) Move the ladle to the pour position, open the emission hood pour door and wait until the metal temperature reaches 2630 +/- 10 oF.
h) Commence pouring keeping the sprue full.
i) Upon completion close the hood door, return the extra metal to the furnace, and cover the ladle.
j) Record Pouring temperature and pour duration.

J. Casting cleaning
1. Spin blast set up.
a) Load the spin blast shot storage bin with 460 steel shot.

b) Turn on the spin blast bag house.
c) Turn on the spin blast machine.
d) Increase the magnetic feeder so that the motor amperage just turns to 12 amps from 11 amps.
e) Record the shot flow and the motor amperage for each wheel

2. Cleaning castings.
a) Place the four (4) castings from a single mold on one (1) casting basket.
b) Process each rotating basket for eight (8) minutes.
c) Remove and remark casting ID on each casting.

K. Rank order evaluation.
1. The supervisor shall select a group of four or five persons to make a collective subjective judgment of the casting's relative surface appearance.
2. Review the general appearance of the castings and select specific casting features to compare. Generally for the gear mold the material related casting features should be metal penetration, veining, expansion defects and texture (tactile feel). Defects arising from loose sand, slag, broken molds, double striking, and shrinkage should be disregarded.
3. For each cavity casting:
a) Place each casting initially in sequential mold number order.
b) Beginning with casting from cavity 1 mold FL001 compare it to castings from cavity 1 mold FL002.
c) Place the better appearing casting in the first position and the lesser appearing casting in the second position.
d) Repeat this procedure with cavity 1 mold FL001 to its nearest neighbors until all castings closer to the beginning of the line are better appearing than cavity 1 mold FL001 and the next casting farther down the line is inferior.
e) Repeat this comparison to next neighbors for each cavity 3 casting number.
f) When all casting numbers have been compared go to the beginning of the line and begin again comparing each casting to its nearest neighbor. Move the castings so that each casting is inferior to the next one closer to the beginning of the line and superior to the one next toward the tail of the line.
g) Repeat this comparison until all evaluators concur with the ranking order.

4. Record cavity 1 mold number by rank-order series.
5. Save the best, median, and worst castings of Cavity 1 for photographing and archiving.
6. Repeat for each cavity.

Steven Knight
Mgr. Process Engineering

TECHNIKON TEST PLAN

- **CONTRACT NUMBER:** 1413 **TASK NUMBER** 111 **SERIES** HJ
- **SITE:** Research Foundry
- **TEST TYPE:** Pouring, cooling, shakeout: Nobake HA Techniset F6000/6478, 6000/6478 and F6000/6435 in iron
- **METAL TYPE:** Class 30 Gray Iron
- **MOLD TYPE:** 4-on Irregular Gear
- **NUMBER OF MOLDS:** 12
- **CORE TYPE:** None
- **CORE COATING:** None
- **SAMPLE EVENTS:** 6 sampling + 2 variations divided into 3 sampling events each
- **TEST DATE(S):** **START:** 7/24/06
  FINISH: 7/28/06

TEST OBJECTIVES:

Measure TGOC and targeted VOCs & HAPs emissions, CO, CO_2, and NOx from PCS of No-Bake molds and compare to Test FL.

VARIABLES:

The pattern shall be the 4-on gear. The mold shall be made with Wexford W450 sand. The no-bake mold binder will be 1.1 % total binder (BOS) in 55/45 ratio of part I/part II and the activator is 10% of part 1. Molds will be poured with iron at 2630 ± 10 °F. Mold cooling will be 45 minutes followed by 15 minutes of shakeout, or until no more material remains to be shaken out. The emission sampling shall be a total of 75 minutes.

BRIEF OVERVIEW:

The pattern will be the 4-on irregular gear. The molds will be made at Technikon, wrapped in plastic and stored for about 24 hours.

SPECIAL CONDITIONS:

The initial sand temperature into the emission collection hood shall be maintained at 80-90 °F. The initial process air temperature shall be 85-90 °F.

RESEARCH FOUNDRY HJ - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments: F6000/6478 Binder System
7/25/2006											
THC, CO, CO2 & Nox	HJ001	X									TOTAL
TO-17	HJ00101		1						60	1	Carbopak charcoal
TO-17	HJ00102				1				0		Carbopak charcoal
	Excess								60	2	Excess
	Excess								60	3	Excess
NIOSH 2002	HJ00103		1						200	4	150/75 mg Silica Gel (SKC 226-10)
NIOSH 2002	HJ00104				1				0		150/75 mg Silica Gel (SKC 226-10)
	Excess								200	5	Excess
OSHA ID200	HJ00105		1						1000	6	100/50 mg Carbon Bead (SKC 226-80)
OSHA ID200	HJ00106				1				0		100/50 mg Carbon Bead (SKC 226-80)
	Excess								1000	7	Excess
NIOSH 1500	HJ00107		1						200	8	100/50 mg Charcoal (SKC 226-01)
NIOSH 1500	HJ00108				1				0		100/50 mg Charcoal (SKC 226-01)
	Excess								200	9	Excess
TO11	HJ00109		1						1000	10	DNPH Silica Gel (SKC 226-119)
TO11	HJ00110				1				0		DNPH Silica Gel (SKC 226-119)
	Excess								1000	11	Excess
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

RESEARCH FOUNDRY HJ - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments: F6000/6478 Binder System
7/25/2006											
THC, CO, CO2 & Nox	HJ002	X									TOTAL
TO-17	HJ00201		1						60	1	Carbopak charcoal
TO-17	HJ00202			1					60	2	Carbopak charcoal
	Excess								60	3	Excess
NIOSH 2002	HJ00203		1						200	4	150/75 mg Silica Gel (SKC 226-10)
NIOSH 2002	HJ00204			1					200	5	150/75 mg Silica Gel (SKC 226-10)
OSHA ID200	HJ00205		1						1000	6	100/50 mg Carbon Bead (SKC 226-80)
OSHA ID200	HJ00206			1					1000	7	100/50 mg Carbon Bead (SKC 226-80)
NIOSH 1500	HJ00207		1						200	8	100/50 mg Charcoal (SKC 226-01)
NIOSH 1500	HJ00208			1					200	9	100/50 mg Charcoal (SKC 226-01)
TO11	HJ00209		1						1000	10	DNPH Silica Gel (SKC 226-119)
TO11	HJ00210			1					1000	11	DNPH Silica Gel (SKC 226-119)
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

RESEARCH FOUNDRY HJ - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments: F6000/6478 Binder System
7/25/2006											
THC, CO, CO2 & Nox	HJ003	X									TOTAL
TO-17	HJ00301		1						60	1	Carbopak charcoal
TO-17 MS	HJ00302		1						60	2	Carbopak charcoal
TO-17 MS	HJ00303			1					60	3	Carbopak charcoal
NIOSH 2002	HJ00304		1						200	4	150/75 mg Silica Gel (SKC 226-10)
	Excess								200	5	Excess
OSHA ID200	HJ00305		1						1000	6	100/50 mg Carbon Bead (SKC 226-80)
OSHA ID200	HJ00306		1						150	7	100/50 mg Carbon Bead (SKC 226-80)
NIOSH 1500	HJ00307		1						200	8	100/50 mg Charcoal (SKC 226-01)
	Excess								200	9	Excess
TO11	HJ00308		1						1000	10	DNPH Silica Gel (SKC 226-119)
	Excess								1000	11	Excess
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

RESEARCH FOUNDRY HJ - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments: F6000/6478 Binder System
7/26/2006											
THC, CO, CO2 & Nox	HJ004	X									TOTAL
TO-17	HJ00401		1						60	1	Carbopak charcoal
TO-17	HJ00402					1			60	1	Carbopak charcoal
	Excess								60	2	Excess
	Excess								60	3	Excess
NIOSH 2002	HJ00403		1						200	4	150/75 mg Silica Gel (SKC 226-10)
	Excess								200	5	Excess
OSHA ID200	HJ00404		1						1000	6	100/50 mg Carbon Bead (SKC 226-80)
OSHA ID200	HJ00405		1						150	7	100/50 mg Carbon Bead (SKC 226-80)
NIOSH 1500	HJ00406		1						200	8	100/50 mg Charcoal (SKC 226-01)
	Excess								200	9	Excess
TO11	HJ00407		1						1000	10	DNPH Silica Gel (SKC 226-119)
	Excess								1000	11	Excess
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

RESEARCH FOUNDRY HJ - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments: F6000/6478 Binder System
7/26/2006											
THC, CO, CO2 & Nox	HJ005	X									TOTAL
TO-17	HJ00501		1						60	1	Carbopak charcoal
	Excess								60	2	Excess
	Excess								60	3	Excess
NIOSH 2002	HJ00502		1						200	4	150/75 mg Silica Gel (SKC 226-10)
	Excess								200	5	Excess
OSHA ID200	HJ00503		1						1000	6	100/50 mg Carbon Bead (SKC 226-80)
OSHA ID200	HJ00504		1						150	7	100/50 mg Carbon Bead (SKC 226-80)
NIOSH 1500	HJ00505		1						200	8	100/50 mg Charcoal (SKC 226-01)
	Excess								200	9	Excess
TO11	HJ00506		1						1000	10	DNPH Silica Gel (SKC 226-119)
	Excess								1000	11	Excess
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

RESEARCH FOUNDRY HJ - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments: F6000/6478 Binder System
7/26/2006											
THC, CO, CO2 & Nox	HJ006	X									TOTAL
TO-17	HJ00601		1						60	1	Carbopak charcoal
	Excess								60	2	Excess
	Excess								60	3	Excess
NIOSH 2002	HJ00602		1						200	4	150/75 mg Silica Gel (SKC 226-10)
	Excess								200	5	Excess
OSHA ID200	HJ00603		1						1000	6	100/50 mg Carbon Bead (SKC 226-80)
OSHA ID200	HJ00604		1						500	7	100/50 mg Carbon Bead (SKC 226-80)
NIOSH 1500	HJ00605		1						200	8	100/50 mg Charcoal (SKC 226-01)
	Excess								200	9	Excess
TO11	HJ00606		1						1000	10	DNPH Silica Gel (SKC 226-119)
	Excess								1000	11	Excess
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

RESEARCH FOUNDRY HJ - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments: 6000/6478 Binder System
7/27/2006											
THC, CO, CO2 & Nox	HJ007	X									TOTAL
TO-17	HJ00701		1						60	1	Carbopak charcoal
TO-17	HJ00707					1			60	1	Carbopak charcoal
	Excess								60	2	Excess
	Excess								60	3	Excess
NIOSH 2002	HJ00702		1						200	4	150/75 mg Silica Gel (SKC 226-10)
	Excess								200	5	Excess
OSHA ID200	HJ00703		1						1000	6	100/50 mg Carbon Bead (SKC 226-80)
OSHA ID200	HJ00704		1						500	7	100/50 mg Carbon Bead (SKC 226-80)
NIOSH 1500	HJ00705		1						200	8	100/50 mg Charcoal (SKC 226-01)
	Excess								200	9	Excess
TO11	HJ00706		1						1000	10	DNPH Silica Gel (SKC 226-119)
	Excess								1000	11	Excess
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

RESEARCH FOUNDRY HJ - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments: 6000/6478 Binder System
7/27/2006											
THC, CO, CO2 & Nox	HJ008	X									TOTAL
TO-17	HJ00801		1						60	1	Carbopak charcoal
TO-17 MS	HJ00807		1						60	2	Excess
TO-17 MS	HJ00808			1					60	3	Excess
NIOSH 2002	HJ00802		1						200	4	150/75 mg Silica Gel (SKC 226-10)
	Excess								200	5	Excess
OSHA ID200	HJ00803		1						1000	6	100/50 mg Carbon Bead (SKC 226-80)
OSHA ID200	HJ00804		1						500	7	100/50 mg Carbon Bead (SKC 226-80)
NIOSH 1500	HJ00805		1						200	8	100/50 mg Charcoal (SKC 226-01)
	Excess								200	9	Excess
TO11	HJ00806		1						1000	10	DNPH Silica Gel (SKC 226-119)
	Excess								1000	11	Excess
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

RESEARCH FOUNDRY HJ - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments: 6000/6478 Binder System
7/27/2006											
THC, CO, CO2 & Nox	HJ009	X									TOTAL
TO-17	HJ00901		1						60	1	Carbopak charcoal
TO-17	HJ00906			1					60	2	Carbopak charcoal
	Excess								60	3	Excess
NIOSH 2002	HJ00902		1						200	4	150/75 mg Silica Gel (SKC 226-10)
NIOSH 2002	HJ00907			1					200	5	150/75 mg Silica Gel (SKC 226-10)
OSHA ID200	HJ00903		1						1000	6	100/50 mg Carbon Bead (SKC 226-80)
OSHA ID200	HJ00908			1					1000	7	100/50 mg Carbon Bead (SKC 226-80)
NIOSH 1500	HJ00904		1						200	8	100/50 mg Charcoal (SKC 226-01)
NIOSH 1500	HJ00909			1					200	9	100/50 mg Charcoal (SKC 226-01)
TO11	HJ00905		1						1000	10	DNPH Silica Gel (SKC 226-119)
TO11	HJ00910			1					1000	11	DNPH Silica Gel (SKC 226-119)
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

RESEARCH FOUNDRY HJ - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments: F6000/6435 Binder System
7/28/2006											
THC, CO, CO2 & Nox	HJ010	X									TOTAL
TO-17	HJ01001		1						60	1	Carbopak charcoal
TO-17	HJ01002					1			60	1	Carbopak charcoal
	Excess								60	2	Excess
	Excess								60	3	Excess
NIOSH 2002	HJ01003		1						200	4	150/75 mg Silica Gel (SKC 226-10)
	Excess								200	5	Excess
OSHA ID200	HJ01004		1						1000	6	100/50 mg Carbon Bead (SKC 226-80)
	Excess								1000	7	
NIOSH 1500	HJ01005		1						200	8	100/50 mg Charcoal (SKC 226-01)
	Excess								200	9	Excess
TO11	HJ01006		1						1000	10	DNPH Silica Gel (SKC 226-119)
	Excess								1000	11	Excess
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

RESEARCH FOUNDRY HJ - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments: F6000/6435 Binder System
7/28/2006											
THC, CO, CO2 & Nox	HJ011	X									TOTAL
TO-17	HJ01101		1						60	1	Carbopak charcoal
TO-17	HJ01102			1					60	2	Carbopak charcoal
	Excess								60	3	Excess
NIOSH 2002	HJ01103		1						200	4	150/75 mg Silica Gel (SKC 226-10)
NIOSH 2002	HJ01104			1					200	5	150/75 mg Silica Gel (SKC 226-10)
OSHA ID200	HJ01105		1						1000	6	100/50 mg Carbon Bead (SKC 226-80)
OSHA ID200	HJ01106			1					1000	7	100/50 mg Carbon Bead (SKC 226-80)
NIOSH 1500	HJ01107		1						200	8	100/50 mg Charcoal (SKC 226-01)
NIOSH 1500	HJ01108			1					200	9	100/50 mg Charcoal (SKC 226-01)
TO11	HJ01109		1						1000	10	DNPH Silica Gel (SKC 226-119)
TO11	HJ01110			1					1000	11	DNPH Silica Gel (SKC 226-119)
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

RESEARCH FOUNDRY HJ - SERIES SAMPLE PLAN

Method	Sample #	Data	Sample	Duplicate	Blank	Breakthrough	Spike	Spike Duplicate	Flow (ml/min)	Train Channel	Comments: F6000/6435 Binder System
7/28/2006											
THC, CO, CO2 & Nox	HJ012	X									TOTAL
TO-17	HJ01201		1						60	1	Carbopak charcoal
TO-17 MS	HJ01202		1						60	2	Carbopak charcoal
TO-17 MS	HJ01203			1					60	3	Carbopak charcoal
NIOSH 2002	HJ01204		1						200	4	150/75 mg Silica Gel (SKC 226-10)
	Excess								200	5	Excess
OSHA ID200	HJ01205		1						1000	6	100/50 mg Carbon Bead (SKC 226-80)
	Excess								1000	7	Excess
NIOSH 1500	HJ01206		1						200	8	100/50 mg Charcoal (SKC 226-01)
	Excess								200	9	Excess
TO11	HJ01207		1						1000	10	DNPH Silica Gel (SKC 226-119)
	Excess								1000	11	Excess
	Moisture		1						500	12	TOTAL
	Excess								5000	13	Excess

1413-1.1.1-HJ

Product Test: PCS, HA –International Techniset® 4-on Irregular Gear Mold, Iron

Process Instructions

A. Experiment:

   1. Measure emissions from an Iron No-Bake Phenolic Urethane binder to compare to the iron no-bake baseline.

B. Materials:

   1. No-bake molds:

      a) Wexford W450 Lakesand

         i) 1.1% HA International Techniset ® No-bake Phenolic-Urethane core binder composed of number F6000 part I resin (55%), 6478 part II co-reactant (45%), & 17-727 part III activator@ 10% of part I for 6 molds.

         ii) 1.1 % HA International Techniset ® No-bake Phenolic-Urethane core binder composed of number 6000 part I resin (55%), 6478 part II co-reactant (45%), & 17-727 part III activator@ 10% of part I for 3 molds.

         iii) 1.1% HA International Techniset® No-bake Phenolic-Urethane core binder composed of number F6000 part I resin (55%), 6435 part II co-reactant (45%), & 17-727 part III activator @ 10% part I for 3 molds.

   2. Metal: Class-30 Gray cast iron.

Caution

Observe all safety precautions attendant to these operations as delineated in the Pre-production operating and safety instruction manual.

C. Mold requirements

   1. Make twelve (12) molds according to standards determined in test series CW & CP capability studies. Make six (6) molds using the F6000/6478 binder, three (3) molds using the 6000/6478 binder, and three (3) molds using the F6000/6435 binder.

D. Phenolic Urethane No-bake Core Sand preparation:

   1. Load the Kloster core sand mixer with 80-90°F Wexford sand.

   2. The phenolic urethane no-bake sand shall be 1.1 % total resin (BOS), Part I/Part II ratio 55/45, Part III at 10% of Part I.

   3. Calibrate the Kloster no-bake sand mixer to dispense 240 pounds of sand /min more or less.

   4. Calibrate the resin pumps:

      a) Premix Part I resin and Part III activator in a 10:1 weight ratio.

      b) Part I +Part III: Based on the actual measured sand dispensing rate calibrate the Part I resin + Part III activator to be 56.20% of 1.1 % (0.618% BOS) total binder.

c) Part II: Based on the actual measured sand dispensing rate calibrate the Part II co-reactant to be 43.80% of 1.1% (0.482% BOS) total binder.

d) All calibrations to have a tolerance of +/- 1% of the calculated value.

E. Dog bones:

1. Make 30 dog bones for each mold according to AFS procedure 3342-00-S.
2. Place the core box on the vibrating compaction table.
3. Start the Kloster mixer and waste a few pounds of sand.
4. Flood the core box with sand then stop the mixer.
5. Using a butt rammer compact the sand into each cavity
6. Strike off the excess sand.

Note: It is important to neither gouge the sand nor leave excess sand in center neck portion of the dogbone or the test results will be affected

7. Set aside for about 6-7 minutes or until hard to the touch.
8. Carefully remove the cores from the core box by separating the corebox components.
9. Store the dog bones on edge in a desiccator for 2 hours.
10. Weigh, and record the weight of each dog bone before tensile testing.
11. Perform tensile tests on 30 bones at 2 hours after the dogbone manufacture.
12. Report the average and standard deviation for each set of thirty (30) for each mold.

Note: maintain the correlation between the reported weight of a dogbone and its tensile strength and scratch hardness.

13. Bag three (3) dog bones, after tensile testing, from each mold for running 1800°F core LOI. Report the average value for each mold.

F. No-bake mold making: 4 on gear core box.

1. Inspect the box for cracks and other damage. Repair before use.
2. Prepare the core box halves with a light coating of Ashland Zipslip ® IP 78. Allow to fully dry.
3. Place the drag core box on the vibrating compaction table.
4. Begin filling the box.
5. When the box is about half full start the table vibration.
6. Manually spread the sand around the box as it is filling.
7. Strike off the box until it is full.
8. Allow the vibrator to run an additional 10 seconds after the box is full.
9. Strike off the core box so that the core mold is 5-1/2 inches thick.
10. Set the core box aside for 5 to 6 minutes or until it is hard to the touch.
11. Invert the box and place on a transport pallet. The pallet itself being on steel tie straps and in turn on a piece of polyethylene film big enough to wrap it up.
12. Remove the pivot-hole pins.

13. Remove the core mold half by tapping lightly on the box with a soft hammer.
14. Set the drag core box aside.
15. Immediately roll the drag mold half parting line up and return to the transport pallet.
16. Place the cope core box on the vibrating compaction table.
17. Follow steps F3-F13 except that the cope mold is 5 inches thick.
18. Rotate the unboxed core to set it on edge.
19. Drill vent-holes as per template.
20. Blow out both mold halves.
21. Apply a 1/4-3/8 inch glue bead of Foseco CoreFix 8 one inch (1) in from the outer edge of the mold.
22. Immediately close cope onto drag. Visually check for closure.
23. Install two (2) steel straps, one on either side of the pouring cup, with 4 metal corner protectors each to hold the mold tightly closed.
24. Prior to pouring, glue a pouring basin over the sprue hole with Foseco CoreFix 8 or equivalent no emission water base refractory adhesive
25. Weigh and record the weight of the sand only from the closed mold and pour basin.
26. Wrap and seal the mold with polyethylene film until time to load the mold into the emission hood.
27. Store the mold for next day use at 80-90°F .

G. Emission hood:

1. Loading.

a) Hoist the mold onto the shakeout deck fixture within the emission hood with the pouring cup side toward the furnace.
b) Install ½ rerod hanger in each riser vent and hand over shakeout supports.
c) Close and seal the emission hood and lock the ducts together.
d) Attach the heated ambient air duct to plenum
e) Wait to pour until the process air thermocouple is in the range 85-90°F.
f) Record the ambient & process ambient air temperature.

2. Shakeout.

a) After 45 minutes of cooling time has elapsed turn on the shakeout unit and run for a full 15 minutes as prescribed in the emission test plan.
b) Turn off the shakeout. The emission sampling will continue for an additional 15 minutes or a total of 75 minutes
c) Wait for the emission team to signal that they are finished sampling.
d) Open the hood, remove the castings
e) Clean core sand out of the waste sand box, off the shakeout, and the floor.
f) Weigh and record cast metal weight adjusted for the re-rod hanger weight.
g) Immediately load the next prepared mold and close the hood.

H. Melting:

1. Initial charge:

a) Charge the furnace according to the heat recipe.

- **b)** Place part of the steel scrap on the bottom, followed by carbon alloys, and the balance of the steel.
- **c)** Place a pig on top on top.
- **d)** Bring the furnace contents to the point of beginning to melt over a period of 1 hour at reduced power.
- **e)** Add the balance of the metallics under full power until all is melted and the temperature has reached 2600 to 2700°F.
- **f)** Slag the furnace and add the balance of the alloys.
- **g)** Raise the temperature of the melt to 2700°F and take a DataCast 2000 sample. The temperature of the primary liquidus (TPL) must be in the range of 2200-2350°F.
- **h)** Hold the furnace at 2500-2550°F until near ready to tap.
- **i)** When ready to tap raise the temperature to 2700°F and slag the furnace.
- **j)** Record all metallic and alloy additions to the furnace & tap temperature. Record all furnace activities with an associated time. Record Data Cast TPL, TPS, CE, C, & Si.

2. Back charging.

- **a)** If additional iron is desired, back charge the furnace according to the heat recipe.
- **b)** Charge a few pieces of steel first to make a splash barrier, followed by the carbon alloys.
- **c)** Follow the above steps beginning with H.1.e

3. Emptying the furnace.

- **a)** Pig the extra metal only after the last emission measurement is complete to avoid contaminating the air sample.
- **b)** Cover the empty furnace with ceramic blanket to cool.

I. Pouring:

1. Preheat the ladle.

- **a)** Tap 450 pounds more or less of iron 2780°F into the ladle while pouring inoculating alloys onto the metal stream near its base.
- **b)** Pour some of the metal back in to preheat the spout.
- **c)** Move the ladle to the pour position, open the emission hood pour door and wait until the metal temperature reaches 2630 +/- 10°F.
- **d)** Commence pouring keeping the sprue full.
- **e)** Upon completion close the hood door, return the extra metal to the furnace, and cover the ladle.
- **f)** Record Pouring temperature and pour duration.

J. Casting cleaning

1. Spin blast set up.

- **a)** Load the spin blast shot storage bin with 460 steel shot.
- **b)** Turn on the spin blast bag house.
- **c)** Turn on the spin blast machine.

d) Increase the magnetic feeder so that the motor amperage just turns to 12 amps from 11 amps.
e) Record the shot flow and the motor amperage for each wheel

2. Cleaning castings.
a) Place the four (4) castings from a single mold on one (1) casting basket.
b) Process each rotating basket for eight (8) minutes.
c) Remove and remark casting ID on each casting.

K. Rank order evaluation.
1. The supervisor shall select a group of four or five persons to make a collective subjective judgment of the casting's relative surface appearance.
2. Review the general appearance of the castings and select specific casting features to compare. Generally for the gear mold the material related casting features should be metal penetration, veining, expansion defects and texture (tactile feel). Defects arising from loose sand, slag, broken molds, double striking, and shrinkage should be disregarded.
3. For each cavity casting:
a) Place each casting initially in sequential mold number order.
b) Beginning with casting from cavity 1 mold HJ001 compare it to castings from cavity 1 mold HJ002.
c) Place the better appearing casting in the first position and the lesser appearing casting in the second position.
d) Repeat this procedure with cavity 1 mold HJ001 to its nearest neighbors until all castings closer to the beginning of the line are better appearing than cavity 1 mold HJ001 and the next casting farther down the line is inferior.
e) Repeat this comparison to next neighbors for each cavity 1 casting number from molds HJ001-HJ006.
f) When all casting numbers have been compared go to the beginning of the line and begin again comparing each casting to its nearest neighbor. Move the castings so that each casting is inferior to the next one closer to the beginning of the line and superior to the one next toward the tail of the line.
g) Repeat this comparison until all evaluators concur with the ranking order.

4. Record cavity 1 mold number by rank-order series.
5. Save the best, median, and worst castings of Cavity 1 for photographing and archiving.
6. Repeat for each cavity.

Thomas J Fennell
Process Engineer

APPENDIX B DETAILED EMISSION RESULTS AND QUANTITATION LIMITS

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Detailed Emissions Results - Test FL - Lb/Tn Metal

TA	POM	HAP		FL001	FL002	FL003	FL004	FL005	FL006	FL007	FL008	FL009	Average	Standard Deviation
			Test Dates	7-Oct-03	7-Oct-03	7-Oct-03	8-Oct-03	8-Oct-03	8-Oct-03	9-Oct-03	9-Oct-03	9-Oct-03	—	—
Emission Indicators														
			TGOC as Propane	1.29E+01	1.30E+01	1.30E+01	1.30E+01	1.26E+01	1.29E+01	I	1.25E+01	1.25E+01	1.28E+01	2.23E-01
			HC as n-Hexane	1.55E+00	4.78E+00	4.12E+00	3.96E+00	3.84E+00	I	3.55E+00	3.86E+00	4.18E+00	3.73E+00	9.49E-01
			Sum of Target Analytes	4.84E-01	3.31E+00	3.25E+00	2.90E+00	3.24E+00	3.03E+00	2.87E+00	3.50E+00	3.14E+00	3.15E+00	9.12E-01
			Sum of Target HAPs	3.92E-01	1.84E+00	1.85E+00	1.70E+00	1.84E+00	1.74E+00	1.66E+00	1.93E+00	1.75E+00	1.79E+00	4.74E-01
			Sum of Target POMs	7.80E-03	5.11E-02	4.68E-02	4.04E-02	4.26E-02	4.04E-02	4.29E-02	5.09E-02	4.37E-02	4.47E-02	1.30E-02
Selected Target HAPs and POMs														
TA		**H**	Cresol, mp-	I	8.71E-01	8.65E-01	7.73E-01	8.49E-01	8.29E-01	7.60E-01	8.89E-01	8.19E-01	8.32E-01	4.65E-02
TA		**H**	Phenol	I	5.36E-01	5.20E-01	4.77E-01	5.38E-01	4.99E-01	4.56E-01	5.67E-01	4.87E-01	5.10E-01	3.68E-02
TA		**H**	Benzene	2.57E-01	2.50E-01	2.56E-01	2.45E-01	2.54E-01	2.26E-01	2.47E-01	2.63E-01	2.46E-01	2.49E-01	1.06E-02
TA		**H**	Toluene	5.28E-02	5.72E-02	5.76E-02	5.84E-02	5.75E-02	5.37E-02	5.63E-02	6.05E-02	5.84E-02	5.69E-02	2.39E-03
TA		**H**	Xylene, mp-	3.06E-02	3.44E-02	3.49E-02	3.51E-02	3.50E-02	3.29E-02	3.38E-02	3.70E-02	3.53E-02	3.43E-02	1.77E-03
TA		**H**	Cresol, o-	2.44E-02	I	3.04E-02	3.08E-02	3.07E-02	2.74E-02	3.08E-02	3.00E-02	3.05E-02	2.94E-02	2.30E-03
TA	**P**	**H**	Naphthalene	I	2.51E-02	2.33E-02	2.01E-02	2.19E-02	2.08E-02	2.09E-02	2.55E-02	2.19E-02	2.24E-02	2.01E-03
TA		**H**	Formaldehyde	1.13E-02	1.67E-02	1.48E-02	1.28E-02	1.18E-02	I	1.06E-02	1.39E-02	1.08E-02	1.28E-02	2.16E-03
TA	**P**	**H**	Methylnaphthalene, 2-	I	1.35E-02	1.15E-02	1.00E-02	1.03E-02	9.70E-03	1.13E-02	1.38E-02	1.08E-02	1.14E-02	1.53E-03
TA		**H**	Xylene, o-	I	1.04E-02	1.06E-02	1.04E-02	1.06E-02	1.02E-02	1.01E-02	1.11E-02	1.06E-02	1.05E-02	3.13E-04
TA		**H**	Styrene	4.76E-03	5.84E-03	5.89E-03	5.66E-03	6.36E-03	6.13E-03	5.67E-03	6.66E-03	5.49E-03	5.83E-03	5.45E-04
TA	**P**	**H**	Methylnaphthalene, 1-	2.67E-03	6.05E-03	5.18E-03	4.50E-03	4.64E-03	4.37E-03	4.83E-03	6.23E-03	4.91E-03	4.82E-03	1.04E-03
TA		**H**	Acetaldehyde	I	3.77E-03	3.43E-03	2.97E-03	2.56E-03	7.92E-03	2.61E-03	3.06E-03	2.68E-03	3.62E-03	1.79E-03
TA		**H**	Ethylbenzene	2.24E-03	2.41E-03	2.44E-03	2.50E-03	2.47E-03	2.42E-03	2.47E-03	I	2.39E-03	2.42E-03	8.14E-05
TA	**P**	**H**	Dimethylnaphthalene, 1,8-	≤PQL	≤PQL	2.60E-03	≤PQL	≤PQL	≤PQL	≤PQL	2.87E-03	≤PQL	2.16E-03	3.31E-04
TA	**P**	**H**	Dimethylnaphthalene, 1,5-	≤PQL	≤PQL	2.39E-03	2.07E-03	2.04E-03	≤PQL	≤PQL	I	2.17E-03	2.08E-03	1.36E-04
TA	**P**	**H**	Dimethylnaphthalene, 1,3-	1.13E-03	2.46E-03	1.86E-03	1.70E-03	1.69E-03	1.56E-03	1.91E-03	2.53E-03	1.81E-03	1.85E-03	4.31E-04
TA		**H**	Hexane	1.02E-03	1.62E-03	1.48E-03	1.20E-03	2.07E-03	2.02E-03	1.32E-03	1.30E-03	1.19E-03	1.47E-03	3.70E-04
TA		**H**	Acrolein	I	8.29E-04	6.72E-04	5.70E-04	4.87E-04	2.19E-03	5.27E-04	6.82E-04	6.10E-04	8.20E-04	5.63E-04
TA		**H**	Propionaldehyde (Propanal)	≤PQL	3.28E-04	2.98E-04	≤PQL	≤PQL	I	≤PQL	≤PQL	≤PQL	2.96E-04	1.32E-05
TA	**P**	**H**	Acenaphthalene	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	**P**	**H**	Dimethylnaphthalene, 1,2-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	**P**	**H**	Dimethylnaphthalene, 1,6-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	**P**	**H**	Dimethylnaphthalene, 2,3-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	**P**	**H**	Dimethylnaphthalene, 2,6-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	I	≤PQL	≤PQL	NA
TA	**P**	**H**	Dimethylnaphthalene, 2,7-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	**P**	**H**	Trimethylnaphthalene, 2,3,5-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA

Detailed Emissions Results - Test FL - Lb/Tn Metal

TA	POM	HAP		FL001	FL002	FL003	FL004	FL005	FL006	FL007	FL008	FL009	Average	Standard Deviation
			Test Dates	7-Oct-03	7-Oct-03	7-Oct-03	8-Oct-03	8-Oct-03	8-Oct-03	9-Oct-03	9-Oct-03	9-Oct-03	—	—
TA		H	Biphenyl	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Aniline	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Cumene	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Dimethylaniline	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
Additional Selected Target Analytes														
TA			Dodecane	I	4.33E-01	3.98E-01	3.37E-01	3.66E-01	3.49E-01	3.52E-01	4.45E-01	3.71E-01	3.81E-01	4.00E-02
TA			Diethylbenzene, 1,4-	I	3.00E-01	3.00E-01	2.58E-01	2.94E-01	2.82E-01	2.51E-01	3.08E-01	2.78E-01	2.84E-01	2.07E-02
TA			Trimethylbenzene, 1,2,3-	I	1.26E-01	1.27E-01	1.15E-01	1.25E-01	1.24E-01	1.11E-01	1.28E-01	1.21E-01	1.22E-01	6.14E-03
TA			Diethylbenzene, 1,3-	I	8.27E-02	8.20E-02	8.28E-02	8.06E-02	8.39E-02	8.18E-02	8.16E-02	8.35E-02	8.24E-02	1.05E-03
TA			Trimethylbenzene, 1,2,4-	I	6.99E-02	7.18E-02	6.45E-02	6.95E-02	6.99E-02	6.31E-02	7.41E-02	6.79E-02	6.88E-02	3.61E-03
TA			Dimethylphenol, 2,5-	3.89E-02	7.88E-02	2.92E-02	6.39E-02	7.09E-02	6.57E-02	6.52E-02	8.24E-02	7.26E-02	6.31E-02	1.77E-02
TA			Dimethylphenol, 3,5-	I	5.91E-02	5.58E-02	4.83E-02	5.26E-02	5.05E-02	4.97E-02	6.05E-02	5.24E-02	5.36E-02	4.44E-03
TA			Dimethylphenol, 3,4-	2.98E-03	6.57E-02	9.94E-02	5.13E-03	9.34E-02	5.51E-03	5.21E-03	1.11E-01	9.34E-02	5.35E-02	4.78E-02
TA			Dimethylphenol, 2,6-	I	5.49E-02	5.36E-02	4.83E-02	5.21E-02	5.09E-02	4.73E-02	5.69E-02	5.03E-02	5.18E-02	3.29E-03
TA			Indan	I	4.98E-02	4.97E-02	4.46E-02	4.93E-02	4.77E-02	4.28E-02	4.98E-02	4.64E-02	4.75E-02	2.67E-03
TA			Dimethylphenol, 2,4-	1.18E-02	1.93E-02	I	2.45E-02	3.46E-02	3.49E-02	3.18E-02	3.56E-02	3.09E-02	2.79E-02	8.65E-03
TA			Diethylbenzene, 1,2-	I	2.74E-02	2.74E-02	2.41E-02	2.54E-02	2.64E-02	2.39E-02	2.83E-02	2.64E-02	2.62E-02	1.56E-03
TA			Butyraldehyde/Methacrolein	1.63E-02	2.55E-02	2.23E-02	1.83E-02	1.53E-02	2.85E-02	1.90E-02	2.17E-02	2.04E-02	2.08E-02	4.25E-03
TA			Cymene, p-	I	1.35E-02	1.38E-02	1.24E-02	1.36E-02	1.34E-02	1.20E-02	1.38E-02	1.30E-02	1.32E-02	6.70E-04
TA			Undecane	I	9.90E-03	9.30E-03	8.60E-03	9.53E-03	8.77E-03	8.83E-03	9.39E-03	9.41E-03	9.22E-03	4.42E-04
TA			Indene	≤PQL	6.92E-03	1.12E-02	6.71E-03	8.42E-03	7.83E-03	7.44E-03	1.19E-02	9.63E-03	8.01E-03	2.91E-03
TA			Tridecane	3.46E-03	6.64E-03	5.80E-03	5.27E-03	5.40E-03	5.09E-03	7.42E-03	6.84E-03	5.53E-03	5.72E-03	1.16E-03
TA			Butylbenzene, sec-	4.31E-03	5.94E-03	6.01E-03	5.50E-03	5.95E-03	6.01E-03	5.17E-03	5.99E-03	5.78E-03	5.63E-03	5.73E-04
TA			Ethyltoluene, 3-	I	4.82E-03	4.87E-03	4.42E-03	4.62E-03	4.81E-03	4.34E-03	5.06E-03	4.50E-03	4.68E-03	2.48E-04
TA			Isobutylbenzene	I	4.58E-03	4.73E-03	4.30E-03	4.48E-03	4.65E-03	4.08E-03	4.66E-03	4.50E-03	4.50E-03	2.15E-04
TA			Ethyltoluene, 2-	3.06E-03	4.65E-03	4.59E-03	4.06E-03	4.64E-03	4.59E-03	3.94E-03	4.74E-03	4.11E-03	4.27E-03	5.42E-04
TA			Tetradecane	≤PQL	4.38E-03	4.02E-03	3.27E-03	3.27E-03	3.18E-03	3.54E-03	4.55E-03	3.34E-03	3.50E-03	7.61E-04
TA			Benzaldehyde	I	2.92E-03	2.46E-03	1.87E-03	1.67E-03	6.06E-03	1.98E-03	2.25E-03	2.10E-03	2.66E-03	1.43E-03
TA			Decane	≤PQL	2.82E-03	2.86E-03	2.54E-03	2.76E-03	2.72E-03	2.35E-03	2.77E-03	2.62E-03	2.60E-03	2.75E-04
TA			Ethyltoluene, 4-	≤PQL	2.42E-03	2.50E-03	2.39E-03	2.43E-03	2.36E-03	2.31E-03	2.59E-03	2.23E-03	2.36E-03	1.70E-04
TA			o,m,p-Tolualdehyde	1.79E-03	2.62E-03	2.84E-03	1.84E-03	1.48E-03	I	1.79E-03	2.12E-03	2.06E-03	2.07E-03	4.57E-04
TA			Pentanal (Valeraldehyde)	1.69E-03	2.59E-03	2.13E-03	1.76E-03	1.45E-03	I	1.89E-03	1.97E-03	2.14E-03	1.95E-03	3.46E-04
TA			Hexaldehyde	≤PQL	1.09E-03	1.11E-03	6.92E-04	5.40E-04	1.55E-03	6.81E-04	8.69E-04	7.61E-04	8.42E-04	3.68E-04
TA			2-Butanone (MEK)	I	4.41E-04	4.47E-04	4.08E-04	3.43E-04	1.01E-03	≤PQL	3.27E-04	≤PQL	4.45E-04	2.37E-04

Detailed Emissions Results - Test FL - Lb/Tn Metal

TA	POM	HAP		FL001	FL002	FL003	FL004	FL005	FL006	FL007	FL008	FL009	Average	Standard Deviation
			Test Dates	7-Oct-03	7-Oct-03	7-Oct-03	8-Oct-03	8-Oct-03	8-Oct-03	9-Oct-03	9-Oct-03	9-Oct-03	—	—
TA			Trimethylphenol, 2,4,6-	≤ PQL	≤ PQL	≤ PQL	≤ PQL	≤ PQL	≤ PQL	≤ PQL	≤ PQL	≤ PQL	≤ PQL	NA
TA			Crotonaldehyde	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	I	≤PQL	NA
TA			Cyclohexane	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Heptane	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Nonane	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Octane	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Propylbenzene, n-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Trimethylbenzene, 1,3,5-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			alpha-Methylstyrene	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Anthracene	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Butylbenzene, n-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Butylbenzene, tert-	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Diisopropylbenzene, 1,3-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,3-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Trimethylphenol, 2,3,5-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	I	≤PQL	≤PQL	≤PQL	NA
TA			Trimethylphenol, 2,4,6-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
Selected Criteria Pollutants and Greenhouse Gases														
			Carbon Dioxide	6.15E-01	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	1.43E-01	1.77E-01
			Methane	7.67E-02	5.85E-02	6.95E-02	6.57E-02	6.02E-02	6.13E-02	6.19E-02	5.46E-02	5.69E-02	6.28E-02	6.85E-03
			Carbon Monoxide	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA

Detailed Emissions Results - Test FL - Lb/Lb Binder

TA	POM	HAP		FL001	FL002	FL003	FL004	FL005	FL006	FL007	FL008	FL009	Average	Standard Deviation
			Test Dates	7-Oct-03	7-Oct-03	7-Oct-03	8-Oct-03	8-Oct-03	8-Oct-03	9-Oct-03	9-Oct-03	09-Oct-03	—	—
Emission Indicators														
			TGOC as Propane	2.17E-01	2.24E-01	2.14E-01	2.08E-01	2.12E-01	2.07E-01	I	2.06E-01	2.04E-01	2.11E-01	6.56E-03
			HC as n-Hexane	2.61E-02	8.57E-02	6.92E-02	6.64E-02	6.60E-02	I	5.98E-02	6.57E-02	7.12E-02	6.37E-02	1.70E-02
			Sum of Target Analytes	8.14E-03	5.04E-02	5.45E-02	4.86E-02	5.57E-02	5.01E-02	4.84E-02	5.94E-02	5.34E-02	5.25E-02	1.53E-02
			Sum of Target HAPs	6.58E-03	2.91E-02	3.11E-02	2.85E-02	3.17E-02	2.88E-02	2.80E-02	3.29E-02	2.99E-02	3.01E-02	7.96E-03
			Sum of Target POMs	1.30E-04	6.92E-04	7.84E-04	6.77E-04	7.31E-04	6.68E-04	7.22E-04	8.65E-04	7.42E-04	7.45E-04	2.11E-04
Selected Target HAPs and POMs														
TA		H	Cresol, mp-	I	1.35E-02	1.45E-02	1.30E-02	1.46E-02	1.37E-02	1.28E-02	1.51E-02	1.39E-02	1.39E-02	8.10E-04
TA		H	Phenol	I	8.38E-03	8.73E-03	8.00E-03	9.25E-03	8.26E-03	7.69E-03	9.64E-03	8.29E-03	8.53E-03	6.46E-04
TA		H	Benzene	4.31E-03	4.26E-03	4.30E-03	4.12E-03	4.37E-03	3.73E-03	4.17E-03	4.47E-03	4.19E-03	4.21E-03	2.09E-04
TA		H	Toluene	8.87E-04	9.65E-04	9.66E-04	9.80E-04	9.89E-04	8.89E-04	9.49E-04	1.03E-03	9.94E-04	9.61E-04	4.69E-05
TA		H	Xylene, mp-	5.15E-04	5.76E-04	5.85E-04	5.89E-04	6.02E-04	5.45E-04	5.69E-04	6.28E-04	6.01E-04	5.79E-04	3.34E-05
TA		H	Cresol, o-	4.10E-04	I	5.09E-04	5.17E-04	5.28E-04	4.53E-04	5.18E-04	5.11E-04	5.19E-04	4.96E-04	4.16E-05
TA	P	H	Naphthalene	I	3.54E-04	3.90E-04	3.37E-04	3.77E-04	3.44E-04	3.52E-04	4.33E-04	3.73E-04	3.70E-04	3.12E-05
TA		H	Formaldehyde	1.89E-04	2.87E-04	2.48E-04	2.15E-04	2.03E-04	I	1.79E-04	2.36E-04	1.83E-04	2.18E-04	3.73E-05
TA	P	H	Methylnaphthalene, 2-	I	1.69E-04	1.92E-04	1.68E-04	1.78E-04	1.61E-04	1.90E-04	2.34E-04	1.84E-04	1.85E-04	2.30E-05
TA		H	Xylene, o-	I	1.74E-04	1.78E-04	1.74E-04	1.83E-04	1.69E-04	1.70E-04	1.89E-04	1.80E-04	1.77E-04	6.69E-06
TA		H	Styrene	8.00E-05	9.65E-05	9.89E-05	9.50E-05	1.09E-04	1.01E-04	9.56E-05	1.13E-04	9.35E-05	9.81E-05	9.58E-06
TA	P	H	Methylnaphthalene, 1-	4.49E-05	7.53E-05	8.70E-05	7.56E-05	7.97E-05	7.24E-05	8.13E-05	1.06E-04	8.36E-05	7.84E-05	1.60E-05
TA		H	Acetaldehyde	I	6.53E-05	5.75E-05	4.98E-05	4.39E-05	1.31E-04	4.40E-05	5.21E-05	4.56E-05	6.12E-05	2.92E-05
TA		H	Ethylbenzene	3.76E-05	3.99E-05	4.10E-05	4.19E-05	4.24E-05	4.00E-05	4.17E-05	I	4.06E-05	4.06E-05	1.52E-06
TA	P	H	Dimethylnaphthalene, 1,8-	≤PQL	≤PQL	4.37E-05	≤PQL	≤PQL	≤PQL	≤PQL	4.87E-05	≤PQL	3.60E-05	5.94E-06
TA	P	H	Dimethylnaphthalene, 1,5-	≤PQL	≤PQL	4.00E-05	3.47E-05	3.50E-05	≤PQL	≤PQL	I	3.70E-05	3.49E-05	2.53E-06
TA	P	H	Dimethylnaphthalene, 1,3-	1.90E-05	2.65E-05	3.13E-05	2.85E-05	2.91E-05	2.57E-05	3.22E-05	4.30E-05	3.07E-05	2.96E-05	6.41E-06
TA		H	Hexane	1.71E-05	2.42E-05	2.48E-05	2.02E-05	3.56E-05	3.34E-05	2.22E-05	2.21E-05	2.03E-05	2.44E-05	6.18E-06
TA		H	Acrolein	I	1.50E-05	1.13E-05	9.56E-06	8.36E-06	3.62E-05	8.87E-06	1.16E-05	1.04E-05	1.39E-05	9.25E-06
TA		H	Propionaldehyde (Propanal)	≤PQL	5.73E-06	5.00E-06	≤PQL	≤PQL	I	≤PQL	≤PQL	≤PQL	4.94E-06	3.26E-07
TA	P	H	Acenaphthalene	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Dimethylnaphthalene, 1,2-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Dimethylnaphthalene, 1,6-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Dimethylnaphthalene, 2,3-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Dimethylnaphthalene, 2,6-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	I	≤PQL	≤PQL	NA

Detailed Emissions Results - Test FL - Lb/Lb Binder

TA	POM	HAP		FL001	FL002	FL003	FL004	FL005	FL006	FL007	FL008	FL009	Average	Standard Deviation
			Test Dates	7-Oct-03	7-Oct-03	7-Oct-03	8-Oct-03	8-Oct-03	8-Oct-03	9-Oct-03	9-Oct-03	09-Oct-03	—	—
TA	P	H	Dimethylnaphthalene, 2,7-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Trimethylnaphthalene, 2,3,5-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Biphenyl	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Aniline	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Cumene	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Dimethylaniline	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
Additional Selected Target Analytes														
TA			Dodecane	—	6.03E-03	6.68E-03	5.65E-03	6.29E-03	5.78E-03	5.93E-03	7.56E-03	6.31E-03	6.28E-03	6.12E-04
TA			Diethylbenzene, 1,4-	—	4.53E-03	5.03E-03	4.32E-03	5.04E-03	4.66E-03	4.24E-03	5.24E-03	4.72E-03	4.72E-03	3.59E-04
TA			Trimethylbenzene, 1,2,3-	—	1.99E-03	2.13E-03	1.93E-03	2.16E-03	2.05E-03	1.87E-03	2.18E-03	2.05E-03	2.05E-03	1.09E-04
TA			Diethylbenzene, 1,3-	—	1.41E-03	1.38E-03	1.39E-03	1.39E-03	1.39E-03	1.38E-03	1.39E-03	1.42E-03	1.39E-03	1.61E-05
TA			Trimethylbenzene, 1,2,4-	—	1.12E-03	1.20E-03	1.08E-03	1.19E-03	1.16E-03	1.06E-03	1.26E-03	1.16E-03	1.15E-03	6.52E-05
TA			Dimethylphenol, 2,5-	6.54E-04	1.13E-03	4.90E-04	1.07E-03	1.22E-03	1.09E-03	1.10E-03	1.40E-03	1.24E-03	1.04E-03	2.89E-04
TA			Dimethylphenol, 3,5-	—	8.49E-04	9.36E-04	8.10E-04	9.05E-04	8.36E-04	8.37E-04	1.03E-03	8.92E-04	8.86E-04	7.07E-05
TA			Dimethylphenol, 2,6-	—	8.38E-04	9.00E-04	8.10E-04	8.94E-04	8.43E-04	7.96E-04	9.67E-04	8.55E-04	8.63E-04	5.55E-05
TA			Indan	—	7.74E-04	8.34E-04	7.49E-04	8.47E-04	7.90E-04	7.22E-04	8.46E-04	7.89E-04	7.94E-04	4.61E-05
TA			Dimethylphenol, 3,4-	5.01E-05	7.91E-05	1.67E-03	8.61E-05	1.60E-03	9.12E-05	8.78E-05	1.88E-03	1.59E-03	7.93E-04	8.51E-04
TA			Dimethylphenol, 2,4-	1.98E-04	4.26E-04	—	4.12E-04	5.95E-04	5.78E-04	5.35E-04	6.05E-04	5.25E-04	4.84E-04	1.37E-04
TA			Diethylbenzene, 1,2-	—	4.29E-04	4.60E-04	4.05E-04	4.37E-04	4.36E-04	4.03E-04	4.80E-04	4.49E-04	4.38E-04	2.61E-05
TA			Butyraldehyde/Methacrolein	2.74E-04	4.57E-04	3.75E-04	3.08E-04	2.63E-04	4.72E-04	3.20E-04	3.69E-04	3.47E-04	3.54E-04	7.34E-05
TA			Cymene, p-	—	2.15E-04	2.32E-04	2.09E-04	2.34E-04	2.22E-04	2.02E-04	2.35E-04	2.22E-04	2.21E-04	1.22E-05
TA			Undecane	—	1.46E-04	1.56E-04	1.44E-04	1.64E-04	1.45E-04	1.49E-04	1.60E-04	1.60E-04	1.53E-04	7.80E-06
TA			Indene	≤PQL	1.18E-04	1.88E-04	1.13E-04	1.45E-04	1.30E-04	1.25E-04	2.03E-04	1.64E-04	1.35E-04	4.95E-05
TA			Butylbenzene, sec-	7.23E-05	9.58E-05	1.01E-04	9.22E-05	1.02E-04	9.95E-05	8.71E-05	1.02E-04	9.84E-05	9.45E-05	9.66E-06
TA			Tridecane	5.81E-05	8.59E-05	9.72E-05	8.85E-05	9.28E-05	8.43E-05	1.25E-04	1.16E-04	9.41E-05	9.36E-05	1.92E-05
TA			Ethyltoluene, 3-	—	7.81E-05	8.17E-05	7.42E-05	7.94E-05	7.96E-05	7.32E-05	8.60E-05	7.66E-05	7.86E-05	4.12E-06
TA			Isobutylbenzene	—	7.43E-05	7.94E-05	7.22E-05	7.70E-05	7.70E-05	6.88E-05	7.93E-05	7.66E-05	7.56E-05	3.64E-06
TA			Ethyltoluene, 2-	5.15E-05	7.19E-05	7.71E-05	6.81E-05	7.97E-05	7.60E-05	6.64E-05	8.06E-05	7.00E-05	7.13E-05	8.96E-06
TA			Tetradecane	≤PQL	5.28E-05	6.75E-05	5.48E-05	5.62E-05	5.25E-05	5.96E-05	7.73E-05	5.68E-05	5.67E-05	1.20E-05
TA			Benzaldehyde	—	5.38E-05	4.13E-05	3.14E-05	2.86E-05	1.00E-04	3.34E-05	3.82E-05	3.57E-05	4.54E-05	2.35E-05
TA			Decane	≤PQL	4.40E-05	4.80E-05	4.25E-05	4.74E-05	4.49E-05	3.96E-05	4.70E-05	4.46E-05	4.35E-05	4.70E-06
TA			Ethyltoluene, 4-	≤PQL	3.99E-05	4.20E-05	4.02E-05	4.17E-05	3.90E-05	3.90E-05	4.40E-05	3.80E-05	3.96E-05	3.09E-06

Detailed Emissions Results - Test FL - Lb/Lb Binder

TA	POM	HAP		FL001	FL002	FL003	FL004	FL005	FL006	FL007	FL008	FL009	Average	Standard Deviation
			Test Dates	7-Oct-03	7-Oct-03	7-Oct-03	8-Oct-03	8-Oct-03	8-Oct-03	9-Oct-03	9-Oct-03	09-Oct-03	—	—
TA			o,m,p-Tolualdehyde	3.00E-05	4.83E-05	4.77E-05	3.09E-05	2.54E-05	I	3.02E-05	3.60E-05	3.50E-05	3.54E-05	8.42E-06
TA			Pentanal (Valeraldehyde)	2.85E-05	4.82E-05	3.57E-05	2.96E-05	2.49E-05	I	3.19E-05	3.35E-05	3.65E-05	3.36E-05	7.04E-06
TA			Hexaldehyde	≤PQL	2.07E-05	1.86E-05	1.16E-05	9.27E-06	2.57E-05	1.15E-05	1.48E-05	1.30E-05	1.44E-05	6.33E-06
TA			2-Butanone (MEK)	I	7.83E-06	7.50E-06	6.85E-06	5.89E-06	1.67E-05	≤PQL	5.56E-06	≤PQL	7.50E-06	3.91E-06
TA			Crotonaldehyde	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	I	≤PQL	NA
TA			Cyclohexane	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Heptane	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Nonane	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Octane	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Propylbenzene, n-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Trimethylbenzene, 1,3,5-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			alpha-Methylstyrene	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Anthracene	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Butylbenzene, n-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Butylbenzene, tert-	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Diisopropylbenzene, 1,3-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,3-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Trimethylphenol, 2,3,5-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	I	≤PQL	≤PQL	≤PQL	NA
TA			Trimethylphenol, 2,4,6-	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
Selected Criteria Pollutants and Greenhouse Gases														
			Carbon Dioxide	2.00E-02	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	3.46E-03	6.20E-03
			Methane	1.29E-03	1.01E-03	1.15E-03	1.05E-03	1.01E-03	9.86E-04	1.02E-03	9.03E-04	9.31E-04	1.04E-03	1.17E-04
			Carbon Monoxide	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA

Comparison Summary Test FL to Test HJ (Techniset® 6000/6478) Average Results - Lb/Tn Metal

Analyte Name	Test FL Average	Test HJ Average Techniset® 6000/6478	Percent Change from Test FL
Emission Indicators			
TGOC as Propane	1.28E+01	1.07E+01	**-16**
HC as Hexane	3.73E+00	8.86E+00	**137**
Sum of Target Analytes	3.15E+00	2.60E+00	-18
Sum of Target HAPs	1.79E+00	1.70E+00	-5
Sum of Target POMs	4.47E-02	6.48E-02	**45**
Selected Target HAPs and POMs			
Cresol, mp-	8.32E-01	≤PQL	NA
Phenol	5.10E-01	6.49E-01	**27**
Benzene	2.49E-01	2.28E-01	-9
Toluene	5.69E-02	6.01E-02	6
Xylene, mp-	3.43E-02	3.79E-02	**10**
Cresol, o-	2.94E-02	3.17E-02	8
Naphthalene	2.24E-02	3.48E-02	**55**
Formaldehyde	1.28E-02	3.34E-02	**160**
Methylnaphthalene, 2-	1.14E-02	1.10E-02	-3
Xylene, o-	1.05E-02	1.08E-02	3
Styrene	5.83E-03	4.07E-03	**-30**
Methylnaphthalene, 1-	4.82E-03	5.84E-03	21
Acetaldehyde	3.62E-03	6.29E-03	**73**
Ethylbenzene	2.42E-03	2.01E-03	**-17**
Dimethylnaphthalene, 1,8-	2.16E-03	≤PQL	NA
Biphenyl	≤PQL	4.25E-03	NA
Dimethylnaphthalene, 2,3-	≤PQL	4.31E-03	NA
Acetophenone	NT	5.63E-01	NA
Additional Selected Target Analytes			
Dodecane	3.81E-01	≤PQL	NA
Diethylbenzene, 1,4-	2.84E-01	3.84E-01	**35**
Trimethylbenzene, 1,2,3-	1.22E-01	1.58E-01	**29**
Diethylbenzene, 1,3-	8.24E-02	≤PQL	NA
Trimethylbenzene, 1,2,4-	6.88E-02	1.10E-01	**60**
Dimethylphenol, 2,5-	6.31E-02	≤PQL	NA
Dimethylphenol, 3,5-	5.36E-02	≤PQL	NA
Dimethylphenol, 3,4-	5.35E-02	≤PQL	NA
Dimethylphenol, 2,6-	5.18E-02	≤PQL	NA
Indan	4.75E-02	7.41E-02	**56**
Diethylbenzene, 1,2-	2.62E-02	2.63E-02	1
Undecane	9.22E-03	1.23E-02	**33**
Tridecane	5.72E-03	1.34E-02	**135**
Ethyltoluene, 3-	4.68E-03	1.10E-02	**135**
Ethyltoluene, 2-	4.27E-03	2.99E-02	**602**
Crotonaldehyde	≤PQL	2.53E-02	NA
Criteria Pollutants and Greenhouse Gases			
Carbon Dioxide	1.43E-01	1.25E+01	**8593**
Methane	6.28E-02	NT	NA
Carbon Monoxide	≤PQL	5.56E+00	NA
Nitrogen Oxides	NT	3.55E-02	NA
Sulfur Dioxide	NT	≤PQL	NA

NT= Not tested
NA= Not Applicable
I=Invalidated Data
≤PQL= Less than or equal to the Practical Quantitation Limit
All gas samples were taken by tedlar bag sampling for Test FL
Bold numbers indicate those compounds whose calculated t-statistic is significant at alpha=0.05

Comparison Summary Test FL to Test HJ (Techniset® 6000/6478) Average Results - Lb/Lb Binder

Analyte Name	Test FL	Test HJ 6000/6478	Percent Change from Test FL
Emission Indicators			
TGOC as Propane	2.11E-01	1.85E-01	**-13**
HC as Hexane	6.37E-02	1.57E-01	**146**
Sum of Target Analytes	5.25E-02	4.60E-02	-12
Sum of Target HAPs	3.01E-02	3.01E-02	0
Sum of Target POMs	7.45E-04	1.15E-03	**54**
Selected Target HAPs and POMs			
Cresol, mp-	1.39E-02	≤PQL	NA
Phenol	8.53E-03	1.15E-02	**35**
Benzene	4.21E-03	4.01E-03	-5
Toluene	9.61E-04	1.07E-03	11
Xylene, mp-	5.79E-04	6.73E-04	**16**
Cresol, o-	4.96E-04	5.62E-04	13
Naphthalene	3.70E-04	6.16E-04	**66**
Formaldehyde	2.18E-04	5.92E-04	**172**
Methylnaphthalene, 2-	1.85E-04	1.95E-04	6
Xylene, o-	1.77E-04	1.92E-04	**8**
Styrene	9.81E-05	7.23E-05	**-26**
Methylnaphthalene, 1-	7.84E-05	1.04E-04	**32**
Acetaldehyde	6.12E-05	1.11E-04	**82**
Ethylbenzene	4.06E-05	3.56E-05	**-12**
Dimethylnaphthalene, 1,8-	3.60E-05	≤PQL	NA
Biphenyl	≤PQL	7.54E-05	NA
Dimethylnaphthalene, 2,3-	≤PQL	7.63E-05	NA
Acetophenone	NT	9.99E-03	NA
Additional Selected Target Analytes			
Dodecane	6.28E-03	≤PQL	NA
Diethylbenzene, 1,4-	4.72E-03	6.85E-03	**45**
Trimethylbenzene, 1,2,3-	2.05E-03	2.80E-03	**37**
Diethylbenzene, 1,3-	1.39E-03	≤PQL	NA
Trimethylbenzene, 1,2,4-	1.15E-03	1.95E-03	**69**
Dimethylphenol, 2,5-	1.04E-03	≤PQL	NA
Dimethylphenol, 3,5-	8.86E-04	≤PQL	NA
Dimethylphenol, 2,6-	8.63E-04	≤PQL	NA
Indan	7.94E-04	1.31E-03	**66**
Dimethylphenol, 3,4-	7.93E-04	≤PQL	NA
Diethylbenzene, 1,2-	4.38E-04	4.67E-04	7
Undecane	1.53E-04	2.18E-04	**42**
Tridecane	9.36E-05	2.38E-04	**154**
Ethyltoluene, 3-	7.86E-05	1.95E-04	**149**
Ethyltoluene, 2-	7.13E-05	5.30E-04	**643**
Crotonaldehyde	≤PQL	4.48E-04	NA
Criteria Pollutants and Greenhouse Gases			
Carbon Dioxide	1.43E-01	2.15E-01	**6108**
Methane	6.28E-02	NT	NA
Carbon Monoxide	≤PQL	9.57E-02	NA
Nitrogen Oxides	NT	6.11E-04	NA
Sulfur Dioxide	NT	≤PQL	NA

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≤PQL= Less than or equal to the Practical Quantitation Limit
All gas samples were taken by tedlar bag sampling for Test FL
Bold numbers indicate those compounds whose calculated t-statistic is significant at alpha=0.05

Comparison Summary Test FL to Test HJ (Techniset® F6000/6435) Average Results - Lb/Tn Metal

Analyte Name	Test FL Average	Test HJ Average F6000/6435	Percent Change from Test FL
Emission Indicators			
TGOC as Propane	1.28E+01	1.10E+01	**-14**
HC as Hexane	3.73E+00	8.85E+00	**137**
Sum of Target Analytes	3.15E+00	2.93E+00	-7
Sum of Target HAPs	1.79E+00	1.92E+00	7
Sum of Target POMs	4.47E-02	7.25E-02	**62**
Selected Target HAPs and POMs			
Cresol, mp-	8.32E-01	≤PQL	NA
Phenol	5.10E-01	8.71E-01	**71**
Benzene	2.49E-01	2.11E-01	-15
Toluene	5.69E-02	6.23E-02	**9**
Xylene, mp-	3.43E-02	3.45E-02	1
Cresol, o-	2.94E-02	2.97E-02	1
Naphthalene	2.24E-02	3.78E-02	**68**
Formaldehyde	1.28E-02	2.50E-02	**95**
Methylnaphthalene, 2-	1.14E-02	1.58E-02	**39**
Xylene, o-	1.05E-02	1.02E-02	**-3**
Styrene	5.83E-03	1.56E-02	**168**
Methylnaphthalene, 1-	4.82E-03	7.58E-03	**57**
Acetaldehyde	3.62E-03	6.83E-03	**88**
Ethylbenzene	2.42E-03	4.53E-03	**87**
Dimethylnaphthalene, 1,8-	2.16E-03	≤PQL	NA
Biphenyl	≤PQL	4.25E-03	NA
Acetophenone	NT	5.72E-01	NA
Additional Selected Target Analytes			
Dodecane	3.81E-01	≤PQL	NA
Diethylbenzene, 1,4-	2.84E-01	4.34E-01	**53**
Trimethylbenzene, 1,2,3-	1.22E-01	1.70E-01	**39**
Diethylbenzene, 1,3-	8.24E-02	≤PQL	NA
Trimethylbenzene, 1,2,4-	6.88E-02	1.09E-01	**59**
Dimethylphenol, 2,5-	6.31E-02	≤PQL	NA
Dimethylphenol, 3,5-	5.36E-02	≤PQL	NA
Dimethylphenol, 3,4-	5.35E-02	≤PQL	NA
Dimethylphenol, 2,6-	5.18E-02	≤PQL	NA
Indan	4.75E-02	1.07E-01	**125**
Diethylbenzene, 1,2-	2.62E-02	2.64E-02	1
Undecane	9.22E-03	2.64E-02	187
Tridecane	5.72E-03	9.70E-03	**70**
Butylbenzene, sec-	5.63E-03	9.86E-03	**75**
Ethyltoluene, 2-	4.27E-03	3.95E-02	**826**
Crotonaldehyde	≤PQL	3.17E-02	NA
Criteria Pollutants and Greenhouse Gases			
Carbon Dioxide	1.43E-01	1.36E+01	**9377**
Methane	6.28E-02	NT	NA
Carbon Monoxide	≤PQL	5.63E+00	NA
Nitrogen Oxides	NT	4.03E-02	NA
Sulfur Dioxide	NT	3.96E-03	NA

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≤PQL= Less than or equal to the Practical Quantitation Limit
All gas samples were taken by Tedlar Bag sampling for Test FL.
Bold numbers indicate those compounds whose calculated t-statistic is significant at alpha=0.05

Comparison Summary Test FL to Test HJ (Techniset® F6000/6435) Average Results - Lb/lb Binder

Analyte Name	Test FL	Test HJ F6000/6435	Percent Change from Test FL
Emission Indicators			
TGOC as Propane	2.11E-01	1.93E-01	-9
HC as Hexane	6.37E-02	1.61E-01	**152**
Sum of Target Analytes	5.25E-02	5.33E-02	1
Sum of Target HAPs	3.01E-02	3.49E-02	16
Sum of Target POMs	7.45E-04	1.31E-03	**76**
Selected Target HAPs and POMs			
Cresol, mp-	1.39E-02	≤PQL	NA
Phenol	8.53E-03	1.58E-02	**85**
Benzene	4.21E-03	3.83E-03	-9
Toluene	9.61E-04	1.13E-03	**18**
Xylene, mp-	5.79E-04	6.27E-04	**8**
Cresol, o-	4.96E-04	5.40E-04	9
Naphthalene	3.70E-04	6.85E-04	**85**
Formaldehyde	2.18E-04	4.54E-04	**108**
Methylnaphthalene, 2-	1.85E-04	2.88E-04	**56**
Xylene, o-	1.77E-04	1.85E-04	**4**
Styrene	9.81E-05	2.84E-04	**189**
Methylnaphthalene, 1-	7.84E-05	1.38E-04	**76**
Acetaldehyde	6.12E-05	1.24E-04	**103**
Ethylbenzene	4.06E-05	8.22E-05	**102**
Dimethylnaphthalene, 1,8-	3.60E-05	≤PQL	NA
Biphenyl	≤PQL	7.72E-05	NA
Acetophenone	NT	1.04E-02	NA
Additional Selected Target Analytes			
Dodecane	6.28E-03	≤PQL	NA
Diethylbenzene, 1,4-	4.72E-03	7.88E-03	**67**
Trimethylbenzene, 1,2,3-	2.05E-03	3.08E-03	**51**
Diethylbenzene, 1,3-	1.39E-03	≤PQL	NA
Trimethylbenzene, 1,2,4-	1.15E-03	1.98E-03	**72**
Dimethylphenol, 2,5-	1.04E-03	≤PQL	NA
Dimethylphenol, 3,5-	8.86E-04	≤PQL	NA
Dimethylphenol, 2,6-	8.63E-04	≤PQL	NA
Indan	7.94E-04	1.94E-03	**145**
Dimethylphenol, 3,4-	7.93E-04	≤PQL	NA
Diethylbenzene, 1,2-	4.38E-04	4.80E-04	**10**
Undecane	1.53E-04	4.81E-04	214
Butylbenzene, sec-	9.45E-05	1.79E-04	**90**
Tridecane	9.36E-05	1.76E-04	**88**
Ethyltoluene, 2-	7.13E-05	7.17E-04	**906**
Crotonaldehyde	≤PQL	5.76E-04	NA
Criteria Pollutants and Greenhouse Gases			
Carbon Dioxide	3.46E-03	2.38E-01	**6768**
Methane	1.04E-03	NT	NA
Carbon Monoxide	≤PQL	9.85E-02	NA
Sulfur Dioxide	NT	4.72E-05	NA
Nitrogen Oxides	NT	6.45E-04	NA

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≤PQL= Less than or equal to the Practical Quantitation Limit
All gas samples were taken by Tedlar Bag sampling for Test FL.
Bold numbers indicate those compounds whose calculated t-statistic is significant at alpha=0.05

Detailed Emission Results - Lb/Tn Metal - Runs 1 through 6 (F6000/6478)

TA	POM	HAP		HJ001	HJ002	HJ003	HJ004	HJ005	HJ006	Average	Standard Deviation
			Test Dates	**25-Jul-06**	**25-Jul-06**	**25-Jul-06**	**26-Jul-06**	**26-Jul-06**	**26-Jul-06**	—	—
Emission Indicators											
			TGOC as Propane	1.05E+01	1.08E+01	1.06E+01	1.13E+01	1.18E+01	1.13E+01	1.11E+01	4.96E-01
			HC as n-Hexane	8.99E+00	8.79E+00	8.58E+00	9.53E+00	9.60E+00	9.10E+00	9.10E+00	4.05E-01
			Sum of Target Analytes	2.96E+00	6.38E-01	2.96E+00	2.84E+00	2.73E+00	2.51E+00	2.81E+00	8.98E-01
			Sum of Target HAPs	2.00E+00	5.91E-01	1.88E+00	2.08E+00	2.01E+00	1.83E+00	1.95E+00	5.66E-01
			Sum of Target POMs	8.87E-02	I	6.99E-02	6.76E-02	7.51E-02	6.29E-02	7.41E-02	3.10E-02
Selected Target HAPs and POMs											
TA		H	Phenol	8.54E-01	I	8.39E-01	8.91E-01	8.83E-01	7.89E-01	8.51E-01	4.08E-02
TA		H	Acetophenone	5.92E-01	5.62E-01	5.54E-01	6.17E-01	6.26E-01	5.75E-01	5.88E-01	2.94E-02
TA		H	Benzene	2.86E-01	I	2.32E-01	3.10E-01	2.32E-01	2.14E-01	2.55E-01	4.11E-02
TA		H	Toluene	5.67E-02	I	5.52E-02	6.12E-02	6.39E-02	6.25E-02	5.99E-02	3.77E-03
TA		H	Xylene, mp-	3.61E-02	I	3.54E-02	3.83E-02	4.00E-02	3.89E-02	3.77E-02	1.93E-03
TA	P	H	Naphthalene	3.74E-02	I	3.73E-02	3.53E-02	4.05E-02	3.28E-02	3.67E-02	2.83E-03
TA		H	Cresol, o-	3.66E-02	I	3.70E-02	3.32E-02	3.49E-02	2.93E-02	3.42E-02	3.12E-03
TA		H	Formaldehyde	2.14E-02	2.17E-02	2.17E-02	2.61E-02	2.56E-02	2.27E-02	2.32E-02	2.10E-03
TA	P	H	Methylnaphthalene, 1-	3.62E-02	I	6.17E-03	6.19E-03	6.65E-03	5.81E-03	1.22E-02	1.34E-02
TA		H	Xylene, o-	1.05E-02	I	1.13E-02	1.15E-02	1.16E-02	1.16E-02	1.13E-02	4.54E-04
TA	P	H	Methylnaphthalene, 2-	≤PQL	I	1.10E-02	1.11E-02	1.18E-02	1.02E-02	8.90E-03	4.78E-03
TA		H	Acetaldehyde	6.49E-03	5.72E-03	6.06E-03	6.77E-03	7.19E-03	6.53E-03	6.46E-03	5.18E-04
TA		H	Styrene	4.83E-03	I	6.03E-03	5.33E-03	5.32E-03	5.38E-03	5.38E-03	4.27E-04
TA		H	Biphenyl	3.95E-03	I	4.72E-03	4.15E-03	4.70E-03	4.05E-03	4.31E-03	3.66E-04
TA	P	H	Dimethylnaphthalene, 2,3-	4.05E-03	I	4.52E-03	4.04E-03	4.36E-03	3.58E-03	4.11E-03	3.62E-04
TA	P	H	Dimethylnaphthalene, 2,6-	3.35E-03	I	4.33E-03	3.90E-03	4.22E-03	3.68E-03	3.90E-03	3.99E-04
TA		H	Ethylbenzene	2.15E-03	I	5.04E-03	2.47E-03	2.57E-03	2.47E-03	2.94E-03	1.18E-03
TA	P	H	Dimethylnaphthalene, 1,3-	2.54E-03	I	2.04E-03	1.83E-03	2.01E-03	1.73E-03	2.03E-03	3.15E-04
TA	P	H	Acenaphthalene	≤PQL	I	9.79E-04	≤PQL	≤PQL	≤PQL	1.83E-03	4.74E-04
TA	P	H	Dimethylnaphthalene, 1,6-	1.45E-03	I	2.05E-03	1.79E-03	1.97E-03	1.69E-03	1.79E-03	2.37E-04
TA	P	H	Dimethylnaphthalene, 1,2-	1.21E-03	I	1.62E-03	1.40E-03	1.57E-03	1.34E-03	1.43E-03	1.70E-04
TA		H	Acrolein	1.08E-03	9.48E-04	1.12E-03	1.24E-03	1.26E-03	1.19E-03	1.14E-03	1.15E-04
TA		H	Propionaldehyde (Propanal)	6.25E-04	4.82E-04	5.23E-04	5.89E-04	5.47E-04	5.72E-04	5.56E-04	5.05E-05
TA	P	H	Dimethylnaphthalene, 1,5-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Dimethylnaphthalene, 1,8-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Dimethylnaphthalene, 2,7-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Trimethylnaphthalene, 2,3,5-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Cresol, mp-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Hexane	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Aniline	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Cumene	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Dimethylaniline	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
Additional Selected Target Analytes											
TA			Diethylbenzene, 1,4-	4.49E-01	I	4.46E-01	1.56E-01	1.41E-01	1.58E-01	2.70E-01	1.62E-01
TA			Trimethylbenzene, 1,2,3-	1.67E-01	I	1.68E-01	1.74E-01	1.76E-01	1.65E-01	1.70E-01	4.88E-03
TA			Trimethylbenzene, 1,2,4-	1.12E-01	I	1.11E-01	1.15E-01	1.19E-01	1.12E-01	1.14E-01	3.45E-03
TA			Indan	3.39E-02	I	1.24E-01	1.28E-01	8.12E-02	7.87E-02	8.92E-02	3.86E-02
TA			Crotonaldehyde	3.27E-02	3.62E-02	3.38E-02	3.81E-02	3.07E-02	3.26E-02	3.40E-02	2.67E-03
TA			Ethyltoluene, 2-	2.71E-02	I	4.84E-02	3.44E-02	3.64E-02	1.48E-02	3.22E-02	1.24E-02
TA			Diethylbenzene, 1,2-	2.67E-02	I	3.26E-02	2.89E-02	2.99E-02	2.82E-02	2.93E-02	2.21E-03
TA			Tridecane	1.37E-02	I	1.47E-02	1.15E-02	1.41E-02	1.07E-02	1.29E-02	1.74E-03
TA			Undecane	1.05E-02	I	1.61E-02	1.15E-02	1.29E-02	1.22E-02	1.27E-02	2.13E-03
TA			Butylbenzene, sec-	1.42E-02	I	1.23E-02	1.02E-02	1.02E-02	9.66E-03	1.13E-02	1.87E-03
TA			Ethyltoluene, 3-	9.14E-03	I	1.41E-02	1.03E-02	1.09E-02	1.04E-02	1.10E-02	1.87E-03
TA			Tetradecane	9.04E-03	I	1.04E-02	9.15E-03	9.94E-03	8.38E-03	9.38E-03	7.86E-04
TA			Isobutylbenzene	6.88E-03	I	8.56E-03	7.11E-03	7.41E-03	6.95E-03	7.38E-03	6.90E-04
TA			Ethyltoluene, 4-	4.87E-03	I	8.75E-03	5.04E-03	5.47E-03	5.25E-03	5.88E-03	1.62E-03
TA			Decane	4.28E-03	I	7.95E-03	5.25E-03	5.33E-03	5.03E-03	5.56E-03	1.39E-03
TA			Indene	1.50E-02	I	≤PQL	≤PQL	≤PQL	≤PQL	4.63E-03	5.78E-03
TA			Butyraldehyde/Methacrolein	4.17E-03	3.93E-03	2.80E-03	3.09E-03	4.34E-03	4.80E-03	3.85E-03	7.66E-04
TA			Propylbenzene, n-	2.93E-03	I	5.69E-03	3.35E-03	3.39E-03	3.31E-03	3.73E-03	1.11E-03
TA			Benzaldehyde	2.93E-03	2.69E-03	3.02E-03	3.55E-03	3.06E-03	3.45E-03	3.12E-03	3.25E-04
TA			Trimethylphenol, 2,3,5-	2.52E-03	I	3.12E-03	2.75E-03	2.77E-03	2.58E-03	2.75E-03	2.32E-04

Detailed Emission Results - Lb/Tn Metal - Runs 1 through 6 (F6000/6478)

TA	POM	HAP		HJ001	HJ002	HJ003	HJ004	HJ005	HJ006	Average	Standard Deviation
			Test Dates	**25-Jul-06**	**25-Jul-06**	**25-Jul-06**	**26-Jul-06**	**26-Jul-06**	**26-Jul-06**	—	—
TA			o,m,p-Tolualdehyde	2.15E-03	1.98E-03	2.17E-03	2.38E-03	2.09E-03	2.34E-03	2.19E-03	1.51E-04
TA			Octane	≤PQL	I	≤PQL	2.69E-03	≤PQL	≤PQL	2.17E-03	2.90E-04
TA			Hexaldehyde	7.00E-04	5.36E-04	5.75E-04	2.35E-03	1.94E-03	2.14E-03	1.37E-03	8.54E-04
TA			2-Butanone (MEK)	1.01E-03	8.15E-04	1.09E-03	1.04E-03	9.29E-04	1.05E-03	9.89E-04	1.01E-04
TA			Pentanal (Valeraldehyde)	9.89E-04	7.36E-04	4.99E-04	1.29E-03	9.22E-04	1.05E-03	9.15E-04	2.72E-04
TA			Cyclohexane	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Diethylbenzene, 1,3-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,4-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,6-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dodecane	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Heptane	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Nonane	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Trimethylbenzene, 1,3,5-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			alpha-methylstyrene	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Anthracene	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Butylbenzene, n-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Butylbenzene, tert-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Cymene, p-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Diisopropylbenzene, 1,3-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,3-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,5-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 3,4-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 3,5-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Trimethylphenol, 2,4,6-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
Selected Criteria Pollutants and Greenhouse Gases											
			Carbon Dioxide	1.29E+01	1.24E+01	1.24E+01	1.28E+01	1.62E+01	1.51E+01	1.36E+01	1.61E+00
			Carbon Monoxide	5.86E+00	6.08E+00	5.56E+00	5.68E+00	5.98E+00	5.69E+00	5.81E+00	1.98E-01
			Nitrogen Oxides	3.81E-02	3.82E-02	3.43E-02	4.07E-02	4.82E-02	4.38E-02	4.06E-02	4.91E-03
			Sulfur Dioxide	≤PQL	4.24E-03	2.94E-03	3.14E-03	3.69E-03	≤PQL	3.80E-03	6.50E-04

Detailed Emission Results - Lb/Lb Binder - Runs 1 through 6 (F6000/6478)

TA	POM	HAP		HJ001	HJ002	HJ003	HJ004	HJ005	HJ006	Average	Standard Deviation
			Test Dates	**25-Jul-06**	**25-Jul-06**	**25-Jul-06**	**26-Jul-06**	**26-Jul-06**	**26-Jul-06**	—	—
Emission Indicators											
			TGOC as Propane	1.88E-01	1.82E-01	1.87E-01	1.96E-01	1.90E-01	1.85E-01	1.88E-01	4.88E-03
			HC as n-Hexane	1.61E-01	1.48E-01	1.54E-01	1.69E-01	1.60E-01	1.53E-01	1.57E-01	7.32E-03
			Sum of Target Analytes	5.27E-02	1.07E-02	5.29E-02	5.04E-02	4.53E-02	4.22E-02	4.85E-02	1.61E-02
			Sum of Target HAPs	3.57E-02	9.96E-03	3.36E-02	3.68E-02	3.34E-02	3.07E-02	3.39E-02	1.01E-02
			Sum of Target POMs	1.54E-03	I	1.25E-03	1.16E-03	1.21E-03	1.03E-03	1.24E-03	5.33E-04
Selected Target HAPs and POMs											
TA		H	Phenol	1.53E-02	I	1.50E-02	1.58E-02	1.47E-02	1.33E-02	1.48E-02	9.43E-04
TA		H	Acetophenone	1.06E-02	9.47E-03	9.92E-03	1.09E-02	1.04E-02	9.68E-03	1.02E-02	5.67E-04
TA		H	Benzene	5.10E-03	I	4.15E-03	5.50E-03	3.85E-03	3.60E-03	4.44E-03	8.20E-04
TA		H	Toluene	1.01E-03	I	9.88E-04	1.08E-03	1.06E-03	1.05E-03	1.04E-03	3.91E-05
TA		H	Xylene, mp-	6.45E-04	I	6.34E-04	6.79E-04	6.66E-04	6.55E-04	6.56E-04	1.77E-05
TA	P	H	Naphthalene	6.69E-04	I	6.68E-04	6.27E-04	6.73E-04	5.53E-04	6.38E-04	5.11E-05
TA		H	Cresol, o-	6.54E-04	I	6.62E-04	5.89E-04	5.81E-04	4.94E-04	5.96E-04	6.79E-05
TA		H	Formaldehyde	3.82E-04	3.66E-04	3.89E-04	4.62E-04	4.26E-04	3.82E-04	4.01E-04	3.59E-05
TA	P	H	Methylnaphthalene, 1-	6.47E-04	I	1.11E-04	1.10E-04	1.11E-04	9.79E-05	2.15E-04	2.41E-04
TA		H	Xylene, o-	1.88E-04	I	2.01E-04	2.05E-04	1.93E-04	1.96E-04	1.96E-04	6.64E-06
TA	P	H	Methylnaphthalene, 2-	ND	I	1.96E-04	1.97E-04	1.96E-04	1.73E-04	1.52E-04	8.58E-05
TA		H	Acetaldehyde	1.16E-04	9.64E-05	1.09E-04	1.20E-04	1.20E-04	1.10E-04	1.12E-04	8.92E-06
TA		H	Styrene	8.62E-05	I	1.08E-04	9.46E-05	8.85E-05	9.06E-05	9.36E-05	8.59E-06
TA		H	Biphenyl	7.06E-05	I	8.44E-05	7.36E-05	7.81E-05	6.83E-05	7.50E-05	6.43E-06
TA	P	H	Dimethylnaphthalene, 2,3-	7.23E-05	I	8.09E-05	7.17E-05	7.25E-05	6.03E-05	7.15E-05	7.35E-06
TA	P	H	Dimethylnaphthalene, 2,6-	5.98E-05	I	7.74E-05	6.93E-05	7.02E-05	6.20E-05	6.77E-05	7.04E-06
TA		H	Ethylbenzene	3.84E-05	I	9.02E-05	4.37E-05	4.28E-05	4.16E-05	5.13E-05	2.18E-05
TA	P	H	Dimethylnaphthalene, 1,3-	4.55E-05	I	3.64E-05	3.25E-05	3.35E-05	2.91E-05	3.54E-05	6.21E-06
TA	P	H	Dimethylnaphthalene, 1,6-	2.59E-05	I	3.66E-05	3.17E-05	3.27E-05	2.84E-05	3.11E-05	4.12E-06
TA	P	H	Dimethylnaphthalene, 1,2-	2.16E-05	I	2.91E-05	2.48E-05	2.61E-05	2.25E-05	2.48E-05	2.97E-06
TA	P	H	Acenaphthalene	1.94E-05	1.60E-05	2.00E-05	2.20E-05	2.09E-05	2.00E-05	1.97E-05	2.04E-06
TA		H	Acrolein	1.12E-05	8.12E-06	9.37E-06	1.05E-05	9.09E-06	9.64E-06	9.64E-06	1.06E-06
TA		H	Propionaldehyde (Propanal)	≤PQL	I	1.75E-05	≤PQL	≤PQL	≤PQL	3.50E-06	7.84E-06
TA	P	H	Dimethylnaphthalene, 1,5-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Dimethylnaphthalene, 1,8-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Dimethylnaphthalene, 2,7-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Trimethylnaphthalene, 2,3,5-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Cresol, mp-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Hexane	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Aniline	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Cumene	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Dimethylaniline	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
Additional Selected Target Analytes											
TA			Diethylbenzene, 1,4-	8.02E-03	I	7.99E-03	2.76E-03	2.34E-03	2.67E-03	4.76E-03	2.97E-03
TA			Trimethylbenzene, 1,2,3-	2.98E-03	I	3.01E-03	3.08E-03	2.93E-03	2.77E-03	2.96E-03	1.15E-04
TA			Trimethylbenzene, 1,2,4-	1.99E-03	I	1.98E-03	2.05E-03	1.98E-03	1.89E-03	1.98E-03	5.66E-05
TA			Indan	6.05E-04	I	2.23E-03	2.27E-03	1.35E-03	1.33E-03	1.56E-03	7.00E-04
TA			Crotonaldehyde	5.84E-04	6.10E-04	6.06E-04	6.75E-04	5.11E-04	5.49E-04	5.89E-04	5.63E-05
TA			Ethyltoluene, 2-	4.84E-04	I	8.67E-04	6.09E-04	6.06E-04	2.49E-04	5.63E-04	2.24E-04
TA			Diethylbenzene, 1,2-	4.78E-04	I	5.85E-04	5.13E-04	4.98E-04	4.75E-04	5.10E-04	4.46E-05
TA			Tridecane	2.44E-04	I	2.63E-04	2.04E-04	2.35E-04	1.80E-04	2.25E-04	3.29E-05
TA			Undecane	1.88E-04	I	2.89E-04	2.05E-04	2.14E-04	2.06E-04	2.20E-04	3.95E-05
TA			Butylbenzene, sec-	2.53E-04	I	2.20E-04	1.81E-04	1.70E-04	1.63E-04	1.97E-04	3.79E-05
TA			Ethyltoluene, 3-	1.63E-04	I	2.52E-04	1.82E-04	1.81E-04	1.74E-04	1.91E-04	3.52E-05
TA			Tetradecane	1.61E-04	I	1.86E-04	1.62E-04	1.65E-04	1.41E-04	1.63E-04	1.58E-05
TA			Isobutylbenzene	1.23E-04	I	1.53E-04	1.26E-04	1.23E-04	1.17E-04	1.29E-04	1.42E-05
TA			Ethyltoluene, 4-	8.70E-05	I	1.57E-04	8.94E-05	9.09E-05	8.85E-05	1.02E-04	3.03E-05
TA			Decane	7.64E-05	I	1.42E-04	9.31E-05	8.86E-05	8.47E-05	9.70E-05	2.60E-05
TA			Indene	7.44E-05	6.62E-05	5.02E-05	5.48E-05	7.22E-05	8.09E-05	6.64E-05	1.19E-05
TA			Butyraldehyde/Methacrolein	5.23E-05	I	1.02E-04	5.93E-05	5.63E-05	5.58E-05	6.51E-05	2.06E-05
TA			Propylbenzene, n-	5.23E-05	4.53E-05	5.41E-05	6.29E-05	5.10E-05	5.81E-05	5.40E-05	6.08E-06
TA			Benzaldehyde	2.67E-04	I	≤PQL	≤PQL	≤PQL	≤PQL	5.35E-05	1.20E-04

Detailed Emission Results - Lb/Lb Binder - Runs 1 through 6 (F6000/6478)

TA	POM	HAP		HJ001	HJ002	HJ003	HJ004	HJ005	HJ006	Average	Standard Deviation
			Test Dates	**25-Jul-06**	**25-Jul-06**	**25-Jul-06**	**26-Jul-06**	**26-Jul-06**	**26-Jul-06**	—	—
TA			Trimethylphenol, 2,3,5-	4.51E-05	I	5.59E-05	4.88E-05	4.60E-05	4.35E-05	4.79E-05	4.87E-06
TA			o,m,p-Tolualdehyde	3.85E-05	3.34E-05	3.89E-05	4.23E-05	3.47E-05	3.93E-05	3.78E-05	3.26E-06
TA			Octane	1.25E-05	9.03E-06	1.03E-05	4.17E-05	3.23E-05	3.60E-05	2.36E-05	1.46E-05
TA			Hexaldehyde	1.80E-05	1.37E-05	1.94E-05	1.85E-05	1.54E-05	1.78E-05	1.72E-05	2.13E-06
TA			2-Butanone (MEK)	1.77E-05	1.24E-05	8.93E-06	2.28E-05	1.53E-05	1.78E-05	1.58E-05	4.81E-06
TA			Pentanal (Valeraldehyde)	≤PQL	I	≤PQL	4.77E-05	≤PQL	≤PQL	9.53E-06	2.13E-05
TA			Cyclohexane	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Diethylbenzene, 1,3-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,4-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,6-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dodecane	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Heptane	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Nonane	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Trimethylbenzene, 1,3,5-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			alpha-Methylstyrene	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Anthracene	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Butylbenzene, n-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Butylbenzene, tert-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Cymene, p-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Diisopropylbenzene, 1,3-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,3-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,5-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 3,4-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 3,5-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Trimethylphenol, 2,4,6-	≤PQL	I	≤PQL	≤PQL	≤PQL	≤PQL	≤PQL	NA
Selected Criteria Pollutants and Greenhouse Gases											
			Carbon Dioxide	2.31E-01	2.09E-01	2.17E-01	2.22E-01	2.61E-01	2.47E-01	2.31E-01	1.96E-02
			Carbon Monoxide	1.05E-01	1.02E-01	9.78E-02	9.82E-02	9.65E-02	9.32E-02	9.88E-02	4.18E-03
			Nitrogen Oxides	6.81E-04	6.43E-04	6.03E-04	7.05E-04	7.78E-04	7.17E-04	6.88E-04	6.10E-05
			Sulfur Dioxide	ND	7.14E-05	5.26E-05	5.56E-05	6.13E-05	ND	4.02E-05	3.18E-05

Detailed Emission Results - Lb/Tn Metal - Runs 7 through 9 (6000/6748)

TA	POM	HAP		HJ007	HJ008	HJ009	Average	Standard Deviation
			Test Dates	**27-Jul-06**	**27-Jul-06**	**27-Jul-06**	—	—
Emission Indicators								
			TGOC as Propane	1.06E+01	1.12E+01	1.04E+01	1.07E+01	3.96E-01
			HC as n-Hexane	8.83E+00	9.23E+00	8.51E+00	8.86E+00	3.62E-01
			Sum of Target Analytes	2.64E+00	2.71E+00	2.44E+00	2.60E+00	1.40E-01
			Sum of Target HAPs	1.69E+00	1.84E+00	1.56E+00	1.70E+00	1.38E-01
			Sum of Target POMs	6.57E-02	6.97E-02	5.90E-02	6.48E-02	5.38E-03
Selected Target HAPs and POMs								
TA		H	Phenol	6.96E-01	6.87E-01	5.66E-01	6.49E-01	7.24E-02
TA		H	Acetophenone	5.59E-01	5.80E-01	5.50E-01	5.63E-01	1.53E-02
TA		H	Benzene	1.81E-01	3.00E-01	2.02E-01	2.28E-01	6.37E-02
TA		H	Toluene	5.90E-02	6.31E-02	5.81E-02	6.01E-02	2.69E-03
TA		H	Xylene, mp-	3.72E-02	3.96E-02	3.70E-02	3.79E-02	1.48E-03
TA	P	H	Naphthalene	3.44E-02	3.70E-02	3.28E-02	3.48E-02	2.14E-03
TA		H	Formaldehyde	3.14E-02	3.43E-02	3.44E-02	3.34E-02	1.69E-03
TA		H	Cresol, o-	3.55E-02	3.20E-02	2.76E-02	3.17E-02	3.95E-03
TA	P	H	Methylnaphthalene, 2-	1.15E-02	1.20E-02	9.64E-03	1.10E-02	1.23E-03
TA		H	Xylene, o-	1.05E-02	1.13E-02	1.06E-02	1.08E-02	4.19E-04
TA		H	Acetaldehyde	6.03E-03	6.78E-03	6.05E-03	6.29E-03	4.26E-04
TA	P	H	Methylnaphthalene, 1-	6.10E-03	6.32E-03	5.11E-03	5.84E-03	6.48E-04
TA	P	H	Dimethylnaphthalene, 2,3-	4.42E-03	4.72E-03	3.79E-03	4.31E-03	4.76E-04
TA		H	Biphenyl	4.40E-03	4.61E-03	3.75E-03	4.25E-03	4.46E-04
TA		H	Styrene	4.13E-03	4.12E-03	3.96E-03	4.07E-03	9.58E-05
TA	P	H	Dimethylnaphthalene, 2,6-	3.87E-03	4.00E-03	3.20E-03	3.69E-03	4.29E-04
TA		H	Ethylbenzene	1.99E-03	2.09E-03	1.94E-03	2.01E-03	7.63E-05
TA	P	H	Dimethylnaphthalene, 1,6-	1.97E-03	2.07E-03	1.63E-03	1.89E-03	2.30E-04
TA	P	H	Dimethylnaphthalene, 1,3-	1.90E-03	1.94E-03	1.57E-03	1.80E-03	2.03E-04
TA		H	Acrolein	1.45E-03	1.62E-03	1.57E-03	1.55E-03	8.76E-05
TA	P	H	Dimethylnaphthalene, 1,2-	1.55E-03	1.60E-03	1.27E-03	1.48E-03	1.79E-04
TA		H	Propionaldehyde (Propanal)	5.21E-04	6.28E-04	5.07E-04	5.52E-04	6.64E-05
TA	P	H	Acenaphthalene	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Dimethylnaphthalene, 1,5-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Dimethylnaphthalene, 1,8-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Dimethylnaphthalene, 2,7-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Trimethylnaphthalene, 2,3,5-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Cresol, mp-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Hexane	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Aniline	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Cumene	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Dimethylaniline	≤PQL	≤PQL	≤PQL	≤PQL	NA
Additional Selected Target Analytes								
TA			Diethylbenzene, 1,4-	4.23E-01	3.35E-01	3.96E-01	3.84E-01	4.52E-02
TA			Trimethylbenzene, 1,2,3-	1.57E-01	1.65E-01	1.52E-01	1.58E-01	6.66E-03
TA			Trimethylbenzene, 1,2,4-	1.11E-01	1.14E-01	1.06E-01	1.10E-01	4.11E-03
TA			Indan	7.38E-02	7.75E-02	7.10E-02	7.41E-02	3.25E-03
TA			Ethyltoluene, 2-	3.62E-02	3.40E-02	1.96E-02	2.99E-02	9.01E-03
TA			Diethylbenzene, 1,2-	2.71E-02	2.74E-02	2.45E-02	2.63E-02	1.58E-03
TA			Crotonaldehyde	2.55E-02	2.65E-02	2.38E-02	2.53E-02	1.34E-03
TA			Tridecane	1.38E-02	1.46E-02	1.19E-02	1.34E-02	1.39E-03
TA			Undecane	1.25E-02	1.30E-02	1.14E-02	1.23E-02	8.39E-04
TA			Ethyltoluene, 3-	1.05E-02	1.15E-02	1.10E-02	1.10E-02	5.03E-04
TA			Tetradecane	1.01E-02	1.09E-02	8.59E-03	9.89E-03	1.19E-03
TA			Butylbenzene, sec-	8.88E-03	9.26E-03	8.69E-03	8.94E-03	2.93E-04
TA			Isobutylbenzene	6.53E-03	6.69E-03	6.29E-03	6.50E-03	2.00E-04
TA			Ethyltoluene, 4-	5.55E-03	5.59E-03	5.60E-03	5.58E-03	2.63E-05
TA			Decane	4.81E-03	5.14E-03	4.83E-03	4.93E-03	1.85E-04
TA			Propylbenzene, n-	3.12E-03	3.19E-03	2.99E-03	3.10E-03	9.98E-05

Detailed Emission Results - Lb/Tn Metal - Runs 7 through 9 (6000/6748)

TA	POM	HAP		HJ007	HJ008	HJ009	Average	Standard Deviation
			Test Dates	**27-Jul-06**	**27-Jul-06**	**27-Jul-06**	—	—
TA			Trimethylphenol, 2,3,5-	2.55E-03	2.55E-03	3.62E-03	2.90E-03	6.22E-04
TA			Butyraldehyde/Methacrolein	2.36E-03	3.28E-03	2.66E-03	2.77E-03	4.71E-04
TA			Benzaldehyde	2.27E-03	2.68E-03	2.43E-03	2.46E-03	2.08E-04
TA			o,m,p-Tolualdehyde	1.86E-03	2.03E-03	1.85E-03	1.91E-03	9.96E-05
TA			Heptane	1.80E-03	1.28E-03	1.31E-03	1.46E-03	2.96E-04
TA			Hexaldehyde	4.02E-04	1.64E-03	5.04E-04	8.49E-04	6.88E-04
TA			Pentanal (Valeraldehyde)	7.28E-04	9.41E-04	8.76E-04	8.48E-04	1.09E-04
TA			2-Butanone (MEK)	7.75E-04	8.83E-04	8.69E-04	8.42E-04	5.86E-05
TA			Cyclohexane	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Diethylbenzene, 1,3-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,4-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,6-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dodecane	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Nonane	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Octane	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Trimethylbenzene, 1,3,5-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			alpha-methylstyrene	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Anthracene	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Butylbenzene, n-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Butylbenzene, tert-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Cymene, p-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Diisopropylbenzene, 1,3-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,3-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,5-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 3,4-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 3,5-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Indene	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Trimethylphenol, 2,4,6-	≤PQL	≤PQL	≤PQL	≤PQL	NA
Selected Criteria Pollutants and Greenhouse Gases								
			Carbon Dioxide	1.17E+01	1.26E+01	1.31E+01	1.25E+01	7.29E-01
			Carbon Monoxide	5.53E+00	5.95E+00	5.19E+00	5.56E+00	3.83E-01
			Nitrogen Oxides	3.37E-02	3.83E-02	3.45E-02	3.55E-02	2.49E-03
			Sulfur Dioxide	≤PQL	≤PQL	≤PQL	≤PQL	NA

Detailed Emission Results - Lb/Lb Binder - Runs 7 through 9 (6000/6748)

TA	POM	HAP		HJ007	HJ008	HJ009	Average	Standard Deviation
			Test Dates	**27-Jul-06**	**27-Jul-06**	**27-Jul-06**	—	—
Emission Indicators								
			TGOC as Propane	1.90E-01	1.81E-01	1.84E-01	1.85E-01	4.45E-03
			HC as n-Hexane	1.61E-01	1.54E-01	1.56E-01	1.57E-01	3.71E-03
			Sum of Target Analytes	4.81E-02	4.53E-02	4.46E-02	4.60E-02	1.86E-03
			Sum of Target HAPs	3.09E-02	3.07E-02	2.86E-02	3.01E-02	1.30E-03
			Sum of Target POMs	1.20E-03	1.16E-03	1.08E-03	1.15E-03	6.14E-05
Selected Target HAPs and POMs								
TA		H	Phenol	1.27E-02	1.15E-02	1.04E-02	1.15E-02	1.17E-03
TA		H	Acetophenone	1.02E-02	9.69E-03	1.01E-02	9.99E-03	2.71E-04
TA		H	Benzene	3.31E-03	5.02E-03	3.69E-03	4.01E-03	8.97E-04
TA		H	Toluene	1.08E-03	1.06E-03	1.06E-03	1.07E-03	1.15E-05
TA		H	Xylene, mp-	6.80E-04	6.63E-04	6.76E-04	6.73E-04	9.17E-06
TA	P	H	Naphthalene	6.28E-04	6.19E-04	6.01E-04	6.16E-04	1.42E-05
TA		H	Formaldehyde	5.74E-04	5.73E-04	6.29E-04	5.92E-04	3.22E-05
TA		H	Cresol, o-	6.47E-04	5.34E-04	5.05E-04	5.62E-04	7.55E-05
TA	P	H	Methylnaphthalene, 2-	2.09E-04	2.00E-04	1.76E-04	1.95E-04	1.70E-05
TA		H	Xylene, o-	1.92E-04	1.89E-04	1.94E-04	1.92E-04	2.68E-06
TA		H	Acetaldehyde	1.10E-04	1.13E-04	1.11E-04	1.11E-04	1.65E-06
TA	P	H	Methylnaphthalene, 1-	1.11E-04	1.06E-04	9.35E-05	1.04E-04	9.17E-06
TA	P	H	Dimethylnaphthalene, 2,3-	8.07E-05	7.89E-05	6.93E-05	7.63E-05	6.13E-06
TA		H	Biphenyl	8.04E-05	7.70E-05	6.87E-05	7.54E-05	6.01E-06
TA		H	Styrene	7.54E-05	6.89E-05	7.25E-05	7.23E-05	3.26E-06
TA	P	H	Dimethylnaphthalene, 2,6-	7.07E-05	6.68E-05	5.86E-05	6.53E-05	6.18E-06
TA		H	Ethylbenzene	3.64E-05	3.49E-05	3.55E-05	3.56E-05	7.32E-07
TA	P	H	Dimethylnaphthalene, 1,6-	3.60E-05	3.45E-05	2.98E-05	3.34E-05	3.23E-06
TA	P	H	Dimethylnaphthalene, 1,3-	3.47E-05	3.25E-05	2.88E-05	3.20E-05	2.99E-06
TA		H	Acrolein	2.65E-05	2.71E-05	2.88E-05	2.74E-05	1.20E-06
TA	P	H	Dimethylnaphthalene, 1,2-	2.84E-05	2.68E-05	2.33E-05	2.62E-05	2.61E-06
TA		H	Propionaldehyde (Propanal)	9.51E-06	1.05E-05	9.28E-06	9.76E-06	6.47E-07
TA	P	H	Acenaphthalene	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Dimethylnaphthalene, 1,5-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Dimethylnaphthalene, 1,8-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Dimethylnaphthalene, 2,7-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Trimethylnaphthalene, 2,3,5-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Cresol, mp-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Hexane	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Aniline	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Cumene	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Dimethylaniline	≤PQL	≤PQL	≤PQL	≤PQL	NA
Additional Selected Target Analytes								
TA			Diethylbenzene, 1,4-	7.72E-03	5.59E-03	7.25E-03	6.85E-03	1.12E-03
TA			Trimethylbenzene, 1,2,3-	2.88E-03	2.76E-03	2.77E-03	2.80E-03	6.44E-05
TA			Trimethylbenzene, 1,2,4-	2.02E-03	1.91E-03	1.94E-03	1.95E-03	5.79E-05
TA			Indan	1.35E-03	1.29E-03	1.30E-03	1.31E-03	2.96E-05
TA			Ethyltoluene, 2-	6.61E-04	5.68E-04	3.59E-04	5.30E-04	1.55E-04
TA			Diethylbenzene, 1,2-	4.94E-04	4.58E-04	4.49E-04	4.67E-04	2.40E-05
TA			Crotonaldehyde	4.66E-04	4.43E-04	4.36E-04	4.48E-04	1.58E-05
TA			Tridecane	2.51E-04	2.44E-04	2.18E-04	2.38E-04	1.77E-05
TA			Undecane	2.29E-04	2.17E-04	2.08E-04	2.18E-04	1.03E-05
TA			Ethyltoluene, 3-	1.92E-04	1.93E-04	2.01E-04	1.95E-04	4.91E-06
TA			Tetradecane	1.85E-04	1.83E-04	1.57E-04	1.75E-04	1.54E-05
TA			Butylbenzene, sec-	1.62E-04	1.55E-04	1.59E-04	1.59E-04	3.71E-06
TA			Isobutylbenzene	1.19E-04	1.12E-04	1.15E-04	1.15E-04	3.77E-06
TA			Ethyltoluene, 4-	1.01E-04	9.35E-05	1.02E-04	9.91E-05	4.87E-06
TA			Decane	8.78E-05	8.59E-05	8.84E-05	8.74E-05	1.32E-06
TA			Propylbenzene, n-	5.69E-05	5.33E-05	5.48E-05	5.50E-05	1.84E-06

Detailed Emission Results - Lb/Lb Binder - Runs 7 through 9 (6000/6748)

TA	POM	HAP		HJ007	HJ008	HJ009	Average	Standard Deviation
			Test Dates	**27-Jul-06**	**27-Jul-06**	**27-Jul-06**	—	—
TA			Trimethylphenol, 2,3,5-	4.65E-05	4.25E-05	6.63E-05	5.18E-05	1.27E-05
TA			Butyraldehyde/Methacrolein	4.31E-05	5.49E-05	4.87E-05	4.89E-05	5.90E-06
TA			Benzaldehyde	4.15E-05	4.49E-05	4.45E-05	4.36E-05	1.85E-06
TA			o,m,p-Tolualdehyde	3.40E-05	3.39E-05	3.38E-05	3.39E-05	1.15E-07
TA			Heptane	3.29E-05	2.13E-05	2.39E-05	2.61E-05	6.10E-06
TA			Pentanal (Valeraldehyde)	1.33E-05	1.57E-05	1.60E-05	1.50E-05	1.49E-06
TA			2-Butanone (MEK)	1.42E-05	1.48E-05	1.59E-05	1.49E-05	8.92E-07
TA			Hexaldehyde	7.35E-06	2.74E-05	9.22E-06	1.47E-05	1.11E-05
TA			Cyclohexane	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Diethylbenzene, 1,3-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,4-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,6-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dodecane	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Nonane	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Octane	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Trimethylbenzene, 1,3,5-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			alpha-methylstyrene	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Anthracene	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Butylbenzene, n-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Butylbenzene, tert-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Cymene, p-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Diisopropylbenzene, 1,3-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,3-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,5-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 3,4-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 3,5-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Indene	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Trimethylphenol, 2,4,6-	≤PQL	≤PQL	≤PQL	≤PQL	NA
Selected Criteria Pollutants and Greenhouse Gases								
			Carbon Dioxide	2.09E-01	2.05E-01	2.32E-01	2.15E-01	1.46E-02
			Carbon Monoxide	9.88E-02	9.65E-02	9.16E-02	9.57E-02	3.67E-03
			Nitrogen Oxides	6.02E-04	6.22E-04	6.10E-04	6.11E-04	1.03E-05
			Sulfur Dioxide	≤PQL	≤PQL	≤PQL	≤PQL	NA

Detailed Emission Results - Lb/Tn Metal - Runs 10 through 12 (F6000/6735)

TA	POM	HAP		HJ010	HJ011	HJ012	Average	Standard Deviation
			Test Dates	**28-Jul-06**	**28-Jul-06**	**28-Jul-06**	—	—
Emission Indicators								
			TGOC as Propane	1.11E+01	1.08E+01	1.12E+01	1.10E+01	2.32E-01
			HC as n-Hexane	9.06E+00	8.58E+00	8.92E+00	8.85E+00	2.47E-01
			Sum of Target Analytes	3.04E+00	2.84E+00	2.92E+00	2.93E+00	9.93E-02
			Sum of Target HAPs	1.96E+00	1.90E+00	1.90E+00	1.92E+00	3.23E-02
			Sum of Target POMs	7.23E-02	6.19E-02	8.32E-02	7.25E-02	1.06E-02
Selected Target HAPs and POMs								
TA		H	Phenol	8.82E-01	8.38E-01	8.93E-01	8.71E-01	2.91E-02
TA		H	Acetophenone	6.00E-01	5.48E-01	5.67E-01	5.72E-01	2.63E-02
TA		H	Benzene	2.09E-01	2.61E-01	1.63E-01	2.11E-01	4.92E-02
TA		H	Toluene	6.24E-02	6.26E-02	6.19E-02	6.23E-02	3.95E-04
TA	P	H	Naphthalene	3.60E-02	3.08E-02	4.65E-02	3.78E-02	7.97E-03
TA		H	Xylene, mp-	3.47E-02	3.48E-02	3.40E-02	3.45E-02	4.46E-04
TA		H	Cresol, o-	3.20E-02	2.85E-02	2.88E-02	2.97E-02	1.94E-03
TA		H	Formaldehyde	2.31E-02	2.38E-02	2.80E-02	2.50E-02	2.68E-03
TA	P	H	Methylnaphthalene, 2-	1.69E-02	1.42E-02	1.64E-02	1.58E-02	1.46E-03
TA		H	Styrene	1.58E-02	1.61E-02	1.50E-02	1.56E-02	5.69E-04
TA		H	Xylene, o-	1.02E-02	1.02E-02	1.02E-02	1.02E-02	1.06E-05
TA	P	H	Methylnaphthalene, 1-	8.09E-03	6.92E-03	7.74E-03	7.58E-03	5.97E-04
TA		H	Acetaldehyde	6.39E-03	6.74E-03	7.35E-03	6.83E-03	4.84E-04
TA		H	Ethylbenzene	4.48E-03	4.59E-03	4.52E-03	4.53E-03	5.14E-05
TA		H	Biphenyl	4.35E-03	3.97E-03	4.45E-03	4.25E-03	2.52E-04
TA	P	H	Dimethylnaphthalene, 2,6-	3.74E-03	3.24E-03	3.73E-03	3.57E-03	2.82E-04
TA	P	H	Dimethylnaphthalene, 2,3-	3.13E-03	2.62E-03	4.60E-03	3.45E-03	1.03E-03
TA	P	H	Dimethylnaphthalene, 1,3-	1.93E-03	1.62E-03	1.88E-03	1.81E-03	1.64E-04
TA		H	Acrolein	1.67E-03	1.48E-03	1.66E-03	1.60E-03	1.10E-04
TA	P	H	Dimethylnaphthalene, 1,6-	1.32E-03	1.33E-03	1.29E-03	1.31E-03	2.36E-05
TA	P	H	Acenaphthalene	1.13E-03	1.18E-03	1.08E-03	1.13E-03	4.93E-05
TA		H	Propionaldehyde (Propanal)	6.96E-04	6.77E-04	9.77E-04	7.84E-04	1.68E-04
TA	P	H	Dimethylnaphthalene, 1,2-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Dimethylnaphthalene, 1,5-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Dimethylnaphthalene, 1,8-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Dimethylnaphthalene, 2,7-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Trimethylnaphthalene, 2,3,5-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Cresol, mp-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Hexane	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Aniline	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Cumene	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Dimethylaniline	≤PQL	≤PQL	≤PQL	≤PQL	NA
Additional Selected Target Analytes								
TA			Diethylbenzene, 1,4-	4.53E-01	4.12E-01	4.37E-01	4.34E-01	2.05E-02
TA			Trimethylbenzene, 1,2,3-	1.76E-01	1.63E-01	1.70E-01	1.70E-01	6.39E-03
TA			Trimethylbenzene, 1,2,4-	1.13E-01	1.06E-01	1.09E-01	1.09E-01	3.58E-03
TA			Indan	1.13E-01	9.06E-02	1.18E-01	1.07E-01	1.45E-02
TA			Ethyltoluene, 2-	4.77E-02	2.78E-02	4.30E-02	3.95E-02	1.04E-02
TA			Crotonaldehyde	3.56E-02	2.91E-02	3.05E-02	3.17E-02	3.46E-03
TA			Undecane	4.51E-02	2.46E-02	9.69E-03	2.64E-02	1.78E-02
TA			Diethylbenzene, 1,2-	2.76E-02	2.52E-02	2.66E-02	2.64E-02	1.20E-03
TA			Butylbenzene, sec-	1.01E-02	9.39E-03	1.01E-02	9.86E-03	4.09E-04
TA			Tridecane	1.02E-02	8.55E-03	1.03E-02	9.70E-03	1.01E-03
TA			Ethyltoluene, 3-	9.55E-03	8.95E-03	8.41E-03	8.97E-03	5.68E-04
TA			Isobutylbenzene	7.35E-03	6.83E-03	9.40E-03	7.86E-03	1.36E-03
TA			Tetradecane	7.80E-03	6.46E-03	7.89E-03	7.38E-03	8.01E-04
TA			Ethyltoluene, 4-	4.88E-03	4.46E-03	4.56E-03	4.64E-03	2.21E-04
TA			Benzaldehyde	5.00E-03	4.26E-03	4.41E-03	4.56E-03	3.88E-04
TA			Decane	3.74E-03	3.55E-03	3.70E-03	3.66E-03	9.99E-05
TA			Butyraldehyde/Methacrolein	3.89E-03	3.09E-03	3.12E-03	3.37E-03	4.52E-04
TA			o,m,p-Tolualdehyde	2.47E-03	2.05E-03	2.12E-03	2.21E-03	2.26E-04
TA			Trimethylphenol, 2,3,5-	2.20E-03	1.94E-03	2.26E-03	2.13E-03	1.71E-04
TA			Heptane	1.59E-03	1.48E-03	1.56E-03	1.54E-03	5.43E-05
TA			2-Butanone (MEK)	1.28E-03	1.15E-03	1.20E-03	1.21E-03	6.70E-05
TA			Pentanal (Valeraldehyde)	1.43E-03	1.01E-03	1.07E-03	1.17E-03	2.25E-04

Detailed Emission Results - Lb/Tn Metal - Runs 10 through 12 (F6000/6735)

TA	POM	HAP		HJ010	HJ011	HJ012	Average	Standard Deviation
			Test Dates	**28-Jul-06**	**28-Jul-06**	**28-Jul-06**	—	—
TA			Hexaldehyde	7.10E-04	1.05E-03	5.58E-04	7.72E-04	2.50E-04
TA			Cyclohexane	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Diethylbenzene, 1,3-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,4-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,6-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dodecane	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Nonane	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Octane	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Propylbenzene, n-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Trimethylbenzene, 1,3,5-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			alpha-Methylstyrene	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Anthracene	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Butylbenzene, n-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Butylbenzene, tert-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Cymene, p-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Diisopropylbenzene, 1,3-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,3-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,5-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 3,4-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 3,5-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Indene	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Trimethylphenol, 2,4,6-	≤PQL	≤PQL	≤PQL	≤PQL	NA
Selected Criteria Pollutants and Greenhouse Gases								
			Carbon Monoxide	5.74E+00	5.49E+00	5.65E+00	5.63E+00	1.27E-01
			Carbon Dioxide	1.42E+01	1.24E+01	1.42E+01	1.36E+01	1.06E+00
			Nitrogen Oxides	4.04E-02	3.97E-02	4.09E-02	4.03E-02	5.95E-04
			Sulfur Dioxide	≤PQL	2.81E-03	≤PQL	3.96E-03	9.91E-04

Detailed Emission Results - Lb/Lb Binder - Runs 10 through 12 (F6000/6735)

TA	POM	HAP		HJ010	HJ011	HJ012	Average	Standard Deviation
			Test Dates	**28-Jul-06**	**28-Jul-06**	**28-Jul-06**	**—**	**—**
Emission Indicators								
			TGOC as Propane	1.94E-01	1.89E-01	1.95E-01	1.93E-01	3.11E-03
			HC as n-Hexane	1.64E-01	1.56E-01	1.61E-01	1.61E-01	4.04E-03
			Sum of Target Analytes	5.52E-02	5.19E-02	5.28E-02	5.33E-02	1.73E-03
			Sum of Target HAPs	3.56E-02	3.47E-02	3.44E-02	3.49E-02	5.95E-04
			Sum of Target POMs	1.31E-03	1.13E-03	1.50E-03	1.31E-03	1.88E-04
Selected Target HAPs and POMs								
TA		H	Phenol	1.60E-02	1.53E-02	1.61E-02	1.58E-02	4.66E-04
TA		H	Acetophenone	1.09E-02	9.99E-03	1.03E-02	1.04E-02	4.62E-04
TA		H	Benzene	3.79E-03	4.77E-03	2.95E-03	3.83E-03	9.09E-04
TA		H	Toluene	1.13E-03	1.14E-03	1.12E-03	1.13E-03	1.18E-05
TA	P	H	Naphthalene	6.54E-04	5.62E-04	8.40E-04	6.85E-04	1.42E-04
TA		H	Xylene, mp-	6.30E-04	6.35E-04	6.15E-04	6.27E-04	1.05E-05
TA		H	Cresol, o-	5.80E-04	5.19E-04	5.20E-04	5.40E-04	3.50E-05
TA		H	Formaldehyde	4.19E-04	4.35E-04	5.07E-04	4.54E-04	4.71E-05
TA	P	H	Methylnaphthalene, 2-	3.07E-04	2.59E-04	2.97E-04	2.88E-04	2.56E-05
TA		H	Styrene	2.86E-04	2.94E-04	2.72E-04	2.84E-04	1.15E-05
TA		H	Xylene, o-	1.85E-04	1.86E-04	1.84E-04	1.85E-04	9.56E-07
TA	P	H	Methylnaphthalene, 1-	1.47E-04	1.26E-04	1.40E-04	1.38E-04	1.05E-05
TA		H	Acetaldehyde	1.16E-04	1.23E-04	1.33E-04	1.24E-04	8.47E-06
TA		H	Ethylbenzene	8.14E-05	8.36E-05	8.17E-05	8.22E-05	1.20E-06
TA		H	Biphenyl	7.89E-05	7.24E-05	8.04E-05	7.72E-05	4.28E-06
TA	P	H	Dimethylnaphthalene, 2,6-	6.79E-05	5.92E-05	6.74E-05	6.48E-05	4.90E-06
TA	P	H	Dimethylnaphthalene, 2,3-	5.69E-05	4.77E-05	8.31E-05	6.26E-05	1.84E-05
TA	P	H	Dimethylnaphthalene, 1,3-	3.50E-05	2.96E-05	3.40E-05	3.28E-05	2.88E-06
TA		H	Acrolein	3.04E-05	2.69E-05	3.00E-05	2.91E-05	1.90E-06
TA	P	H	Dimethylnaphthalene, 1,6-	2.40E-05	2.42E-05	2.32E-05	2.38E-05	5.20E-07
TA	P	H	Acenaphthalene	2.05E-05	2.14E-05	1.95E-05	2.05E-05	9.80E-07
TA		H	Propionaldehyde (Propanal)	1.26E-05	1.24E-05	1.77E-05	1.42E-05	2.99E-06
TA	P	H	Dimethylnaphthalene, 1,2-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Dimethylnaphthalene, 1,5-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Dimethylnaphthalene, 1,8-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Dimethylnaphthalene, 2,7-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA	P	H	Trimethylnaphthalene, 2,3,5-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Cresol, mp-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Hexane	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Aniline	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Cumene	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA		H	Dimethylaniline	≤PQL	≤PQL	≤PQL	≤PQL	NA
Additional Selected Target Analytes								
TA			Diethylbenzene, 1,4-	8.22E-03	7.51E-03	7.91E-03	7.88E-03	3.52E-04
TA			Trimethylbenzene, 1,2,3-	3.19E-03	2.97E-03	3.07E-03	3.08E-03	1.09E-04
TA			Trimethylbenzene, 1,2,4-	2.05E-03	1.93E-03	1.97E-03	1.98E-03	6.18E-05
TA			Indan	2.05E-03	1.65E-03	2.13E-03	1.94E-03	2.55E-04
TA			Ethyltoluene, 2-	8.66E-04	5.08E-04	7.77E-04	7.17E-04	1.87E-04
TA			Crotonaldehyde	6.47E-04	5.30E-04	5.51E-04	5.76E-04	6.23E-05
TA			Undecane	8.18E-04	4.49E-04	1.75E-04	4.81E-04	3.23E-04
TA			Diethylbenzene, 1,2-	5.01E-04	4.59E-04	4.81E-04	4.80E-04	2.07E-05
TA			Butylbenzene, sec-	1.83E-04	1.71E-04	1.83E-04	1.79E-04	6.80E-06
TA			Tridecane	1.85E-04	1.56E-04	1.87E-04	1.76E-04	1.76E-05
TA			Ethyltoluene, 3-	1.73E-04	1.63E-04	1.52E-04	1.63E-04	1.06E-05
TA			Isobutylbenzene	1.33E-04	1.25E-04	1.70E-04	1.43E-04	2.41E-05

Detailed Emission Results - Lb/Lb Binder - Runs 10 through 12 (F6000/6735)

TA	POM	HAP		HJ010	HJ011	HJ012	Average	Standard Deviation
			Test Dates	**28-Jul-06**	**28-Jul-06**	**28-Jul-06**	—	—
TA			Tetradecane	1.42E-04	1.18E-04	1.43E-04	1.34E-04	1.41E-05
TA			Ethyltoluene, 4-	8.87E-05	8.13E-05	8.25E-05	8.42E-05	3.94E-06
TA			Benzaldehyde	9.07E-05	7.77E-05	7.98E-05	8.28E-05	6.97E-06
TA			Decane	6.78E-05	6.47E-05	6.69E-05	6.65E-05	1.61E-06
TA			Butyraldehyde/Methacrolein	7.06E-05	5.64E-05	5.65E-05	6.12E-05	8.19E-06
TA			o,m,p-Tolualdehyde	4.49E-05	3.73E-05	3.84E-05	4.02E-05	4.08E-06
TA			Trimethylphenol, 2,3,5-	3.99E-05	3.53E-05	4.08E-05	3.87E-05	2.95E-06
TA			Heptane	2.88E-05	2.70E-05	2.82E-05	2.80E-05	9.02E-07
TA			2-Butanone (MEK)	2.33E-05	2.10E-05	2.17E-05	2.20E-05	1.18E-06
TA			Pentanal (Valeraldehyde)	2.59E-05	1.85E-05	1.93E-05	2.12E-05	4.08E-06
TA			Hexaldehyde	1.29E-05	1.91E-05	1.01E-05	1.40E-05	4.60E-06
TA			Cyclohexane	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Diethylbenzene, 1,3-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,4-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,6-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dodecane	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Nonane	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Octane	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Propylbenzene, n-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Trimethylbenzene, 1,3,5-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			alpha-methylstyrene	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Anthracene	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Butylbenzene, n-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Butylbenzene, tert-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Cymene, p-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Diisopropylbenzene, 1,3-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,3-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 2,5-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 3,4-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Dimethylphenol, 3,5-	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Indene	≤PQL	≤PQL	≤PQL	≤PQL	NA
TA			Trimethylphenol, 2,4,6-	≤PQL	≤PQL	≤PQL	≤PQL	NA
Selected Criteria Pollutants and Greenhouse Gases								
			Carbon Monoxide	1.00E-01	9.67E-02	9.86E-02	9.85E-02	1.76E-03
			Carbon Dioxide	2.48E-01	2.18E-01	2.47E-01	2.38E-01	1.75E-02
			Nitrogen Oxides	7.05E-04	6.22E-04	6.10E-04	6.45E-04	5.16E-05
			Sulfur Dioxide	≤PQL	5.13E-05	≤PQL	4.72E-05	3.57E-06

Practical Reporting Limits - Test FL

Analytes	Lb/Tn Metal	Analytes	Lb/Tn Metal
1,2,3-Trimethylbenzene	4.10E-04	Indan	2.05E-03
1,2,4-Trimethylbenzene	4.10E-04	Indene	2.05E-03
1,3,5-Trimethylbenzene	4.10E-04	m,p-Cresol	2.05E-03
1,3-Dimethylnaphthalene	4.10E-04	Nonane	2.05E-03
1-Methylnaphthalene	4.10E-04	o-Cresol	2.05E-03
2-Ethyltoluene	4.10E-04	Octane	2.05E-03
2-Methylnaphthalene	4.10E-04	Phenol	2.05E-03
Benzene	4.10E-04	Propylbenzene	2.05E-03
Ethylbenzene	4.10E-04	Tetradecane	2.05E-03
Hexane	4.10E-04	Acetaldehyde	2.91E-04
m,p-Xylene	4.10E-04	2-Butanone (MEK)	2.91E-04
Naphthalene	4.10E-04	Acetone	2.91E-04
o-Xylene	4.10E-04	Acrolein	2.91E-04
Styrene	4.10E-04	Benzaldehyde	2.91E-04
Toluene	4.10E-04	Butyraldehyde	2.91E-04
Undecane	4.10E-04	Crotonaldehyde	2.91E-04
1,2-Dimethylnaphthalene	2.05E-03	Formaldehyde	2.91E-04
1,3-Diethylbenzene	2.05E-03	Hexaldehyde	2.91E-04
1,5-Dimethylnaphthalene	2.05E-03	Butyraldehyde/Methacrolein	4.84E-04
1,6-Dimethylnaphthalene	2.05E-03	o,m,p-Tolualdehyde	7.75E-04
1,8-Dimethylnaphthalene	2.05E-03	Pentanal (Valeraldehyde)	2.91E-04
2,3,5-Trimethylnaphthalene	2.05E-03	Propionaldehyde (Propanal)	2.91E-04
2,3-Dimethylnaphthalene	2.05E-03	HC as Hexane	2.72E-02
2,4-Dimethylphenol	2.05E-03	Carbon Monoxide	5.37E-01
2,6-Dimethylnaphthalene	2.05E-03	Methane	3.07E-02
2,6-Dimethylphenol	2.05E-03	Carbon Dioxide	8.44E-01
2,7- Dimethylnaphthalene	2.05E-03	Ethane	5.76E-01
3-Ethyltoluene	2.05E-03	Propane	8.44E-01
Acenaphthalene	2.05E-03	Isobutane	1.11E+00
Biphenyl	2.05E-03	Butane	1.11E+00
Cyclohexane	2.05E-03	Neopentane	1.38E+00
Decane	2.05E-03	Isopentane	1.38E+00
Dodecane	2.05E-03	Pentane	1.38E+00
Heptane	2.05E-03		

Analytes	Lb/Lb Binder	Analytes	Lb/Lb Binder
1,2,3-Trimethylbenzene	6.77E-06	Indan	3.39E-05
1,2,4-Trimethylbenzene	6.77E-06	Indene	3.39E-05
1,3,5-Trimethylbenzene	6.77E-06	m,p-Cresol	3.39E-05
1,3-Dimethylnaphthalene	6.77E-06	Nonane	3.39E-05
1-Methylnaphthalene	6.77E-06	o-Cresol	3.39E-05
2-Ethyltoluene	6.77E-06	Octane	3.39E-05
2-Methylnaphthalene	6.77E-06	Phenol	3.39E-05
Benzene	6.77E-06	Propylbenzene	3.39E-05
Ethylbenzene	6.77E-06	Tetradecane	3.39E-05
Hexane	6.77E-06	2-Butanone (MEK)	4.80E-06
m,p-Xylene	6.77E-06	Acetaldehyde	4.80E-06
Naphthalene	6.77E-06	Acetone	4.80E-06
o-Xylene	6.77E-06	Acrolein	4.80E-06
Styrene	6.77E-06	Benzaldehyde	4.80E-06
Toluene	6.77E-06	Butyraldehyde	4.80E-06
Undecane	6.77E-06	Crotonaldehyde	4.80E-06
1,2-Dimethylnaphthalene	3.39E-05	Formaldehyde	4.80E-06
1,3-Diethylbenzene	3.39E-05	Hexaldehyde	4.80E-06
1,5-Dimethylnaphthalene	3.39E-05	Butyraldehyde/Methacrolein	8.00E-06
1,6-Dimethylnaphthalene	3.39E-05	o,m,p-Tolualdehyde	1.28E-05
1,8-Dimethylnaphthalene	3.39E-05	Pentanal (Valeraldehyde)	4.80E-06
2,3,5-Trimethylnaphthalene	3.39E-05	Propionaldehyde (Propanal)	4.80E-06
2,3-Dimethylnaphthalene	3.39E-05	HC as Hexane	4.49E-04
2,4-Dimethylphenol	3.39E-05	Carbon Monoxide	8.87E-03
2,6-Dimethylnaphthalene	3.39E-05	Methane	5.07E-04
2,6-Dimethylphenol	3.39E-05	Carbon Dioxide	1.39E-02
2,7- Dimethylnaphthalene	3.39E-05	Ethane	9.50E-03
3-Ethyltoluene	3.39E-05	Propane	1.39E-02
Acenaphthalene	3.39E-05	Isobutane	1.84E-02
Biphenyl	3.39E-05	Butane	1.84E-02
Cyclohexane	3.39E-05	Neopentane	2.28E-02
Decane	3.39E-05	Isopentane	2.28E-02
Dodecane	3.39E-05	Pentane	2.28E-02
Heptane	3.39E-05		

Practical Reporting Limit -Test HJ - Runs 1 through 6 (F6000/6478)

Analyte	lb/ton Metal	Analyte	lb/ton Metal
Carbon Monoxide	5.08E-02	Indene	2.04E-03
Methane	2.90E-02	Isobutylbenzene	2.04E-03
Carbon Dioxide	7.99E-02	Methylnaphthalene, 1-	4.08E-04
THC as Propane	7.99E-02	Methylnaphthalene, 2-	4.08E-04
Acenaphthalene	2.04E-03	Naphthalene	4.08E-04
alpha-methylstyrene	2.04E-03	Nonane	2.04E-03
Anthracene	2.04E-03	Octane	2.04E-03
Benzene	4.08E-04	Phenol	2.04E-03
Biphenyl	2.04E-03	Propylbenzene, n-	2.04E-03
Butylbenzene, n-	2.04E-03	Styrene	4.08E-04
Butylbenzene, sec-	2.04E-03	Tetradecane	2.04E-03
Butylbenzene, tert-	2.04E-03	THC as Undecane	2.04E-03
Cresol, mp-	2.04E-03	Toluene	4.08E-04
Cresol, o-	2.04E-03	Tridecane	2.04E-03
Cyclohexane	2.04E-03	Trimethylbenzene, 1,2,3-	4.08E-04
Cymene, p-	2.04E-03	Trimethylbenzene, 1,2,4-	4.08E-04
Decane	2.04E-03	Trimethylbenzene, 1,3,5-	4.08E-04
Diethylbenzene, 1,2-	2.04E-03	Trimethylnaphthalene, 2,3,5-	2.04E-03
Diethylbenzene, 1,3-	2.04E-03	Trimethylphenol, 2,3,5-	2.04E-03
Diethylbenzene, 1,4-	2.04E-03	Trimethylphenol, 2,4,6-	2.04E-03
Diisopropylbenzene, 1,3-	2.04E-03	Undecane	4.08E-04
Dimethylnaphthalene, 1,2-	2.04E-03	Xylene, mp-	4.08E-04
Dimethylnaphthalene, 1,3-	4.08E-04	Xylene, o-	4.08E-04
Dimethylnaphthalene, 1,5-	2.04E-03	Aniline	1.78E-02
Dimethylnaphthalene, 1,6-	2.04E-03	Dimethylaniline	3.12E-02
Dimethylnaphthalene, 1,8-	2.04E-03	Sulfur Dioxide	4.40E-03
Dimethylnaphthalene, 2,3-	2.04E-03	Acetophenone	2.00E-02
Dimethylnaphthalene, 2,6-	2.04E-03	Cumene	2.00E-02
Dimethylnaphthalene, 2,7-	2.04E-03	Phenyl Isopropyl Alcohol	8.02E-03
Dimethylphenol, 2,3-	2.04E-03	THCs as n-Hexane	4.01E-02
Dimethylphenol, 2,4-	2.04E-03	2-Butanone (MEK)	3.38E-04
Dimethylphenol, 2,5-	2.04E-03	Acetaldehyde	3.38E-04
Dimethylphenol, 2,6-	2.04E-03	Acetone	3.38E-04
Dimethylphenol, 3,4-	1.02E-03	Acrolein	3.38E-04
Dimethylphenol, 3,5-	1.02E-03	Benzaldehyde	3.38E-04
Dodecane	2.04E-03	Butyraldehyde/Methacrolein	5.63E-04
Ethylbenzene	4.08E-04	Crotonaldehyde	3.38E-04
Ethyltoluene, 2-	4.08E-04	Formaldehyde	3.38E-04
Ethyltoluene, 3-	2.04E-03	Hexaldehyde	3.38E-04
Ethyltoluene, 4-	2.04E-03	o,m,p-Tolualdehyde	9.01E-04
Heptane	2.04E-03	Pentanal (Valeraldehyde)	3.38E-04
Hexane	4.08E-04	Propionaldehyde (Propanal)	3.38E-04
Indan	2.04E-03		

Analyte	lb/lb Binder	Analyte	lb/lb Binder
Carbon Monoxide	8.65E-04	Indene	2.08E-05
Methane	4.94E-04	Isobutylbenzene	2.08E-05
Carbon Dioxide	1.36E-03	Methylnaphthalene, 1-	4.15E-06
THC as Propane	1.36E-03	Methylnaphthalene, 2-	4.15E-06
Acenaphthalene	2.08E-05	Naphthalene	4.15E-06
alpha-methylstyrene	2.08E-05	Nonane	2.08E-05
Anthracene	2.08E-05	Octane	2.08E-05
Benzene	4.15E-06	Phenol	2.08E-05
Biphenyl	2.08E-05	Propylbenzene, n-	2.08E-05
Butylbenzene, n-	2.08E-05	Styrene	4.15E-06
Butylbenzene, sec-	2.08E-05	Tetradecane	2.08E-05
Butylbenzene, tert-	2.08E-05	THC as Undecane	2.08E-05
Cresol, mp-	2.08E-05	Toluene	4.15E-06
Cresol, o-	2.08E-05	Tridecane	2.08E-05
Cyclohexane	2.08E-05	Trimethylbenzene, 1,2,3-	4.15E-06
Cymene, p-	2.08E-05	Trimethylbenzene, 1,2,4-	4.15E-06
Decane	2.08E-05	Trimethylbenzene, 1,3,5-	4.15E-06
Diethylbenzene, 1,2-	2.08E-05	Trimethylnaphthalene, 2,3,5-	2.08E-05
Diethylbenzene, 1,3-	2.08E-05	Trimethylphenol, 2,3,5-	2.08E-05
Diethylbenzene, 1,4-	2.08E-05	Trimethylphenol, 2,4,6-	2.08E-05
Diisopropylbenzene, 1,3-	2.08E-05	Undecane	4.15E-06
Dimethylnaphthalene, 1,2-	2.08E-05	Xylene, mp-	4.15E-06
Dimethylnaphthalene, 1,3-	4.15E-06	Xylene, o-	4.15E-06
Dimethylnaphthalene, 1,5-	2.08E-05	Aniline	1.82E-04
Dimethylnaphthalene, 1,6-	2.08E-05	Dimethylaniline	3.18E-04
Dimethylnaphthalene, 1,8-	2.08E-05	Sulfur Dioxide	4.48E-05
Dimethylnaphthalene, 2,3-	2.08E-05	Acetophenone	2.04E-04
Dimethylnaphthalene, 2,6-	2.08E-05	Cumene	8.16E-05
Dimethylnaphthalene, 2,7-	2.08E-05	Phenyl Isopropyl Alcohol	8.16E-05
Dimethylphenol, 2,3-	2.08E-05	THCs as n-Hexane	4.08E-04
Dimethylphenol, 2,4-	2.08E-05	2-Butanone (MEK)	3.44E-06
Dimethylphenol, 2,5-	2.08E-05	Acetaldehyde	3.44E-06
Dimethylphenol, 2,6-	2.08E-05	Acetone	3.44E-06
Dimethylphenol, 3,4-	1.04E-05	Acrolein	3.44E-06
Dimethylphenol, 3,5-	1.04E-05	Benzaldehyde	3.44E-06
Dodecane	2.08E-05	Butyraldehyde/Methacrolein	5.73E-06
Ethylbenzene	4.15E-06	Crotonaldehyde	3.44E-06
Ethyltoluene, 2-	4.15E-06	Formaldehyde	3.44E-06
Ethyltoluene, 3-	2.08E-05	Hexaldehyde	3.44E-06
Ethyltoluene, 4-	2.08E-05	o,m,p-Tolualdehyde	9.17E-06
Heptane	2.08E-05	Pentanal (Valeraldehyde)	3.44E-06
Hexane	4.15E-06	Propionaldehyde (Propanal)	3.44E-06
Indan	2.08E-05		

Practical Reporting Limits - Runs 7 through 9 (6000/6478)

Analyte	lb/ton Metal	Analyte	lb/ton Metal
Carbon Monoxide	5.04E-02	Hexane	3.59E-04
Methane	2.88E-02	Indan	1.80E-03
Carbon Dioxide	7.93E-02	Indene	1.80E-03
THC as Propane	7.93E-02	Isobutylbenzene	1.80E-03
Nitrogen Oxides	5.40E-02	Methylnaphthalene, 1-	3.59E-04
Acenaphthalene	1.80E-03	Methylnaphthalene, 2-	3.59E-04
alpha-methylstyrene	1.80E-03	Naphthalene	3.59E-04
Anthracene	1.80E-03	Nonane	1.80E-03
Benzene	3.59E-04	Octane	1.80E-03
Biphenyl	1.80E-03	Phenol	1.80E-03
Butylbenzene, n-	1.80E-03	Propylbenzene, n-	1.80E-03
Butylbenzene, sec-	1.80E-03	Styrene	3.59E-04
Butylbenzene, tert-	1.80E-03	Tetradecane	1.80E-03
Cresol, mp-	1.80E-03	Toluene	3.59E-04
Cresol, o-	1.80E-03	Tridecane	1.80E-03
Cyclohexane	1.80E-03	Trimethylbenzene, 1,2,3-	3.59E-04
Cymene, p-	1.80E-03	Trimethylbenzene, 1,2,4-	3.59E-04
Decane	1.80E-03	Trimethylbenzene, 1,3,5-	3.59E-04
Diethylbenzene, 1,2-	1.80E-03	Trimethylnaphthalene, 2,3,5-	1.80E-03
Diethylbenzene, 1,3-	1.80E-03	Trimethylphenol, 2,3,5-	1.80E-03
Diethylbenzene, 1,4-	1.80E-03	Trimethylphenol, 2,4,6-	1.80E-03
Diisopropylbenzene, 1,3-	1.80E-03	Undecane	3.59E-04
Dimethylnaphthalene, 1,2-	1.80E-03	Xylene, mp-	3.59E-04
Dimethylnaphthalene, 1,3-	3.59E-04	Xylene, o-	3.59E-04
Dimethylnaphthalene, 1,5-	1.80E-03	Aniline	1.83E-02
Dimethylnaphthalene, 1,6-	1.80E-03	Dimethylaniline	3.21E-02
Dimethylnaphthalene, 1,8-	1.80E-03	Sulfur Dioxide	4.52E-03
Dimethylnaphthalene, 2,3-	1.80E-03	Acetophenone	2.06E-02
Dimethylnaphthalene, 2,6-	1.80E-03	Cumene	8.25E-03
Dimethylnaphthalene, 2,7-	1.80E-03	THCs as n-Hexane	4.13E-02
Dimethylphenol, 2,3-	1.80E-03	2-Butanone (MEK)	3.47E-04
Dimethylphenol, 2,4-	1.80E-03	Acetaldehyde	3.47E-04
Dimethylphenol, 2,5-	1.80E-03	Acrolein	3.47E-04
Dimethylphenol, 2,6-	1.80E-03	Benzaldehyde	3.47E-04
Dimethylphenol, 3,4-	8.98E-04	Butyraldehyde/Methacrolein	5.79E-04
Dimethylphenol, 3,5-	8.98E-04	Crotonaldehyde	3.47E-04
Dodecane	1.80E-03	Formaldehyde	3.47E-04
Ethylbenzene	3.59E-04	Hexaldehyde	3.47E-04
Ethyltoluene, 2-	3.59E-04	o,m,p-Tolualdehyde	9.26E-04
Ethyltoluene, 3-	1.80E-03	Pentanal (Valeraldehyde)	3.47E-04
Ethyltoluene, 4-	1.80E-03	Propionaldehyde (Propanal)	3.47E-04
Heptane	1.80E-03		

Analyte	lb/lbBinder	Analyte	lb/lb Binder
Carbon Monoxide	8.70E-04	Hexane	3.61E-06
Methane	4.97E-04	Indan	1.80E-05
Carbon Dioxide	1.37E-03	Indene	1.80E-05
THC as Propane	1.37E-03	Isobutylbenzene	1.80E-05
Nitrogen Oxides	9.32E-04	Methylnaphthalene, 1-	3.61E-06
Acenaphthalene	1.80E-05	Methylnaphthalene, 2-	3.61E-06
alpha-methylstyrene	1.80E-05	Naphthalene	3.61E-06
Anthracene	1.80E-05	Nonane	1.80E-05
Benzene	3.61E-06	Octane	1.80E-05
Biphenyl	1.80E-05	Phenol	1.80E-05
Butylbenzene, n-	1.80E-05	Propylbenzene, n-	1.80E-05
Butylbenzene, sec-	1.80E-05	Styrene	3.61E-06
Butylbenzene, tert-	1.80E-05	Tetradecane	1.80E-05
Cresol, mp-	1.80E-05	Toluene	3.61E-06
Cresol, o-	1.80E-05	Tridecane	1.80E-05
Cyclohexane	1.80E-05	Trimethylbenzene, 1,2,3-	3.61E-06
Cymene, p-	1.80E-05	Trimethylbenzene, 1,2,4-	3.61E-06
Decane	1.80E-05	Trimethylbenzene, 1,3,5-	3.61E-06
Diethylbenzene, 1,2-	1.80E-05	Trimethylnaphthalene, 2,3,5-	1.80E-05
Diethylbenzene, 1,3-	1.80E-05	Trimethylphenol, 2,3,5-	1.80E-05
Diethylbenzene, 1,4-	1.80E-05	Trimethylphenol, 2,4,6-	1.80E-05
Diisopropylbenzene, 1,3-	1.80E-05	Undecane	3.61E-06
Dimethylnaphthalene, 1,2-	1.80E-05	Xylene, mp-	3.61E-06
Dimethylnaphthalene, 1,3-	3.61E-06	Xylene, o-	3.61E-06
Dimethylnaphthalene, 1,5-	1.80E-05	Aniline	1.84E-04
Dimethylnaphthalene, 1,6-	1.80E-05	Dimethylaniline	3.22E-04
Dimethylnaphthalene, 1,8-	1.80E-05	Sulfur Dioxide	4.54E-05
Dimethylnaphthalene, 2,3-	1.80E-05	Acetophenone	2.07E-04
Dimethylnaphthalene, 2,6-	1.80E-05	Cumene	8.28E-05
Dimethylnaphthalene, 2,7-	1.80E-05	THCs as n-Hexane	4.14E-04
Dimethylphenol, 2,3-	1.80E-05	2-Butanone (MEK)	3.49E-06
Dimethylphenol, 2,4-	1.80E-05	Acetaldehyde	3.49E-06
Dimethylphenol, 2,5-	1.80E-05	Acrolein	3.49E-06
Dimethylphenol, 2,6-	1.80E-05	Benzaldehyde	3.49E-06
Dimethylphenol, 3,4-	9.02E-06	Butyraldehyde/Methacrolein	5.81E-06
Dimethylphenol, 3,5-	9.02E-06	Crotonaldehyde	3.49E-06
Dodecane	1.80E-05	Formaldehyde	3.49E-06
Ethylbenzene	3.61E-06	Hexaldehyde	3.49E-06
Ethyltoluene, 2-	3.61E-06	o,m,p-Tolualdehyde	9.30E-06
Ethyltoluene, 3-	1.80E-05	Pentanal (Valeraldehyde)	3.49E-06
Ethyltoluene, 4-	1.80E-05	Propionaldehyde (Propanal)	3.49E-06
Heptane	1.80E-05		

Practical Reporting Limit - Runs 10 through 12 (F6000/6435)

Analyte	lb/ton Metal	Analyte	lb/ton Metal
Carbon Monoxide	4.92E-02	Hexane	3.60E-04
Methane	2.81E-02	Indan	1.80E-03
Carbon Dioxide	7.74E-02	Indene	1.80E-03
THC as Propane	7.74E-02	Isobutylbenzene	1.80E-03
Nitrogen Oxides	5.27E-02	Methylnaphthalene, 1-	3.60E-04
Acenaphthalene	1.80E-03	Methylnaphthalene, 2-	3.60E-04
alpha-methylstyrene	1.80E-03	Naphthalene	3.60E-04
Anthracene	1.80E-03	Nonane	1.80E-03
Benzene	3.60E-04	Octane	1.80E-03
Biphenyl	1.80E-03	Phenol	1.80E-03
Butylbenzene, n-	1.80E-03	Propylbenzene, n-	1.80E-03
Butylbenzene, sec-	1.80E-03	Styrene	3.60E-04
Butylbenzene, tert-	1.80E-03	Tetradecane	1.80E-03
Cresol, mp-	1.80E-03	THC as Undecane	1.80E-03
Cresol, o-	1.80E-03	Toluene	3.60E-04
Cyclohexane	1.80E-03	Tridecane	1.80E-03
Cymene, p-	1.80E-03	Trimethylbenzene, 1,2,3-	3.60E-04
Decane	1.80E-03	Trimethylbenzene, 1,2,4-	3.60E-04
Diethylbenzene, 1,2-	1.80E-03	Trimethylbenzene, 1,3,5-	3.60E-04
Diethylbenzene, 1,3-	1.80E-03	Trimethylnaphthalene, 2,3,5-	1.80E-03
Diethylbenzene, 1,4-	1.80E-03	Trimethylphenol, 2,3,5-	1.80E-03
Diisopropylbenzene, 1,3-	1.80E-03	Trimethylphenol, 2,4,6-	1.80E-03
Dimethylnaphthalene, 1,2-	1.80E-03	Undecane	3.60E-04
Dimethylnaphthalene, 1,3-	3.60E-04	Xylene, mp-	3.60E-04
Dimethylnaphthalene, 1,5-	1.80E-03	Xylene, o-	3.60E-04
Dimethylnaphthalene, 1,6-	1.80E-03	Aniline	1.84E-02
Dimethylnaphthalene, 1,8-	1.80E-03	Dimethylaniline	3.22E-02
Dimethylnaphthalene, 2,3-	1.80E-03	Sulfur Dioxide	4.53E-03
Dimethylnaphthalene, 2,6-	1.80E-03	Acetophenone	2.06E-02
Dimethylnaphthalene, 2,7-	1.80E-03	Cumene	8.26E-03
Dimethylphenol, 2,3-	1.80E-03	THCs as n-Hexane	4.13E-02
Dimethylphenol, 2,4-	1.80E-03	2-Butanone (MEK)	3.48E-04
Dimethylphenol, 2,5-	1.80E-03	Acetaldehyde	3.48E-04
Dimethylphenol, 2,6-	1.80E-03	Acrolein	3.48E-04
Dimethylphenol, 3,4-	9.01E-04	Benzaldehyde	3.48E-04
Dimethylphenol, 3,5-	9.01E-04	Butyraldehyde/Methacrolein	5.80E-04
Dodecane	1.80E-03	Crotonaldehyde	3.48E-04
Ethylbenzene	3.60E-04	Formaldehyde	3.48E-04
Ethyltoluene, 2-	3.60E-04	Hexaldehyde	3.48E-04
Ethyltoluene, 3-	1.80E-03	o,m,p-Tolualdehyde	9.29E-04
Ethyltoluene, 4-	1.80E-03	Pentanal (Valeraldehyde)	3.48E-04
Heptane	1.80E-03	Propionaldehyde (Propanal)	3.48E-04

Analyte	lb/lb Binder	Analyte	lb/lb Binder
Carbon Monoxide	8.61E-04	Hexane	3.59E-06
Methane	4.92E-04	Indan	1.79E-05
Carbon Dioxide	1.35E-03	Indene	1.79E-05
THC as Propane	1.35E-03	Isobutylbenzene	1.79E-05
Nitrogen Oxides	9.23E-04	Methylnaphthalene, 1-	3.59E-06
Acenaphthalene	1.79E-05	Methylnaphthalene, 2-	3.59E-06
alpha-methylstyrene	1.79E-05	Naphthalene	3.59E-06
Anthracene	1.79E-05	Nonane	1.79E-05
Benzene	3.59E-06	Octane	1.79E-05
Biphenyl	1.79E-05	Phenol	1.79E-05
Butylbenzene, n-	1.79E-05	Propylbenzene, n-	1.79E-05
Butylbenzene, sec-	1.79E-05	Styrene	3.59E-06
Butylbenzene, tert-	1.79E-05	Tetradecane	1.79E-05
Cresol, mp-	1.79E-05	THC as Undecane	1.79E-05
Cresol, o-	1.79E-05	Toluene	3.59E-06
Cyclohexane	1.79E-05	Tridecane	1.79E-05
Cymene, p-	1.79E-05	Trimethylbenzene, 1,2,3-	3.59E-06
Decane	1.79E-05	Trimethylbenzene, 1,2,4-	3.59E-06
Diethylbenzene, 1,2-	1.79E-05	Trimethylbenzene, 1,3,5-	3.59E-06
Diethylbenzene, 1,3-	1.79E-05	Trimethylnaphthalene, 2,3,5-	1.79E-05
Diethylbenzene, 1,4-	1.79E-05	Trimethylphenol, 2,3,5-	1.79E-05
Diisopropylbenzene, 1,3-	1.79E-05	Trimethylphenol, 2,4,6-	1.79E-05
Dimethylnaphthalene, 1,2-	1.79E-05	Undecane	3.59E-06
Dimethylnaphthalene, 1,3-	3.59E-06	Xylene, mp-	3.59E-06
Dimethylnaphthalene, 1,5-	1.79E-05	Xylene, o-	3.59E-06
Dimethylnaphthalene, 1,6-	1.79E-05	Aniline	1.83E-04
Dimethylnaphthalene, 1,8-	1.79E-05	Dimethylaniline	3.20E-04
Dimethylnaphthalene, 2,3-	1.79E-05	Sulfur Dioxide	4.51E-05
Dimethylnaphthalene, 2,6-	1.79E-05	Acetophenone	2.06E-04
Dimethylnaphthalene, 2,7-	1.79E-05	Cumene	8.22E-05
Dimethylphenol, 2,3-	1.79E-05	THCs as n-Hexane	4.11E-04
Dimethylphenol, 2,4-	1.79E-05	2-Butanone (MEK)	3.47E-06
Dimethylphenol, 2,5-	1.79E-05	Acetaldehyde	3.47E-06
Dimethylphenol, 2,6-	1.79E-05	Acrolein	3.47E-06
Dimethylphenol, 3,4-	8.97E-06	Benzaldehyde	3.47E-06
Dimethylphenol, 3,5-	8.97E-06	Butyraldehyde/Methacrolein	5.78E-06
Dodecane	1.79E-05	Crotonaldehyde	3.47E-06
Ethylbenzene	3.59E-06	Formaldehyde	3.47E-06
Ethyltoluene, 2-	3.59E-06	Hexaldehyde	3.47E-06
Ethyltoluene, 3-	1.79E-05	o,m,p-Tolualdehyde	9.25E-06
Ethyltoluene, 4-	1.79E-05	Pentanal (Valeraldehyde)	3.47E-06
Heptane	1.79E-05	Propionaldehyde (Propanal)	3.47E-06

APPENDIX C DETAILED PROCESS DATA AND CASTING QUALITY PHOTOS

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Detailed Process Data - Test FL

No-Bake Mix/Make/Cure										
Test Dates	**10/6/2003**	**10/6/2003**	**10/6/2003**	**10/7/2003**	**10/7/2003**	**10/7/2003**	**10/8/2003**	**10/8/2003**	**10/8/2003**	
Emissions Sample # / Production Sample #	**FL001**	**FL002**	**FL003**	**FL004**	**FL005**	**FL006**	**FL007**	**FL008**	**FL009**	**Average**
Sand Dispensing Rate, lbs/15 sec	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Binder Part 1+ Part 3 Dispensing Rate, gms/15 sec	83.80	83.80	83.80	85.70	85.70	85.70	85.30	85.30	85.30	84.93
Binder Part 2 Dispensing Rate, gms/15 sec	61.60	61.60	61.60	64.70	64.70	64.70	64.10	64.10	64.10	63.47
Calculated Standard % Binder	1.06	1.06	1.06	1.09	1.09	1.09	1.09	1.09	1.09	1.08
Calculated % Binder (BOS)	1.07	1.07	1.07	1.10	1.10	1.10	1.10	1.10	1.10	1.09
Mold Weight, lbs	330.50	328.00	336.50	334.00	328.00	329.00	328.00	331.00	335.00	331.11
Calculated Total Binder Weight, lbs	3.49	3.46	3.55	3.65	3.58	3.59	3.56	3.59	3.63	3.57
1800°F LOI, % **(Note 1)**	1.04	1.13	1.11	1.02	0.96	1.26	1.02	1.27	1.09	1.10
Sand Temperature, °F	80.00	80.00	80.00	82.00	83.00	81.00	86.00	81.00	84.00	81.89
Dogbone Core 2 hr. Tensile Strength, psi	46.58	49.50	55.00	47.00	35.83	38.08	23.50	33.50	51.08	42.23

No-Bake PCS										
Test Dates	**10/7/2003**	**10/7/2003**	**10/7/2003**	**10/8/2003**	**10/8/2003**	**10/8/2003**	**10/9/2003**	**10/9/2003**	**10/9/2003**	
Emissions Sample # / Production Sample #	**FL001**	**FL002**	**FL003**	**FL004**	**FL005**	**FL006**	**FL007**	**FL008**	**FL009**	**Average**
Pouring Temp, °F	2624.00	2629.00	2628.00	2640.00	2630.00	2637.00	2636.00	2628.00	2635.00	2631.89
Pouring Time, sec.	34.00	32.00	34.00	35.00	35.00	35.00	30.00	32.00	31.00	33.11
Cast Weight (all metal inside mold), Lbs.	117.30	119.05	117.15	117.15	119.95	115.55	117.65	118.65	118.80	117.92
Process Air Temperature in Hood, °F (**Note 2**)	86.00	88.00	90.00	86.00	85.00	89.00	85.00	86.00	86.00	86.78
Mold Temperature when placed in hood, °F	78.80	78.60	77.40	80.20	79.90	77.60	80.50	79.50	77.40	78.88
Ambient Temperature, °F	73.12	75.89	79.39	72.88	75.34	78.85	68.56	72.09	75.92	74.67
Mold Age When Poured, hr	22.77	24.22	24.50	22.43	23.57	23.72	23.48	24.77	24.58	23.78
Test Length, min	75	75	75	75	75	75	75	75	75	75
Rank Order Cavity 'A'	8	1	2	5	6	7	9	3	4	

Note 1: 1800°F LOI is the net sample weight difference when combusted at 1800°F for 2 hours and includes decomposition of carbonates that originate in the source sand.

Note 2: Process air in the hood is ambient air infiltrated under the hood and controlled heated air from an oven blended at the base of the hood and measured at the level of the mold.

Detailed Process Data - Test HJ

No-Bake Mix/Make/Cure							
Mix/Make/Cure Dates	7/24/2006	7/24/2006	7/24/2006	7/25/2006	7/25/2006	7/25/2006	
Binder	HA International F6000/6478						
Emissions Sample # / Production Sample #	HJ001	HJ002	HJ003	HJ004	HJ005	HJ006	Averages
Sand Dispensing Rate, lbs/15 sec	32.23	32.23	32.23	32.23	32.23	32.23	32.23
Binder Part 1+ Part 3 Dispensing Rate, gms/15 sec	88.7	88.7	88.7	88.7	88.7	88.7	88.7
Binder Part 2 Dispensing Rate, gms/15 sec	72.4	72.4	72.4	72.4	72.4	72.4	72.4
Calculated Standard % Binder	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Calculated % Binder (BOS)	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Mold Weight, lbs	334.35	330.85	340.35	342.85	344.35	344.35	339.5
Calculated Total Binder Weight, lbs	3.63	3.59	3.69	3.72	3.74	3.74	3.69
Sand Temperature, °F	96	96	96	90	90	90	93
Dogbone Core 2 hr. Tensile Strength, psi	93.6	93.6	93.6	93.6	93.6	93.6	94
Dogbone Core 24 hr. Tensile Strength, psi	ND	ND	ND	ND	ND	ND	ND

No-Bake PCS							
Pour Dates	7/25/2006	7/25/2006	7/25/2006	7/26/2006	7/26/2006	7/26/2006	
Emissions Sample # / Production Sample #	HJ001	HJ002	HJ003	HJ004	HJ005	HJ006	Averages
Pouring Temp, deg F	2622	2624	2627	2640	ND	2633	2629.2
Pouring Time, sec.	36	35	35	41	37	33	36.2
Cast Weight (all metal inside mold), Lbs.	129.65	121.05	129.95	128.75	120.70	122.30	125.4
Process Air Temperature in Hood,°F	88	94	100	88	94	99	93.7
Mold Temperature when placed in hood, °F	91	91	93	93	92	90	91.5
Ambient Temperature, °F	86.79	90.80	97.81	87.41	91.10	95.97	91.6
1800F LOI, % when poured	1.10	0.97	1.04	1.04	1.01	0.95	1.0
Mold Age When Poured, hr	21.81	23.50	25.90	25.26	26.81	27.75	25.2
Rank order cavity '3'	3	6	4	2	1	5	

ND=Not Determined

The temperature for mold HJ005 was measured at 2645 then the thermocouple was withdrawn. After a few moments the thermocouple was put back in, and the thermocouple failed. The temperture was assumed to be in the correct range, but the exact temperature is not known.

The activator percentage was changed between each of the molds HJ007-HJ006, and the molds were not as hard as the molds form the previous day, so a 24 hour test was taken to show the final strength of the molds.

Detailed Process Data - Test HJ

No-Bake Mix/Make/Cure								
Mix/Make/Cure Dates	7/26/2006	7/26/2006	7/26/2006		7/27/2006	7/27/2006	7/27/2006	
Binder	HA International 6000/6478				HA International F6000/6435			
Emissions Sample # / Production Sample #	HJ007	HJ008	HJ009	Averages	HJ010	HJ011	HJ012	Averages
Sand Dispensing Rate, lbs/15 sec	32.15	32.15	32.15	32.15	32.15	32.15	32.15	32.15
Binder Part1 + Part3 Dispensing Rate, gms/15 sec	89.0	89.0	89.0	89.0	88.6	88.6	88.6	88.60
Binder Part 2 Dispensing Rate, gms/15 sec	73.1	73.1	73.1	73.1	72.8	72.8	72.8	72.80
Calculated Standard % Binder	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Calculated % Binder (BOS)	1.11	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Mold Weight, lbs	338.85	342.85	344.85	342.18	346.35	344.85	344.85	345.35
Calculated Total Binder Weight, lbs	3.71	3.74	3.76	3.74	3.78	3.76	3.76	3.76
Sand Temperature, °F	96	96	96	96	90	90	90	90
Dogbone Core 2 hr. Tensile Strength, psi	21.6	12.0	44.0	26	113.0	113.0	113.0	113.0
Dogbone Core 24 hr. Tensile Strength, psi	136.4	136.4	136.4	136.43	ND	ND	ND	ND

No-Bake PCS								
Pour Dates	7/27/2006	7/27/2006	7/27/2006		7/28/2006	7/28/2006	7/28/2006	
Emissions Sample # / Production Sample #	HJ007	HJ008	HJ009	Averages	HJ010	HJ011	HJ012	Averages
Pouring Temp, deg F	2640	2634	2625	2633	2631	2641	2636	2636.00
Pouring Time, sec.	43	37	37	39	40	36	36	37.33
Cast Weight (all metal inside mold), Lbs.	132.55	121.30	132.85	129	131.75	132.35	131.25	131.78
Process Air Temperature in Hood,°F	86	87	90	88	88	88	89	88.43
Mold Temperature when placed in hood, °F	93	88	83	88	83	86	84	84.47
Ambient Temperature, °F	77.35	80.68	86.45	81	73.06	76.85	82.52	77.48
1800F LOI, % when poured	0.99	0.95	0.96	1	1.20	0.98	1.09	1.09
Mold Age When Poured, hr	25.03	24.32	24.94	25	25.29	26.83	27.86	26.66
Rank order cavity '3'	1	2	3	0	2	3	1	

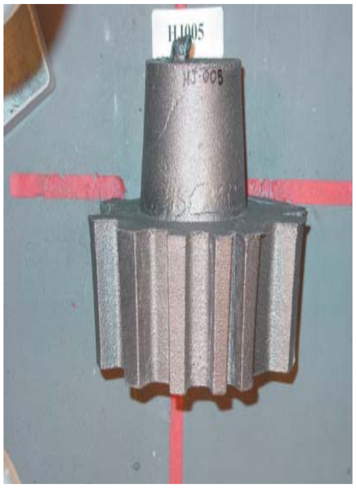
ND=Not Determined

The activator percentage was changed between each of the molds HJ007-HJ006, and the molds were not as hard as the molds form the previous day, so a 24 hour test was taken to show the final strength of the molds.

Casting Quality Photos

Best

FL002



HJ005

Median

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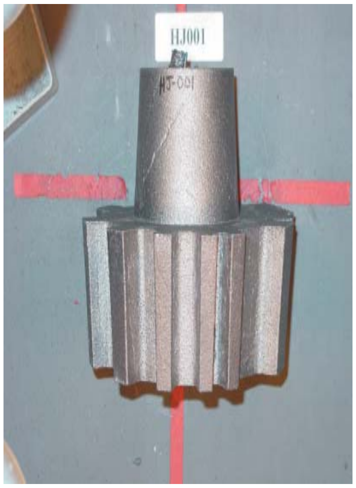
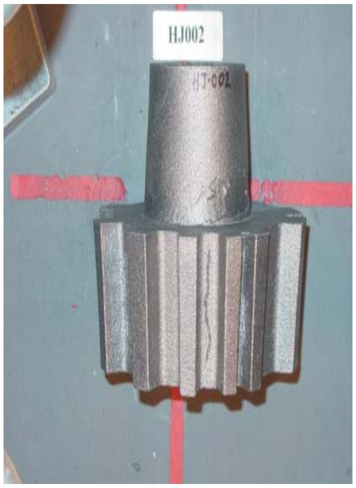


HJ001

Worst

FL007

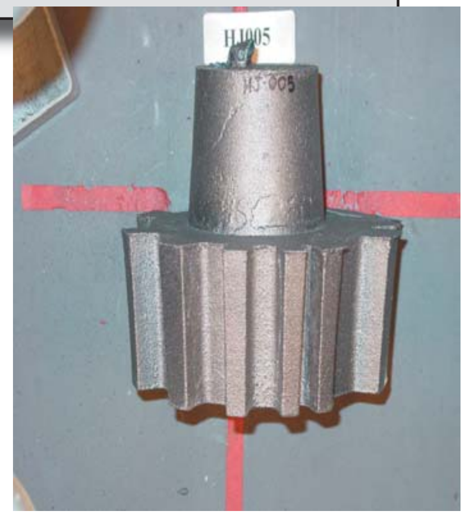


HJ002

Casting Quality Photos

Best

FL002



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Median

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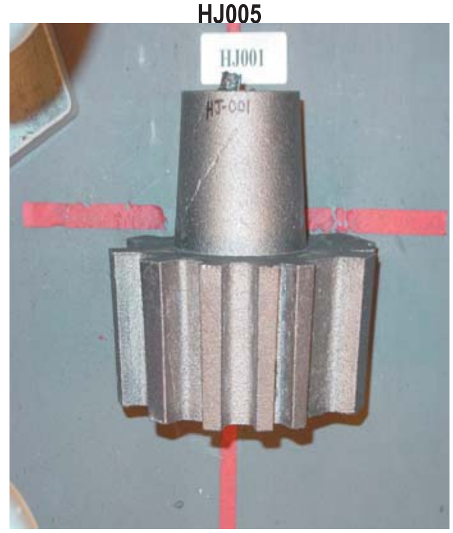

HJ001

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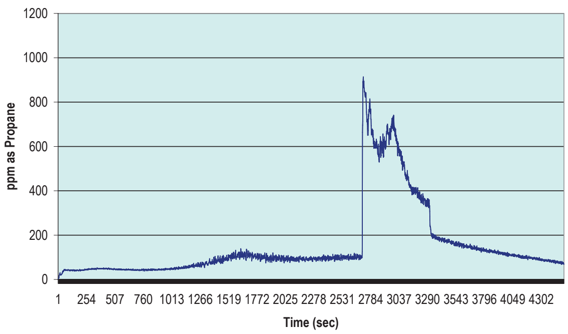
FL001 TGOC



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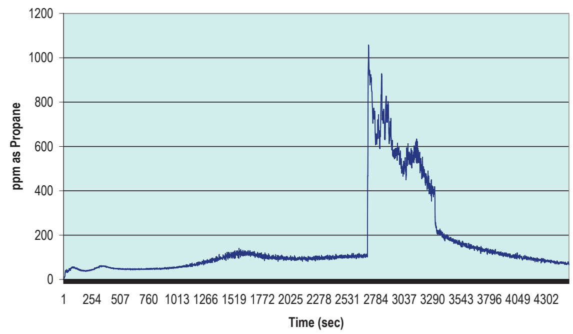

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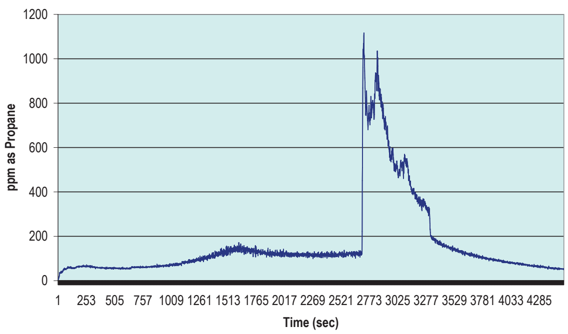

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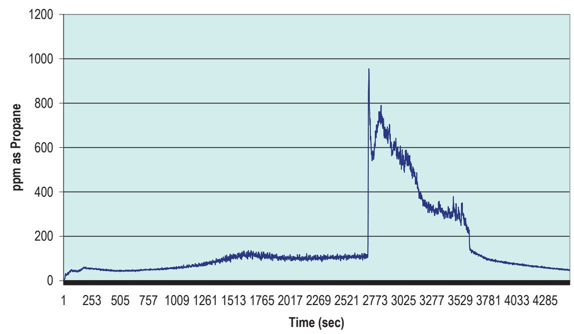

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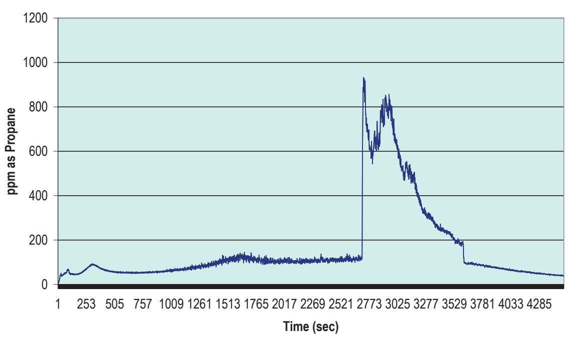

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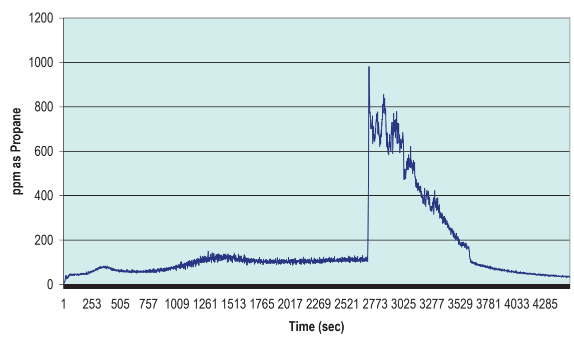

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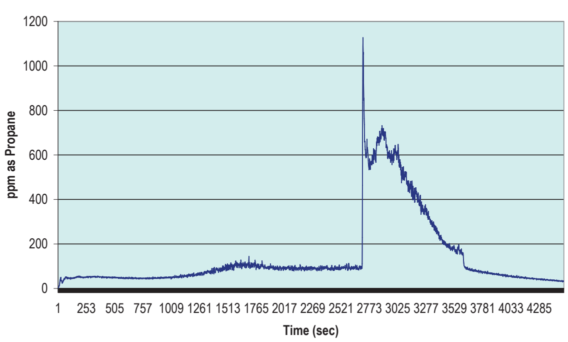

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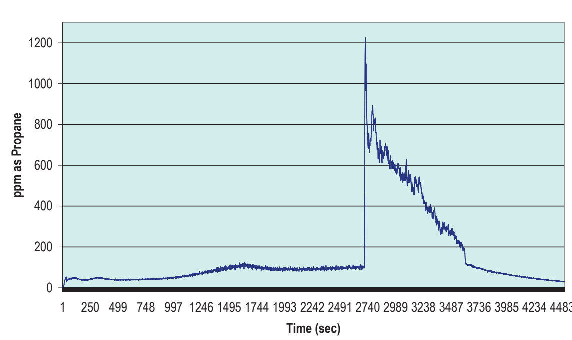

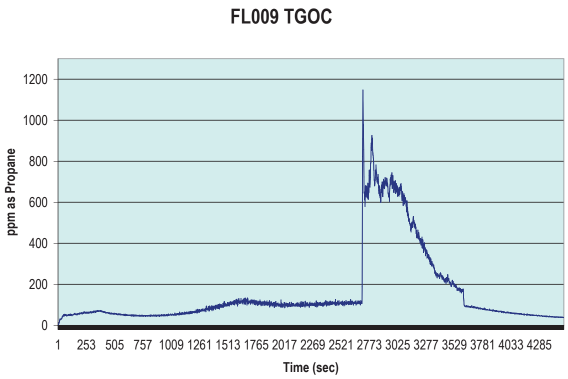
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800
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2017
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2521
2773
3025
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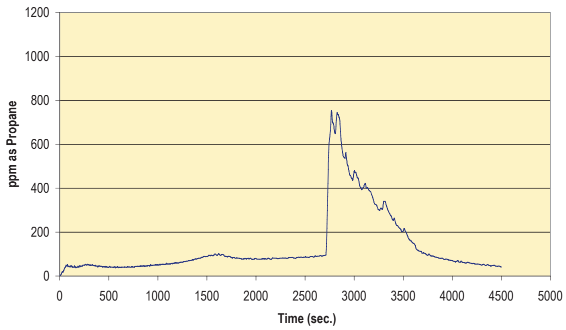
3529
3781
4033
4285
Time (sec)

HJ001 TGOC



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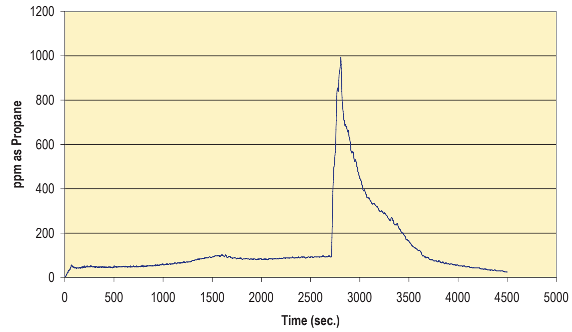

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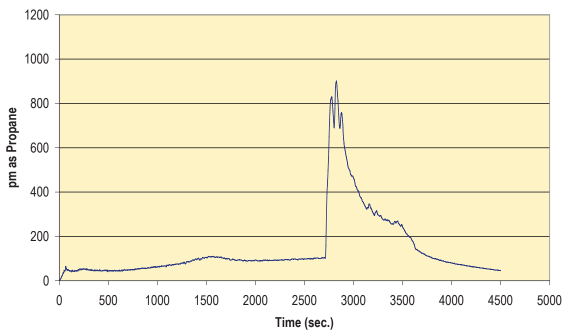

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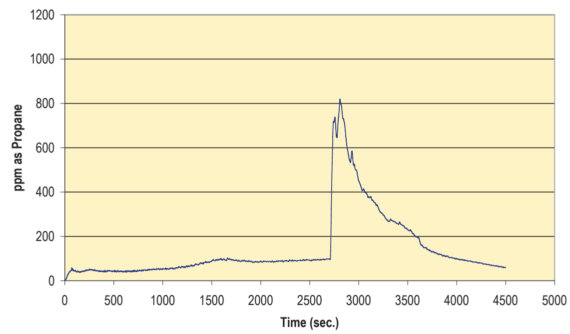

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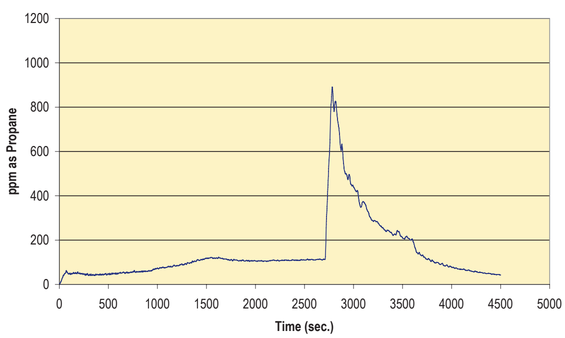

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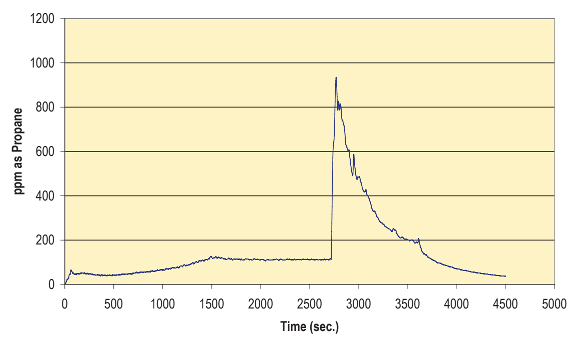

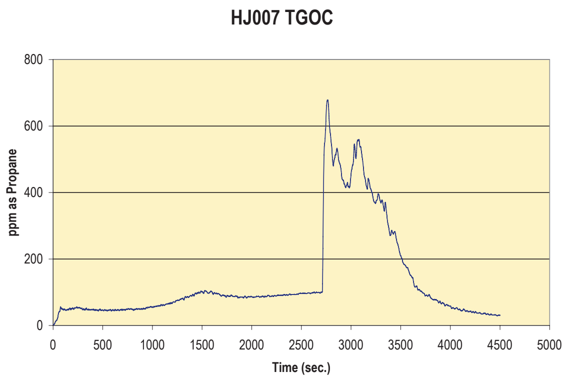
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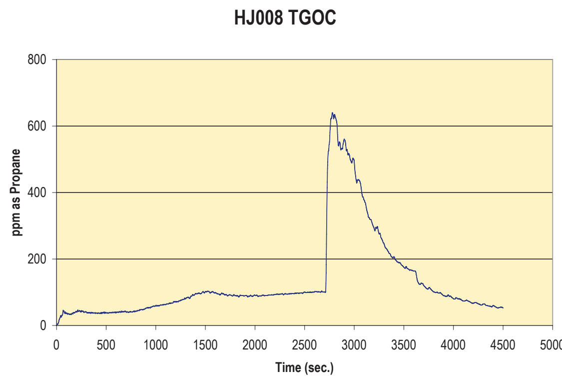
Time (sec.)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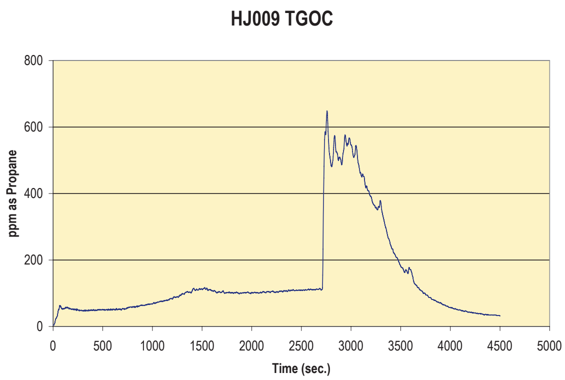
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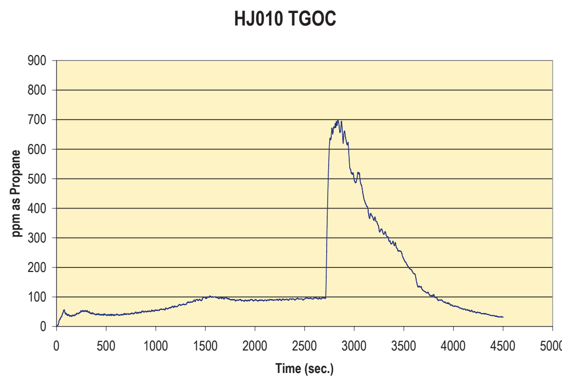
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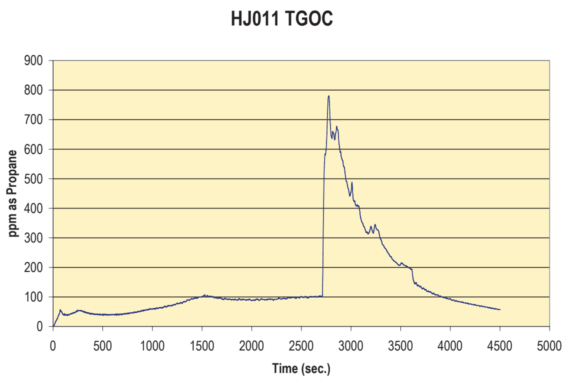
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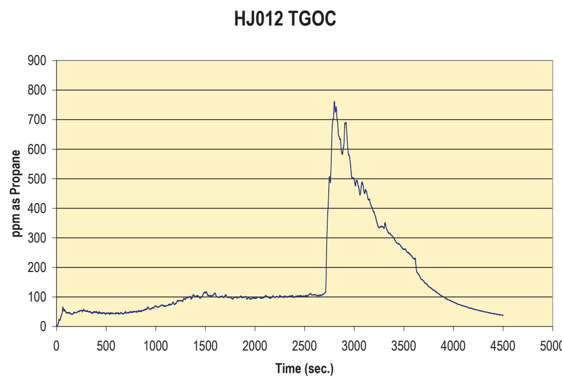
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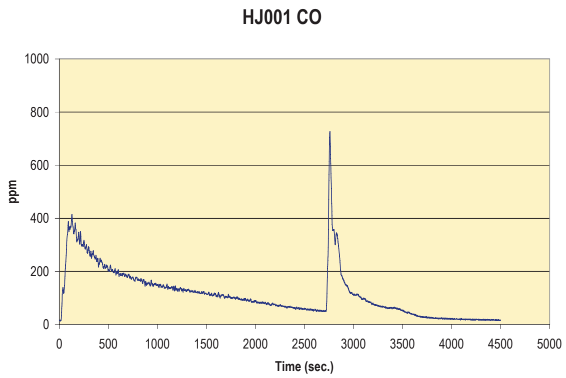
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Time (sec.)
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500
1000
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2000
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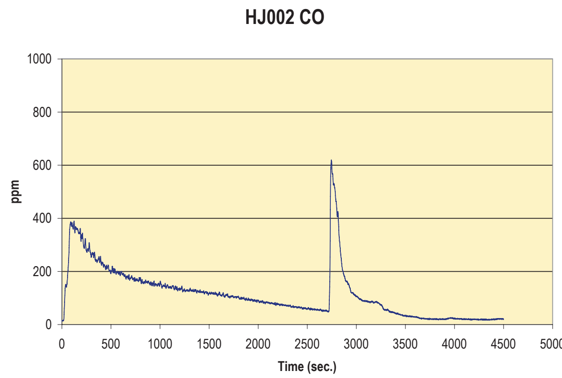
4000
4500
5000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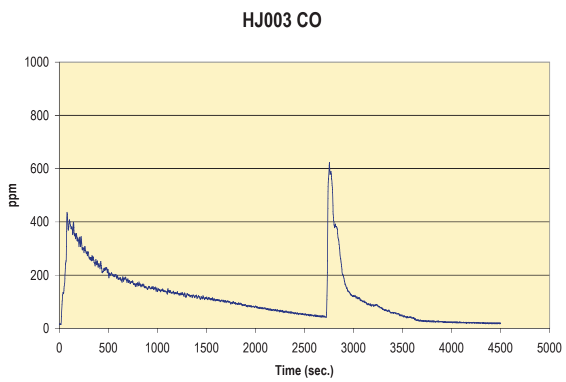
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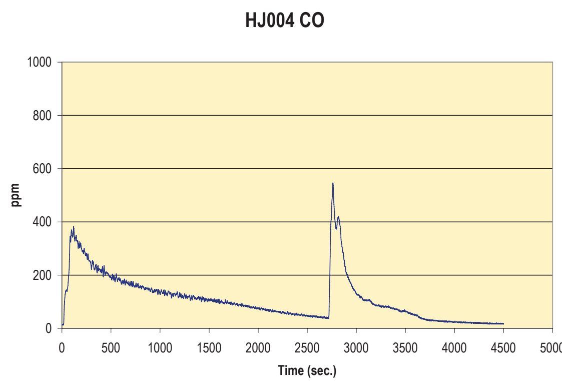
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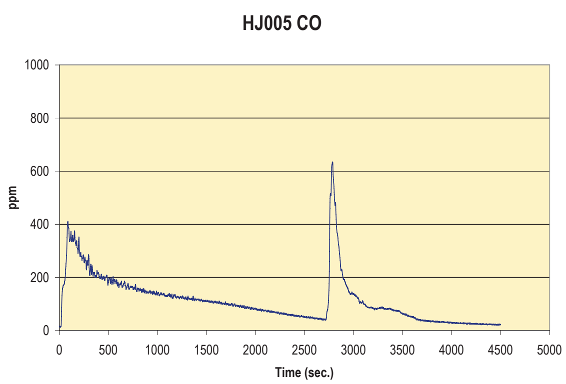
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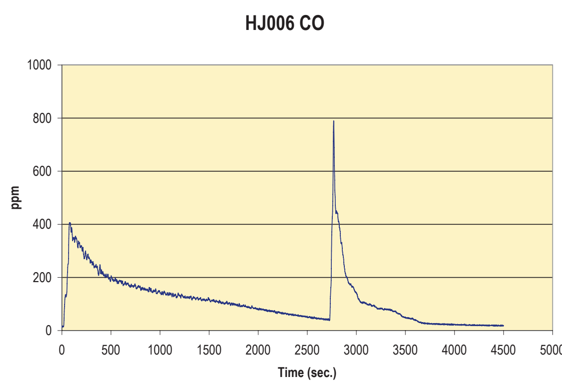
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2000
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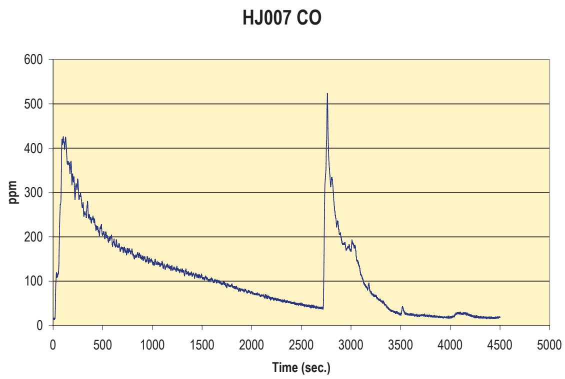
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300
400
500
600
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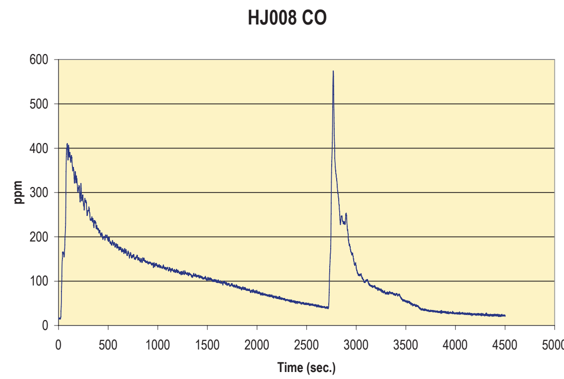
Time (sec.)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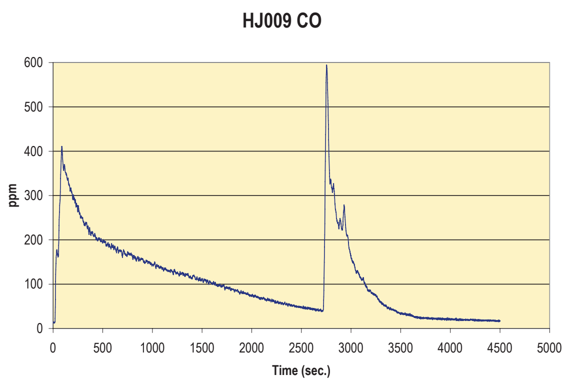
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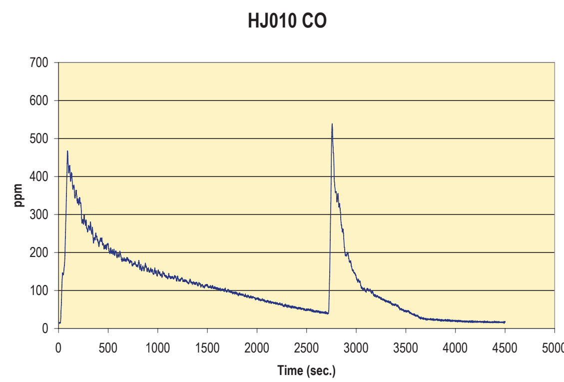
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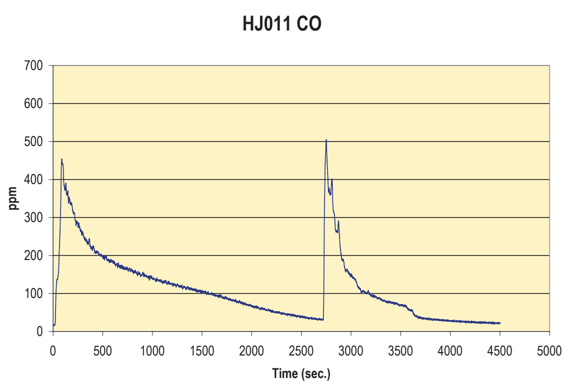
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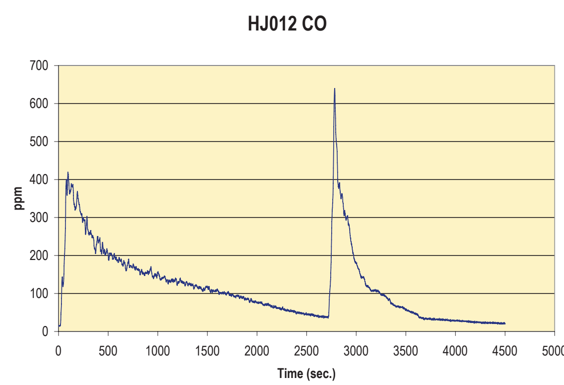
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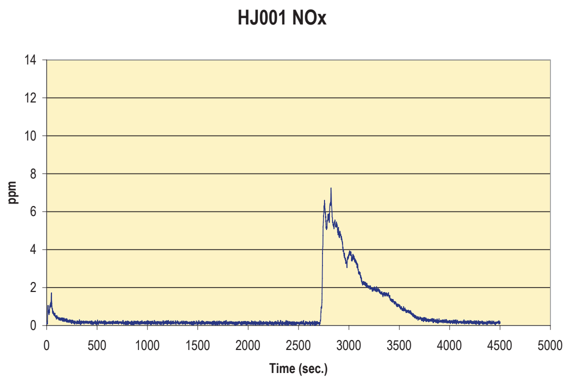
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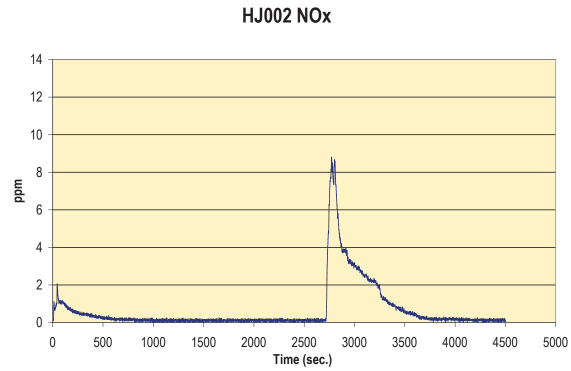
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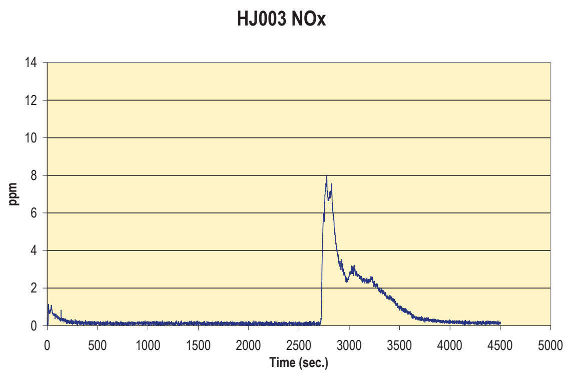
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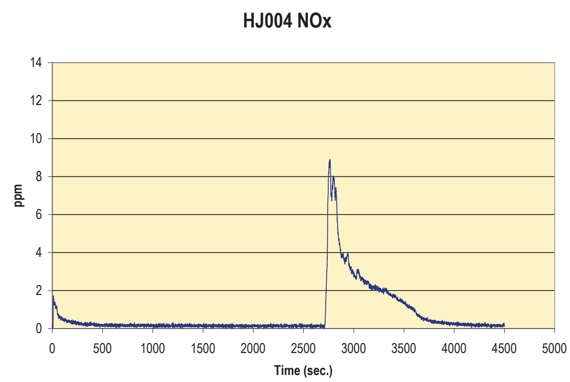
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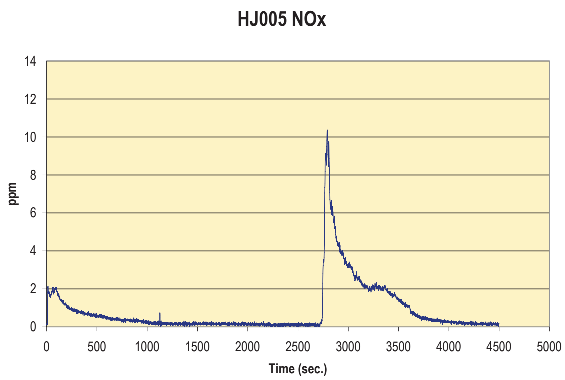
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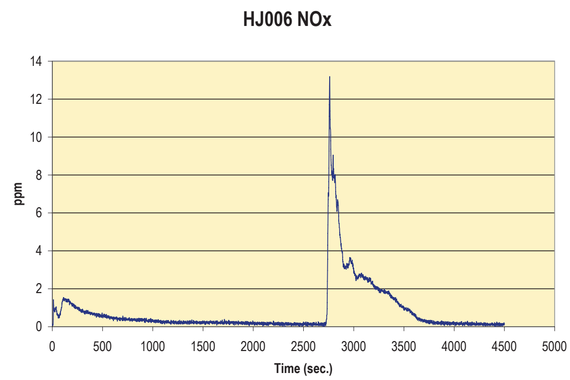
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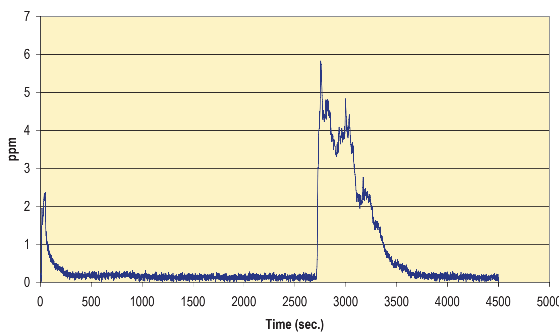

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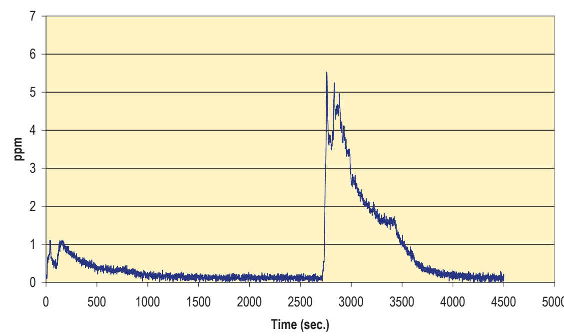

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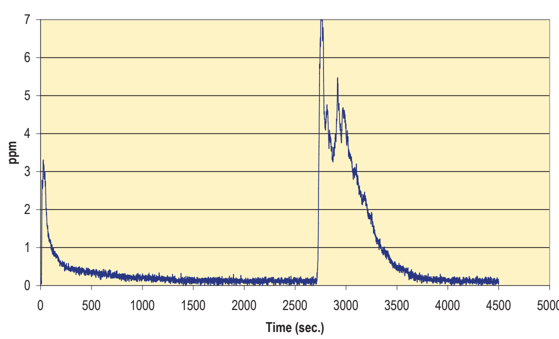

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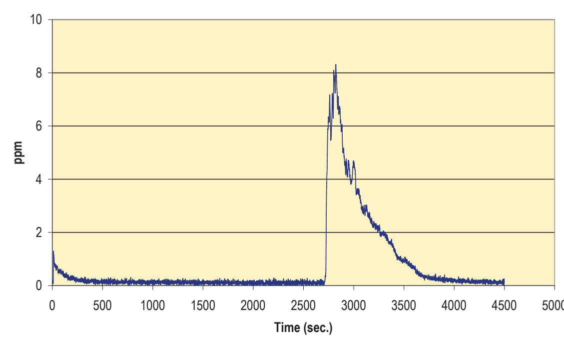

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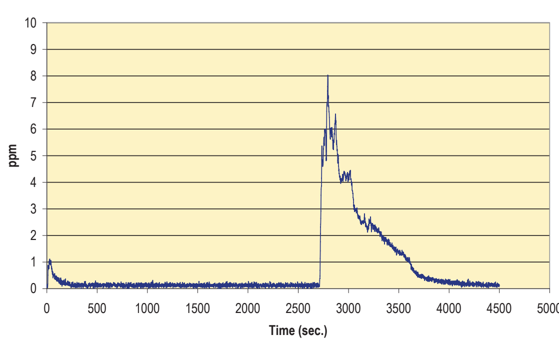

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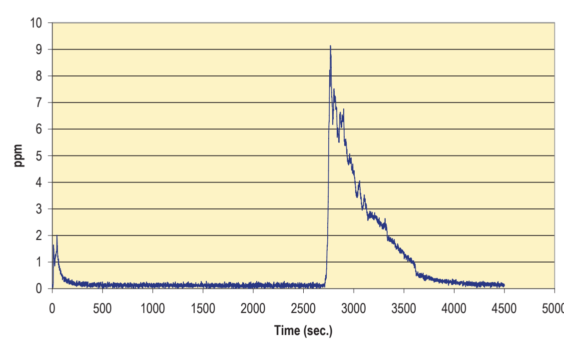

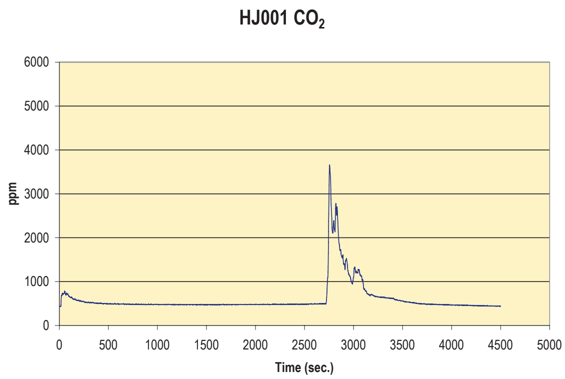
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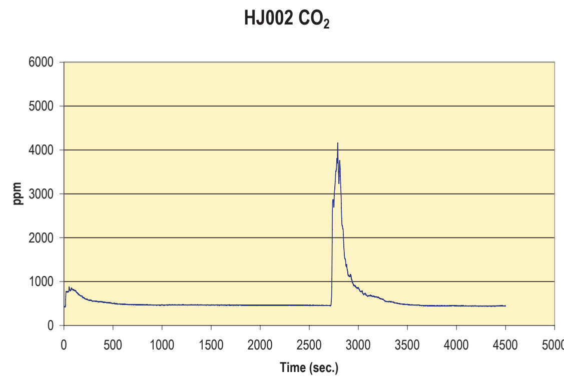
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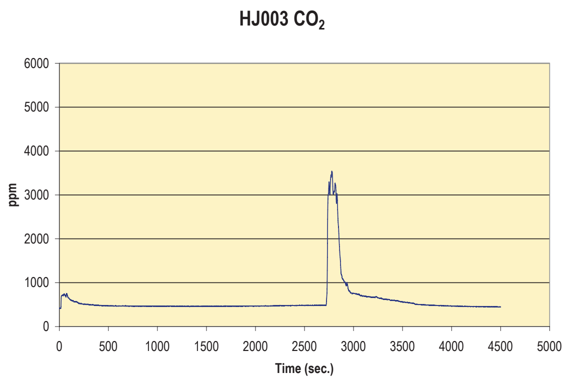
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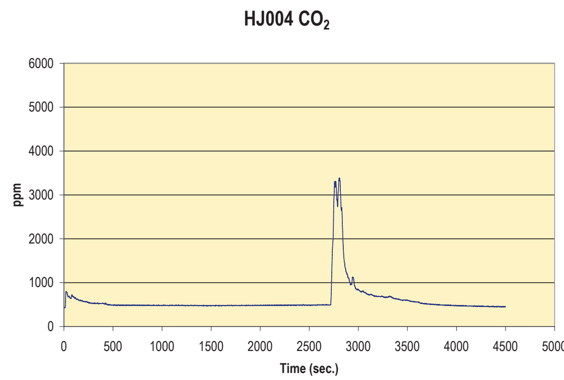
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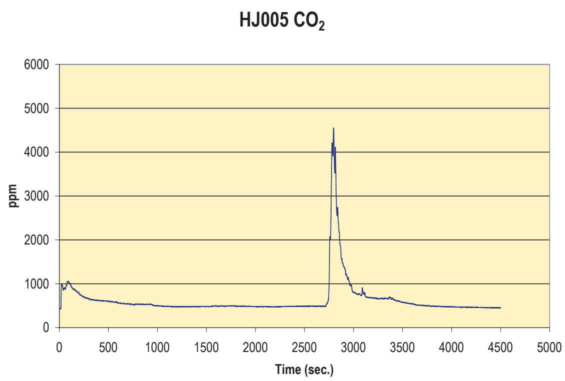
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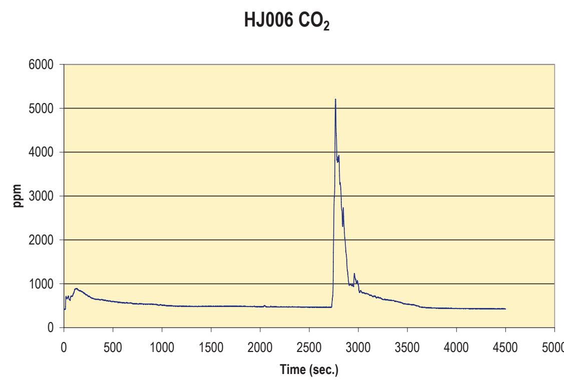
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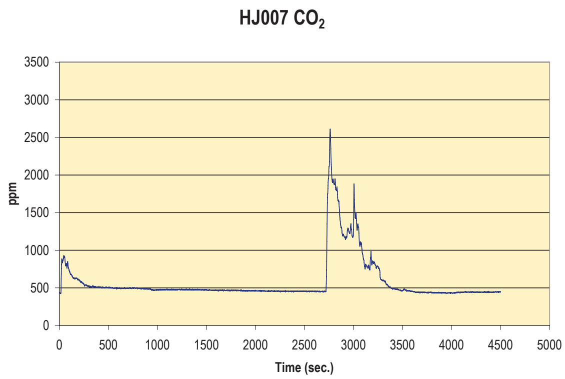
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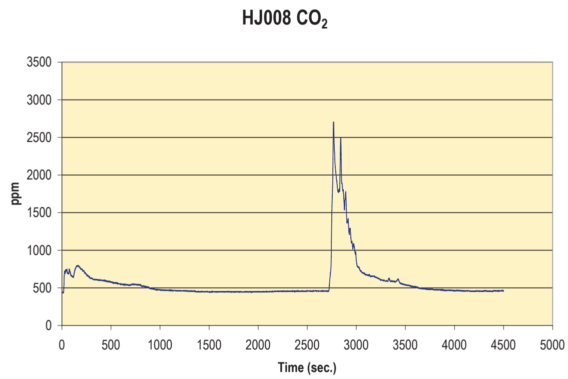
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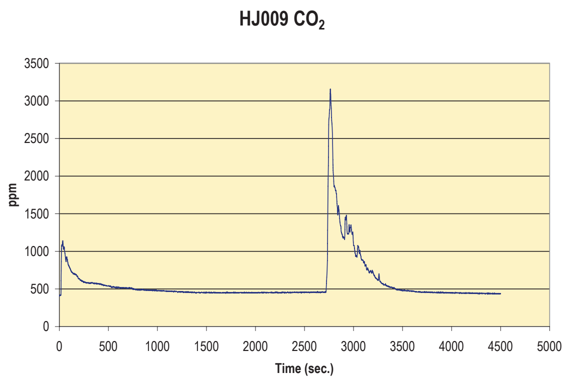
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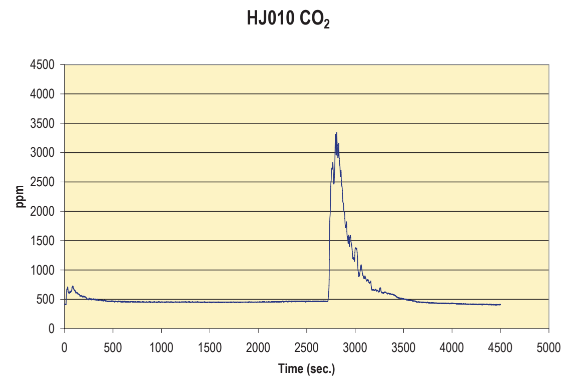
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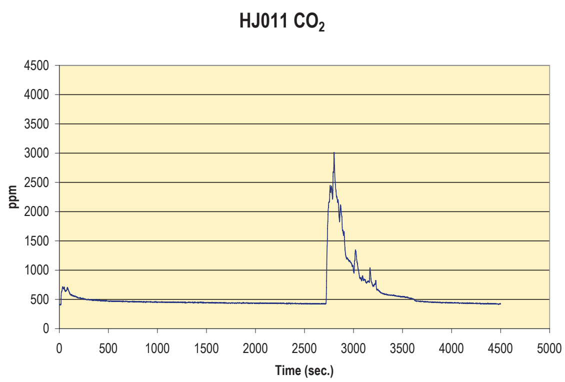
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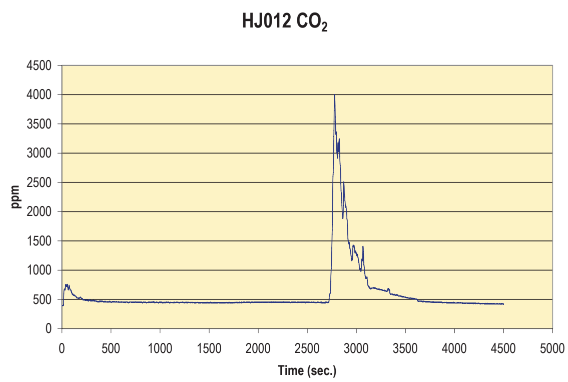
HJ012 CO_2
ppm
Time (sec.)

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ACRONYMS AND ABBREVIATIONS

°C	Degrees Centigrade
°F	Degrees Fahrenheit
AFS	American Foundry Society
ARDEC	(US) Army Armament Research, Development and Engineering Center
ASTM	American Society for Testing and Materials
BO	Based on ( ).
BOS	Based on Sand.
CAAA	Clean Air Act Amendments of 1990
CAD	Computer Aided Design
CARB	California Air Resources Board
CEMS	Continuous Emissions Monitoring Systems
CERP	Casting Emission Reduction Program
CFR	Code of Federal Regulations
CISA	Casting Industry Suppliers Association
CO	Carbon Monoxide
COR	Contracting Officers' Representative
CRADA	Cooperative Research and Development Agreement
DLA	Defense Logistics Agency
DOD	Department of Defense
DOE	Department of Energy
EEF	Established Emission Factors
EPA	Environmental Protection Agency
ERC	Environmental Research Consortium
GC	Gas Chromatography
HAP	Hazardous Air Pollutant defined by the 1990 Clean Air Act Amendment
JMTC	Joint Manufacturing and Technology Center
Lb/Lb	Pound per pound of binder used
Lb/Tn	Pound per ton of metal poured
LOI	Loss on ignition

MACT	Maximum Achievable Control Technology
MIL	Military specification
MMS	Mixing, Making, Storage
MSDS	Material Safety Data Sheet
NA	Not Applicable; Not Available
ND	Not Detected
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NIST	National Institute of Standards and Technology
NT	Not Tested - Lab testing was not done
PCS	Pouring, Cooling, Shakeout
PM	Particulate Matter
POM	Polycyclic Organic Matter
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
SO_2	Sulfur Dioxide
TEA	Triethylamine
TGOC	Total Gaseous Organic Concentration
TGOC as Propane	Quantity of undifferentiated hydrocarbons including methane determined by EPA Method 25A.
THC	Total Hydrocarbon Concentration
TTE	Temporary Total Enclosure
US EPA	United States Environmental Protection Agency
USCAR	United States Council for Automotive Research
UV	Ultraviolet
VOC	Volatile Organic Compound
W	Watt - an International System unit of power
WBS	Work Breakdown Structure