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CORPORATE HEADQUARTERS

RECEIVED
JUN 20 2013
DEPARTMENT OF ENVIRONMENTAL QUALITY
STATE A Q PROGRAM

June 20, 2013

HAND DELIVERED TO IDEQ

Mr. Mike Simon
Air Quality Division
Idaho Department of Environmental Quality
1410 N. Hilton
Boise, ID 83706-1255

Subject: PTC Application for Lab Scale Thermal Beneficiation

Dear Mr. Simon:

As we discussed in a meeting on April 12, 2013, Simplot is submitting this Permit to Construct Application to operate a bench top kiln to test the feasibility of beneficiating phosphate ore and to determine where to focus efforts in the Conda Pilot Calciner operation. (Simplot applied for that permit application June 5, 2013).

No combustion sources are associated with the lab scale test, and the testing is expected to take place no more than 1200 hours per year. Due to the configuration of the property, we were unable to demonstrate compliance with the Air Toxics Screening Limits and Acceptable Ambient Concentrations without use of a baghouse. Proof of payment of the application fee is incorporated into the application.

If you have any questions regarding this submittal, please contact Chelly Reesman at (208) 389-7558.

Sincerely,

James A. Samuelson
Director Engineering and Optimization
J.R. Simplot Company

Attachments: PTC Application

cc: (electronic copy only)
Bill Rogers, IDEQ
Howard Skidmore, J.R. Simplot Co.
Trisha Arave, J.R. Simplot Co.

LAB SCALE THERMAL BENEFICIATION PROJECT – PTC APPLICATION

J.R. SIMPLOT COMPANY EMT FACILITY

J. R. Simplot Company

1130 Highway 30 West

Pocatello, Idaho 83204-7510

June 2013

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INTRODUCTION

J.R. Simplot Company (Simplot) is proposing to utilize a lab scale kiln for research purposes at the Engineering and Manufacturing Technology (EMT) facility at 1130 Highway 30 West in Pocatello, Idaho. The EMT facility performs lab scale testing in support of Simplot's Agribusiness Unit.

The purpose of this document is to provide all necessary and applicable information regarding the proposed project and a description of impacts on the facility's air emissions. Simplot's EMT facility is currently a minor source and these projects will not impact that status.

FACILITY DESCRIPTION

Operations at EMT[1] consist of offices, meeting spaces, and laboratory space to support agribusiness functions for Simplot within the US with the potential to provide support worldwide as needed. Within the company, Agribusiness includes the following business units:

- Mining and Manufacturing,
- Fertilizer Marketing,
- Simplot Grower Solutions
- Turf and Horticulture
- Industrial and Feed
- Advanced Technology and Research.

Previously, the EMT building laboratory space has not triggered air permits; however, a lab scale study of phosphate ore thermal beneficiation using the lab scale kiln may potentially emit air pollutants.

[1] A Simplot Credit Union occupies the south end of the building.

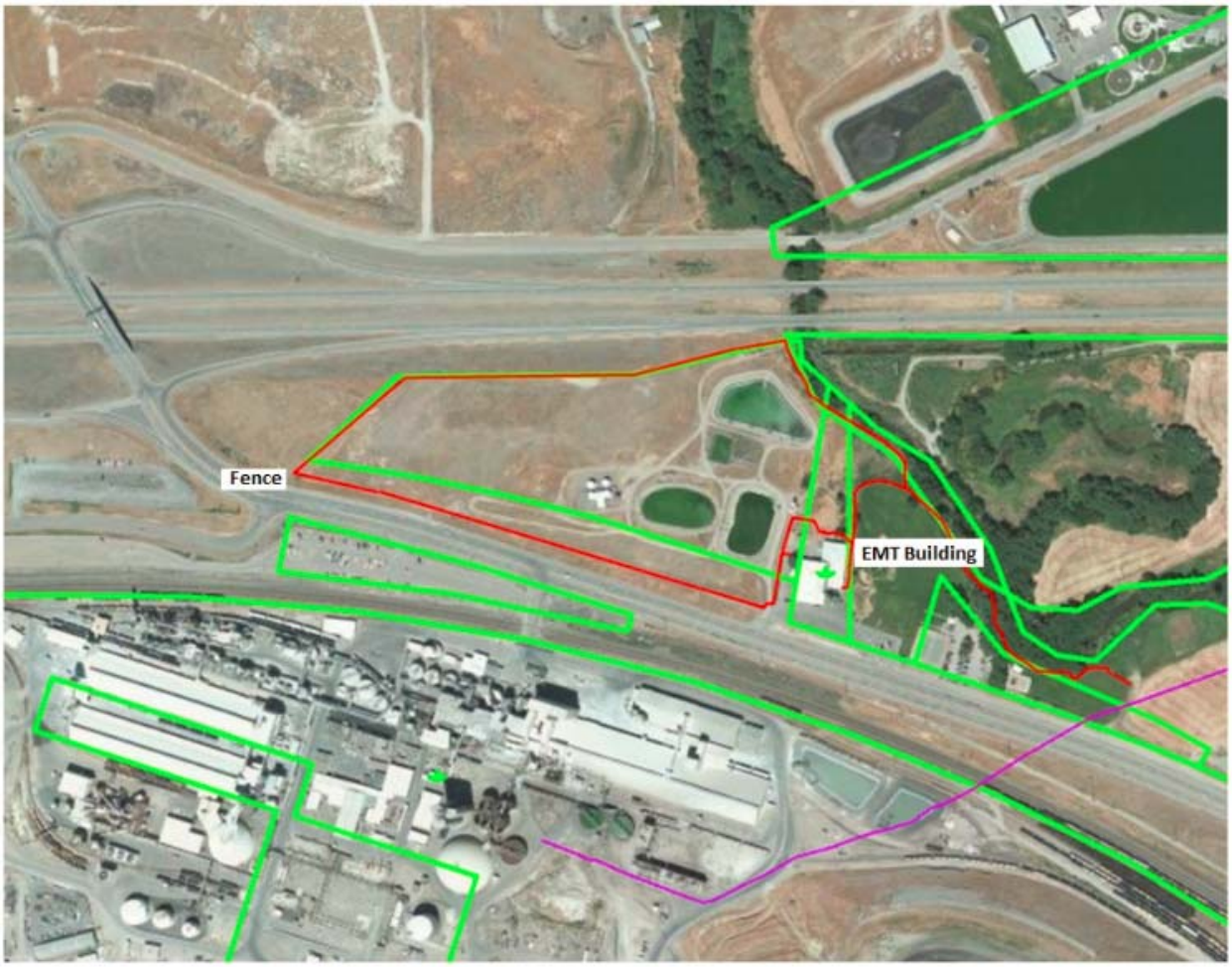
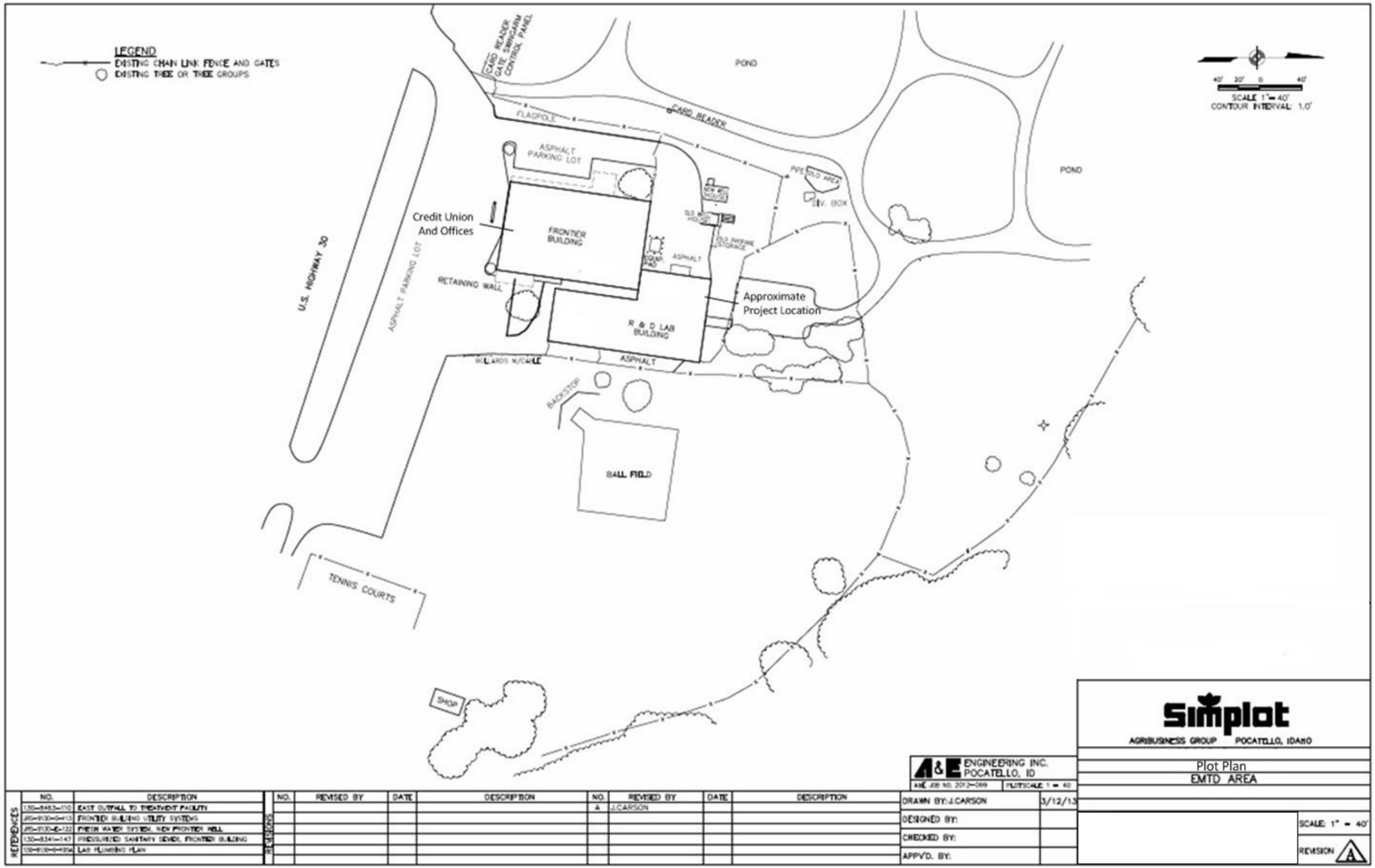


Figure 1. General Location

Figure 2. Plot Plan



PROJECT DESCRIPTION

Simplot plans to utilize a bench scale kiln to study thermal beneficiation of phosphate ore.

Utilizing a 6-inch bench rotary kiln, the study will help determine operational parameters for the Conda Pilot Calciner. Off-gas will be collected and ducted through a fabric filter device. See Appendix A for technical information on the rotary kiln and baghouse.

The purpose of the study is to determine whether the project is suitable for larger scale operation. Due to the small size and capacity of the equipment it is not feasible to utilize the lab scale equipment long term.

A batch quantity of ore from the Smoky Canyon Mine will be placed in the rotary kiln. The ore will be roasted at various temperatures and durations to determine optimal evolution of volatile constituents. Information from this bench-scale study will be utilized to help guide the pilot calciner operation planned in Conda, Idaho.[2]

There is no positive air draw on the kiln, as it does not have an integral blower. Dilution air is necessary to reduce the gas temperature to ensure it does not melt ducting associated with the Camfil Farr baghouse.

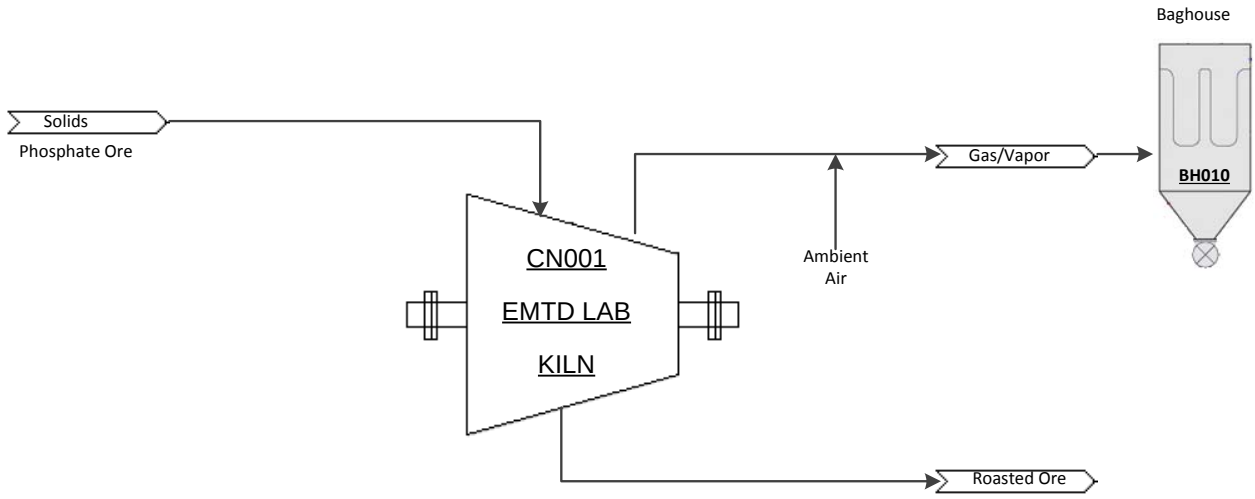


Figure 3. Process Flow Diagram

[2] Discussed with IDEQ during a 3/28/2013 conference call.

The kiln temperature will be between 750 and 1500 degrees F. Air is added to the exhaust stream for two reasons: 1) to draw process gas from the kiln in a controlled manner within the laboratory because the kiln does not have an integral blower and 2) to drop the temperature so that the existing ducting is not melted.

EQUIPMENT LIST

Equipment included in the project can be found in the following table.

Information	Kiln CN001	Baghouse BH010
Manufacturer	Quinn	Camfil
Model Number	QPEC - 6	GS4M
Max Process Rate	23-lb/batch[3]	NA
Proposed Process Rate	9 lb/batch[4]	1,000 cfm
Flowrate	NA – batch process	100 cfm
Stack Temperature	90 – 120 F	90 – 120 F

SCHEDULE

The project work is slated to begin the middle of September or potentially earlier if the permit is issued earlier. No construction is necessary for this project.

EMISSIONS

Potential emissions of particulates, hazardous air pollutants (HAPs), and toxic air pollutants (TAPs) may result from the proposed project. Fugitive emissions were included in the calculations because for the purposes of this project, the kiln is a listed source (a calciner under 40 CFR 60 401(d) and a phosphate rock plant under 40 CFR 60.401(a).

Although the EMT facility is a research facility which is not involved in the processing of phosphate rock on an ongoing basis, for the purposes of this project we have included fugitive emissions in the potential to emit calculations. See PSD applicability discussion.

Emissions were calculated assuming hours of operation per year would 1,200 or less. Normal hours of operation would be from 8 AM to 5 PM; however, there may be some periods when the kiln would operate outside those times. In no case will the kiln operate more than 1,200 hours per year and Simplot is willing to accept a limit at that amount.

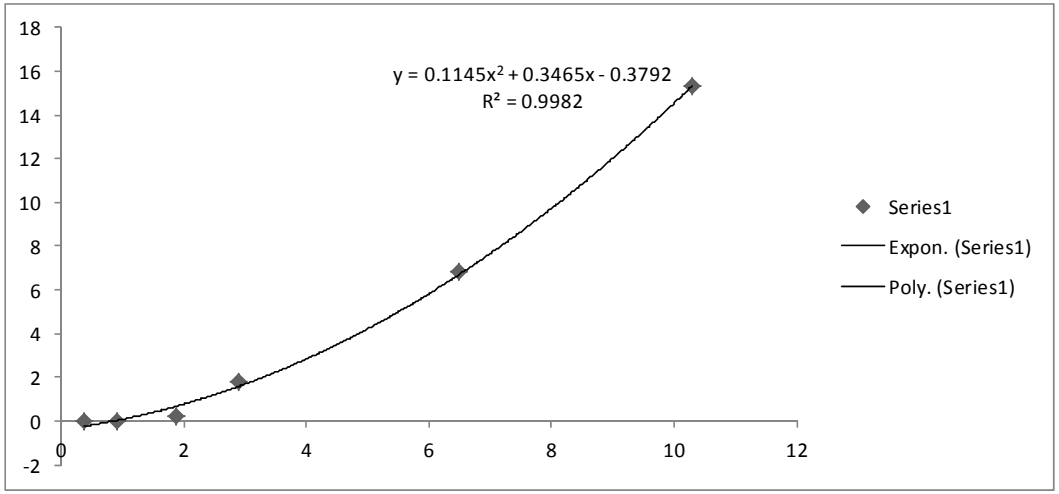
[3] Maximum process rate is determined by the dimensions of the kiln. The capacity varies with the density of the material being processed. This number was provided by the vendor. Each batch is expected to take 2 hours.

[4] In order to get adequate mixing and distribution within the kiln, the manufacturer has recommended that 40% of the maximum capacity be utilized for our laboratory test.

In 2012, a firm in Wisconsin performed some thermal beneficiation test runs using Smoky Canyon ore. Stack test information from that test (see Appendix D) was used to generate emission factors for the emissions analysis for this project. Hourly emission rates from the test were adjusted based on differences in feed rate, but pound per ton values were not adjusted. During the test run, a natural gas-fired combustion source contributed to the emissions from the thermal beneficiation test. Simplot's bench top testing will not include combustion source; however, emission factors utilized from the Wisconsin stack tests conservatively include the emissions due to combustion.

During the stack test, several cut sizes for particulate were determined. These were graphed according to the percentage of material less than the specified cut size. A best fit equation was determined, and the percentages for PM_{10} and $PM_{2.5}$ were calculated. See chart on the next page.

Cut Size (μ)	Percent Less Than
0.38	0
0.90	0
1.87	0.2
2.90	1.8
6.50	6.8
10.3	15.3
2.5	1.9



Goal Seek Diameter		Percent
PM 10	10.000	8.127146
PM2.5	2.499071	3.723832

GREEN BAY DATA (Uncontrolled)

Figure 4. Best Fit for Particle Sizes

Wisconsin Emission Test Information[5]

Test Parameter	Average Emission Rate Uncontrolled (lb/hr)	Average Emission Rate Uncontrolled (lb/ton)
Particulate Matter	30.12	298.71
Metals - Antimony	4.46E-05	4.42E-02
Metals - Arsenic	8.37E-04	8.30E-03
Metals - Beryllium	4.72E-05	4.68E-04
Metals - Cadmium	1.51E-02	1.50E-01
Metals - Chromium	9.49E-03	9.41E-02
Metals - Cobalt	7.20E-05	7.14E-04
Metals - Lead	1.28E-04	1.27E-03
Metals - Manganese	1.81E-03	1.80E-02
Metals - Mercury	2.03E-05	2.02E-04
Metals - Nickel	1.34E-03	1.32E-02
Metals - Selenium	7.89E-04	7.82E-03
Metals - Zinc	5.16E-02	5.11E-01
Carbon Monoxide	0.041	0.41
Sulfur Dioxide	0.809	8.02
Nitrogen Oxides	0.14	1.39
Total VOCs	0.0067	0.07
Fluoride	0.109	1.08

[5] The emission test results in this table are specific to the unit tested. The entire stack test report is provided in Appendix D.

Wisconsin Emission Test Information[6]

Constituent	Emission Rate Uncontrolled (lb/hr)	Emission Rate Uncontrolled (lb/ton)	TAP/HAP
Dichlorodifluoromethane	6.34E-07	5.00E-06	
Chloromethane	4.38E-06	3.46E-05	TAP/HAP
Vinyl Chloride	2.50E-07	1.97E-06	TAP/HAP
Bromomethane	1.42E-06	1.12E-05	TAP/HAP
Methylene Chloride	7.55E-07	5.96E-06	TAP/HAP
Benzene	7.24E-06	5.72E-05	TAP/HAP
Toluene	2.08E-06	1.64E-05	TAP/HAP
Ethylbenzene	1.14E-07	9.03E-07	TAP/HAP
Xylenes	1.08E-06	8.54E-06	TAP/HAP
Styrene	5.33E-08	4.21E-07	TAP/HAP
Chloroethane	3.16E-07	2.50E-06	TAP/HAP
Chlorobenzene	3.79E-07	2.99E-06	TAP/HAP
Isopropylbenzene (Cumene)	1.48E-06	1.17E-05	TAP/HAP
1,1,2,2-Tetrachloroethane	1.62E-07	1.28E-06	TAP/HAP
n-Propylbenzene	5.74E-08	4.53E-07	
1,3,5-Trimethylbenzene	1.11E-06	8.77E-06	
4-Chlorotoluene	1.49E-07	1.18E-06	
tert/sec-Butylbenzene	3.20E-08	2.53E-07	
p-isopropyltoluene	1.08E-07	8.53E-07	
n-Butylbenzene	2.10E-07	1.66E-06	
Naphthalene	4.97E-07	3.92E-06	TAP/HAP

Emissions summaries have been prepared showing results of emission calculations for all emission sources on a potential to emit and project design basis.

[6] The emission test results in this table are specific to the unit tested. The entire stack test report is provided in Appendix D.

ROTARY KILN PROJECT UNCONTROLLED EMISSIONS TONS/YEAR											Mercury Rule lb/yr
PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	SO_X	CO	CO_2	F^-	Pb	HAP	
3.01	0.24	0.11	0.01	6.69E-04	0.08	4.10E-03	12.35	0.01	1.28E-05	1.09E-03	1.02E-02

ROTARY KILN PROJECT DESIGN EMISSIONS TONS/YEAR											Mercury Rule lb/yr
PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	SO_X	CO	CO_2	F^-	Pb	HAP	
4.12E-05	3.35E-06	1.54E-04	1.92E-03	9.17E-05	1.11E-02	5.61E-04	1.69	1.49E-03	1.75E-06	3.46E-07	1.39E-03

Emission Summary

No control efficiencies were applied to gaseous emissions and organic HAPs. Simplot is willing to accept a production limit at the 1200 hours per year which forms the basis for the design calculations.

Emission controls were applied to particulate emissions utilizing the particle size distribution information determined in the Wisconsin stack test. It is assumed that all metal TAPs will be in particulate form, so they were calculated utilizing the same particle size distribution and control efficiencies.

EMISSIONS UNITS AND CONTROL EQUIPMENT

The primary emission unit for the lab scale thermal beneficiation project is a bench top kiln which is controlled by a baghouse. Emissions will also be generated when ore is transferred into and out of the kiln. All emissions will be generated within the EMT building and vented to the outside through a baghouse and existing laboratory hood.

APPLICABLE RULES AND REGULATIONS

A review of potential applicable federal and state air quality regulations has been performed for the proposed Lab Scale Kiln Project.

ATTAINMENT DESIGNATION

The Simplot facility is located in Power County, which is designated as unclassifiable/attainment for $PM_{2.5}$, PM_{10}, SO_2, NO_X, CO, and Ozone for federal and state criteria air pollutants. (Reference 40 CFR 81.313.)

PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

Federal rules for PSD (40 CFR 52.21) have been incorporated by reference (with certain modification) into IDAPA 58.01.01.205 *Permit Requirements for New Major Facilities or Major Modifications in Attainment or Unclassifiable Areas.* For the purposes of the Idaho PSD permitting program, the EMT facility is a minor stationary source. Simplot's proposed project constitutes a 'physical change' at the EMT facility, and a PSD applicability analysis was performed in accordance with 40 CFR 52.21 (a) (2). PSD analysis methodology and a summary of results is presented below. Detailed emission calculations and supporting documentation are contained in Appendix C.

PSD APPLICABILITY ANALYSIS

Emission increases for the planned project were calculated according to the procedures identified in 40 CFR 52.21 (a) (2) (iv) (d) *Actual-to-potential test for projects that only involve construction of a new emissions unit(s).* This test specifies the following procedure for determining whether a given physical change results in a significant increase.

> *A significant emissions increase of a regulated NSR pollutant is projected to occur if the sum of the difference between the potential to emit (as defined in paragraph (b)(4) of this section) from each new emissions unit following completion of the project and the baseline actual emissions (as defined in paragraph (b)(48)(iii) of this section) of these units before the project equals or exceeds the significant amount for that pollutant (as defined in paragraph (b)(23) of this section).*

Major stationary source defined in 40 CFR 52.21 (b) (1), is defined as:

Any of the following stationary sources of air pollutants which emits, or has the potential to emit, 100 tons per year or more of any regulated NSR pollutant: Fossil fuel-fired steam electric plants of more than 250 million British thermal units per hour heat input, coal cleaning plants (with thermal dryers), kraft pulp mills, Portland cement plants, primary zinc smelters, iron and steel mill plants, primary aluminum ore reduction plants (with thermal dryers), primary copper smelters, municipal incinerators capable of charging more than 250 tons of refuse per day, hydrofluoric, sulfuric, and nitric acid plants, petroleum refineries, lime plants, phosphate rock processing plants, coke oven batteries, sulfur recovery plants, carbon black plants (furnace process), primary lead smelters, fuel conversion plants, sintering plants, secondary metal production plants, chemical process plants (which does not include ethanol production facilities that produce ethanol by natural fermentation included in NAICS codes 325193 or 312140), fossil-fuel boilers (or combinations thereof) totaling more than 250 million British thermal units per hour heat input, petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels, taconite ore processing plants, glass fiber processing plants, and charcoal production plants, or

Notwithstanding the stationary source size specified in paragraph (b)(1)(i) of this section, any stationary source which emits, or has the potential to emit, 250 tons per year or more of a regulated NSR pollutant; or

Any physical change that would occur at a stationary source not otherwise qualifying under paragraph (b)(1) of this section, as a major stationary source, if the changes would constitute a major stationary source by itself.

The thermal beneficiation lab scale kiln may constitute a facility designated as a phosphate rock processing plant; therefore, fugitive emissions have been included in the calculation of potential to emit.

Simplot's EMT facility is not a PSD major source because the annual facility-wide potential emissions of all regulated New Source Review emissions are below the PSD major source thresholds (100 tons/year) found in 40 CFR 52.21(b)(1). Emission units associated with the project were evaluated[7], and there are no other operations at the EMT facility that are affected by the project. Results of the analysis indicate that the operation of the proposed project will not change this classification.

NEW SOURCE PERFORMANCE STANDARDS (NSPS)

Federal NSPS regulations in 40 CFR Part 60 are incorporated by reference in IDAPA 58.01.01.107.03. NSPS apply to new, modified, or reconstructed facilities in designated source categories. 40 CFR Part 60 Subpart NN defines a calciner as follows.

> Calciner *means a unit in which the moisture and organic matter of phosphate rock is reduced within a combustion chamber.*

The lab scale kiln will be used to achieve a reduction of moisture and organic matter of phosphate rock; however, the kiln will not be subject to 40 CFR Part 60 Subpart NN because the capacity of the kiln is significantly under the applicability threshold of 4 tons per hour[8].

It is important to note that the EMT facility is not engaged in phosphate rock preparation for commercial purposes. The EMT facility performs research projects to support Simplot's Agribusiness operations.

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP)

Federal NESHAP regulations are found in 40 CFR Part 61 (area source standards) and 40 CFR Part 63 (MACT standards). The proposed project will not be subject to any requirements pursuant to 40 CFR Part 61 because it does not include any of the pollutants or areas source types regulated under the referenced part.

MACT standards do not apply to the project because the EMT facility is not a major source of HAP emissions and is not subject to any of the source-specific MACT standards.

POTENTIALLY APPLICABLE PART 61 REQUIREMENTS

Subpart R is not applicable because no phosphogypsum will be produced, stored, or managed at the EMT building as part of this project.

[7] See pages 9 - 11.
[8] 40 CFR 60.400 (a).

POTENTIALLY APPLICABLE PART 63 REQUIREMNTS

Subpart AA applies to calciners at phosphoric acid manufacturing plants that are located at major sources of hazardous air pollutants. Subpart AA does not apply to the lab scale thermal beneficiation unit because the facility is not a major source of hazardous air pollutants and it is not a phosphoric acid manufacturing plant.

PERMIT TO CONSTRUCT

Simplot is requesting that the Department issue a PTC providing for the construction of the proposed emission sources as described in this application. A PTC is required in accordance with IDAPA 58.01.01.200. IDAPA 58.01.01.200 – 228 contains the requirements for applying for and issuance of permits to construct (PTC). As demonstrated above, in Appendix C, and on the Emission Inventory Form, the proposed project is a minor modification to a minor source for the purpose of PSD applicability. Therefore, the following sections are not applicable – IDAPA 58.01.01.204 – 208.

Application Cross-reference for PTC Requirements

IDAPA SECTION	DESCRIPTION	APPLICABLE?	CROSS- REFERENCE / DISCUSSION
204	Permit Requirements for New Major Facilities or Major Modifications in Nonattainment Areas	No	This PTC application is for a minor new source at a minor facility in an area classified as attainment or unclassifiable for all criteria pollutants.
205	Permit Requirements for New Major Facilities or Major Modifications in Attainment or Unclassifiable Areas	No	This PTC application is for a minor new source at a minor facility in an area classified as attainment or unclassifiable for all criteria pollutants.
206	Optional Offsets for Permits to Construct	No	Offsets are not necessary for this project
207	Requirements for Emission Reduction Credit	No	Emission reduction credits are not necessary
208	Demonstration of Net Air Quality Benefit	No	No emissions trades are needed.
209	Procedures for Issuing Permits	Yes	See 209.1 – 209.05 below.
209.01	General Procedures	Yes	IDEQ responsibility
209.02	Additional Procedures for specified sources	No	Applies only to major new sources or major modifications
209.03	Establishing a Good Engineering Stack Height	No	IDEQ responsibility – no new stack height is being established as part of this application
209.04	Revisions of Permits to Construct	No	No PTC currently exists at this location, and Simplot is requesting a new PTC

IDAPA SECTION	DESCRIPTION	APPLICABLE?	CROSS- REFERENCE / DISCUSSION
209.05	Permit to Construct Procedures for Tier I Sources	No	Simplot's EMT facility is not an existing Tier I Source, and this application does not change the facility's status.
210	Demonstration of Preconstruction Compliance with Toxic Standards	Yes	See pages 35-36.
211	Conditions for Permits to Construct	Yes	See 211.01 – 211.04 below.
211.01	Reasonable Conditions	Yes	IDEQ responsibility – [See page 20 for proposed permit conditions.]
211.02	Cancellation	Yes	IDEQ responsibility.
211.03	Notification to the Department	Yes	Simplot will provide the Department with a notification of anticipated start-up & actual start-up within the specified timelines.
211.04	Performance Test	Yes	Simplot will conduct any required performance tests in a timely manner consistent with these requirements.
212	Obligation to Comply	Yes	See 212.01 – 212.02 below.
212.01	Responsibility to Comply with All Requirements.	Yes	Simplot will comply with all applicable requirements. [See pages 16-17.]
212.02	Relaxation of Standards or Restrictions	No	This project does not involve relaxation of any synthetic minor restrictions.
213	Pre-permit Construction	No	Simplot is not requesting pre-permit construction at this time.
214	Demonstration of Preconstruction Compliance for New and Reconstructed Major Sources of Hazardous Air Pollutants	No	Planned changes do not involve construction or a major source of HAPs.
220-223	Exemptions	No	Planned changes constitute non-exempt new construction.
224	Permit to Construct Application Fee	Yes	See page 22. (Simplot has paid the application fee of $1,000 for this PTC application.)
225	Permit to Construct Processing Fee	Yes	Simplot will pay the applicable fee upon assessment by DEQ.
226	Payment of Fees for Permits to Construct	Yes	See page 22. Simplot has included proof of the application fee payment with this application.
227	Receipt and Usage of Fees	Yes	IDEQ responsibility
228	Appeals	Yes	Generally applicable to all applications.

AMBIENT IMPACTS

As specified in IDAPA 58.01.01.203, an adequate demonstration is required that the proposed source or modification will:

1) Comply with all applicable emission standards,
2) Not cause or contribute to a violation of any ambient standard, and
3) Not injure or unreasonably affect human or animal life or vegetation.

NAAQS

Project emissions are below PSD significant emissions rate thresholds for all regulated pollutants, and the project does not trigger PSD ambient impact analysis requirements.

The Idaho Air Quality Modeling Guideline contains modeling thresholds for criteria pollutants. Project emissions have been compared to the modeling thresholds on the following page. Thresholds requiring modeling are as follows[9]:

[9] The table is taken directly from IDEQ's *State of Idaho Guideline for Performing Air Quality Impact Analyses* page 9.

Pollutant	Potential Emission Rate from a New Source or Facility-wide Emissions Increase from a Modification	
	Level I Thresholds	Level II Thresholds[a]
CO	15 pounds per hour[b]	175 pounds per hour[c]
NO_x	1.2 ton per year[b] and 0.20 pounds per hour[b]	(14 ton per year)[c] and (2.4 pounds per hour)[c]
SO_2	1.2 ton per year[b] and 0.21 pounds per hour[b]	(14 ton per year)[c] and (2.5 pounds per hour)[c]
PM_{10}	0.22 pounds per hour[b]	(2.6 pounds per hour)[c]
$PM_{2.5}$	0.35 ton per year[b] and 0.054 pounds per hour[b]	(4.1 ton per year)[c] and (0.63 pounds per hour)[c]
Pb	14 pounds per month	

a. Modeling may be required for emissions below the Level II threshold for the following:
1. Sources where a substantial portion of the new or modified emissions have poor dispersion characteristics (e.g., rain caps, horizontal stacks, fugitive releases, or building downwash) in close proximity to ambient air
2. Sources located in complex terrain (e.g., there is terrain above stack height that is in close proximity to the source)
3. Sources located in areas with poor existing air quality
4. Modifications at existing major stationary sources, including grandfathered sources that have never been modeled before

b. Level I thresholds are emissions rates below which modeling will not be required in most instances. Thorough justification for using Level I thresholds is not generally required. These thresholds are based on the following methods and assumptions: AERSCREEN with the MAKEMET program run separately for land use of grassland, conifer forest, and desert shrubland, using the maximum impact of the tree. The highest value was taken and compared to the significant contribution levels. Stack height = 10 m, exit temperature = 150 °F, diameter = 0.3 m, exit velocity = 10 meters per second, ambient air is 100 meters from stack in all direction, building of 4 m (w) by 4 m (l) by 5 m (h).

c. The Level II thresholds, in parentheses, are applicable on a case-by-case conditional basis. They are based on the following analyses/assumptions: AERSCREEN with the MAKEMET program run for landuse of grassland, conifer forest, and desert shrubland, using the maximum impact of the tree. The highest value was taken and compared to the significant contribution levels. Stack height = 15 m, exit temperature = 260° F, diameter = 1.0 m, exit velocity = 20 meters per second, ambient air is 100 meters from the stack in all directions, there is a 10 m (w) by 10 m (l) by 5 m (h) building present at the stack location.

[10]

Project emissions are less than the Level I and Level II Thresholds and so modeling is not required. See the table below.

Pollutant	Level I	Level II	Units	Project
CO	15	175	PPH	1.29 E-06
NO_X	1.2	14	TPY	1.92E-03
	0.2	2.4	PPH	4.41E-06
SO_2	1.2	14	TPY	1.11E-02
	0.21	2.5	PPH	2.55E-05
PM_{10}	0.22	2.6	PPH	1.40E-05
$PM_{2.5}$	0.35	4.1	TPY	
	0.054	0.63	PPH	
Pb	14 pounds per month			3.00E-06

[10] Source: *State of Idaho Guideline for Performing Air Quality Impact Analyses.*

TOXIC AIR POLLUTANTS

TAP emissions were evaluated in accordance with IDAPA 58.01.01.210 *Demonstration of Preconstruction Compliance with Toxic Standards.* The following TAPs were identified with the proposed project.

Toxic Air Pollutant	Section Idenftified	Emissions Screening Level (lb/hr)	Acceptable Ambient Concentration (mg/m³ or µg/m³)
Chloromethane	585	2.67	5.15 mg/m³
Vinyl Chloride	586	6.867	1.4E-01 µg/m³
Bromomethane	585	1.27	0.95 mg/m³
Methylene Chloride	586	1.60E-03	2.4E-01 µg/m³
Benzene	586	8.00E-04	1.2E-01 µg/m³
Toluene	585	25	18.75 mg/m³
Ethylbenzene	585	29	21.75 mg/m³
Xylenes	585	29	21.75 mg/m³
Styrene	585	6.67	1 mg/m³
Chloroethane	585	176	132 mg/m³
Chlorobenzene	585	23.3	17.5 mg/m³
Isopropylbenzene	585	16.3	12.25 mg./m³
1,1,2,2- Tetrachloroethane	586	1.1E-05	1.7E-02 µg/m³
Napthalene	586	3.33	2.5 µg/m³
Metals - Antimony	585	3.30E-02	0.025 mg/m³
Metals - Arsenic	586	1.50E-06	2.3E-04 µg/m³
Metals - Beryllium	586	2.80E-05	4.2E-03 µg/m³
Metals - Cadmium	586	3.70E-06	5.6E-04 µg/m³
Metals - Chromium[11]	586	3.30E-02	8.3E-05 µg/m³
Metals - Cobalt	585	3.30E-03	0.0025 mg/m³
Metals - Manganese	585	3.33E-01	0.25 mg/m³
Metals - Nickel	586	2.70E-05	4.2E-03 µg/m³
Metals - Selenium	585	1.30E-02	0.010 mg/m³
Metals - Zinc	585	6.67E-01	0.5 mg/m³
Fluoride	585	1.67E-01	0.125 mg/m³

Uncontrolled hourly emissions screening levels are exceeded for Arsenic, Cadmium, Nickel, and possibly Hexavalent Chromium[12] which are carcinogens identified in Section 586. Detailed calculations and supporting documentation can be found in Appendix C.

Controlled TAP emissions are below the emissions screening levels for all air toxics as demonstrated in the following table.

[11] Trivalent Chromium is found on the non-carcinogenic increment list while Hexavalent Chromium can be found on the carcinogenic increment list. The stack test conducted in Green Bay did not differentiate.
[12] See previous footnote.

Toxic Air Pollutant	Section Idenftified	Emissions Screening Level (lb/hr)	Controlled Project Emissions (lb/hr)	EL Exceeded? Y or N
Chloromethane	585	2.67	2.50E-07	N
Vinyl Chloride	586	6.867	1.43E-08	N
Bromomethane	585	1.27	8.10E-08	N
Methylene Chloride	586	1.60E-03	4.31E-08	N
Benzene	586	8.00E-04	4.13E-07	N
Toluene	585	25	1.19E-07	N
Ethylbenzene	585	29	6.52E-09	N
Xylenes	585	29	6.16E-08	N
Styrene	585	6.67	3.04E-09	N
Chloroethane	585	176	1.80E-08	N
Chlorobenzene	585	23.3	2.16E-08	N
Isopropylbenzene	585	16.3	8.44E-08	N
1,1,2,2- Tetrachloroethane	586	1.10E-05	8.44E-08	N
Napthalene	586	3.33	9.24E-09	N
Metals - Antimony	585	3.30E-02	1.43E-09	N
Metals - Arsenic	586	1.50E-06	2.68E-08	N
Metals - Beryllium	586	2.80E-05	1.51E-09	N
Metals - Cadmium	586	3.70E-06	4.84E-07	N
Metals - Chromium[13]	586	3.30E-02	3.04E-07	N
Metals - Cobalt	585	3.30E-03	2.31E-09	N
Metals - Manganese	585	3.33E-01	5.81E-08	N
Metals - Nickel	586	2.70E-05	4.28E-08	N
Metals - Selenium	585	1.30E-02	2.53e-08	N
Metals - Zinc	585	6.67E-01	1.56E-06	N
Fluoride	585	1.67E-01	3.50E-06	N

Utilizing IDAPA 58.01.01.210 with Department form AQ-CH-P006[14], site-specific dispersion modeling is unnecessary if the sum of the emissions is below the EL for each TAP. Because controlled emissions are below the EL for the project, ambient monitoring is not required and compliance and preconstruction compliance is demonstrated for each pollutant.

[13] Trivalent Chromium is found on the non-carcinogenic increment list while Hexavalent Chromium can be found on the carcinogenic increment list. The stack test conducted in Green Bay did not differentiate.
[14] Department of Environmental Quality – Air Quality Division *Toxic Air Pollutant (TAP) Preconstruction Application Completeness Checklist (Section II.C).*

OTHER POTENTIALLY APPLICABLE RULES

Other rules potentially applicable to the project are identified in the table below:

IDAPA Section	Requirement	Applicable	Discussion
130 - 136	Actions to take for startup, shutdown, scheduled maintenance, safety measure, upset and breakdown.	Yes	Simplot will comply with facility requirements as applicable.
155	Facility prohibited from circumvention of the rules.	Yes	Simplot will not conceal emissions or violations of the rules.
157	Test methods.	Yes	Simplot will use the applicable methods and procedures if required to test.
400-410	Tier II Operating Permits	No	PTC is not required to establish limits different from what is in the rules, and mercury emissions are below 62 pounds per year.
300-399	Title V Classification	No	Pre- and post-project project emissions are below the major facility thresholds found in IDAPA 58.01.01.008.10.
625	Visible emissions limited to 20% opacity for 3 minutes during any 60-minute period.	Yes	Baghouse controls opacity, and product handling operations are inside a building, the project will comply with this rule.
650-651	Reasonable precautions are required to prevent particulate from becoming airborne.	No	All activities will be conducted inside a building, so there is no opportunity for fugitive emissions.
701	New Equipment Process Weight	Yes	With use of baghouse, Simplot PM emissions will not exceed 1 lb/hr.
750-751	Fluoride emissions are limited from Phosphate Fertilizer Plants	No	The project does not constitute a Phosphate Fertilizer Plant.
775 - 776	Control of Odors	Yes	Simplot will comply with odor control requirements as necessary.
790-794	Nonmetallic Mineral Processing Plants	No	The project does not include equipment used to crush or grind any mineral or rock as described in Section 0.11.

PROPOSED PERMIT CONDITIONS

Simplot proposes the following permit conditions to ensure that the project complies with the requirements found in the *Rules and Regulations for the Control of Air Pollution in Idaho*.

- Use of the kiln will be limited to 1200 hours per year.
- A baghouse will be used to control emissions from the kiln.
- No more than 2.8 tons of ore will be fed into the kiln in one year.

CERTIFICATION

Based on information and belief formed after reasonable inquiry, the statements and information in this PTC application are true, accurate, and complete.

NAME	TITLE	DATE
	Director of Engineering	6-20-13

PROOF OF PAYMENT

IDAHO Department of Environmental Quality

Categories

- Show All
- Pay Your Drinking Water Fee Assessment
- Pay Your Air Permitting Fee(s)
- Pay Invoice

Receipt

Print this page or check your email for a receipt.

Payment Complete

Idaho.gov State of ID will appear on your statement for this transaction. Thank you for your business.

Order Number:	PP3ID1446584SID6755151-1446584
Order Date:	Thu Jun 20 10:57:55 MDT 2013
Payment Method:	Visa xxxxxxxxxxxx1115
Cost:	$1,030.00

Order

Item/Service	Qty	Price	Total
PTC Application Fee	1	$1,000.00	$1,000.00
		Subtotal	$1,000.00
		Sales Tax	$0.00
		Shipping	$0.00
		Purchased through Idaho.gov Price	$1,030.00

Contact information

Bill To:	Trisha Arave 1130 W Highway 30 Pocatello, ID 83204
Phone:	(208) 235-5605
Email:	trisha.arave@simplot.com

Billing questions

Contact Idaho.gov by phone 208-332-0102 or toll-free at 1-877-443-3468.

« Return to Catalog | Sign out

APPENDIX A – EQUIPMENT SPECIFIC INFORMATION

J.R. Simplot Company

March 7, 2013

Lab unit

Model:	GS4M
Quantity:	1
Filter Quantity:	4
Rating:	1,000 CFM @ 9.00 Inches SP
Application:	
Voltage:	460V 60Hz - 3PH

GS4M Dust Collector

- Looks like a safe because it's built like a safe!
- Fully assembled and prewired unit - 3HP fan, controls, filters and cleaning system.
- Built-in spark trap inlet to protect cartridges.
- Tool-less cam-lock cartridge removal.
- Built-in safety monitoring filter.
- Factory installed sprinkler head mounted in dust collector.
- Cartridge overbags for laser/plasma applications.

Housing

- Gold Series module is constructed of rugged 10 gauge steel.
- Most other dust collectors on the market are only 12 gauge or thinner.

Powder Paint Finish

- Baked on, durable Farr green Dupont® powder coat paint. All carbon steel components are 5-stage acid washed prior to powder coating for maximum adhesion of the paint.
- Painted inside and outside for unsurpassed weather and corrosion resistance.

System Blower

- Backward inclined Hi Efficiency fan.
- 3 HP, 1800 RPM 3PH/60Hz TEFC motor.
- Silencer reduces fan noise to under 70dBA.

Filter Access

- Tool-less quick-open access door(s) to super-fast cartridge change-out system that does not require entry into the collector.
- Cam-operated clamp bars provide easy filter clamping and sealing.
- Most competitive units use a laborious threaded handle system for door removal, in which knobs can be lost and threads can bind.

Safety Monitoring Filter

- Integral after filter built into fan sound enclosure
- Provides safety backup to primary filter should a leak ever occur
- Visual gauge to show if filter is dirty and needs to be replaced.

Integrated Prewired Controls

- Prewired control panel in a NEMA 4 enclosure
- Main disconnect
- Motor starter and fuses
- Hand/off/auto switch for direct control of dust collector
- 24 VDC relay for remote access power control
- On-demand pulse cleaning controls
- Digital and analog readout of filter pressure differential, alarm output of high pressure
- Control voltage transformer

Automatic Filter Cleaning

- Filters are automatically back-flush cleaned on demand with pulses of compressed air.
- Vertical design of the Farr cartridges provides more efficient pulsing of dust, thus eliminating uneven dust loading associated with horizontally mounted cartridges.
- Powerful cleaning system delivers 100% more cleaning energy than horizontal designs and includes: 6" compressed air header, nozzled purge pipes, diaphragms, and solenoid valves in NEMA 4 enclosure. Diaphragms are factory plumbed to the solenoids. Reverse pulsing system is mounted on the inside of clean air plenum to reduce footprint and noise.

Dust Drawers

- Easy to remove aluminum dust drawers slide out for easy dust disposal.

High Entry Inlet

- A high entry inlet shall be supplied instead of the standard laser inlet.
- Farr's high cross flow inlet eliminates upward can velocities associated with traditional hopper inlets.
- Channel baffles installed in the inlet protect the filters from incoming dust and separates the larger dust particles directly into the hopper, reducing the load on the filters.

M25000023 - G/P-SMH-A-1x1 w/ Holding Frame

M23000258 - CP35-201-E Carbon Canister **(16)**

049880005 - 30/30 24x24x2 Prefilter

Mounting Camsorb Housing on GS4M frame

Upgraded GS4M frame housing

Eplosion Vent

Hemiplete eXtreme Media

HemiPleat Technology

HemiPleat retrofit into a horizontal gas turbine intake filter.

Specifications

- **Efficiency:** 99.99% on 0.5 micron and larger particles by weight
- **Air Permeability:** 25-35 cfm/sq.ft. per 0.5" w.c. (457-640 m³/m²h at 125 Pa)
- **Mullen Burst:** (Dry) 40psi (2.8 bars) –AIM 20psi (1.4 bars) – minimum
- **Pans:** Galvanized steel (top & bottom) Optional: Stainless steel
- **Filter Sealant:** Solid Polyurethane top/bottom
- **Max. Temps:** 160°F (71°C) Operating 180°F (82°C) Surge

PolyTech Filter Media

PTS-PolyTech Standard (Color: green)
Proprietary blend of cellulosic fibers and polyester fibers with a moisture resistant silicone treatment for optimum dust release characteristics, yielding long service life at high filtration efficiencies. **MERV 12***

PTC-PolyTech Carbon Impregnated (Color: black)
Base PTS media described above, chemically treated and impregnated with carbon for static dissipation. **MERV 12***

PTF-PolyTech Flame Retardant (Color: off-white with blue stripes)
Base PTS media described above, chemically treated with a fire retardant. **MERV 12***

PTU-PolyTech Ultra High Efficiency (Color: white/green)
Base PTS media described above with a microfiber synthetic melt blown surface laminate that yields the industry's best filtration efficiency at 99.999% on 0.5 micron and larger particles by weight. **MERV 16***

HEMIPLEAT FILTERS ARE AVAILABLE IN ALL SHAPES AND SIZES AND AS REPLACEMENT UPGRADE CARTRIDGES.

*The Minimum Efficiency Reporting Value (MERV) was determined by product testing conducted by an independent lab. ASHRAE standard 52.2.

Typical Applications

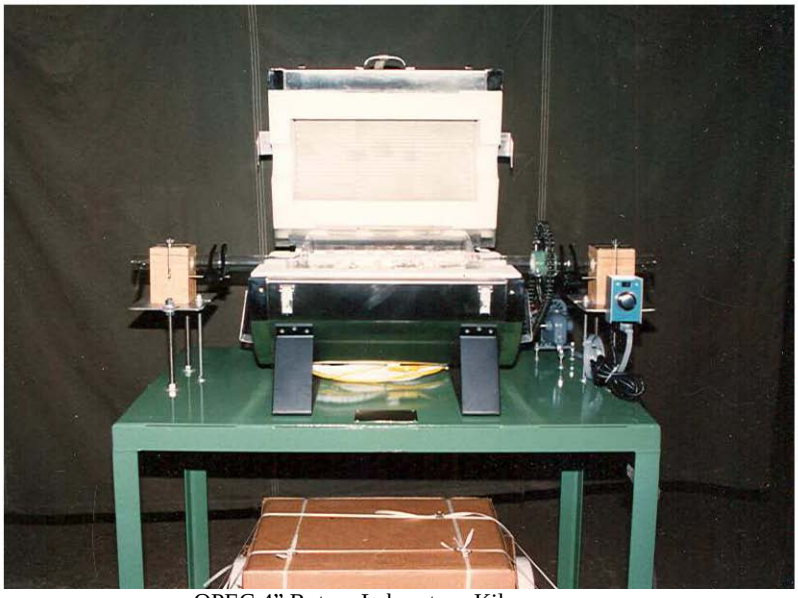
- Gas turbine intake
- Blasting (room & wheel)
- Thermal/flame spray
- Paper trim/scrap systems
- Sanding & grinding dust
- Talc & cornstarch dust
- Foundry sand/metal pouring
- Laser/plasma cutter fumes
- Wood dust
- Fiberglass manufacturing
- Carbon black/toner dust
- Lead & other toxic dust
- Pharmaceutical dust
- Welding fumes
- Mixing & blending dust
- Mineral, silica dust
- Plastic & composite dust
- Food additives/spices

FARR
Air Pollution Control
Farr APC is a proud member of the Camfil Farr family.
800-479-6801 camfil
www.farrapc.com
870-933-8048 Jonesboro, AR
email: filterman@farrapc.com

QUINN PROCESS EQUIPMENT CO.

QUINN ROTARY LABORATORY KILN

Bulletin QPEC K-001



QPEC 4" Rotary Laboratory Kiln

Applications Carefully controlled roasting is often times an important initial process treatment for the subsequent leaching and recovery of most metal values. The Quinn laboratory furnace permits roasting of such materials at a designated temperature with a controlled input of desired atmosphere and with an off-gas which can be collected and analyzed.

Typical applications include (a) roasting of sulphides in oxidizing atmosphere for conversion to soluble sulphates, (b) roasting of sulphides in presence of reducing atmosphere to approach the metallic stage, (c) roasting of silicates in chloridizing roast to produce water soluble or volatile chlorides, (d) removal of organics by oxidizing roast.

Advantages

Rotating kiln is of Vycor to withstand temperature and corrosion. The internal surface is dimpled to lift and tumble the charge. The stationary ends of the kiln are sealed to the rotating kiln through spring-loaded ball joints to accommodate thermal expansion of the kiln. Variable speed drive provides flexibility to meet specific conditions.

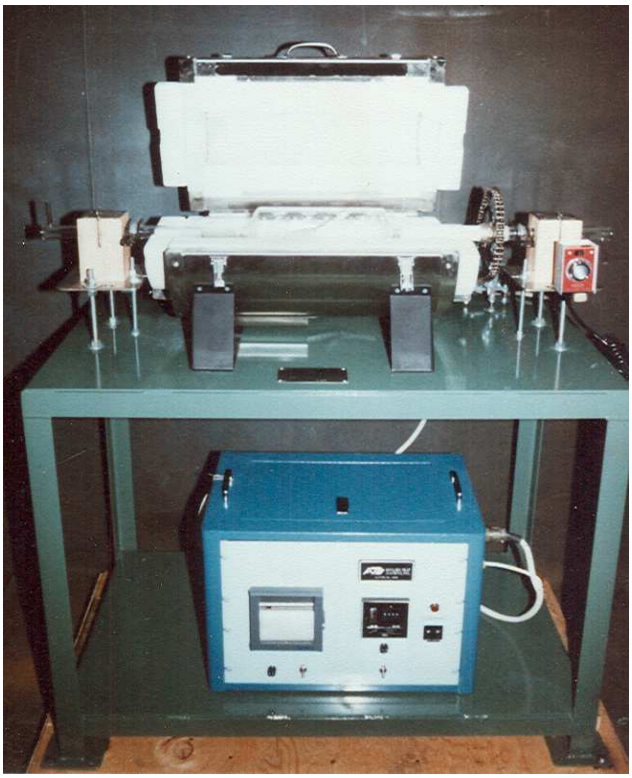
The temperature inside the kiln is measured, controlled, and recorded.

The shell protecting the refractory is of 304 stainless steel as are the mechanisms which support the kiln.

Unit is conveniently mounted on a portable steel support table provided with rubber-tired casters.

(Dimensions and specifications on reverse side.)

3400 Brighton Blvd., Denver, Colorado 80216 Phone: (303) 295-2872 Fax (303) 295-2706 Email: quinnproc@aol.com Website: http://www.quinnprocess.com



QPEC Laboratory Rotary Kiln with temperature controller-recorder mounted on portable steel support stand

Specifications

Shell: 21" long x 15" wide x 14" high of SS 304 with east ceramic fiber insulation.

Kiln: Material is Vycor with built-in lifters.
- Size: Major diameter 3 inches; length of major diameter 10".
- Seals: Spring loaded ball joints.
- Supports: Adjustable SS 304 base and rods.
- Heating elements: Two 5.75" I.D. by 18" long, each rated 4460 watts for 230 volt operation.
- Maximum temperature range: To 1100° C.

Drive Motor: 1/15 hp AC/DC gearmotor with 3 to 100 rpm range for 1 ph, 50 or 60 cycle, 115 volt operation.

Drive: Roller chain.

Temperature controls: Digital set point controller with deviation indicator, on-off switch and temperature recorder. Includes thermowell and thermocouple in furnace.

Portable support stand: Mild steel, epoxy painted with caster.

Overall dimensions: 48" high, 24" wide, and 44" long.

Note: Smaller and larger size units available.

3400 Brighton Blvd., Denver, Colorado 80216 Phone: (303) 295-2872 Fax (303) 295-2706 Email: quinnproc@aol.com Website: http://www.quinnprocess.com

ALL PURCHASES ARE SUBJECT TO OUR GENERAL TERMS AND CONDITIONS OF SALE.

HemiPleat Performance Warranty
For
J. R. Simplot Company

Florikan (Fertilizer) Dust Collection
AC ratio: Not to exceed 1.27:1 on HemiPleat® Tenkay Gold Cones
GS4M for 1,000 cfm

Camfil APC warranties that the HemiPleat filters will last one year minimum from startup, with an expectation to last two years. This is defined as the filters not being able to be pulsed down from 6" WC. If filter life is not met, Camfil APC will supply one replacement set of filters.

Camfil APC warranties that the emissions from the collector will not exceed 0.002 gr/dscf (5 mg/cu meter) in particulate emissions. Camfil APC also warranties that the filters will maintain an efficiency of 99.99% on 0.5 micron and larger (by weight) if operated under normal conditions and a 2.0"w.g. or higher of differential pressure is maintained.
If a verification stack test is to be performed, it must be done at least 30 days after startup, and no more than 90 days after startup. If emissions level is not met, then Camfil APC will be responsible for supplying a higher efficiency filter media to meet emissions level. Camfil APC requests proper notification for any stack test in order to be present at the test. Camfil APC will not be responsible for the costs associated with any stack tests.

The following conditions will apply to this warranty:

(1) The collectors will be operated per industry standard practices, (Reference Collector Operating Instruction Manual)
(2) Upset conditions, loss of power to the cleaning system, excessive moisture, abrasion due to improper evacuation of dust collector hopper or exceeding air flow or temperature specified, may void this warranty.
(3) Review of inlet duct design by Camfil APC.
(4) Daily records will be kept on pressure drop across the filters.
(5) Under no circumstances will Camfil APC be responsible for incidental or consequential damages.

Lee Morgan

President

camfil FARR
AIR POLLUTION CONTROL

Camfil Farr APC
Address: 3505 S. Airport Road, Jonesboro, AR 72401 Tel: 800-479-6801 Fax: 870-933-8381 • www.farrapc.com

APPENDIX B – FORMS & CHECKLISTS

DEQ AIR QUALITY PROGRAM
1410 N. Hilton, Boise, ID 83706
For assistance, call the
Air Permit Hotline: 1-877-5PERMIT

General Information Form GI
Revision 7
6/29/12

Please see instructions on back page before filling out the form. All information is required. If information is missing, the application will not be processed.

Identification

1. Facility name: Engineering Manufacturing Technology
2. Existing facility identification number:
☐ Check if new facility (not yet operating)

3. Brief project description: Phosphate ore thermal beneficiation testing - laboratory scale.

Facility Information

4. Primary facility permitting contact name: Chelly Reesman
Contact type: Facility permitting contact
Telephone number: 208-389-7558
E-mail: michelle.reesman@simplot.com

5. Alternate facility permitting contact name: Burl Ackerman
Alternate contact type: Facility permitting contact
Telephone number: 208-389-7466
E-mail: burl.ackerman@simplot.com

6. Mailing address where permit will be sent (street/city/county/state/zip code): P.O. Box 27, Boise, Idaho 83707

7. Physical address of permitted facility (if different than mailing address) (street/city/county/state/zip code): 1130 Highway 30 W, Pocatello, Idaho 83204-7510

8. Is the equipment portable? ☐ Yes* ☒ No *If yes, complete and attach PERF; see instructions.

9. NAICS codes: Primary NAICS: 5413 Secondary NAICS: 541380

10. Brief business description and principal product produced: Research and engineering support to agribusiness manufacturing and mining.

11. Identify any adjacent or contiguous facility this company owns and/or operates: The Don Plant facility is located across Highway 30.

12. Specify type of application ☒ Permit to construct (PTC); application fee of $1,000 required. See instructions.

☐ Tier I permit ☐ Tier II permit ☐ Tier II/Permit to construct

For Tier I permitted facilities only: If you are applying for a PTC then you must also specify how the PTC will be incorporated into the Tier I permit.

☐ Co-process Tier I modification and PTC ☐ Incorporate PTC at the time of Tier I renewal ☐ Administratively amend the Tier I permit to incorporate the PTC upon applicant's request (IDAPA 58.01.01.209.05.a, b, or c)

Certification

In accordance with IDAPA 58.01.01.123 (Rules for the Control of Air Pollution in Idaho), I certify based on information and belief formed after reasonable inquiry, the statements and information in the document(s) are true, accurate, and complete.

13. Responsible official's name: James A. Samuelson
Official's title: Director, Engineering & Optimization
Official's address: P.O. Box 27, Boise, Idaho 83702
Telephone number: (208) 672-2745
E-mail: jim.samuelson@simplot.com
Official's signature:
Date: 6-20-13

☒ 14. Check here to indicate that you want to review the draft permit before final issuance.

DEQ AIR QUALITY PROGRAM
1410 N. Hilton, Boise, ID 83706
For assistance, call the
Air Permit Hotline – 1-877-5PERMIT

Emissions Unit - General **Form EU0**
Revision 4

08/28/08

*Please see instructions on page **Error! Bookmark not defined.** before filling out the form.*

IDENTIFICATION

1. Company Name:	2. Facility Name:	3. Facility ID No:
J.R. Simplot Company	Engineering Manufacturing Technology	

4. Brief Project Description:	Phosphate ore thermal beneficiation testing

EMISSIONS UNIT (PROCESS) IDENTIFICATION & DESCRIPTION

5.	Emissions Unit (EU) Name:	BENCH SCALE KILN
6.	EU ID Number:	BH010
7.	EU Type:	☒ New Source ☐ Unpermitted Existing Source ☐ Modification to a Permitted Source -- Previous Permit #: Date Issued:
8.	Manufacturer:	QUINN PROCESS EQUIPMENT CO.
9.	Model:	QPEC 4" LABORATORY ROTARY BENCH KILN
10..	Maximum Capacity:	11.5 CU FT
11.	Date of Construction:	UNKNOWN - SHELF UNIT
12.	Date of Modification (if any):	NA
13.	Is this a Controlled Emission Unit?	☐ No ☒ Yes If Yes, complete the following section. If No, go to line 22.

EMISSIONS CONTROL EQUIPMENT

14. Control Equipment Name and ID:	Dust Collector
15. Date of Installation:	16. Date of Modification (if any):
17. Manufacturer and Model Number:	Camfil GS4M
18. ID(s) of Emission Unit Controlled:	
19. Is operating schedule different than emission units(s) involved?	☒ Yes ☐ No
20. Does the manufacturer guarantee the control efficiency of the control equipment?	☒ Yes ☐ No (If Yes, attach and label manufacturer guarantee)

	PM	PM10	SO_2	NOx	VOC	CO
Control Efficiency	99.99	99.99				

21. If manufacturer's data is not available, attach a separate sheet of paper to provide the control equipment design specifications and performance data to support the above mentioned control efficiency. See Appendix A

EMISSION UNIT OPERATING SCHEDULE (hours/day, hours/year, or other)

22.	Actual Operation:	1000 HOURS/YEAR
23.	Maximum Operation:	1200 HOURS/YEAR

REQUESTED LIMITS

24.	Are you requesting any permit limits?	☒ Yes ☐ No (If Yes, indicate all that apply below)
	☒ Operation Hour Limit(s):	1200 HOURS/YEAR
	☐ Production Limit(s):	
	☐ Material Usage Limit(s):	
	☐ Limits Based on Stack Testing:	Please attach all relevant stack testing summary reports
	☐ Other:	
25.	Rationale for Requesting the Limit(s):	Research facility is only staffed 40 hours/week, most tests are of short duration.

DEQ AIR QUALITY PROGRAM
1410 N. Hilton, Boise, ID 83706
For assistance, call the
Air Permit Hotline – 1-877-5PERMIT

Baghouse Control Equipment **Form BCE**

Revision 6

2/18/10

Complete this form for each baghouse. Please see instructions on page 2 before filling out the form.

IDENTIFICATION	
1. Company Name	2. Facility Name:
J.R. Simplot Co	Engineering Manufacturing and Technology
3. Brief Project Description: Phosphate ore thermal beneficiation testing.	

BAGHOUSE INFORMATION		
4. Baghouse Manufacturer: Farr	5. Baghouse Model: GS4M	6. Baghouse Equipment ID: BH010

7 (a). Baghouse particulate matter emission concentration. **Note: Provide information in 7(a)-(c) or answer question #8 below.**	0.002 gr/dscf	*Manufacturers typically provide guarantees in grains per dry standard cubic foot (gr/dscf). Provide a copy of the guarantee, or other documentation, with the application along with a description of the types of bags that must be used to achieve the emission concentration.* ***Emission concentrations less than 0.01 gr/dscf will receive additional scrutiny by DEQ and a source test of the baghouse may be required.*** *If a guarantee is not provided then you must document how you obtained the emission concentration. Without documentation the application is not complete.*
7 (b). Percentage PM_{10} Or Provide PM_{10} Emission Concentration	_____ % _____ gr/dscf	*What percentage of the PM concentration listed in question #7(a) is PM_{10}. You must provide documentation as to how the percentage was determined (i.e per the baghouse manufacturer). Without documentation the application is not complete.*
7 (c). Baghouse flow rate	1,000 dscfm	*Provide the baghouse flow rate in dry standard cubic feet per minute. Actual cubic feet per minute may be given in lieu of dscfm* ***if it is documented*** *that moisture content is insignificant. You must provide documentation as to how this flow rate was determined (i.e. per the exhaust fan manufacturer, combustion evaluation, etc.). Without documentation the application is not complete.*
8. Baghouse particulate matter control efficiency. **Note: Not needed if section #7 is completed.**	99.99 % PM control 99.99 % PM_{10} control	*Applicant's providing the control efficiency of the baghouse must provide control efficiency for both PM and PM_{10}. Provide a copy of the control efficiency documentation with the application. Documentation must include a description of the types of bags that must be used to achieve the control efficiency. Without documentation the application is not complete.*
9. Is the baghouse equipped with a bag leak detector?	☐ Yes ☒ No	*If a bag leak detector is installed provide documentation on the leak detector, including; how the leak detector functions and what level of the output signal indicates that a bag is leaking. Without documentation the application is not complete.*

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

Version 1, August 2010

Facility Wide Potential to Emit Emission Inventory

Application Template and Instructions

For new stationary sources provide the facility's potential to emit for all NSR Regulated Air Pollutants. The potential to emit provided here must match the emissions rates which are requested to be permitted.

For modifications to existing facilities (including the addition of new emissions units), if the existing facility classification is in question an existing facility wide potential to emit emission inventory will be required to be submitted[1]. Contact DEQ to determine if a facility wide emission inventory for the existing facility is required.

All emissions inventories must be submitted with thorough documentation. The emission inventories will be subjected to technical review. Therefore, prepare your application with sufficient documentation so that the public and DEQ can verify the validity of the emission estimates. **Applications submitted without sufficient documentation are incomplete. Follow the instructions provided on page 2; do not proceed until you have read the instructions.**

Applicants must use the Potential to Emit Summary table provided below.

TABLE 1. POTENTIAL TO EMIT FOR NSR REGULATED POLLUTANTS

Emissions Unit	PM	PM_{10}	$PM_{2.5}$	VOC	Pb	NO_2	CO	CO_2	F^-
	T/yr	T/yr	T/yr	T/yr	T/yr	T/yr			
Point Sources									
Rotary Kiln	3.01	0.24	0.11	6.69E-04	1.28E-05	0.01	4.10E-03	12.35	0.01
Fugitive Sources *{For listed source categories only, see item 3 below in the instructions}*									
Kiln Charging or Discharging	2.43E-06	1.15E-06	1.74E-07	0.00	0.00	0.00			
XXX	0.00	0.00	0.00	0.00	0.00	0.00			
XXX	0.00	0.00	0.00	0.00	0.00	0.00			
Totals	**3.01**	**0.24**	**0.11**	**6.69E-04**	**1.28E-05**	**0.01**	**4.10E-03**	**12.35**	**0.01**

a) NSR Regulated air Pollutants are defined[2] as: Particulate Matter (PM, PM-10, PM-2.5), Carbon Monoxide, Lead, Nitrogen Dioxide, Ozone (VOC), Sulfur Dioxide, CO_2e[3], Green House Gases (GHG) mass, all pollutants regulated by NSPS (40 CFR 60)(i.e. TRS, fluoride, sulfuric acid mist) & Class I & Class II Ozone Depleting Substances (40 CFR 82)(i.e. CFC, HCFC, Halon, etc.)

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[1] The applicant must determine if the existing facility is a major facility. If the facility is an existing PSD major facility and changes are being made to the facility the major modification test must be conducted.

[2] 40 CFR 52.21(b)(50), as incorporated by reference at IDAPA 58.01.01.107.03.d

[3] Multiply each green house gas (GHG) by the global warming potential (GWP) listed at 40 CFR 98, Table A- 1 of Subpart A then sum all values to determine CO_2e (GHGs are carbon dioxide, nitrous oxide, methane, hydrofluorcarbons, perfluorcarbons, sulfur hexafluoride). Be sure to show all calculations as described in the instructions.

Table 1. PRE- AND POST PROJECT NON-CARCINOGENIC TAP EMISSIONS SUMMARY POTENTIAL TO EMIT

Non-Carcinogenic Toxic Air Pollutants (sum of all emissions)	Pre-Project 24-hour Average Emissions Rates for Units at the Facility (lb/hr)	Post Project 24-hour Average Emissions Rates for Units at the Facility (lb/hr)	Change in 24-hour Average Emissions Rates for Units at the Facility (lb/hr)	Non-Carcinogenic Screening Emis-sion Level (lb/hr)	Exceeds Screening Level? (Y/N)
Chloromethane	**0.00E-03**	**2.50E-07**	**2.50E-07**	**2.67**	**N**
Vinyl Chloride	**0.00E-03**	**1.43E-08**	**1.43E-08**	**6.867**	**N**
Bromomethane	**0.00E-03**	**8.10E-08**	**8.10E-08**	**1.27**	**N**
Methylene Chloride	**0.00E-03**	**4.31E-08**	**4.31E-08**	**1.60E-03**	**N**
Toluene	**0.00E-03**	**1.19E-07**	**1.19E-07**	**25**	**N**
Ethylbenzene	**0.00E-03**	**6.52E-09**	**6.52E-09**	**29**	**N**
Xylene	**0.00E-03**	**6.16E-08**	**6.16E-08**	**29**	**N**
Styrene	**0.00E-03**	**3.04E-09**	**3.04E-09**	**6.67**	**N**
Chloroethane	**0.00E-03**	**1.80E-08**	**1.80E-08**	**176**	**N**
Chlorobenzene	**0.00E-03**	**2.16E-08**	**2.16E-08**	**23.3**	**N**
Isopropylbenzene	**0.00E-03**	**8.44E-08**	**8.44E-08**	**16.3**	**N**
1,1,2,2-Tetrachloroethane	**0.00E-03**	**9.24E-09**	**9.24E-09**	**1.10E-05**	**N**
Napthalene	**0.00E-03**	**2.83E-08**	**2.83E-08**	**3.33**	**N**
Antimony	**0.00E-03**	**1.43E-09**	**1.43E-09**	**3.30E-02**	**N**
Cobalt	**0.00E-03**	**2.31E-09**	**2.31E-09**	**3.30E-03**	**N**
Manganese	**0.00E-03**	**5.81E-09**	**5.81E-09**	**3.33E-01**	**N**
Selenium	**0.00E-03**	**2.53E-08**	**2.53E-08**	**1.30E-02**	**N**
Zinc	**0.00E-03**	**1.65E-06**	**1.65E-06**	**6.67E-01**	**N**
Fluoride	**0.00E-03**	**3.50E-06**	**3.50E-06**	**1.67E-01**	**N**

TABLE 2. PRE- AND POST PROJECT CARCINOGENIC TAP EMISSIONS SUMMARY POTENTIAL TO EMIT

Carcinogenic Toxic Air Pollutants (sum of all emissions)	Pre-Project Annual Average Emissions Rates for Units at the Facility (lb/hr)	Post Project Annual Average Emissions Rates for Units at the Facility (lb/hr)	Change in Annual Average Emissions Rates for Units at the Facility (lb/hr)	Carcinogenic Screening Emis-sion Level (lb/hr)	Exceeds Screening Level? (Y/N)
Benzene	**0.00E-03**	**4.13E-07**	**4.13E-07**	**8.00E-04**	**N**
Arsenic	**0.00E-03**	**2.68E-08**	**2.68E-08**	**1.50E-06**	**N**
Beryllium	**0.00E-03**	**1.51E-09**	**1.51E-09**	**2.08E-05**	**N**
Cadmium	**0.00E-03**	**4.84E-07**	**4.84E-07**	**8.61E-04**	**N**
Chromium[1]	**0.00E-03**	**3.04E-07**	**3.04E-07**	**3.30E-02**	**N**
Nickel	**0.00E-03**	**4.28E-08**	**4.28E-08**	**2.70E-05**	**N**
Selenium	**0.00E-03**	**2.53E-08**	**2.53E-08**	**1.3E-02**	**N**
Zinc	**0.00E-03**	**1.65E-06**	**1.65E-06**	**6.67E-01**	**N**
XXX *{586 listed TAP}*	**0.00E-03**	**0.00E-03**	**0.0000**	**XXX**	**Yes/No**
XXX *{586 listed TAP}*	**0.00E-03**	**0.00E-03**	**0.0000**	**XXX**	**Yes/No**

a) *{If you have POM include the following footnote.}* Polycyclic Organic Matter (POM) is considered as one TAP comprised of: benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, chrysene, indeno(1,2,3-cd)pyrene, benzo(a)pyrene. The total is compared to benzo(a)pyrene.

Pre-project average emissions are the existing allowable emission rates.

Post-project average emissions are the new proposed emission rates.

[1] Stack test information did not differentiate between Cr+3 and Cr+6. For purposes of this exercise, the EL in 586 was used.

Department of Environmental Quality - Air Quality Division
Minor Source Permit to Construct Application Completeness Checklist

This checklist is designed to aid the applicant in submitting a complete permit to construct application.

I. Actions Recommended Before Submitting Application

☒ Refer to the Rule. Read the Permit to Construct requirements contained in IDAPA 58.01.01.200-228, Rules for the Control of Air Pollution in Idaho. The Rules are available on DEQ's website (go to http://adm.idaho.gov/adminrules/rules/idapa58/0101.pdf).

☒ Refer to DEQ's Permit to Construct Guidance Document. DEQ has developed a guidance document to aid applicants in submitting a complete permit to construction application. The guidance document is located on DEQ's website (go to http://www.deq.idaho.gov/air/permits_forms/permitting/ptc_prepermit_guidance.pdf).

☒ Consult with DEQ Representatives. It is recommended that the applicant schedule a pre-application meeting with DEQ to discuss application requirements before submitting the permit to construct application. The meeting can be in person or on the phone. Contact DEQ's Air Quality Hotline at **877-5PERMIT** to schedule the pre-application meeting. Meeting held at DEQ on April 12, 2013

☐ Submit Ambient Air Quality Modeling Protocol. It is strongly recommended that an ambient air quality modeling protocol be submitted to DEQ at least two (2) weeks before the permit to construct application is submitted. Contact DEQ's Air Quality Hotline at **877-5PERMIT** for information about the protocol. According to modeling guideline and TAP compliance method, air dispersion modeling is not required.

II. Application Content

Application content should be prepared using the checklist below. The checklist is based on the requirements contained in IDAPA 58.01.01.202.

☒ Apply for a Permit to Construct. Submit a Permit to Construct application using forms available on DEQ's website at http://www.deq.idaho.gov/air/permits_forms/forms/ptc_general_application.pdf. See Appendix B.

☐ Permit to Construct Application Fee. The permit to construct application fee of $1000 must be submitted at the time the original permit to construct application is submitted. Refer to IDAPA 58.01.01.224. If the permit to construct application is withdrawn or denied and a new application is submitted, a new $1,000 application fee is required to be submitted. The application fee is not transferable or refundable. The application fee can be paid by check, credit card or Electronic Funds Transfer (EFT). If you choose to pay by credit card or EFT, please refer to the following Access Idaho link: https://www.accessidaho.org/secure/deq/payport/item.html?id=511

If you choose to pay by check, enclose the check with your permit to construct application. See page 22.

☒ Process Description(s). The process or processes for which construction is requested must be described in sufficient detail and clarity such that a member of the general public not familiar with air quality can clearly understand the proposed project. A process flow diagram is required for each process. See pages 4-5

☒ Equipment List. All equipment that will be used for which construction is requested must be described in detail. Such description includes, but is not limited to, manufacturer, model number or other descriptor, serial number, maximum process rate, proposed process rate, maximum heat input capacity, stack height, stack diameter, stack gas flowrate, stack gas temperature, etc. All equipment that will be

used for which construction is requested must be clearly labeled on the process flow diagram. See page 5.

☒ Potential to Emit. Submit the uncontrolled potential to emit (pre-control equipment emissions estimates) and the controlled potential to emit (post-control equipment emissions estimates) for all equipment for which construction is requested. Any limit on the equipment for which is construction is requested may become a limit on that equipment in the permit to construct. See page 10 of the narrative and Appendix C.

☒ Potential to Emit and Modeled Ambient Concentration for All Regulated Air Pollutants. All proposed emission limits and modeled ambient concentrations for all regulated air pollutants must demonstrate compliance with all applicable air quality rules and regulations. Regulated air pollutants include criteria air pollutants, toxic air pollutants listed pursuant to IDAPA 58.01.01.585 and 586, and hazardous air pollutants listed pursuant to Section 112 of the 1990 Clean Air Act Amendments (go to http://www.epa.gov/ttn/atw/188polls.html).
Describe in detail how the proposed emissions limits and modeled ambient concentrations demonstrate compliance with each applicable air quality rule and regulation. It is requested that emissions calculations, assumptions, and documentation be submitted with sufficient detail so DEQ can verify the validity of the emissions estimates. See pages 10, 16, Appendix C.

☒ Scaled Plot Plan. It is required a scaled plot plan be included in the permit to construct application and it must clearly label the location of each proposed process and the equipment that will be used in the process. See page 3.

☒ List all Applicable Requirements. All applicable requirements must be cited by the rule or regulation section/subpart that applies for each emissions unit. See pages 10-20

☒ Certification of Permit to Construct Application. The permit to construct application must be signed by the Responsible Official and must contain a certification signed by the Responsible Official. The certification must state that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete. Refer to IDAPA 58.01.01.123. See page 21

☒ Submit the Permit to Construct Application. Submit the permit to construct application and application fee to the following address:

Air Quality Program Office – Application Processing
Department of Environmental Quality
1410 N. Hilton
Boise, ID 83706-1255

Department of Environmental Quality - Air Quality Division

Toxic Air Pollutant (TAP) Preconstruction Compliance Application Completeness Checklist

This checklist is designed to aid the applicant in submitting a complete preconstruction compliance demonstration for toxic air pollutants (TAPs) in permit to construct applications. The applicant must place a check mark in the box for each section below that applies.

I. Actions Needed Before Submitting Application

☒ Refer to the Rule. Read the Demonstration of Preconstruction Compliance with Toxic Standards contained in IDAPA 58.01.01.210 (Rules Section 210) Rules for the Control of Air Pollution in Idaho (Rules). Toxic air pollutants (TAPs) are regulated in accordance with Rules Section 210 only from emission units constructed or modified on or after July 1, 1995.

Determine if a new (constructed after June 30, 1995) emission unit has the potential to emit a TAP listed in IDAPA 58.01.01.585 (Rules Section 585) or IDAPA 58.0101.586 (Rules Section 586). Potential toxic air pollutants can be determined by reviewing commonly available emission factors, such as EPA's AP-42, or calculating emissions using a mass balance. For TAPs that are emitted but not listed in Rules Section 585 and 586, contact the Air Permit Hotline at 877-5PERMIT.

Determine if the proposed construction or modification is exempt from the need to obtain a permit to construct in accordance with IDAPA 58.01.01.220-223. Use the Exemption Criteria and Reporting Requirements for TAPs IDAPA 58.01.01.223 checklist to assist you in the exemption determination. If the source does not qualify for an exemption in accordance with IDAPA 58.01.01.220-223 complete the following checklist and submit it with the permit application. Please note that fugitive TAP emissions are not included in the IDAPA 58.01.01.223 exemption determination, but fugitive TAP emissions are included in the analysis if a permit is required. Stated another way: if a source is required to obtain a Permit to Construct because it does not meet the exemption criteria for any reason all TAP emissions, including fugitive TAPs, are included in the compliance demonstration in the application for the permit to construct. Should you have any questions regarding the fact that all TAPs, including fugitive TAPs, are included in the TAP preconstruction compliance demonstration submitted with a permit to construct application you may call the Air Permit Hotline at 877-5PERMIT.

Will the new or modified source result in new or increased potential emissions of TAPs?

☒ Yes. If yes, continue to section II.

☐ No. If no, no further action is required.

II. Application Content

If a new source has the potential to emit a TAP, or if a modification to an existing source increases the potential to emit of a TAP, then one of the following methods (A-J) of demonstrating TAP preconstruction compliance must be documented for each TAP. Standard methods are one of A-C. The applicant may also use one of the specialized methods in D-J. Fugitive TAP emissions shall be included in the analysis. The compliance methods are based on the requirements of Rules Section 210. Applicants are often able to demonstrate preconstruction TAP compliance using a combination of methods A and B.

Emission Calculations

Emissions calculation methodologies used are dependent on whether a specific TAP is a non-carcinogen or a carcinogen and whether the compliance method chosen from the list below calls for controlled or uncontrolled emissions. Non-carcinogens are regulated based on a 24-hour averaging period and emission rates used for comparison to the non-carcinogen screening emissions level (EL) should be the maximum controlled or uncontrolled emissions quantity during any 24-hour period divided by 24. Carcinogens are regulated as a long term increment and emission rates used for comparison to the carcinogen EL should be the maximum controlled or uncontrolled emissions quantity during any 1 year period divided by 8760.

Modeling Analyses

Atmospheric dispersion modeling is required when controlled TAP emissions rates exceed ELs. Modeling analyses should be conducted in accordance with IDAPA 58.01.01.210.03. Quantification of Ambient Concentrations and the State of Idaho Air Quality Modeling Guideline (http;//www.deq.idaho.gov/air/data_reports/publications.cfm#model). For non-carcinogen 24-hour increments, compliance is demonstrated using the maximum modeled 24-hour-averaged concentration from available meteorological data (typically a five-year data set). For carcinogen long-term increments, compliance is demonstrated using the maximum modeled average concentration for the duration of the data set (one-year to five-year data set).

A submitted modeling report should clearly specify modeled emissions rates and results. All electronic model input files should be submitted, including BPIP input files.

Poly aromatic Hydrocarbons

Questions often arise regarding polyaromatic hydrocarbons as they are listed in Rules Section 586 of the Rules. The following two points are provided for clarification.

1) The following group of 7 PAH's (i.e. named POM), shall be combined and considered as one TAP equivalent in potency to benzo(a)pryrene:

   Benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a, h) anthrancene, chrysene, indeno(1,2,3,-cd) pyrene, benzo (a) pyrene

2) All other PAH's are considered as a single pollutant and the emission of each is compared the PAH increment listed in Rules Section 586.

Compliance Methods

Fill in letter(s) (A-J) from the list below for TAP compliance demonstration method(s) used: C.

A. TAPs Compliance Using Uncontrolled Emissions (Rules Section 210.05)

☐ Calculate the uncontrolled emissions (Rules Section 210.05) of each TAP from new emissions units. Uncontrolled emission rates are emissions at maximum capacity without the effect of physical or operational limitations. See Quantification of Emission Rates (Rules Section 210.02). Show calculations and state all assumptions.

☐ Calculate the increase of TAP emissions from modified emissions units. Show calculations and state all assumptions. The increase in emissions for a modified emission unit is determined by subtracting the potential to emit the TAP before the modification from the uncontrolled potential to emit after the modification. In conducting this analysis please note the following for TAP emission rate increase determinations:

Uncontrolled emission rates after the modification are emissions at maximum capacity without the effect of physical or operational limitations.

When determining the emissions increase from existing permitted emissions units the emission rate before the modification is equivalent to the emission limits contained in the permit for the TAPs or, if there no emission limits in the permit, by determining what the emission rate is under the physical or operational limitations contained in the permit.

☐ Aggregate the uncontrolled emissions for each TAP from all new emissions units with the increase in emissions from all modified emissions units.

☐ If the aggregated emissions increase for each TAP from the new and modified units, as determined above, are less than or equal to the respective TAP screening emissions level (EL) then preconstruction compliance with toxic standards has been demonstrated and no further analysis is required. Submit a table comparing the uncontrolled emissions rate to the applicable EL.

If aggregated emissions are greater than the respective screening emissions level (EL) for any pollutants, use another compliance demonstration method for those pollutants, such as methods B, C, or D.

B. <u>TAP Compliance Using Uncontrolled Ambient Concentration (Rules Section 210.06)</u>

☐ Determine the uncontrolled emissions of each TAP from new emission units and the increase in emissions from all modified emissions units as described above in compliance Method A. Show calculations and state all assumptions.

☐ Model the uncontrolled emissions of each TAP from new emissions units and the increase in emissions from all modified emissions units.

☐ If the uncontrolled ambient concentration is less than or equal to the acceptable ambient concentration increment listed in Rules Section 585 and 586 no further procedures for demonstrating preconstruction compliance will be required for that TAP as part of the application process. Submit a table comparing uncontrolled ambient concentrations to the applicable acceptable ambient concentration.

C. <u>TAP Compliance Using Controlled Ambient Concentrations (Rules Section 210.08)</u>

☒ Determine the controlled emissions from new emissions units and the controlled emission increase from modified emissions units. Show all calculations and state all assumptions, including the control methods.

☒ Model the controlled emissions of each TAP from new emissions units and the increase in controlled emissions from all modified emissions units.

TAP emissions levels (EL) included in Rules Section 585 and 586 are derived based on generic modeling. If the sum the of emissions from new and modified sources is below the EL compliance is demonstrated without the need to conduct site-specific dispersion modeling.

Emission calculations utilizing controls demonstrate that TAP emissions are below the EL for all TAPs.

☐ If the controlled ambient concentration from emission increases from new emissions units and modified emissions units is less than the applicable acceptable ambient concentration no further procedures for demonstrating preconstruction compliance are required.

☐ The Department shall include an emission limit for the TAP in the permit to construct that is equal to or, if requested by the applicant, less than the emission rate that was used in the modeling (Rules Section 210.08.c).

In some instances the Department may consider a throughput limit or other inherently-limiting operational restriction in a permit as an effective emission limit for the TAP, rather than including a specific emission rate limit.. Note that the applicant may model uncontrolled emissions as described in compliance Method B in an attempt to avoid TAPs emissions limitations.

D. TAPs Compliance for NSPS and NESHAP Sources (Rules Section 210.20)

☐ If the owner or operator demonstrates that the TAP emissions from the source or modification is regulated by 40 CFR Part 60, 40 CFR Part 61 or 40 CFR Part 63, no further procedures for demonstrating preconstruction compliance will be required for that TAP.

☐ Provide a demonstration that the TAP is regulated under 40 CFR Part 60, 40 CFR Part 61 or 40 CFR Part 63. This demonstration must be specific for each TAP emitted.

E. TAP Compliance Using Net Emissions (Rules Section 210.09)

An applicant may use TAP net emissions to show preconstruction compliance; however this analysis may require more work than some of the others procedures available to demonstrate preconstruction compliance. When netting, all emissions increases and decreases of the TAP that have occurred within five years must be included in the analysis as described below.

☐ Determine the net emission increase for a TAP. A net emissions increase shall be an emission increase from a particular modification plus any other increase and decreases in actual emissions at the facility that are creditable and contemporaneous with particular modification (Rules Section 210.09). Show all calculations and state all assumptions.

☐ A creditable increase or decrease in actual emissions is contemporaneous with a particular modification if it occurs within five (5) years of the commencement of the construction or modification (Rules Section 210.09.a).

Actual emissions are (Rules Section 006.03):

☐ In general, actual emissions as of a particular date shall equal the average rate, in tons per year, at which the unit actually emitted the pollutant during a two year period which precedes the particular date and which is representative of normal source operation. The Department shall allow the use of a different time period upon a determination that it is more representative of normal source operation. Actual emissions shall be calculated using the unit's actual operating hours, productions rates, and types of materials processed, stored, or combusted during the selected time period.

☐ The Department may presume that the source-specific allowable emissions for the unit are equivalent to actual emissions of the unit.

☐ For any emission unit (except electric utility steam generating units) that has not begun normal operations on the particular date, actual emissions shall equal the potential to emit of the unit on that date.

☐ Do not include emissions increases from emission units that have an uncontrolled emission rate that is 10% or less than the applicable screening emission level (EL) in Rules Section 585 and 586 (Rules Section 007.09.c.ii) and do not include emission increases from environmental remediation sources (Rules Section 007.09.c.iii). Show all calculations and state all assumptions.

☐ If the net emission increase is less than or equal to the applicable screening emissions level (EL) listed in Rules Section 585 and 586, no further procedures for demonstrating preconstruction compliance will be required (Rules Section 210.09.c).

☐ The Department shall include emission limits and other permit terms for the TAP in the permit to construct that will assure that the facility will be operated in the manner described in the preconstruction compliance demonstration (Rules Section 210.09.d).

In some instances the Department may consider a throughput limit or other inherently-limiting operational restriction in a permit as an effective emission limit for the TAP. rather than including a specific emission rate limit..

F. <u>TAP Compliance Using Net Ambient Concentration (Rules Section 210.10)</u>

☐ Determine the emission increase from the new source or modification, and all other creditable emission increases and decrease using the methods described above in compliance Method E.

☐ Model the emissions increases and decreases for each TAP. Modeling TAP decreases is accomplished by using negative valued emissions rates in the model input.

☐ If the net ambient concentration is less than or equal to the applicable ambient concentration increment listed in Rules Section 585 and 586, no further procedures for demonstrating preconstruction compliance are required.

☐ The Department shall include emission limits and other permit terms for the TAP in the permit to construct that will assure that the facility will be operated in the manner described in the preconstruction compliance demonstration (Rules Section 210.10.d).

In some instances the Department may consider a throughput limit or other inherently-limiting operational restriction in a permit as an effective emission limit for the TAP, rather than including a specific emission rate limit..

G. <u>TAP Compliance Using T-RACT Ambient Concentration for Carcinogens (Rules Section 210.12)</u>

The applicant may use T-RACT to demonstrate preconstruction compliance for TAPs listed in Rules Section 586 only.

T-RACT is an emissions standard based on the lowest emission of TAPs that a particular source is capable of meeting by application of control technology that is reasonably available, as determined by the Department, considering technological and economic feasibility. If control technology is not feasible, the emission standard may be based on the application of a design, equipment, work practice or operational requirement, or combination thereof (Rules Section 007.16).

<u>T-RACT Submittal Requirements</u>

☐ The applicant shall submit the following information to the Department identifying and documenting which control technologies or other requirements the applicant believes to be T-RACT (Rules Section 210.14).

The technical feasibility of a control technology or other requirements for a particular source shall be determined considering several factors including but not limited to:

☐ Process and operating procedures, raw materials and physical plant layout.

☐ The environmental impacts caused by the control technology that can not be mitigated, including but not limited to, water pollution and the production of solid wastes.

☐ The energy requirements of the control technology.

The economic feasibility of a control technology or other requirement, including the costs of necessary mitigation measures, for a particular source shall be determined considering several factors including, but not limited to:

☐ Capital costs.

☐ Cost effectiveness, which is the annualized cost of the control technology divided by the amount of emission reduction.

☐ The difference in costs between the particular source and other similar sources, if any, that have implemented emissions reductions.

☐ Compare the source's or modification's approved T-RACT ambient concentration to the applicable acceptable ambient concentration increment listed in Rules Section 586 multiplied by a factor of 10. If the sources approved T-RACT concentration is less than or equal to 10 times the applicable acceptable ambient concentration increment listed in Rules Section 586, no further procedures for demonstrating preconstruction compliance will be required.

☐ If an application is submitted to the Department without T-RACT and determined complete, and T-RACT is later determined to be applicable the completeness determination of the application will be revoked until a supplemental application is submitted and determined complete. When the supplemental application is determined complete, the timeline for agency action shall be reinitiated (Rules Section 210.13.b).

☐ If the Department determines that the source has proposed T-RACT, the Department shall develop emission standards to be incorporated into a permit to construct.

In some instances, the Department may consider a throughput limit or other inherently limiting operational restriction in a permit as an effective emission limit for the TAP, rather than including a specific emission rate limit..

H. TAP Compliance Using the Short Term Source Factor (Rules Section 210.15)

☐ For short term sources, the applicant may utilize a short term adjustment factor of ten (10) only for a carcinogenic pollutant listed in Rules Section 586. For a carcinogen listed in Rules Section 586 multiply either the applicable acceptable ambient concentration increment or the screening emission rate (EL), but not both, by ten (10) to demonstrate preconstruction compliance (Rules Section 210.15).

☐ A short term source is any new stationary source or modification to an existing source, with an operational life no greater than five (5) years from the inception of any operations to cessation of actual operations (Rules Section 210.15).

I. TAP Compliance for Environmental Remediation Sources (Rules Section 210.16)

☐ For remediation sources subject to or regulated by the Resource Conservation and Recovery Act and the Idaho Rules and Standard for Hazardous Waste, or the comprehensive Environmental Response, Compensation and Liability Act or a consent order, if the estimated ambient concentration is greater than the acceptable ambient impact increment listed in Rules Section 585 and

586, Best Available Control Technology shall be applied and operated until the estimated uncontrolled emission from the remediation source are below the applicable acceptable ambient concentration increment (Rules Section 210.16).

J. <u>TAP Compliance Using Offset Ambient Concentration (Rules Section 210.11)</u>

☐ Contact the Department prior to proposing to utilize Offset Ambient Concentrations to demonstrate preconstruction compliance.

☐ Emission offsets must satisfy the requirements for emission reduction credits (Rules Section 460).

- The proposed level of allowable emissions must be less than the actual emissions of the emissions units providing the offsets (Rules Section 460.01).
- An air quality permit must be issued that restricts the potential to emit of the emission unit providing the offset.
- Emission reduction imposed by local, state or federal regulations or permits shall not be allowed.

☐ Compare the source's or modifications approved emission offset ambient concentration to the applicable acceptable ambient concentration listed in Rules Section 585 and 586. If the source's or modifications approved offset concentration is less than the acceptable ambient concentration listed in Rules Section 585 and 586, no further procedures for demonstrating preconstruction compliance will be required.

☐ The Department shall include emission limits and other permit terms for the TAP in the permit to construct that will assure that the facility will be operated in the manner described in the preconstruction compliance demonstration (Rules Section 210.10.d).

APPENDIX C - CALCULATIONS

Emissions Summary
Lab Scale Thermal Beneficiation

ROTARY KILN PROJECT UNCONTROLLED EMISSIONS TONS/YEAR											Mercury Rule lb/yr
PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	SO_X	CO	CO_2	F^-	Pb	HAP	
3.01	0.24	0.11	0.01	6.69E-04	0.08	4.10E-03	12.35	0.01	1.28E-05	1.09E-03	1.02E-02

ROTARY KILN PROJECT DESIGN EMISSIONS TONS/YEAR											Mercury Rule lb/yr
PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	SO_X	CO	CO_2	F^-	Pb	HAP	
4.12E-05	3.35E-06	1.54E-04	1.92E-03	9.17E-05	1.11E-02	5.61E-04	1.69	1.49E-03	1.75E-06	3.46E-07	1.39E-03

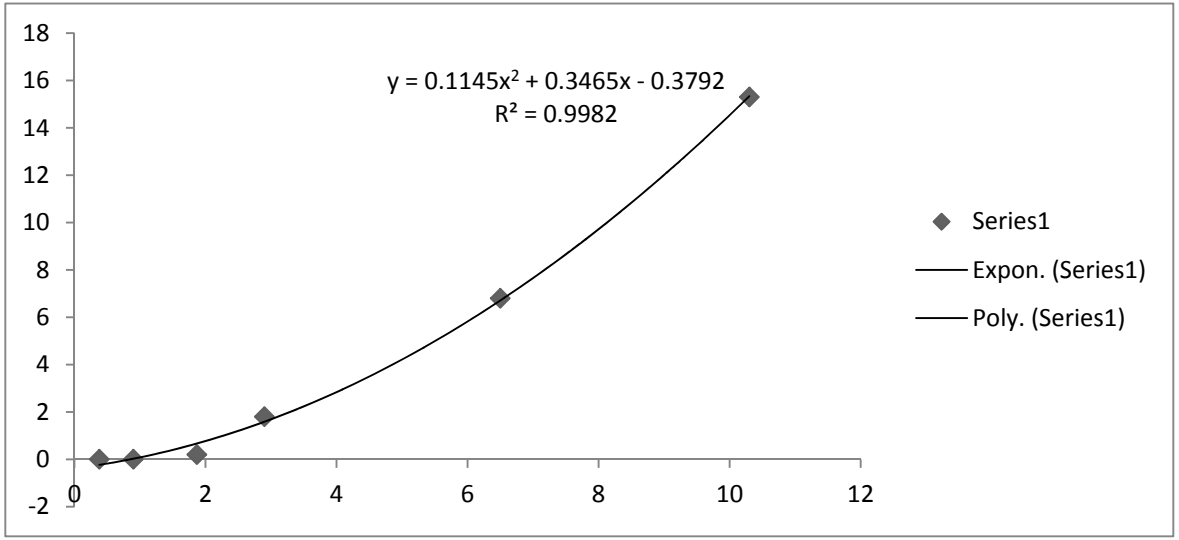
ROTARY KILN PROJECT DESIGN EMISSIONS POUNDS/HR										
PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	SO_X	CO	CO_2	F^-	Pb	HAP
3.72E-07	1.39E-07	3.73E-07	4.41E-06	2.11E-07	2.55E-05	1.29E-06	3.89E-03	3.43E-06	4.03E-09	7.96E-10

Comparison to Modeling Thresholds
Lab Scale Thermal Beneficiation

Pollutant	Level I	Level II	Units	Project	Status
CO	15	175	PPH	1.29E-06	< L1
NO_X	1.2	14	TPY	1.92E-03	< L1
	0.2	2.4	PPH	4.41E-06	< L1
SO_2	1.2	14	TPY	1.11E-02	< L1
	0.21	2.5	PPH	2.55E-05	< L1
PM_{10}	0.22	2.6	PPH	1.40E-05	< L1
$PM_{2.5}$	0.35	4.1	TPY	1.54E-04	< L1
	0.054	0.63	PPH	3.73E-07	< L1

Particle Size Distribution Emission Factor Calculation
Lab Scale Thermal Beneficiation

Cut Size (μ)	Percent Less Than
0.38	0
0.90	0
1.87	0.2
2.90	1.8
6.50	6.8
10.3	15.3
2.5	1.9



Goal Seek	Diameter	Percent
PM 10	10.000	8.127146
PM2.5	2.499071	3.723832
PM+PM10		96.27617

GREEN BAY DATA (Uncontrolled)

$$E = k(0.0032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (pound [lb]/ton)}$$

where:

E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s) (miles per hour [mph])
M = material moisture content (%)

Where:				lb/ton
	KPM =	0.74		**1.21E-04**
	KPM10 =	0.35		**5.71E-05**
	KPM2.5 =	0.053		**8.64E-06**
	U =	1.3	MPH	(Lowest value from AP-42 for use in-doors)
	M =	4.8	%	(Highest value from AP-42 - comes out of ground > 10%)

Assumptions for Calculation
Lab Scale Thermal Beneficiation

Thermal Beneficiation

1 Once the phosphate ore reaches a certain temperature, it will sustain combustion. There is no need for an additional combustion source to operate continuously.

2 Emissions sampled during the FEECO test include natural gas combustion emissions which have been used for the emissions estimate. There is no additional combustion source associated with the bench-scale test.

3 The Smoky Ore speciation numbers were only used for constituents where there was no additional information provided by Jacobs

4 Used a polynomial equation rather than the linear equation Jacobs used because it yielded a better r^2 value (based on FEECO test)

5 Moisture content of 10.5% was provided by mine for use on Dairy Syncline permitting

6 Each batch takes 2 hours

Assumptions for Calculation
Lab Scale Thermal Beneficiation

Air coming from the EMTD lab kiln will be cooled with ambient air and pulled into a baghouse.

The reason for the dilution air is two-fold. The first reason is to draw all the process gas from the kiln unit so it goes in a controlled inside the lab. There is no positive air draw on the kiln, as it does not have an integral blower. The second reason for the air flow is to get the temperature of the gas down to a point that it does not melt the ducting. Estimate gas/air temperature is as follows:

Basis:

Total: 100 cfm total air/gas flow
Kiln Gas: 5 cfm kiln gas; Molecular weight (MW) of kiln gas is CO_2 = 44#/mol; Temperature (T) of the kiln gas is 750-1,500 F,
Air Draw: 95 cfm air, MW of air = 29#/mol, Temperature of the air is 70 F

Determine mass of kiln gas: PV=nRT; n= PV/(RT);
m=n(MW); where P=pressure (psia); V=volume (cfm); R=ideal gas constant (10.73 ft3/psia/#mol R); T=Temperature (R); n=#mol; MW=molecular weight; m=mass #

m=n*(MW)=PV/RT*(MW)= (12.5 psia*5 cfm)/(10.73*(750+460))*44= 0.212 # gas/min

Determine mass of air: m=(12.5*95)/(10.73*(70+460)) * 29 = 6.056 # air/min

Total Air/Gas mass: 0.212+6.056 = 6.268 #/min

Determine Air/Gas blend temperature:

Gas mass fraction * Gas Temperature + Air mass fraction * Air Temperature
(0.212/6.268)*750 F + (6.056/6.268)*70 = 93 F blend temperature
(0.212/6.268)*1500 F + (6.056/6.268)*70 = 118 F blend temperature

Therefore, the expected range of the exit gas/air stream reporting to the baghouse is 93-118 F based on 100 cfm total flow.
The gas air flow is conservative and won't be this high (5 cfm), so temperatures are not expected to exceed this.

HAP Analysis
Lab Scale Thermal Beneficiation

Organics from FEECO Test

Constituent	(lb/hr) @ 11.5 lb/hr	(lb/ton)	TAP/HAP
Dichlorodifluoromethane	3.61E-08	6.28E-06	
Chloromethane	2.50E-07	4.35E-05	TAP/HAP
Vinyl Chloride	1.43E-08	2.48E-06	TAP/HAP
Bromomethane	8.10E-08	1.41E-05	TAP/HAP
Methylene Chloride	4.31E-08	7.49E-06	TAP/HAP
Benzene	4.13E-07	7.18E-05	TAP/HAP
Toluene	1.19E-07	2.06E-05	TAP/HAP
Ethylbenzene	6.52E-09	1.13E-06	TAP/HAP
Xylenes	6.16E-08	1.07E-05	TAP/HAP
Styrene	3.04E-09	5.29E-07	TAP/HAP
Chloroethane	1.80E-08	3.13E-06	TAP/HAP
Chlorobenzene	2.16E-08	3.76E-06	TAP/HAP
Isopropylbenzene (Cumene)	8.44E-08	1.47E-05	TAP/HAP
1,1,2,2-Tetrachloroethane	9.24E-09	1.61E-06	TAP/HAP
n-Propylbenzene	3.27E-09	5.69E-07	
1,3,5-Trimethylbenzene	6.33E-08	1.10E-05	
4-Chlorotoluene	8.50E-09	1.48E-06	
tert/sec-Butylbenzene	1.82E-09	3.17E-07	
p-isopropyltoluene	6.16E-09	1.07E-06	
n-Butylbenzene	1.20E-08	2.08E-06	
Napthalene	2.83E-08	4.93E-06	TAP/HAP
TOTAL ORGANIC HAPS	1.15E-06	2.00E-04	lb/ton

Calculations

lb/hr @11.5 = ER (lb/hr $_{@\ 201.7\ lb/hr}$) x 11.5 (lb/hr)/201.7 (lb/hr)

lb/ton = ER (lb/hr $_{@\ 201.7\ lb/hr}$) X 1/0.100833 (hr/ton)

HAP Analysis
Lab Scale Thermal Beneficiation

Other HAPs from FEECO

Constituent

FEECO Emission Test Data

Test Parameter	Average Emission Rate Un-controlled (lb/hr) (@11.5 lb/hr)	Sreening Limit (lb/hr)	Status	Emission Rate Controlled (lb/hr)(@ 11.5 lb/hr)lb/hr	Status
Metals - Antimony	2.54E-06	3.30E-02	Okay	1.43E-09	OKAY
Metals - Arsenic	4.77E-05	1.50E-06	4.77E-05	2.68E-08	OKAY
Metals - Beryllium	2.69E-06	2.80E-05	Okay	1.51E-09	OKAY
Metals - Cadmium	8.61E-04	3.70E-06	8.61E-04	4.84E-07	OKAY
Metals - Chromium	5.41E-04	3.30E-02	Okay	3.04E-07	OKAY
Metals - Cobalt	4.11E-06	3.30E-03	Okay	2.31E-09	OKAY
Metals - Lead	7.30E-06	NA	NA		
Metals - Manganese	1.03E-04	3.33E-01	Okay	5.81E-08	OKAY
Metals - Mercury	1.16E-06	7.00E-03	NA		
Metals - Nickel	7.62E-05	2.70E-05	7.62E-05	4.28E-08	OKAY
Metals - Selenium	4.50E-05	1.30E-02	Okay	2.53E-08	OKAY
Metals - Zinc	2.94E-03	6.67E-01	Okay	1.65E-06	OKAY
Fluoride	6.22E-03	1.67E-01	Okay	3.50E-06	OKAY

TOTAL HAPS	1.08E-02	lb/hr
	1.08E-01	lb/ton

Lab Scale Thermal Beneficiation

Potential to Emit Kiln Loading/Unloading

Parameter		Value	Units	Source/Basis
Emission Unit(s) ID				
Potential Production Data				
Production Factor	=	20.1	ton/yr	= 23 (lb/2-hr)/ 2000 (lb/ton) x 8760 hr/yr x 0.40 1 load & 1 unload
Emission Data & Factors				
PM Emission Factor	=	1.21E-04	lb/ton	AP-42 13.2.4-4 (11/06)
PM_{10} Emission Factor	=	5.71E-05	lb/ton	AP-42 13.2.4-4 (11/06)
$PM_{2.5}$ Emission Factor	=	8.64E-06	lb/ton	AP-42 13.2.4-4 (11/06)

$$E = k(0.0032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (pound [lb]/ton)}$$

where:

E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s) (miles per hour [mph])
M = material moisture content (%)

Annual Emissions Calculations					
PM Potential to Emit	=	2.43E-06	TPY	= 2 x PF x EF / 2000 lb/ton	Factor of 2 supplied to cover load & unload transitions
PM_{10} Potential to Emit	=	1.15E-06	TPY	= 2 x PF x EF / 2000 lb/ton	
$PM_{2.5}$ Potential to Emit	=	1.74E-07	TPY	= 2 x PF x EF / 2000 lb/ton	

Summary of Results

	Potential To Emit (Tons/Year)		
	PM	**PM_{10}**	**$PM_{2.5}$**
	2.43E-06	1.15E-06	1.74E-07

Lab Scale Thermal Beneficiation

Project Design Kiln Loading/Unloading

Parameter		Value	Units	Source/Basis
Emission Unit(s) ID				
Potential Production Data				
Production Factor	=	2.8	ton/yr	= (23 lb/2-hr) x 1200 (hr/yr) / 2000 (lb/ton) x 0.40 1 load & 1 unload
Emission Data & Factors				
PM Emission Factor	=	1.21E-04	lb/ton	AP-42 13.2.4-4 (11/06)
PM_{10} Emission Factor	=	5.71E-05	lb/ton	AP-42 13.2.4-4 (11/06)
$PM_{2.5}$ Emission Factor	=	8.64E-06	lb/ton	AP-42 13.2.4-4 (11/06)
Annual Emissions Calculations				
PM Potential to Emit	=	3.33E-07	TPY	= 2 x PF x EF / 2000 lb/ton
PM_{10} Potential to Emit	=	1.58E-07	TPY	= 2 x PF x EF / 2000 lb/ton
$PM_{2.5}$ Potential to Emit	=	2.39E-08	TPY	= 2 x PF x EF / 2000 lb/ton

$$E = k(0.0032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (pound [lb]/ton)}$$

where:

E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s) (miles per hour [mph])
M = material moisture content (%)

Factor of 2 supplied to cover load & unload transitions

Summary of Results

	Potential To Emit (Tons/Year)		
	PM	**PM_{10}**	**$PM_{2.5}$**
	3.33E-07	1.58E-07	2.39E-08

	Controlled Emissions (Pounds per Hour)		
	PM	**PM_{10}**	**$PM_{2.5}$**
0.40 x 23 (lb)/2 (hr) x 1 (ton)/2000 (lb) X EF (lb/ton) =	2.78E-07	1.31E-07	1.99E-08

Kiln Potential to Emit

Parameter		Value	Units	Source/Basis	
Emission Unit(s) ID					
Potential Production Data					
Production Factor	=	20.1	ton/yr	= 23 (lb/2-hr)/ 2000 (lb/ton) x 8760 hr/yr x 0.40	To get adequate air flow and mixing only 40% of kiln is utilized
Emission Data & Factors					
PM Emission Factor	=	299	lb/ton	FEECO Test Report	Includes emissions associated with combustion source which is not part of this project
PM_{10} Emission Factor	=	24.28	lb/ton	FEECO Test Report - interpolated	
$PM_{2.5}$ Emission Factor	=	11.12	lb/ton	FEECO Test Report - interpolated	
NO_X Emission Factor	=	1.39	lb/ton	FEECO Test Report	
VOC Emission Factor	=	0.07	lb/ton	FEECO Test Report	
SO_X Emission Factor	=	8.02	lb/ton	FEECO Test Report	
CO Emission Factor	=	0.41	lb/ton	FEECO Test Report	
CO_2 Emission Factor	=	1,226	lb/ton	FEECO Test Report	
F^- Emission Factor	=	1.08	lb/ton	FEECO Test Report	
Pb Emission Factor	=	1.27E-03	lb/ton	FEECO Test Report	
HAP Emission Factor	=	1.08E-01	lb/ton	FEECO Test Report (Sum of HAPs)	= Σ organic HAPs + Σ other HAPS
Annual Emissions Calculations					
PM Potential to Emit	=	3.01	TPY	= PFxEF/2000 lb/ton	
PM_{10} Potential to Emit	=	0.24	TPY	= PFxEF/2000 lb/ton	
$PM_{2.5}$ Potential to Emit	=	0.11	TPY	= PFxEF/2000 lb/ton	
NO_X Potential to Emit	=	0.01	TPY	= PFxEF/2000 lb/ton	
VOC Potential to Emit	=	6.69E-04	TPY	= PFxEF/2000 lb/ton	
SO_X Potential to Emit	=	8.08E-02	TPY	= PFxEF/2000 lb/ton	
CO Potential to Emit	=	4.10E-03	TPY	= PFxEF/2000 lb/ton	
CO_2 Potential to Emit	=	12.35	TPY	= PFxEF/2000 lb/ton	
F^- Potential to Emit	=	0.01	TPY	= PFxEF/2000 lb/ton	
Pb Potential to Emit	=	1.28E-05	TPY	= PFxEF/2000 lb/ton	
HAP Potential to Emit	=	1.09E-03	TPY	= PFxEF/2000 lb/ton	

Kiln dimensions: 6" diam x 14 inches long.

Volume: 0.23 ft3
Density: 100 #/ft3
Mass = Vol X Density = 23 # total.
Batch Time: 2 hours; 1200 hrs/yr

Summary of Results

Potential to Emit (Tons per Year)										
PM	**PM_{10}**	**$PM_{2.5}$**	**NO_X**	**VOC**	**SO_X**	**CO**	**CO_2**	**F^-**	**Pb**	**HAP**
3.01	0.24	0.11	0.01	6.69E-04	0.08	4.10E-03	12.35	0.01	1.28E-05	1.09E-03

Lab Scale Thermal Beneficiation

Kiln Controlled Emissions

Parameter		Value	Units	Source/Basis			
Emission Unit(s) ID							
Potential Production Data							
Production Factor	=	2.8	ton/yr	= (23 lb/2-hr) x 1200 (hr/yr) / 2000 (lb/ton) x 0.40	To get adequate air flow and mixing only 40% of kiln is utilized		
Emission Data & Factors							
PM Emission Factor	=	299	lb/ton	FEECO Test Report	Includes some emissions associated with combustion source		
PM_{10} Emission Factor	=	24.28	lb/ton	FEECO Test Report - interpolated			
$PM_{2.5}$ Emission Factor	=	11.12	lb/ton	FEECO Test Report - interpolated			
NO_X Emission Factor	=	1.39	lb/ton	FEECO Test Report			
VOC Emission Factor	=	0.07	lb/ton	FEECO Test Report			
SO_X Emission Factor	=	8.02	lb/ton	FEECO Test Report			
CO Emission Factor	=	0.41	lb/ton	FEECO Test Report			
CO_2 Emission Factor	=	1,226.00	lb/ton	FEECO Test Report			
F^- Emission Factor	=	1.08	lb/ton	FEECO Test Report			
Pb Emission Factor	=	1.27E-03	lb/ton	FEECO Test Report			
HAP Emission Factor	=	2.51E-04	lb/ton	FEECO Test Report (Sum of $HAP_{controlled}$ + Sum of $HAP_{uncontrolled}$)			
Annual Emissions Calculations							
PM Controlled Emissions	=	4.12E-05	TPY	= CE xPFxEF/2000 lb/ton	Assume filter efficency	99.99	Manufacturer PM & PM_{10}
PM_{10} Controlled Emissions	=	3.35E-06	TPY	= CE xPFxEF/2000 lb/ton			
$PM_{2.5}$ Controlled Emissions	=	1.54E-04	TPY	= CE xPFxEF/2000 lb/ton	Lowest from EPA-452/F-03-026		
NO_X Controlled Emissions	=	1.92E-03	TPY	= PFxEF/2000 lb/ton			
VOC Controlled Emissions	=	9.17E-05	TPY	= PFxEF/2000 lb/ton			
SO_X Controlled Emissions	=	1.11E-02	TPY	= PFxEF/2000 lb/ton			
CO Controlled Emissions	=	5.61E-04	TPY	= PFxEF/2000 lb/ton			
CO_2 Controlled Emissions	=	1.69	TPY	= PFxEF/2000 lb/ton	No control for CO_2		
F^- Controlled Emissions	=	1.49E-03	TPY	= PFxEF/2000 lb/ton			
Pb Controlled Emissions	=	1.75E-06	TPY	= PFxEF/2000 lb/ton			
HAP Controlled Emissions	=	3.46E-07	TPY	= PFxEF/2000 lb/ton	Control taken above		

Kiln dimensions: 6" diam x 14 inches long.

Volume: 0.23 ft3
Density: 100 #/ft3
Mass = Vol X Density = 23 # total.
Batch Time: 2 hours; 1200 hrs/yr

Summary of Results

	Controlled Emissions (Tons per Year)										
	PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	SO_X	CO	CO_2	F^-	Pb	HAP
	4.12E-05	3.35E-06	1.54E-04	1.92E-03	9.17E-05	1.11E-02	5.61E-04	1.69E+00	1.49E-03	1.75E-06	3.46E-07

	Controlled Emissions (Pounds per Hour)										
	PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	SO_X	CO	CO_2	F^-	Pb	HAP
0.40 x 23 (lb)/2 (hr) x 1 (ton)/2000 (lb) X EF (lb/ton) =	9.48E-08	7.71E-09	3.53E-07	4.41E-06	2.11E-07	2.55E-05	1.29E-06	3.89E-03	3.43E-06	4.03E-09	7.96E-10
										3.00E-06 lb/month	

Wisconsin Emissions Test
Lab Scale Thermal Beneficiation

FEECO Emission Test Data				
Test Parameter	Test Location	Average Concentration	Average Emission Rate Un-controlled (lb/hr)	Average Emission Rate Uncontrolled (lb/ton)
Particulate Matter	Kiln Duct	11.93 gr/dscf	30.12	298.71
Silica (quartz)	Kiln Duct	0.53 % (1)	0.16	1.59
Metals - Antimony	Kiln Duct	0.0414 mg/m3	4.46E-05	4.42E-04
Metals - Arsenic	Kiln Duct	0.778 mg/m3	8.37E-04	8.30E-03
Metals - Beryllium	Kiln Duct	0.0438 mg/m3	4.72E-05	4.68E-04
Metals - Cadmium	Kiln Duct	14.03 mg/m3	1.51E-02	1.50E-01
Metals - Chromium	Kiln Duct	8.815 mg/m3	9.49E-03	9.41E-02
Metals - Cobalt	Kiln Duct	0.0668 mg/m3	7.20E-05	7.14E-04
Metals - Lead	Kiln Duct	0.119 mg/m3	1.28E-04	1.27E-03
Metals - Manganese	Kiln Duct	1.684 mg/m3	1.81E-03	1.80E-02
Metals - Mercury	Kiln Duct	0.01887 mg/m3	2.03E-05	2.02E-04
Metals - Nickel	Kiln Duct	1.241 mg/m3	1.34E-03	1.32E-02
Metals - Selenium	Kiln Duct	0.733 mg/m3	7.89E-04	7.82E-03
Metals - Zinc	Kiln Duct	47.898 mg/m3	5.16E-02	5.11E-01
Carbon Monoxide	Kiln Duct	33 ppm	0.041	0.41
Sulfur Dioxide	Kiln Duct	282 ppm	0.809	8.02
Nitrogen Oxides	Kiln Duct	66 ppm	0.14	1.39
Total VOCs	Kiln Duct	3.4 ppm (2)	0.0067	0.07
Fluoride	Kiln Duct	101 mg/m3	0.109	1.08
Phosphate	Kiln Duct	0.87 mg/m3	0.00093	0.01

Average Feed During Test				201.6667	lb/hr
				0.100833	ton/hr
lb	x	hr	=	lb	
hr		tons		ton	

APPENDIX D – WISCONSIN STACK TEST

Report to

FEECO INTERNATIONAL
Green Bay, Wisconsin

for

Air Emissions Testing

of the

PHOSPHATE ORE PILOT KILN

April 27, 2012

ETE

Report to

FEECO INTERNATIONAL
Green Bay, Wisconsin

for

Air Emissions Testing

of the

PHOSPHATE ORE PILOT KILN

April 27, 2012

Michael J. Huenink
Industrial Hygienist
June 5, 2012

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EXECUTIVE SUMMARY

On April 27, 2012, Environmental Technology & Engineering Corp (ETE) personnel visited the FEECO International facility in Green Bay, Wisconsin. The purpose of the visit was to perform air emissions testing on a pilot kiln exhaust duct and final discharge stack while processing a phosphate ore material. The testing was performed to obtain potential emissions information for a number of targeted compounds.

The results of the testing are summarized in the following table:

Test Parameter	Test Location	Average Concentration	Average Emission Rate
Particulate Matter	Kiln Duct	11.93 gr/dscf	30.12 lb/hr
	Final Stack	0.0006 gr/dscf	0.014 lb/hr
Silica (quartz)	Kiln Duct	0.53 % (1)	0.16 lb/hr
Metals - Antimony	Kiln Duct	0.0414 mg/m3	0.0000446
Metals - Arsenic	Kiln Duct	0.778 mg/m3	0.000837
Metals - Beryllium	Kiln Duct	0.0438 mg/m3	0.0000472
Metals - Cadmium	Kiln Duct	14.03 mg/m3	0.0151
Metals - Chromium	Kiln Duct	8.815 mg/m3	0.009491
Metals - Cobalt	Kiln Duct	0.0668 mg/m3	0.000072
Metals - Lead	Kiln Duct	0.119 mg/m3	0.000128
Metals - Manganese	Kiln Duct	1.684 mg/m3	0.001813
Metals - Mercury	Kiln Duct	0.01887 mg/m3	0.00002033
Metals - Nickel	Kiln Duct	1.241 mg/m3	0.001336
Metals - Selenium	Kiln Duct	0.733 mg/m3	0.000789
Metals - Zinc	Kiln Duct	47.898 mg/m3	0.051564
Carbon Monoxide	Kiln Duct	33 ppm	0.041
Sulfur Dioxide	Kiln Duct	282 ppm	0.809
Nitrogen Oxides	Kiln Duct	66 ppm	0.14
Total VOCs	Kiln Duct	3.4 ppm (2)	0.0067
Fluoride	Kiln Duct	101 mg/m3	0.109
Phosphate	Kiln Duct	0.87 mg/m3	0.00093

Notes: (1) Silica (quartz) is reported as a percentage of particulate levels
(2) ppm means parts per million, as compared to propane per EPA Method 25A
gr/dscf means grains per dry standard cubic foot of exhaust air
mg/m3 means milligrams per cubic meter
lb/hr means pounds per hour

1.0 GENERAL

On April 27, 2012, Environmental Technology & Engineering Corp (ETE) personnel visited the FEECO International facility located in Green Bay, Wisconsin. The purpose of the visit was to perform air emissions testing on a pilot kiln operation during the processing of phosphate ore.

Testing for a number of targeted compounds was performed at the kiln exhaust duct. The test location was in the exhaust duct immediately following the kiln and prior to any emission control equipment. A sketch of that sampling location is included as Figure 1-1. Additional testing to determine particulate levels was also performed in the final exhaust stack following emissions control devices; a sketch showing that sampling location is included as Figure 1-2. Testing occurred at the following times:

Test 1 -	11:25 - 12:25
Test 2 -	13:30 - 14:30
Test 3 -	15:25 - 16:25

The test team remained in close contact with production personnel throughout the test efforts. Mr. Mike Weinecke of FEECO International facilitated in the coordination of the production conditions and field test efforts. The field test and analytical efforts (except as noted) were performed by ETE personnel; Michael Huenink was the test team leader. The VOC speciation analysis was performed by Data Analysis Technologies, Inc. (DAT) of Plain City, Ohio. The metals analysis was performed by SF Analytical Labs of New Berlin, Wisconsin. The fluoride, phosphate, and silica analysis was performed by the Wisconsin Occupational Health Lab of Madison, Wisconsin.

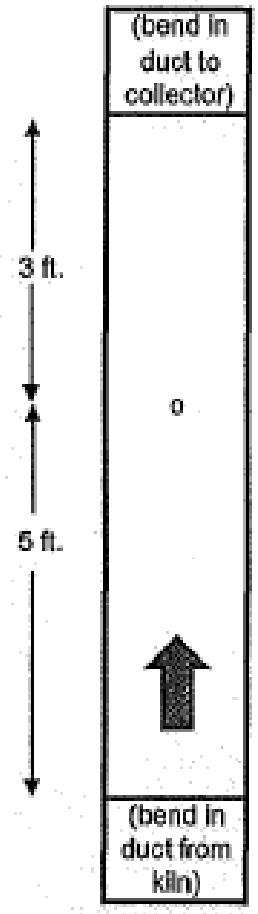
FEECO - GREEN BAY, WI
PILOT KILN VENT

FIGURE 1-1

VELOCITY POINT LOCATIONS

Point	Distance (in.) from back wall
1	0.4
2	1.2
3	2.4
4	5.6
5	6.8
6	7.6

SAMPLE PORT LOCATION



Duct Dimensions: 8.0 in. (stack runs horizontally at sampling location)

Notes: 12 sampling points used on this round duct; 6 points along each of two perpendicular traverses.

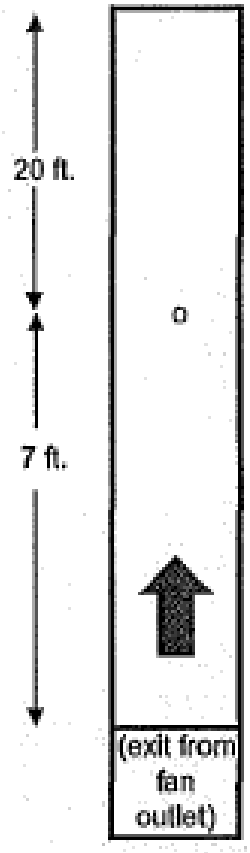
FEECO - GREEN BAY, WI
PILOT KILN - FINAL EXHAUST STACK

FIGURE 1-2

VELOCITY POINT LOCATIONS

Point	Distance (in.) from back wall
1	0.5
2	1.5
3	2.6
4	3.9
5	5.5
6	7.8
7	14.2
8	16.5
9	18.1
10	19.4
11	20.5
12	21.5

SAMPLE PORT LOCATION



Duct Dimensions: 22 in. (stack runs vertically at sampling location)

Notes: 24 sampling points used on this round stack; 12 points along each of two perpendicular traverses.

2.0 RESULTS

2.1 Particulate Results, Particle Size Distribution, & Silica Content

Testing to determine particulate levels at the kiln duct and final exhaust stack was performed simultaneously using EPA Method 5. A brief description of the sampling and analytical methods is included in Section 3.1 of this report.

The stack flow parameters measured during testing and the weights of the particulate collected were used to determine the particulate levels for each test. Three separate one hour tests were performed simultaneously at the kiln exhaust duct and the final exhaust stack. The detailed particulate results for the kiln duct are included as Tables 2-1 through 2-3; the results for the final exhaust stack are included as Tables 2-4 through 2-6. The particulate results are summarized in the following table:

Test	Kiln Duct Particulate Levels	Final Stack Particulate Levels
1	34.23 lb/hr	0.013 lb/hr
2	27.31 lb/hr	0.014 lb/hr
3	28.83 lb/hr	0.016 lb/hr
AVG	**30.12 lb/hr**	**0.014 lb/hr**

Testing to characterize the particle size distribution of the particulate emissions was also performed. The testing was performed at both the kiln duct and final stack sampling locations. The testing was performed using an EPA Method 201A approach (constant sampling rate) and an Anderson Mark II cascade impactor. The testing collected particles on a set of filters, with each filter representing a different particle "cut" size.

This type of testing targets airborne particulates in the size range of 0 to 10 microns. It should be noted that there was a significant amount of large (much greater than 10 microns) particulate matter which was carried out of the kiln and settled out in the kiln duct and subsequent emissions control equipment. This material comprised approximately 80 percent (by weight) of the particulates measured at the kiln duct sampling location. Therefore, the particle size distribution data for the kiln duct represents about 20 percent of the material passing through that duct. The particle size data for the kiln duct is summarized in the following table:

Test Location	Filter "Cut" Size, Microns	Percent, by weight, less than the cut size
Kiln Duct	0.38	0 %
	0.90	0 %
	1.87	0.2 %
	2.90	1.8 %
	6.50	6.8 %
	10.3	15.3 %

2.1 (continued)

The particle size data for the final exhaust stack is summarized in the following table:

Test Location	Filter "Cut" Size, Microns	Percent, by weight, less than the cut size
Final Stack	0.35	0 %
	0.87	9.1 %
	1.72	36.4 %
	2.73	54.5 %
	5.92	81.8 %
	9.45	100 %

The particle size distribution data is plotted in Figures 2-1 (kiln vent) and 2-2 (final exhaust stack).

Separate particulate samples were collected at the kiln duct to allow for analysis of silica. Exhaust gas was drawn (at a constant sampling rate throughout each test hour) through a stainless steel probe and heated PVC filters to capture the filterable dust. The samples were then submitted for X-ray diffraction analysis based upon OSHA Method ID 142. The analysis yields a percent silica (quartz) results for the material collected on the filter. The results were as follows:

Test 1 - 0.83 % quartz
Test 2 - 0.32 % quartz
Test 3 - 0.43 % quartz

2.2 Metals Results

Testing to determine twelve select metals emissions was performed using EPA Method 29 at the kiln exhaust. A brief description of this method is included in Section 3.2 of this report. This testing was integrated with the particulate testing in that the particulate emissions were also determined from this sampling train. Following determination of the particulate weights, the filter and wash residues were re-suspended in concentrated acid and analyzed for metal content along with the other portions of each test run.

The stack flow parameters measured during testing and the weights of the various metals collected were used to determine the metals emissions for each test. The detailed isokinetic data and exhaust flow calculations were included in Tables 2-1, 2-2, and 2-3 of this report. The results of the metals testing are included in Table 2-7 (2 pages total). Of the twelve targeted metals, zinc was found at the highest level, with cadmium and chromium following in prominence.

2.3 CO, SO_2, & NOx Results

Testing to determine carbon monoxide (CO), sulfur dioxide (SO_2), and nitrogen oxides (NOx) levels was performed using a direct reading analyzer. A brief discussion of the method and sampling train is included in Section 3.3. The readings taken over each test hour were averaged for determining hourly emissions. The testing was performed concurrently with the particulate test efforts and the exhaust air flow rates measured during those efforts were used in the calculations. The various results are included in Tables 2-8 (CO), 2-9 (SO_2), and 2-10 (NOx).

2.4 VOC Results & Species Information

Testing to determine volatile organic compound (VOCs) levels at the kiln duct was performed using EPA Method 25A (further described in Section 3.4). The testing was performed concurrently with the particulate test efforts and the exhaust air flow rates measured during those efforts were used in the VOC calculations. The results of the VOC testing are included as Table 2-11.

EPA Method 25A is a "total response" measurement method which quantifies all of the combined organics that are detected by the instrument as a single sum. In order to determine the character of those organic compounds, additional sampling was performed using an approach based upon EPA Method 18 - Absorption Tube Sampling Procedures. The method is described further in Section 3.4 of this report. The testing was performed at a single point in the center of the stack. The testing was performed at the same time as the other test efforts and the exhaust gas flows measured during the particulate testing were also used in these emissions calculations. The results of the testing are included in Tables 2-12 through 2-14. Those results indicated the presence of about twenty different organic compounds in the samples. However, the method is highly sensitive and the possibility of trace amounts of these compounds being present near the test area, during transport, and in the lab could influence the sample results. In general, the VOC levels were very low and such influence could be significant.

2.5 Fluoride & Phosphate Results

Testing to determine fluoride and phosphate (ionic) levels was performed using sampling and analytical methods based on EPA Method 26 and NIOSH Method 7903 . A description of the sampling and analytical methods is included in Section 3.5 of this report. Again, the testing was performed concurrent with the other test efforts and the stack flow parameters measured during the test hours were used to determine the hourly emission levels for each test. The results for both fluoride and phosphate levels are included as Table 2-15.

FEECO - PILOT KILN | KILN OUTLET | 4/27/12 | TABLE 2-1

PM EMISSIONS

TEST NO.	1	
BAROMETRIC PRESSURE	29.55	IN HG
TIP DIAMETER	0.382	IN
STACK DIAMETER	8.0	IN
STACK AREA	0.349	FT3
SAMPLING TIME PER POINT	5	MIN
NUMBER OF POINTS	12	
METER VOLUME	42.45	FT3
PITOT COEFFICIENT	0.84	
METER COEFFICIENT	0.988	
PARTICULATE COLLECTED	36.4213	GRAMS
WATER COLLECTED	60	ML
STATIC PRESSURE	-0.35	IN H2O

ORSAT RESULTS

CO2	O2	CO	N2
6.10%	11.60%	0.00%	82.30%

POINT	STACK TEMP DEG F	DELTA P IN H2O	ORIFICE DEL P IN H2O	METER TEMP DEG F	VELOCITY AFPS
1	1055	0.18	1.35	59	40.89
2	1058	0.19	1.43	59	42.05
3	1059	0.20	1.50	60	43.18
4	1058	0.22	1.65	60	45.25
5	1058	0.20	1.50	62	43.14
6	1059	0.20	1.50	65	43.18
7	1055	0.19	1.43	70	42.01
8	1050	0.20	1.50	76	43.03
9	1047	0.22	1.65	82	45.08
10	1048	0.22	1.65	87	45.10
11	1049	0.22	1.65	90	45.11
12	1053	0.20	1.50	95	43.07
AVERAGE	1054		1.53	72	43.42

DRY STANDARD VOLUME	41.59	SCF		
PERCENT WATER VAPOR	8.30	% VOL		
FLOW RATE	909	ACFM		
	287	DSCFM		
	488	M3/HR		
PARTICULATE CONCENTRATION	13.51	GR/DSCF	4.26	GR/ACF
PARTICULATE EMISSION RATE	34.23	LB/HR		
LB PART PER 1000 LB GAS	24.74			
ISOKINETIC PERCENT	106.0			

FEECO - PILOT KILN | KILN OUTLET | 4/27/12 | TABLE 2-2

PM EMISSIONS

TEST NO.	2	
BAROMETRIC PRESSURE	29.55	IN HG
TIP DIAMETER	0.382	IN
STACK DIAMETER	8.0	IN
STACK AREA	0.349	FT3
SAMPLING TIME PER POINT	5	MIN
NUMBER OF POINTS	12	
METER VOLUME	42.01	FT3
PITOT COEFFICIENT	0.84	
METER COEFFICIENT	0.988	
PARTICULATE COLLECTED	28.9119	GRAMS
WATER COLLECTED	86	ML
STATIC PRESSURE	-0.35	IN H2O

ORSAT RESULTS

CO2	O2	CO	N2
6.30%	11.50%	0.00%	82.20%

POINT	STACK TEMP DEG F	DELTA P IN H2O	ORIFICE DEL P IN H2O	METER TEMP DEG F	VELOCITY AFPS
1	1048	0.20	1.50	90	43.04
2	1049	0.20	1.50	90	43.05
3	1045	0.21	1.58	90	44.05
4	1050	0.22	1.65	91	45.17
5	1053	0.22	1.65	91	45.21
6	1052	0.18	1.35	91	40.88
7	1052	0.19	1.43	92	42.00
8	1054	0.20	1.50	94	43.12
9	1053	0.22	1.65	96	45.21
10	1052	0.22	1.65	98	45.20
11	1050	0.22	1.65	100	45.17
12	1050	0.20	1.50	100	43.06
AVERAGE	1051		1.55	94	43.76

DRY STANDARD VOLUME	41.27	SCF		
PERCENT WATER VAPOR	8.93	% VOL		
FLOW RATE	917	ACFM		
	288	DSCFM		
	489	M3/HR		
PARTICULATE CONCENTRATION	10.81	GR/DSCF	3.40	GR/ACF
PARTICULATE EMISSION RATE	27.31	LB/HR		
LB PART PER 1000 LB GAS	19.58			
ISOKINETIC PERCENT	104.8			

FEECO - PILOT KILN | KILN OUTLET | 4/27/12 | TABLE 2-3

TEST NO.	3	
BAROMETRIC PRESSURE	29.55	IN HG
TIP DIAMETER	0.382	IN
STACK DIAMETER	8.0	IN
STACK AREA	0.349	FT3
SAMPLING TIME PER POINT	5	MIN
NUMBER OF POINTS	12	
METER VOLUME	41.76	FT3
PITOT COEFFICIENT	0.84	
METER COEFFICIENT	0.988	
PARTICULATE COLLECTED	30.4491	GRAMS
WATER COLLECTED	84	ML
STATIC PRESSURE	-0.30	IN H2O

ORSAT RESULTS

CO2	O2	CO	N2
6.30%	11.70%	0.00%	82.00%

POINT	STACK TEMP DEG F	DELTA P IN H2O	ORIFICE DEL P IN H2O	METER TEMP DEG F	VELOCITY AFPS
1	1058	0.20	1.50	86	43.16
2	1060	0.20	1.50	86	43.19
3	1058	0.22	1.65	86	45.26
4	1050	0.22	1.65	87	45.14
5	1045	0.22	1.65	89	45.07
6	1048	0.18	1.35	90	40.81
7	1050	0.18	1.35	91	40.83
8	1047	0.19	1.43	93	41.91
9	1045	0.21	1.58	95	44.03
10	1036	0.22	1.65	98	44.94
11	1034	0.22	1.65	100	44.90
12	1032	0.20	1.50	100	42.79
AVERAGE	1047		1.54	92	43.50

DRY STANDARD VOLUME	41.01	SCF		
PERCENT WATER VAPOR	8.79	% VOL		
FLOW RATE	911	ACFM		
	287	DSCFM		
	488	M3/HR		
PARTICULATE CONCENTRATION	11.46	GR/DSCF	3.61	GR/ACF
PARTICULATE EMISSION RATE	28.83	LB/HR		
LB PART PER 1000 LB GAS	20.72			
ISOKINETIC PERCENT	104.3			

FEECO - PILOT KILN | FINAL STACK | 4/27/2012 | TABLE 2-4

PM EMISSIONS

TEST NO.	1	
BAROMETRIC PRESSURE	29.55	IN HG
TIP DIAMETER	0.375	IN
STACK DIAMETER	22	IN
STACK AREA	2.640	FT3
SAMPLING TIME PER POINT	2.5	MIN
NUMBER OF POINTS	24	
METER VOLUME	57.14	FT3
PITOT COEFFICIENT	0.84	
METER COEFFICIENT	1.006	
PARTICULATE COLLECTED	0.0017	GRAMS
WATER COLLECTED	20	ML
STATIC PRESSURE	-0.07	IN H2O

ORSAT RESULTS

CO2	O2	CO	N2
0.60%	20.00%	0.00%	79.40%

TEST POINT	STACK TEMP DEG F	PITOT DEL P IN H2O	ORIFICE DEL P IN H2O	METER TEMP DEG F	STACK VELOCITY AFPS
1	78	0.17	1.36	51	23.58
2	78	0.19	1.52	52	24.93
3	79	0.16	1.28	54	22.89
4	79	0.12	0.96	54	19.83
5	79	0.10	0.80	56	18.10
6	80	0.07	0.56	56	15.16
7	80	0.09	0.72	55	17.19
8	80	0.16	1.28	55	22.92
9	80	0.20	1.60	56	25.62
10	80	0.20	1.60	58	25.62
11	80	0.20	1.60	60	25.62
12	79	0.15	1.20	62	22.17
13	79	0.04	0.32	64	11.45
14	80	0.05	0.40	67	12.81
15	81	0.05	0.40	68	12.82
16	82	0.05	0.40	68	12.83
17	82	0.04	0.32	69	11.48
18	82	0.04	0.32	69	11.48
19	81	0.12	0.96	69	19.86
20	80	0.24	1.92	69	28.07
21	80	0.30	2.40	69	31.38
22	81	0.42	3.36	70	37.16
23	81	0.37	2.96	71	34.88
24	80	0.29	2.32	73	30.85
AVERAGE	80	0.16	1.27	62	21.61

DRY STANDARD VOLUME	56.90	SCF
PERCENT WATER VAPOR	1.63	% VOL
FLOW RATE	3423	ACFM
	3251	DSCFM
	5524	M3/HR
PARTICULATE CONCENTRATION	0.0005	GR/DSCF
PARTICULATE EMISSION RATE	0.013	LB/HR
LB PART PER 1000 LB GAS	0.0009	
ISOKINETIC PERCENT	100.4	

FEECO - PILOT KILN | FINAL STACK | 4/27/2012 | TABLE 2-5

PM EMISSIONS

TEST NO.	2	
BAROMETRIC PRESSURE	29.55	IN HG
TIP DIAMETER	0.375	IN
STACK DIAMETER	22	IN
STACK AREA	2.640	FT3
SAMPLING TIME PER POINT	2.5	MIN
NUMBER OF POINTS	24	
METER VOLUME	53.07	FT3
PITOT COEFFICIENT	0.84	
METER COEFFICIENT	1.006	
PARTICULATE COLLECTED	0.0019	GRAMS
WATER COLLECTED	19	ML
STATIC PRESSURE	-0.1	IN H2O

ORSAT RESULTS

CO2	O2	CO	N2
0.60%	20.10%	0.00%	79.30%

TEST POINT	STACK TEMP DEG F	PITOT DEL P IN H2O	ORIFICE DEL P IN H2O	METER TEMP DEG F	STACK VELOCITY AFPS
1	83	0.04	0.32	68	11.49
2	84	0.04	0.32	66	11.50
3	84	0.05	0.40	67	12.86
4	83	0.04	0.32	67	11.49
5	83	0.03	0.24	68	9.95
6	83	0.05	0.40	69	12.85
7	83	0.10	0.80	71	18.17
8	82	0.13	1.04	71	20.69
9	82	0.19	1.52	72	25.02
10	83	0.29	2.32	73	30.94
11	83	0.33	2.64	74	33.00
12	82	0.31	2.48	73	31.96
13	81	0.16	1.28	73	22.94
14	82	0.16	1.28	74	22.96
15	82	0.13	1.04	75	20.69
16	82	0.11	0.88	77	19.04
17	83	0.07	0.56	77	15.20
18	82	0.04	0.32	78	11.48
19	82	0.09	0.72	78	17.22
20	81	0.14	1.12	79	21.46
21	81	0.17	1.36	80	23.64
22	80	0.19	1.52	82	24.97
23	82	0.21	1.68	83	26.30
24	82	0.16	1.28	85	22.96
AVERAGE	82		1.08	74	19.95

DRY STANDARD VOLUME	52.90	SCF
PERCENT WATER VAPOR	1.66	% VOL
FLOW RATE	3160	ACFM
	2987	DSCFM
	5076	M3/HR
PARTICULATE CONCENTRATION	0.0006	GR/DSCF
PARTICULATE EMISSION RATE	0.014	LB/HR
LB PART PER 1000 LB GAS	0.0011	
ISOKINETIC PERCENT	101.6	

FEECO - PILTO KILN | FINAL STACK | 4/27/2012 | TABLE 2-6

PM EMISSIONS

TEST NO.	3	
BAROMETRIC PRESSURE	29.55	IN HG
TIP DIAMETER	0.375	IN
STACK DIAMETER	22	IN
STACK AREA	2.640	FT3
SAMPLING TIME PER POINT	2.5	MIN
NUMBER OF POINTS	24	
METER VOLUME	53.87	FT3
PITOT COEFFICIENT	0.84	
METER COEFFICIENT	1.006	
PARTICULATE COLLECTED	0.0021	GRAMS
WATER COLLECTED	19	ML
STATIC PRESSURE	-0.09	IN H2O

ORSAT RESULTS

CO2	O2	CO	N2
0.60%	20.10%	0.00%	79.30%

TEST POINT	STACK TEMP DEG F	PITOT DEL P IN H2O	ORIFICE DEL P IN H2O	METER TEMP DEG F	STACK VELOCITY AFPS
1	81	0.04	0.32	73	11.47
2	81	0.05	0.40	72	12.82
3	80	0.05	0.40	72	12.81
4	80	0.04	0.32	71	11.46
5	80	0.03	0.24	71	9.92
6	81	0.04	0.32	71	11.47
7	81	0.11	0.88	73	19.02
8	81	0.24	1.92	76	28.09
9	81	0.33	2.64	78	32.94
10	82	0.38	3.04	78	35.38
11	82	0.35	2.80	79	33.96
12	81	0.23	1.84	79	27.50
13	80	0.16	1.28	78	22.92
14	81	0.16	1.28	79	22.94
15	81	0.14	1.12	80	21.46
16	82	0.12	0.96	81	19.88
17	82	0.10	0.80	84	18.15
18	81	0.05	0.40	86	12.82
19	81	0.09	0.72	88	17.20
20	80	0.14	1.12	89	21.44
21	80	0.19	1.52	90	24.97
22	81	0.21	1.68	91	26.28
23	81	0.19	1.52	91	25.00
24	81	0.15	1.20	92	22.21
AVERAGE	81		1.20	80	20.92

DRY STANDARD VOLUME	53.75	SCF
PERCENT WATER VAPOR	1.64	% VOL
FLOW RATE	3314	ACFM
	3142	DSCFM
	5338	M3/HR
PARTICULATE CONCENTRATION	0.0006	GR/DSCF
PARTICULATE EMISSION RATE	0.016	LB/HR
LB PART PER 1000 LB GAS	0.0011	
ISOKINETIC PERCENT	98.2	

FIGURE 2-1

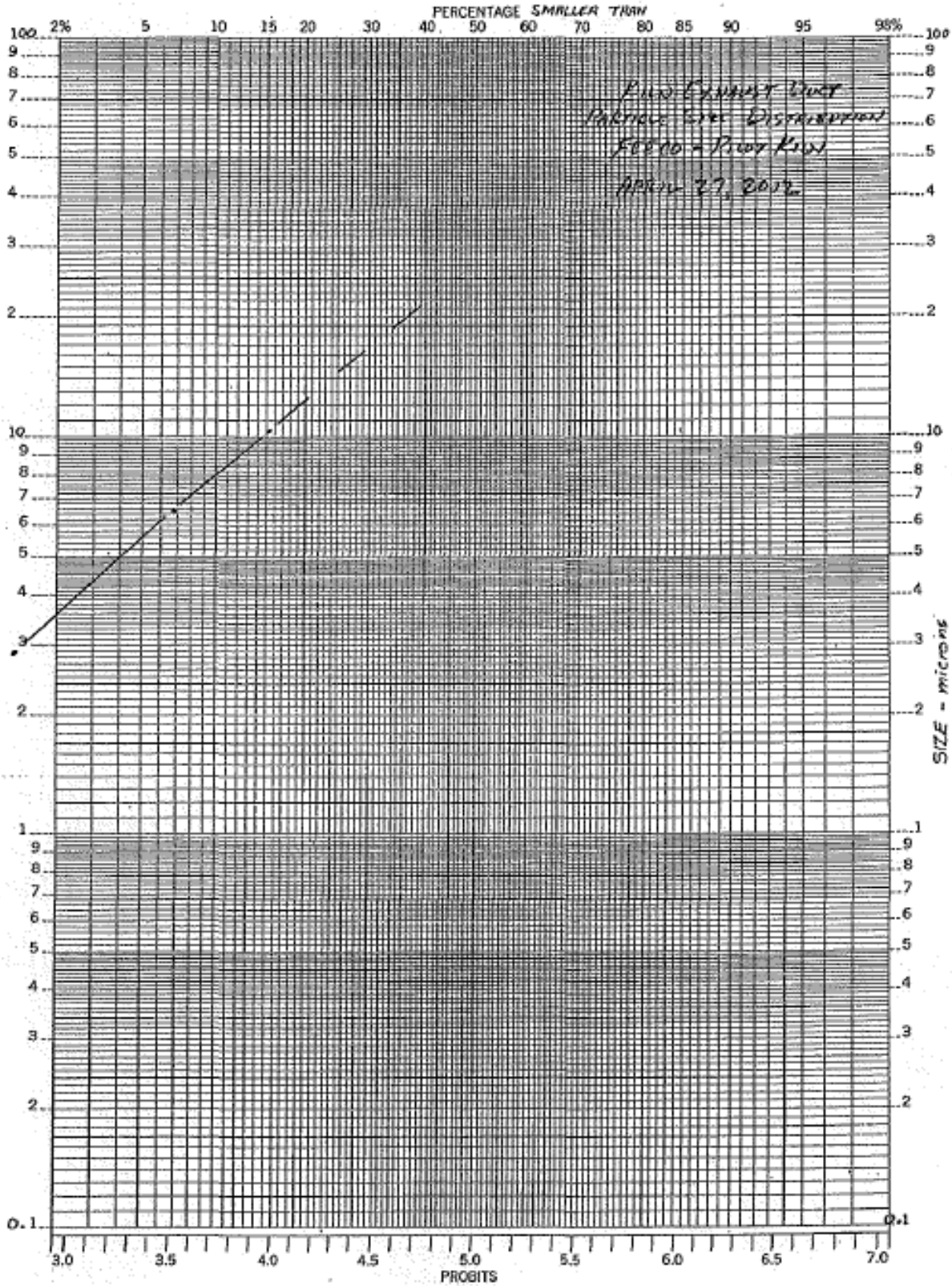
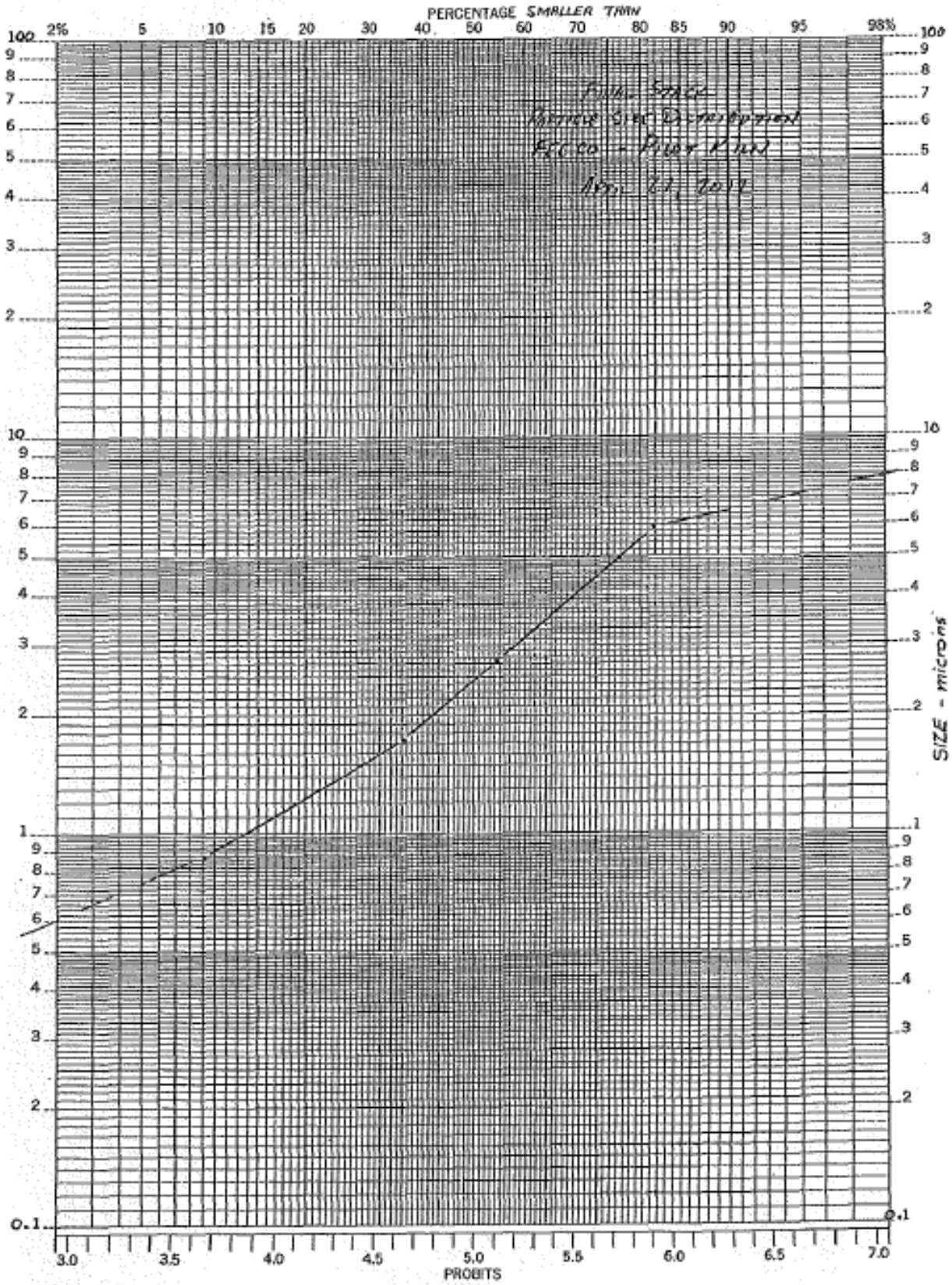

PERCENTAGE SMALLER THAN
2% 5 10 15 20 30 40 50 60 70 80 85 90 95 98%
100 9 8 7 6 5 4 3 2 10 9 8 7 6 5 4 3 2 1 9 8 7 6 5 4 3 2 0.1
SIZE - microns
3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0
PROBITS
KILN EXHAUST DUCT
PARTICLE SIZE DISTRIBUTION
FEB 10 - PILOT KILN
APRIL 27, 2012

FIGURE 2-2


PERCENTAGE SMALLER THAN
2%
5
10
15
20
30
40
50
60
70
80
85
90
95
98%
SIZE - microns
PROBITS
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0

METALS TEST RESULTS
KILN OUTLET DUCT
FEECO - PILOT KILN
APRIL 27, 2012

TABLE 2-7

Metal Tested	Test	Amount of Metal Detected (mg)	Sample Volume (scf)	Sample Volume (m3)	Metal Emission Concen. (mg/m3)	Standard Exhaust Flow Rate (m3/hr)	Metal Emission Rate (lb/hr)
Antimony	1	0.0492	41.59	1.18	0.0418	488	0.0000449
	2	0.0380	41.27	1.17	0.0325	489	0.0000351
	3	0.0580	41.01	1.16	0.0499	488	0.0000537
	AVG				0.0414		0.0000446
Arsenic	1	0.852	41.59	1.18	0.723	488	0.000778
	2	0.933	41.27	1.17	0.798	489	0.000861
	3	0.943	41.01	1.16	0.812	488	0.000874
	AVG				0.778		0.000837
Beryllium	1	0.0573	41.59	1.18	0.0486	488	0.0000523
	2	0.0456	41.27	1.17	0.0392	489	0.0000422
	3	0.0506	41.01	1.16	0.0436	488	0.0000469
	AVG				0.0438		0.0000472
Cadmium	1	14.59	41.59	1.18	12.39	488	0.01333
	2	15.89	41.27	1.17	13.60	489	0.01466
	3	18.69	41.01	1.16	16.09	488	0.01731
	AVG				14.03		0.01510
Chromium	1	9.632	41.59	1.18	8.178	488	0.008798
	2	10.592	41.27	1.17	9.063	489	0.009770
	3	10.692	41.01	1.16	9.206	488	0.009904
	AVG				8.815		0.009491
Cobalt	1	0.0674	41.59	1.18	0.0572	488	0.0000616
	2	0.0877	41.27	1.17	0.0750	489	0.0000809
	3	0.0793	41.01	1.16	0.0683	488	0.0000735
	AVG				0.0668		0.0000720
Lead	1	0.0544	41.59	1.18	0.0462	488	0.0000497
	2	0.181	41.27	1.17	0.1549	489	0.0001670
	3	0.181	41.01	1.16	0.1558	488	0.0001677
	AVG				0.1190		0.0001281
Manganese	1	2.227	41.59	1.18	1.891	488	0.002034
	2	1.717	41.27	1.17	1.469	489	0.001584
	3	1.967	41.01	1.16	1.694	488	0.001822
	AVG				1.684		0.001813
Mercury	1	0.035255	41.59	1.18	0.02993	488	0.00003220
	2	0.030836	41.27	1.17	0.02638	489	0.00002844
	3	0.000359	41.01	1.16	0.00031	488	0.00000033
	AVG				0.01887		0.00002033

(table continued on next page)

METALS TEST RESULTS
INCINERATOR 1 TESTING
GREEN BAY MSD - WWTP
MAY 31, 2007

TABLE 2-7 (continued)

Metal Tested	Test	Amount of Metal Detected (mg)	Sample Volume (scf)	Sample Volume (m3)	Metal Emission Concen. (mg/m3)	Standard Exhaust Flow Rate (m3/hr)	Metal Emission Rate (lb/hr)
Nickel	1	1.438	41.59	1.18	1.221	488	0.001313
	2	1.438	41.27	1.17	1.230	489	0.001326
	3	1.478	41.01	1.16	1.273	488	0.001369
	AVG				1.241		0.001336
Selenium	1	0.738	41.59	1.18	0.627	488	0.000674
	2	0.760	41.27	1.17	0.650	489	0.000701
	3	1.070	41.01	1.16	0.921	488	0.000991
	AVG				0.733		0.000789
Zinc	1	53.756	41.59	1.18	45.640	488	0.049101
	2	52.456	41.27	1.17	44.882	489	0.048384
	3	61.756	41.01	1.16	53.174	488	0.057206
	AVG				47.898		0.051564

Notes: lb/hr = Metal Concen. (mg/m3) x Exhaust Flow Rate (m3/hr) x 1 lb/453600 mg

TABLE 2-8

CARBON MONOXIDE TEST RESULTS
FEECO - GREEN BAY
PILOT KILN - PHOSPHATE ORE RUNS
APRIL 27, 2012

Stack Tested	Test	Average Measured CO Level (ppm)	Average Measured CO Level (mg/m3)	Standard Exhaust Flow Rate (m3/hr)	CO Emission Rate (lb/hr)
Kiln Duct	1	20	23	488	0.024
	2	40	47	489	0.050
	3	39	45	488	0.049
	AVG	33			0.041

Notes: CO Conc. (mg/m3) = CO Conc. (ppm) x (28.01/24.05)
Emission Rate = Conc.(mg/m3) x Exhaust Flow(mg/m3) x (1 lb/453600 mg)

TABLE 2-9

SULFUR DIOXIDE TEST RESULTS
FEECO - GREEN BAY
PILOT KILN - PHOSPHATE ORE RUNS
APRIL 27, 2012

Stack Tested	Test	Average Measured SO2 Level (ppm)	Average Measured SO2 Level (mg/m3)	Standard Exhaust Flow Rate (m3/hr)	SO2 Emission Rate (lb/hr)
Kiln Duct	1	262	698	488	0.751
	2	276	735	489	0.793
	3	308	820	488	0.883
	AVG	282			0.809

Notes: SO2 Conc. (mg/m3) = SO2 Conc. (ppm) x (64.06/24.05)
Emission Rate = Conc.(mg/m3) x Exhaust Flow(mg/m3) x (1 lb/453600 mg)

TABLE 2-10

NITROGEN OXIDES TEST RESULTS
FEECO - GREEN BAY
PILOT KILN - PHOSPHATE ORE RUNS
APRIL 27, 2012

Stack Tested	Test	Average Measured NOx Level (ppm)	Average Measured NOx Level (mg/m3)	Standard Exhaust Flow Rate (m3/hr)	NOx Emission Rate (lb/hr)
Kiln Duct	1	61	117	488	0.13
	2	66	126	489	0.14
	3	70	134	488	0.14
	AVG	66			0.14

Notes: NOx Conc. (mg/m3) = NOx Conc. (ppm) x (46.01/24.05)
Emission Rate = Conc.(mg/m3) x Exhaust Flow(mg/m3) x (1 lb/453600 mg)

TABLE 2-11

VOLATILE ORGANIC COMPOUND TEST RESULTS
FEECO - GREEN BAY
PILOT KILN - PHOSPHATE ORE RUNS
APRIL 27, 2012

Stack Tested	Test	Average Measured non-methane VOC Level * (ppm)	Average Measured non-methane VOC Level * (mg/m3)	Standard Exhaust Flow Rate (m3/hr)	VOC Emission Rate * (lb/hr)
Kiln Duct	1	6.5	11.9	488	0.0128
	2	1.7	3.1	489	0.0034
	3	2.0	3.7	488	0.0039
	AVG	**3.4**			**0.0067**

Notes: VOC Conc. (mg/m3) = VOC Conc. (ppm) x (44.10/24.05)
Emission Rate = Conc.(mg/m3) x Exhaust Flow(mg/m3) x (1 lb/453600 mg)

* All VOC levels quantified through comparison to propane as noted in EPA Method 25A, with methane levels subtracted out as appropriate.

VOC SPECIES RESULTS - TEST 1
FEECO - PILOT KILN
KILN VENT DUCT
4/27/12

TABLE 2-12

VOC Compound	Amount of Compound Detected (mg.)	Standard Sample Volume (m3)	Concentration of Compound (mg/m3)	Exhaust Air Flow at Sample Location (m3/hr)	Compound Emission Rate (lb/hr)
Dichlorodifluoromethane	0.0000442	0.05862	0.000754	488	8.11E-07
Chloromethane	0.0004041		0.006894		7.42E-06
Vinyl Chloride	0.000021		0.000358		3.85E-07
Bromomethane	0.0000772		0.001317		1.42E-06
Methylene Chloride	0.0000485		0.000827		8.90E-07
Benzene	0.0001606		0.00274		2.95E-06
Toluene	0.0000265		0.000452		4.86E-07
				Total -	1.35E-05

Notes: **lb/hr** = Compound Concen. (mg/m3) x Exhaust Air Flow (m3/hr) x 1 lb/453600 mg

VOC SPECIES RESULTS - TEST 2
FEECO - PILOT KILN
KILN VENT DUCT
4/27/12

TABLE 2-13

VOC Compound	Amount of Compound Detected (mg.)	Standard Sample Volume (m3)	Concentration of Compound (mg/m3)	Exhaust Air Flow at Sample Location (m3/hr)	Compound Emission Rate (lb/hr)
Chloromethane	0.0003568	0.06851	0.005208	489	5.61E-06
Benzene	0.0001833		0.002676		2.88E-06
Toluene	0.0000081		0.000118		1.27E-07
Ethyl Benzene	0.0000017		2.48E-05		2.68E-08
Xylenes	0.0000071		0.000104		1.12E-07
Styrene	0.000005		7.3E-05		7.87E-08
				Total -	3.23E-06

Notes: **lb/hr** = Compound Concen. (mg/m3) x Exhaust Air Flow (m3/hr) x 1 lb/453600 mg

VOC SPECIES RESULTS - TEST 3
FEECO - PILOT KILN
KILN VENT DUCT
4/27/12

TABLE 2-14

VOC Compound	Amount of Compound Detected (mg.)	Standard Sample Volume (m3)	Concentration of Compound (mg/m3)	Exhaust Air Flow at Sample Location (m3/hr)	Compound Emission Rate (lb/hr)
Dichlorodifluoromethane	0.0000278	0.06565	0.00042346	488	4.56E-07
Vinyl chloride	0.000007		0.00010663		1.15E-07
Chloroethane	0.0000193		0.00029398		3.16E-07
Methylene chloride	0.00003782		0.00057609		6.20E-07
Benzene	0.0009697		0.01477075		1.59E-05
Toluene	0.0003437		0.00523534		5.63E-06
Chlorobenzene	0.0000231		0.00035187		3.79E-07
Ethyl Benzene	0.0000123		0.00018736		2.02E-07
Xylenes	0.0001252		0.00190708		2.05E-06
Styrene	0.0000017		2.5895E-05		2.79E-08
Isopropylbenzene	0.0000906		0.00138005		1.48E-06
1,1,2,2 Tetrachloroethane	0.0000099		0.0001508		1.62E-07
n-Propylbenzene	0.0000035		5.3313E-05		5.74E-08
1,3,5 Trimethylbenzene	0.0000675		0.00102818		1.11E-06
4 Chlorotoluene	0.0000091		0.00013861		1.49E-07
tert/sec Butylbenzene	0.00000195		2.9703E-05		3.20E-08
p-Isopropyltoluene	0.0000066		0.00010053		1.08E-07
n-Butylbenzene	0.0000128		0.00019497		2.10E-07
Naphthalene	0.0000303		0.00046154		4.97E-07
				Total -	2.80E-05

Notes: lb/hr = Compound Concen. (mg/m3) x Exhaust Air Flow (m3/hr) x 1 lb/453600 mg

FLUORIDE & PHOSPHATE ION TEST RESULTS
Pilot Kiln - Phosphate Ore
FEECO - Green Bay, WI
4/27/2012

TABLE 2-15

Ionic Compound	Test	Ion in Sample (mg)	Meter Sample Volume (liters)	Meter Temp. (F)	Standard Sample Volume (m3)	Measured Ion Concen. (mg/m3)	Standard Exhaust Flow Rate (m3/hr)	Ion Emission Rate (lb/hr)
Fluoride	1	4.50	58.58	77	0.05763	78	488	0.084
	2	6.00	60.26	79	0.05906	102	489	0.110
	3	7.30	59.66	72	0.05924	123	488	0.133
	Average -					**101**		**0.109**
Phosphate	1	0.069	58.58	77	0.05763	1.20	488	0.00129
	2	0.045	60.26	79	0.05906	0.76	489	0.00082
	3	0.038	59.66	72	0.05924	0.64	488	0.00069
	Average -					**0.87**		**0.00093**

Dry Gas Meter Coefficients (gamma): 1.013 (Inlet)

Local Barometric Pressure: 29.55

Notes: Emission Rate = Conc.(mg/m3) x Exhaust Flow(mg/m3) x (1 lb/453600 mg)
Std. Sample Volume = Meter Vol. x Meter Coeff. x 0.001 x (Barom Press/29.92) x (528/(460 + Meter Temp))

3.0 TEST METHODS

The emissions were determined as a product of the measured test emission (e.g., particulate) concentration and the measured exhaust gas flow rates. The exhaust gas flow rates were measured using EPA Methods 1 through 4 as found in 40 CFR Part 60, Appendix A. An S-type pitot tube, inclined manometers, calibrated thermometer, and analyzer were utilized to measure the various exhaust gas flow parameters. The exhaust gas flow rates for the test efforts were included in the particulate results Tables 2-1 through 2-6 (near the bottom of each table).

3.1 Particulate Matter Testing

The equipment used to sample particulate at both test locations was the Western Precipitation Division of the Joy Manufacturing Company Emission Parameter Analyzer. Samples were collected and analyzed in accordance with procedures outlined in EPA Methods 5 - "Determination of Particulate Emissions from Stationary Sources."

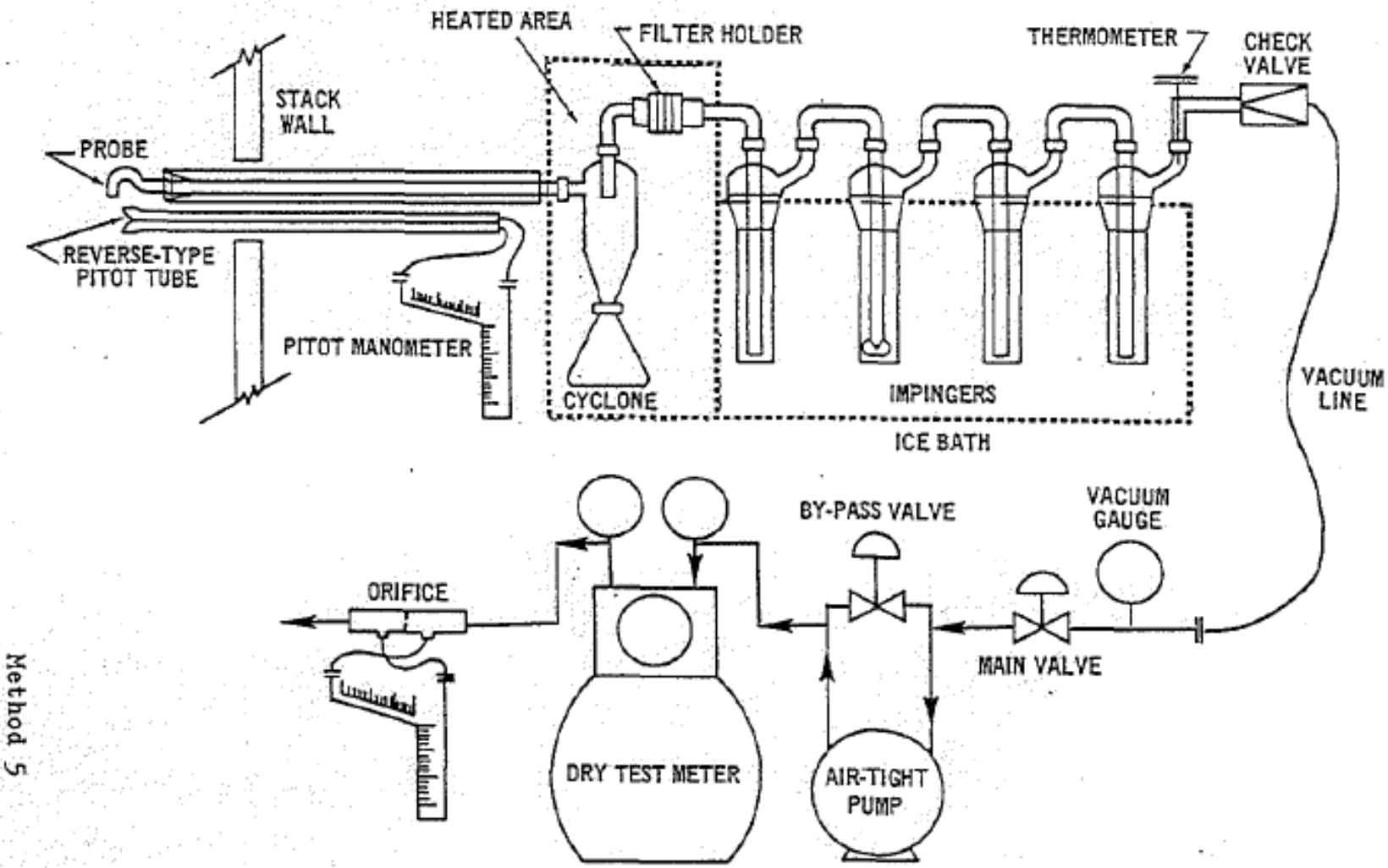
The sampling train consisted of a quartz probe tip, a heated glass-lined probe, and a glass filter holder containing a tared glass fiber filter. A series of four impingers followed in an ice bath. For the final stack, the first was a modified Greenburg-Smith impinger with 100 ml of distilled water, the second was a Greenburg-Smith impinger with 100 ml of distilled water, the third was a modified Greenburg-Smith impinger with 100 ml of distilled water, and the fourth was also a modified Greenburg-Smith impinger containing a tared quantity of Silica Gel. The impinger contents for the kiln duct are described in Section 3.2. The gas then passed through a vacuum pump, calibrated dry gas meter, and a calibrated orifice. A schematic drawing of the sampling train is included.

The temperatures of the stack gas stream, as well as strategic locations within the sampling devices, were monitored by RTDs and read directly from a gauge on the control unit.

The initial gas stream velocity was obtained from a preliminary traverse using an "S" type pitot tube. The initial moisture was estimated from previous tests of similar processes. This data, along with the stack temperature, was used to set a nomograph so that rapid calculations of isokinetic sampling conditions could be made.

The principle of the method was to collect the sample representative of the exhaust by adjusting the sample collection velocity to match the exhaust gas stream velocity at the point of collection. The velocity at the point of collection was measured with an "S" type pitot tube attached to the probe and the collection velocity was matched to the stack gas velocity by adjusting the flow as indicated by the calibrated orifice.

To determine the molecular weight of the stack gas, stack gas was drawn into a TECO Model 350XL analyzer and analyzed for percentage carbon dioxide and oxygen as well as parts per million of carbon monoxide. Nitrogen levels were determined as the difference between the CO_2, O_2, CO levels and 100 percent.



Particulate sampling train.

Method 5

3.1 (continued)

At the completion of the test, the probe tip and probe preceding the filter was washed and brushed with acetone; this rinse was later placed in a tared beaker and evaporated to dryness at room temperature. The filter and beaker were then desiccated to the tared humidity conditions and weighed. The sum of these two weights constituted the "filterable" particulate fraction. The impinger contents were measured and weighed for determination of the actual moisture content of the exhaust gas stream.

A computer was used to calculate the stack velocities, emission concentrations, emission rates and volumetric flow rates using the field and laboratory data.

3.2 Metals Testing

The equipment used to sample for lead and other metals was the Western Precipitation Division of the Joy Manufacturing Company Emission Parameter Analyzer. Samples were collected and analyzed in accordance with procedures outlined in EPA Method 29 - "Determination of Metals Emissions from Stationary Sources."

The sampling train consisted of a quartz probe tip, a heated glass lined probe, and a glass filter holder containing a tared quartz filter. A series of four impingers followed in an ice bath. The first was a modified Greenburg-Smith impinger with 100 ml of hydrogen peroxide/nitric acid solution, the second was a Greenburg-Smith impinger with 100 ml of hydrogen peroxide/nitric acid solution, the third was a modified Greenburg-Smith impinger left dry for solution spill-over, and the fourth was a modified Greenburg-Smith impinger containing a tared quantity of Silica Gel. The gas then passed through a vacuum pump, calibrated dry gas meter, and a calibrated orifice. A schematic drawing of the sampling train is included.

The temperatures of the stack gas stream, as well as strategic locations within the sampling devices, were monitored by RTDs and read directly from a gauge on the control unit.

The initial gas stream velocity was obtained from a preliminary traverse using an "S" type pitot tube. The initial moisture was estimated from previous tests of similar processes. This data, along with the stack temperature, was used to set a nomograph so that rapid calculations of isokinetic sampling conditions could be made.

The principle of the method was to collect the sample representative of the exhaust by adjusting the sample collection velocity to match the exhaust gas stream velocity at the point of collection. The velocity at the point of collection was measured with an "S" type pitot tube attached to the probe and the collection velocity was matched to the stack gas velocity by adjusting the flow as indicated by the calibrated orifice.

To determine the molecular weight of the stack gas, stack gas was drawn into a TECO Model 350XL analyzer and analyzed for percentage carbon dioxide and oxygen as well as parts per million of carbon monoxide. Nitrogen levels were determined as the difference between the CO_2, O_2, CO levels and 100 percent.

3.2 (continued)

At the completion of the test, the probe tip and probe preceding the filter was washed and brushed with acetone. The acetone rinse was later evaporated to dryness, the remaining residue (sample catch) was weighed, and the residue was reconstituted with nitric acid for metals analysis. The probe was then rinsed again with 0.1 N nitric acid; this rinse was later added to the impinger solution catches for metals analysis. The quartz filter was removed from the sampling train and allowed to come to tare conditions for re-weighing. The sum of the filter weight gain and acetone wash residue was reported in the particulate results tables.

The impinger contents were measured and weighed for determination of the actual moisture content of the exhaust gas stream. The first two impingers were then rinsed with nitric acid solution. The rinse was added to the impinger solution catch of the first two impingers for analysis of all metals.

The filters, acidic peroxide solutions and rinses, and the rinses from each test were then submitted to the lab for analysis of metals content; a blank of the solutions and filter was also submitted for analysis. The sample and blanks were digested using the procedures found in EPA Method 29. All results were blank subtracted as appropriate.

3.3 CO, SO_2, & NOx Testing

Testing to determine carbon monoxide (CO), sulfur dioxide (SO_2), and nitrogen oxides (NOx) levels was performed using a direct reading analyzer. Exhaust gas was drawn at a constant sampling rate through a stainless steel sampling probe (placed near the center of the exhaust duct) and a condenser (to remove interfering moisture). Readings were taken every five minutes during each hour of testing and those readings were averaged for determining hourly emissions. The analyzer (TECO Model 350XL, equipped with specialty electrochemical cells) was calibrated before and after each hour of testing. Those calibration sheets are included in Appendix A of this report.

3.4 VOC Testing

The initial plan to monitor VOC levels was to utilize the analyzer noted in Section 3.3. However, that analyzer had a minimum detection level of 10 parts per million (ppm). Since VOC levels were below that detection limit, integrated bag samples were collected for VOC analysis. Exhaust gas was drawn at a constant sampling rate through a stainless steel sampling probe (placed near the center of the exhaust duct) and a condenser (to remove interfering moisture). The bag was then returned to the lab for analysis of VOC levels based on EPA Method 25A (40 CFR Part 60, Appendix A).

The analyzer was calibrated before and after the analysis efforts using EPA Protocol gas standards (propane in nitrogen). The concentrations of the gas standards used were 15.1, 25.4, and 45.4 ppm. The certification sheets for the gas standards are included in Appendix A of this report. The calibration gases were introduced to the analyzer (through Tedlar bags) in the same manner as the samples.

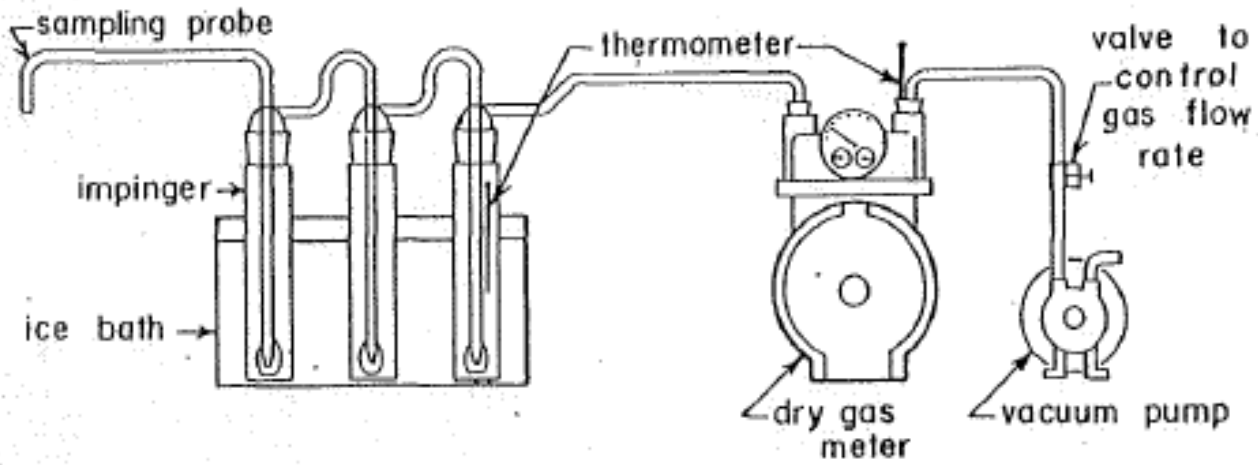
3.4 (continued)

Specific VOC compound levels were determined using the Absorption Tube Procedures as described in EPA Method 18 and the analytical methods found in EPA Method 0030. A stainless steel probe was inserted into the center of the duct and was thus maintained near the exhaust gas stream temperature. Exhaust gas was drawn directly through the sampling probe through a series of two large sampling tubes filled with absorbent media. The first tube contained Tenax as the sole absorbent material; the second tube contained Tenax and a back-up section of activated charcoal. Over the course of each test hour, a small pump drew exhaust air through each set of the sample tubes at a fixed sampling rate (approx. 1 liter per minute in order to achieve good detection levels). The sample volumes of the air drawn through the tubes were determined using a calibrated dry gas meter.

Immediately following the testing, the absorption tubes were capped, sealed, and refrigerated. The samples and blank were returned to the lab for analysis. The organic compound content on the sample tubes were determined following purge and trap desorption, separation by gas chromatograph (GC), and identification by gas chromatograph/mass spectrometry (GC/MS).

3.5 Fluoride & Phosphate Testing

Testing to determine fluoride and phosphate (ionic) levels was performed based upon the sampling train and methods of EPA Method 26. Exhaust gas was drawn through a heated glass sampling probe and connective Teflon tubing into a midget impinger sampling train containing deionized water absorbing solution. A figure showing the sampling train is attached. Following sampling, the sampling solutions were placed in glass bottles. The sampling probe and glassware was then rinsed with DI water and the rinses were added to the sample solutions. The solutions were then submitted to the lab for analysis by ion chromatography. The results were corrected for field blanks as appropriate.



IMPINGER SAMPLING TRAIN

4.0 CALIBRATION DATA

The probe tips, pitot tubes, dry gas meters, and sample box orifices used in the isokinetic testing were calibrated prior to the testing in accordance with the procedures outlined in the Maintenance, Calibration, and Operation of Isokinetic Source-Sampling Equipment as published by the US EPA. The values obtained were:

Test Location - Test Parameters	Control Box ID	Orifice Coeff. (ΔH@)	Dry Gas Meter Coeff. (γ)	Probe Tip Diameter
Kiln - Particulates & metals	1	1.742	0.988	0.382 in.
Final stack - Particulates	2	0.722	1.006	0.375 in.

The flow measurements were made with S-type pitot tubes attached to the sampling probes. For the sampling probes used, all had pitot tube coefficients (C_p) of 0.84.

The dry gas meters installed in the control boxes were temperature compensating meters; therefore, no temperature correction needed to be made to the volume of gas sampled. The correction factors for the meters could best be described by the equations:

Box 1 $\gamma = 0.988 + [(T_M - 70) \times 0.00012]$

Box 2 $\gamma = 1.006 + [(T_M - 70) \times 0.00012]$

The most recent calibrations on the particulate sampling equipment were performed on March 21 (Box 1) and April 25, 2012 (Box 2). The isokinetic ratios from the test runs were all within the acceptable ranges of 90 to 110 percent.

The dry gas meters used to measure the VOC speciation and ionic testing sample volumes were not temperature compensating meters and, therefore, the appropriate corrections were made to each sample volume. The meter coefficients for those test efforts were 1.019 (VOC speciation) and 1.013 (Ionic testing). Those meters were most recently calibrated on March 21, 2012.

APPENDIX A

EPA Protocol Calibration Gas Certifications

AIR LIQUIDE — Air Liquide America Specialty Gases LLC — SCOTT™

RATA CLASS

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET, TROY, MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory
AIR LIQUIDE AMERICA SPECIALTY GASES LLC
1290 COMBERMERE STREET
TROY, MI 48083

P.O. No.: 58091-71-65000
Project No.: 05-87129-001

Customer
CLEAN AIR ENGINEERING
DON ALLEN
500 W. WOOD STREET
PALATINE IL 60067

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM042811 Certification Date: 03May2010 Exp. Date: 02May2013
Cylinder Pressure***: 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
CARBON MONOXIDE	23.5	PPM	+/- 1%	Direct NIST and VSL
NITROGEN		BALANCE		

*** Do not use when cylinder pressure is below 150 psig.
** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 2635	02Oct2010	KAL003166	25.21 PPM	CARBON MONOXIDE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
SIEMENS ULTRAMAT 6E/N1-VN-0545	12Apr2010	NDIR

ANALYZER READINGS

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

First Triad Analysis

CARBON MONOXIDE

Date: 12Apr2010	Response Unit: PPM	
Z1=0.00000	R1=25.21000	T1=23.55000
R2=25.22000	Z2=0.00000	T2=23.45000
Z3=0.00000	T3=23.52000	R3=25.24000
Avg. Concentration:	23.54	PPM

Second Triad Analysis

Date: 04May2010	Response Unit: PPM	
Z1=0.00000	R1=25.21000	T1=23.40000
R2=25.18000	Z2=0.00000	T2=23.44000
Z3=0.00000	T3=23.50000	R3=25.30000
Avg. Concentration:	23.45	PPM

Calibration Curve

Concentration=A+Bx+Cx2+Dx3+Ex4
r=0.999989394
Constants: A=0.021937044
B=1.003957697 C=-0.0030507
D=0.000051106 E=0

APPROVED BY: _____

AIR LIQUIDE Air Liquide America Specialty Gases LLC Scott

RATA CLASS

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET, TROY, MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

P.O. No.: 58157-71-65000
AIR LIQUIDE AMERICA SPECIALTY GASES LLC Project No.: 05-87624-001
1290 COMBERMERE STREET
TROY, MI 48083

Customer

CLEAN AIR ENGINEERING
DON ALLEN
500 W. WOOD STREET
PALATINE IL 60067

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM024011 Certification Date: 19May2010 Exp. Date: 18May2013
Cylinder Pressure***: 2015 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
CARBON MONOXIDE	49.3	PPM	+/- 1%	Direct NIST and VSL
NITROGEN		BALANCE		

*** Do not use when cylinder pressure is below 150 psig.
** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
	02Oct2010	KAL003166	25.21 PPM	CARBON MONOXIDE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR/0928821	13May2010	FTIR

ANALYZER READINGS

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

First Triad Analysis

Date: 12May2010 Response Unit:PPM

Z1=-0.05522	R1=25.20702	T1=48.49792
R2=25.30373	Z2=-0.00283	T2=48.41721
Z3=0.08340	T3=48.48810	R3=25.37800
Avg. Concentration:	48.20	PPM

Second Triad Analysis

Date: 19May2010 Response Unit: PPM

Z1=0.01616	R1=25.11051	T1=48.22831
R2=25.13564	Z2=0.05040	T2=48.34473
Z3=0.11040	T3=48.27846	R3=25.15053
Avg. Concentration:	48.43	PPM

Calibration Curve

Concentration=A+Bx+Cx2+Dx3+Ex4
r=9.999925-1

Constants:	A=0.00000E+0
B=8.77600E-1	C=8.03000E-4
D=1.00000E-6	E=0.00000E+0

CARBON MONOXIDE

APPROVED BY: Rob McCrandell

AIR LIQUIDE Air Liquide America Specialty Gases LLC Scott™

RATA CLASS

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET, TROY, MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory
AIR LIQUIDE AMERICA SPECIALTY GASES LLC
1290 COMBERMERE STREET
TROY, MI 48083

P.O. No.: LJH101110
Document # : 39581052-002

Customer
ENVIRONMENTAL TECH & ENG

13000 W BLUEMOUNT RD
ATTN: RECEIVING
ELM GROVE WI 53122
US

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM005785 Certification Date: 04Nov2010 Exp. Date: 03Nov2012
Cylinder Pressure***: 1605 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ACCURACY**	TRACEABILITY
NITRIC OXIDE	50.0	PPM	+/- 1%	Direct NIST and VSL
NITROGEN - OXYGEN FREE		BALANCE		
TOTAL OXIDES OF NITROGEN	50.0	PPM		Reference Value Only

*** Do not use when cylinder pressure is below 150 psig.
** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1684 10	15Oct2012	KAL004399	95.84 PPM	NITRIC OXIDE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR/0928621	01Nov2010	FTIR

ANALYZER READINGS

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

First Triad Analysis

NITRIC OXIDE
Date: 15Feb2010 Response Unit:PPM
Z1=0.00000 R1=0.00000 T1=0.00000
R2=0.00000 Z2=0.00000 T2=0.00000
Z3=0.00000 T3=0.00000 R3=0.00000
Avg. Concentration: 49.75 PPM

Second Triad Analysis

Date: 04Nov2010 Response Unit: PPM
Z1=0.07661 R1=95.18300 T1=49.81548
R2=95.24405 Z2=0.07728 T2=49.85204
Z3=0.07965 T3=50.20285 R3=95.47716
Avg. Concentration: 50.20 PPM

Calibration Curve

Concentration=A+Bx+Cx2+Dx3+Ex4
r=9.99989E-1
Constants: A=0.00000E+0
B=9.31916E-1 C=1.94000E-4
D=0.00000E+0 E=0.00000E+0

Special Notes: RECERT CYL ALM005785

APPROVED BY: Rob McCrandall

AIR LIQUIDE Air Liquide America Specialty Gases LLC Scott

RATA CLASS
Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET, TROY, MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory
AIR LIQUIDE AMERICA SPECIALTY GASES LLC
1290 COMBERMERE STREET
TROY, MI 48083

P.O. No.: LJH101110
Document # : 39581052-001

Customer
ENVIRONMENTAL TECH & ENG
13000 W BLUEMOUNT RD
ATTN: RECEIVING
ELM GROVE WI 53122
US

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM016920 Certification Date: 04Nov2010 Exp. Date: 03Nov2012
Cylinder Pressure***: 1553 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ACCURACY**	TRACEABILITY
NITRIC OXIDE	94.5	PPM	+/- 1%	Direct NIST and VSL
NITROGEN - OXYGEN FREE		BALANCE		
TOTAL OXIDES OF NITROGEN	94.6	PPM		Reference Value Only

*** Do not use when cylinder pressure is below 150 psig.
** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1684 10	15Oct2012	KAL004399	95.84 PPM	NITRIC OXIDE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR/0928621	01Nov2010	FTIR

ANALYZER READINGS

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

First Triad Analysis

NITRIC OXIDE
Date: 28Sep2008 Response Unit:PPM
Z1=0.00000 R1=0.00000 T1=0.00000
R2=0.00000 Z2=0.00000 T2=0.00000
Z3=0.00000 T3=0.00000 R3=0.00000
Avg. Concentration: 94.24 PPM

Second Triad Analysis

Date: 04Nov2010 Response Unit: PPM
Z1=0.07661 R1=95.18380 T1=93.97678
R2=95.24405 Z2=0.07728 T2=94.31127
Z3=0.07985 T3=94.42110 R3=95.47718
Avg. Concentration: 94.27 PPM

Calibration Curve

Concentration=A+Bx+Cx2+Dx3+Ex4
r=9.99989E-1
Constants: A=0.00000E+0
B=9.31915E-1 C=1.84000E-4
D=0.00000E+0 E=0.00000E+0

Special Notes: RECERT CYL alm016920 nte 100 PPM

APPROVED BY: Rob McCrandall

PRAXAIR

Praxair Distribution Mid-Atlantic
145 Shimersville Rd.
Bethlehem, PA 18015
Telephone: (610) 317-1608
Facsimile: (610) 758-8382

DocNumber: 000009313

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

PDI WHSE BROOKFIELD WI HUB
100 N JANACEK RD
BROOKFIELD WI 530450

Praxair Order Number: 02803670
Customer P. O. Number: --None-- 91
Customer Reference Number:

Fill Date: 2/23/2011
Part Number: EV NIPR15ME-AS
Lot Number: 917105462
Cylinder Style & Outlet: AS CGA 350
Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

Certified Concentration:

Expiration Date:	2/28/2014		NIST Traceable
Cylinder Number:	CC83632		Analytical Uncertainty:
15.1	ppm	PROPANE	± 1 %
	Balance	NITROGEN	

Certification Information: *Certification Date:* 2/28/2011 *Term:* 36 Months *Expiration Date:* 2/28/2014

This cylinder was certified according to the 1997 EPA Traceability Protocol, Document #EPA-600/R-97/121, using Procedure G1

Do Not Use this Standard if Pressure is less than 150 PSIG

Analytical Data: *(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)*

1. Component: PROPANE

Requested Concentration: 15 ppm
Certified Concentration: 15.1 ppm
Instrument Used: VARIAN 3300 INST 023 (PROPANE)
Analytical Method: FID
Last Multipoint Calibration: 2/16/2011

Reference Standard Type: GMIS
Ref. Std. Cylinder # : SA9284
Ref. Std. Conc: 20.00 PPM
Ref. Std. Traceable to SRM # : 1667c
SRM Sample # : 83-1-52
SRM Cylinder # : XF0040798

First Analysis Date:						Date:	2/28/2011
Z:	0	R:	20.02	C:	15.11	Conc:	15.116
R:	20.00	Z:	0	C:	15.04	Conc:	15.045
Z:	0	C:	15.08	R:	20.17	Conc:	15.085
UOM:	PPM			Mean Test Assay:			15.082 PPM

Second Analysis Date:						Date:	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	PPM			Mean Test Assay:			0 PPM

Analyzed by: John Pribish 03/03/11

Certified by: Ashley Davila

Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Praxair Distribution, Inc., arising out of the use of the information contained herein exceed the fee established for providing such information.

PRAXAIR

Praxair Distribution Mid-Atlantic
145 Shimersville Rd.
Bethlehem, PA 18015
Telephone: (610) 317-1608
Facsimile: (610) 758-8382

DocNumber: 000009036

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

PDI WHSE BROOKFIELD WI HUB
100 N JANACEK RD
BROOKFIELD WI 530450

Praxair Order Number: 02780031
Customer P. O. Number: --None-- 91
Customer Reference Number:

Fill Date: 2/9/2011
Part Number: EV NIPR25ME-AS
Lot Number: 917104031
Cylinder Style & Outlet: AS CGA 350
Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

Certified Concentration:

Expiration Date:	2/15/2014		NIST Traceable
Cylinder Number:	SGAL1326		Analytical Uncertainty:
25.4	ppm	PROPANE	± 1 %
	Balance	NITROGEN	

Certification Information: *Certification Date:* 2/15/2011 *Term:* 36 Months *Expiration Date:* 2/15/2014

This cylinder was certified according to the 1997 EPA Traceability Protocol, Document #EPA-600/R-97/121, using Procedure G1

Do Not Use this Standard If Pressure Is less than 150 PSIG

Analytical Data: *(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)*

1. Component: PROPANE

Requested Concentration: 25 ppm
Certified Concentration: 25.4 ppm
Instrument Used: VARIAN 3300 INST 033 (PROPANE)
Analytical Method: FID
Last Multipoint Calibration: 1/17/2011

Reference Standard Type: SRM
Ref. Std. Cylinder # : XF0000798
Ref. Std. Conc: 49.54 PPM
Ref. Std. Traceable to SRM # : 2165Ta
SRM Sample # :
SRM Cylinder # :

First Analysis Data:						Date:	2/15/2011
Z:	0	R:	49.52	C:	25.32	Conc:	25.303
R:	49.38	Z:	0	C:	25.32	Conc:	25.363
Z:	0	C:	25.27	R:	49.47	Conc:	25.313
UOM:	PPM			Mean Test Assay:			25.346 PPM

Second Analysis Data:						Date:	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	PPM			Mean Test Assay:			0 PPM

Analyzed by: John Pribish 02/9/11

Certified by: Ashley Davila

Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Praxair Distribution, Inc., arising out of the use of the information contained herein exceed the fee established for providing such information.

PRAXAIR

Praxair Distribution Mid-Atlantic
145 Shimersville Rd.
Bethlehem, PA 18015
Telephone: (610) 317-1608
Facsimile: (610) 758-8382

DocNumber: 000009318

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

PDI WHSE BROOKFIELD WI HUB
100 N JANACEK RD
BROOKFIELD WI 530450

Praxair Order Number: 02803669
Customer P. O. Number: --None-- 91
Customer Reference Number:

Fill Date: 2/28/2011
Part Number: EV NIPR45WE-AS
Lot Number: 917105431
Cylinder Style & Outlet: AS CGA 350
Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

Certified Concentration:

Expiration Date:	2/28/2014		NIST Traceable
Cylinder Number:	CC107984		Analytical Uncertainty:
45.4	ppm	PROPANE	± 1 %
	Balance	NITROGEN	

Certification Information: *Certification Date:* 2/28/2011 *Term:* 36 Months *Expiration Date:* 2/28/2014

This cylinder was certified according to the 1997 EPA Traceability Protocol, Document #EPA-600/R-97/121, using Procedure G1

Do Not Use this Standard if Pressure is less than 150 PSIG

Analytical Data: *(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)*

1. Component: PROPANE

Requested Concentration: 45 ppm
Certified Concentration: 45.4 ppm
Instrument Used: VARIAN 3300 INST 023 (PROPANE)
Analytical Method: FID
Last Multipoint Calibration: 2/15/2011

Reference Standard Type: GMIS
Ref. Std. Cylinder #: SA15097
Ref. Std. Conc: 50.24 PPM
Ref. Std. Traceable to SRM #: 1667b
SRM Sample #: 83-I-52
SRM Cylinder #: XF0040795

First Analysis Date:						Date:	2/28/2011
Z:	0	R:	50.38	C:	45.5	Conc:	45.434
R:	50.3	Z:	0	C:	45.53	Conc:	45.434
Z:	0	C:	45.51	R:	50.36	Conc:	45.414
UOM:	PPM			Mean Test Assay:			45.417 PPM

Second Analysis Date:						Date:	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	PPM			Mean Test Assay:			0 PPM

Analyzed by: John Rabish 03/03/11

Certified by: Robin Morgan

Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Praxair Distribution, Inc., arising out of the use of the information contained herein exceed the fee established for providing such information.

APPENDIX B

Contracted Lab Reports

Environmental Technology & Engineering
Attention: Michael Huenink
13000 W Bluemound Rd
Elm Grove,WI 53122

Date Received: 05/08/2012
Date Reported: 05/15/12 16:30
Client Project: solutions
Client Project ID: [none]
PO# 050712-MJH
Project #: [none]

Certificate of Analysis

All quality control samples and checks were within acceptance limits unless otherwise indicated.Test results pertain only to those items tested. All samples were in good condition when received by the laboratory unless otherwise noted. All LOD/LOQs are adjusted to reflect dilutions.

Analyte	Result	Units	LOD	Dilution Factor	Analyzed	Analyst	Method	Notes
SVE0350-01 F1-H								
Date Sampled: 04/27/2012	**Sample Type:Grab**							
✓Arsenic	852	µg	2	1	5/14/12	GGG	SW-846 6010B	
Beryllium	57.3	µg	0.400	1	5/14/12	GGG	SW-846 6010B	
Cadmium	14600	µg	24.0	20	5/14/12	GGG	SW-846 6010B	
Cobalt	67.4	µg	2.00	1	5/14/12	GGG	SW-846 6010B	
Chromium	9640	µg	40.0	20	5/14/12	GGG	SW-846 6010B	
Mercury	6.600	µg	0.02400	200	5/14/12	HTM	SW-846 7474	
Manganese	2230	µg	2.00	1	5/14/12	GGG	SW-846 6010B	
Nickel	1440	µg	2.00	1	5/14/12	GGG	SW-846 6010B	
Lead	54.4	µg	4.0	1	5/14/12	GGG	SW-846 6010B	
✓Antimony	49.2	µg	4.0	1	5/14/12	GGG	SW-846 6010B	
Selenium	738	µg	2.4	1	5/14/12	GGG	SW-846 6010B	
Zinc	53800	µg	60.0	20	5/14/12	GGG	SW-846 6010B	

Analyte	Result	Units	LOD	Dilution Factor	Analyzed	Analyst	Method	Notes
SVE0350-02 F2-H								
Date Sampled: 04/27/2012	**Sample Type:Grab**							
Arsenic	933	µg	2	1	5/14/12	GGG	SW-846 6010B	
Beryllium	45.8	µg	0.400	1	5/14/12	GGG	SW-846 6010B	
Cadmium	15900	µg	24.0	20	5/14/12	GGG	SW-846 6010B	
Cobalt	87.7	µg	2.00	1	5/14/12	GGG	SW-846 6010B	
Chromium	10600	µg	40.0	20	5/14/12	GGG	SW-846 6010B	
Mercury	0.06070	µg	0.006000	50	5/14/12	HTM	SW-846 7474	
Manganese	1720	µg	2.00	1	5/14/12	GGG	SW-846 6010B	
Nickel	1440	µg	2.00	1	5/14/12	GGG	SW-846 6010B	
Lead	181	µg	4.0	1	5/14/12	GGG	SW-846 6010B	
Antimony	38.0	µg	4.0	1	5/14/12	GGG	SW-846 6010B	
Selenium	760	µg	2.4	1	5/14/12	GGG	SW-846 6010B	
Zinc	52500	µg	60.0	20	5/14/12	GGG	SW-846 6010B	

This report was prepared and printed by:

Gary Geipel, SIA Department Manager

SF Analytical Laboratories • 2345 South 170th Street • New Berlin, WI 53151
Phone: (262) 754-5300 • Toll Free: (800) 300-6700 • Fax: (262) 754-5310 • sflabs.com

Wisconsin Dept. of Trade and Consumer Protection Certified #165 • Dept. of Natural Resources State Certified Laboratory #241249350
FDA Registered Laboratory #2134640 • USDA Soil Permit #S-76521

Environmental Technology & Engineering
13000 W Bluemound Rd
Elm Grove, WI 53122

Project: solutions
Project Number: [none]
Project Manager: Michael Huenink

Reported:
05/15/12 16:30

Analyte	Result	Units	LOD	Dilution Factor	Analyzed	Analyst	Method	Notes
SVE0350-03 F3-H								
Date Sampled: 04/27/2012	Sample Type:Grab							
Arsenic	943	µg	2	1	5/14/12	GGG	SW-846 6010B	
Beryllium	50.6	µg	0.400	1	5/14/12	GGG	SW-846 6010B	
Cadmium	18700	µg	24.0	20	5/14/12	GGG	SW-846 6010B	
Cobalt	79.3	µg	2.00	1	5/14/12	GGG	SW-846 6010B	
Chromium	10700	µg	40.0	20	5/14/12	GGG	SW-846 6010B	
Mercury	0.03630	µg	0.006000	50	5/14/12	HTM	SW-846 7474	
Manganese	1970	µg	2.00	1	5/14/12	GGG	SW-846 6010B	
Nickel	1480	µg	2.00	1	5/14/12	GGG	SW-846 6010B	
Lead	181	µg	4.0	1	5/14/12	GGG	SW-846 6010B	
Antimony	58.0	µg	4.0	1	5/14/12	GGG	SW-846 6010B	
Selenium	1070	µg	2.4	1	5/14/12	GGG	SW-846 6010B	
Zinc	61800	µg	60.0	20	5/14/12	GGG	SW-846 6010B	

Analyte	Result	Units	LOD	Dilution Factor	Analyzed	Analyst	Method	Notes
SVE0350-04 FBlank								
Date Sampled: 04/27/2012	Sample Type:Grab							
Arsenic	<2	µg	2	1	5/14/12	GGG	SW-846 6010B	
Beryllium	<0.400	µg	0.400	1	5/14/12	GGG	SW-846 6010B	
Cadmium	9.3	µg	1.2	1	5/14/12	GGG	SW-846 6010B	
Cobalt	<2.00	µg	2.00	1	5/14/12	GGG	SW-846 6010B	
Chromium	8.00	µg	2.00	1	5/14/12	GGG	SW-846 6010B	
Mercury	<0.001200	µg	0.001200	10	5/14/12	HTM	SW-846 7474	
Manganese	3.44	µg	2.00	1	5/14/12	GGG	SW-846 6010B	J
Nickel	2.40	µg	2.00	1	5/14/12	GGG	SW-846 6010B	J
Lead	<4.0	µg	4.0	1	5/14/12	GGG	SW-846 6010B	
Antimony	<4.0	µg	4.0	1	5/14/12	GGG	SW-846 6010B	
Selenium	<2.4	µg	2.4	1	5/14/12	GGG	SW-846 6010B	
Zinc	43.9	µg	3.0	1	5/14/12	GGG	SW-846 6010B	

Environmental Technology & Engineering
13000 W Bluemound Rd
Elm Grove, WI 53122

Project: solutions
Project Number: [none]
Project Manager: Michael Huenink

Reported:
05/15/12 16:30

Mercury by Atomic Fluorescence - Quality Control

SF Analytical Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 12E0314 - ENV - Mercury Solids/Other Prep										
Blank (12E0314-BLK1)				Prepared: 05/08/12 Analyzed: 05/14/12						
Mercury	ND	0.0000019	µg							

SVE0350-04 J This result is greater than our LOD (Limit of Detection) and less than our LOQ (Limit of Quantitation).

Environmental Technology & Engineering
Attention: Michael Huenink
13000 W Bluemound Rd
Elm Grove,WI 53122

Date Received: 05/08/2012
Date Reported: 05/15/12 16:31
Client Project: solutions
Client Project ID: [none]
PO# 050712-MJH
Project #: [none]

Certificate of Analysis

All quality control samples and checks were within acceptance limits unless otherwise indicated.Test results pertain only to those items tested. All samples were in good condition when received by the laboratory unless otherwise noted. All LOD/LOQs are adjusted to reflect dilutions.

Analyte	Result	Units	LOD	Dilution Factor	Analyzed	Analyst	Method	Notes
SVE0354-01 F1-K								
Date Sampled: 04/27/2012	**Sample Type:Grab**							
Mercury	28.66	µg	0.3144	2000	5/14/12	HTM	SW-846 7474	
Analyte	**Result**	**Units**	**LOD**	**Dilution Factor**	**Analyzed**	**Analyst**	**Method**	**Notes**
SVE0354-02 F2-K								
Date Sampled: 04/27/2012	**Sample Type:Grab**							
Mercury	30.78	µg	0.3048	2000	5/14/12	HTM	SW-846 7474	
Analyte	**Result**	**Units**	**LOD**	**Dilution Factor**	**Analyzed**	**Analyst**	**Method**	**Notes**
SVE0354-03 F3-K								
Date Sampled: 04/27/2012	**Sample Type:Grab**							
Mercury	0.3282	µg	0.03096	200	5/14/12	HTM	SW-846 7474	
Analyte	**Result**	**Units**	**LOD**	**Dilution Factor**	**Analyzed**	**Analyst**	**Method**	**Notes**
SVE0354-04 Fblank-K								
Date Sampled: 04/27/2012	**Sample Type:Grab**							
Mercury	0.005475	µg	0.001500	10	5/14/12	HTM	SW-846 7474	

Mercury by Atomic Fluorescence - Quality Control

SF Analytical Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 12E0314 - ENV - Mercury Solids/Other Prep										
Blank (12E0314-BLK1)				Prepared: 05/08/12 Analyzed: 05/14/12						
Mercury	ND	0.0000019	µg							

This report was prepared and printed by:

Gary Geipel, SIA Department Manager

SF Analytical Laboratories • 2345 South 170th Street • New Berlin, WI 53151
Phone: (262) 754-5300 • Toll Free: (800) 300-6700 • Fax: (262) 754-5310 • sflabs.com

Wisconsin Dept. of Trade and Consumer Protection Certified #166 • Dept. of Natural Resources State Certified Laboratory #241249300
FDA Registered Laboratory #2134660 • USDA Soil Permit #S-76531

DAT Reports®

Data Analysis Technologies, Inc.
7715 Corporate Blvd.
Plain City, OH 43064
800-733-8644

Sample Analysis Certificate

Client:	Environmental Technology & Engineering	Date:	5/23/2012
Address:	13000 West Bluemound Road Elm Grove, WI 53122	DAT Project ID:	0512004
		Date Received:	5/2/2012

Attn: Mike Huenick
Client Project: Ore Kiln
Analysis: VOC-Speciation- Method 0030 Type

The following samples were received on 5/2/2012:

DAT Sample ID	Client Sample ID	Date Sampled	Matrix
0512004-01	1A Tenax Tube	4/27/2012	Tenax
0512004-02	1B Tenax/Charcoal Tube	4/27/2012	Tenax
0512004-03	2A Tenax Tube	4/27/2012	Tenax
0512004-04	2B Tenax/Charcoal Tube	4/27/2012	Tenax
0512004-05	3A Tenax Tube	4/27/2012	Tenax
0512004-06	3B Tenax/Charcoal Tube	4/27/2012	Tenax
0512004-07	Blank Tenax Tube	4/27/2012	Tenax
0512004-08	Blank Tenax/Charcoal Tube	4/27/2012	Tenax

Results: The field blank contained analytes which were in the samples. The tube may have leaked or not been sealed which could have caused the results. See attached summary.

QC: Met the criteria for the method.

Reviewed and approved for release by: Ronald K. Mitchum, Ph.D.
President, DAT

Date: 5/23/12

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VOST Method 0030/ Method 5041A- METHOD 8260 B
VOLATILE ORGANIC COMPOUNDS BY GAS CHROMATOGRAPHY/ MASS SPECTROMETRY (GC/MS)

Reference: 5041A-SW-846 Ch 4.2.1
8260B- Rev. 2, 1996

SCOPE AND APPLICATION

Method 8260B is used to determine volatile organic compounds in a variety of matrices. This method is applicable to air sampling trapping media via Method 5041A.

Method 5041A describes the desorption of volatile principal organic hazardous constituents (POHCs) collected from the stack gas effluents of hazardous waste incinerators using the Volatile Organic Sampling Train (VOST) methodology (1) with analysis by GC/MS (Method 8260).

Method 8260B its common application uses a purge and trap interface to introduce volatile compounds which are stripped from an aqueous matrix. Method 5041A utilizes a tube furnace to desorb the Method 0030 VOST tube into the purge and trap interface.

The results are in total nanograms (ng; 10-9 grams) of analyte. Method 5041A adsorption media results or condensate results are reported in ng total.

Common laboratory solvents are known to interfere with the analysis. These common laboratory interferences are typically methylene chloride, toluene and hexane. Reporting limits may be increased due to the blank level present in the analysis.

DAT Facts™

Tentatively Identified Compounds

The TIC search consisted of the forward search of individual mass spectra contained in the NIST mass spectral library. A similarity index was calculated for the best mass spectral match. High index values generally results in the identification of unknown compounds. Where several closely matching compounds exist such as isomers, hydrocarbon homologues, and other closely related compounds the index may simply indicate the general class. Low index values may be used to indicate compounds of similar structure or functionality but not necessarily a match.

Mass spectral library matches should be viewed with some reservation since an 80% match in a database of 110,000 compounds may not be representative of the more than 8 million known organic compounds.

Review: All TIC results have been reviewed with respect to mass spectral identification. Low index matches have been assigned a generalized compound classification, where applicable. If no classification could be made the term "unknown" has been assigned.

Unknown Hydrocarbon: This designation is due to the similarity of hydrocarbon mass spectra.

Unknown Cx Benzene: This designation is due to the similarity of the mass spectra of all 3-carbon substitutions such as "1-methyl-ethyl", "trimethyl", "propyl" or "isopropyl substituted in the three available positions, "ortho, meta, para", on the benzene ring.

Calculations:

The calculation of a quantitative estimate for each TIC has been made. The reported value is based upon the response of an internal standard with the assumption that the response factor is equal to 1. Since the response factor assumption may be biased all TIC values should be used as estimates only. All dilutions have been factored into the final value.

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Contact Dr. R.K. Mitchum, 800-733-8644; e-mail datlab@datlab.com; web site www.datlab.com

C:\HPCHEM\1\DATA\0512004\05161214.D

Volatile Sample Analysis Summary
Method 8260B

Client	Environmental Tech. & Eng.
Client ID	Tenax Tube 1 A&B
Sample Name	0512004-1&2
Data File Name	05161214.D
Data File Path	C:\HPCHEM\1\DATA\0512004\
Operator	CSM
Instrument Name	F4500
Multiplier:	1
Sample volume(mL)	1.0
Sample Type	SAmple
Sample Matrix:	air

Name	Q		Results	RDL
			ng	ng
Dichlorodifluoromethane			44.22	2.57
Chloromethane		E	2417.71	4.61
Vinyl chloride			20.95	1.82
Bromomethane			213.03	2.67
Chloroethane	ND			3.27
Trichlorofluoromethane	ND			2.30
1,1-Dichloroethene	ND			2.61
Methylene Chloride			139.49	5.99
trans-1,2-Dichloroethene	ND			2.60
1,1-Dichloroethane	ND			1.57
cis-1,2-Dichloroethene	ND			2.21
Bromochloromethane	ND			3.37
Chloroform	ND			2.64
1,1,1,-Trichloroethane	ND			2.22
Carbon tetrachloride	ND			1.90
1,1-Dichloropropene	ND			2.76
Benzene	B		212.54	8.91
1,2-Dichloroethane	ND			1.53
Trichloroethene	ND			2.36
1,2-Dichloropropane	ND			1.96
Dibromomethane	ND			2.30
Bromodichloromethane	ND			2.40
cis-1,3-Dichloropropene	ND			2.00
trans-1,3-Dichloropropene	ND			2.00
Toluene			89.71	2.21
1,1,2-Trichloroethane	ND			1.12
Tetrachloroethylene	ND			1.61
1,3-Dichloropropane	ND			2.12
Chlorodibromomethane	ND			1.70

C:\HPCHEM\1\DATA\0512004\05161214.D

Name	Q	Results ng	RDL ng
1,2-Dibromoethane	ND		2.14
Chlorobenzene	ND		1.95
Ethylbenzene	ND		1.92
1,1,1,2-Tetrachloroethane	ND		2.64
m/p-Xylene	ND		2.91
o-Xylene	ND		2.01
Styrene	ND		1.52
Bromoform	ND		2.10
Isopropylbenzene	ND		2.25
Bromobenzene	ND		1.36
1,1,2,2-Tetrachloroethane	ND		3.34
n-Propylbenzene	ND		2.59
1,2,3-Trichloropropane	ND		2.72
2-Chlorotoluene	ND		2.31
1,3,5-Trimethylbenzene	ND		2.54
4-Chlorotoluene	ND		2.70
1,2,4-Trimethylbenzene	ND		2.39
tert/sec-Butylbenzene	ND		2.27
1,3-Dichlorobenzene	ND		1.37
p-isopropyltoluene	ND		3.41
n-Butylbenzene	ND		2.00
1,4-Dichlorobenzene	ND		2.57
1,2-Dichlorobenzene	ND		2.19
1,2-Dibromo-3-chloropropane	ND		1.60
1,2,4-Trichlorobenzene	ND		2.25
Hexachlorobutadiene	ND		2.22
Naphthalene	ND		1.61
1,2,3-Trichlorobenzene	ND		2.22

Surrogates	%Recovery
Dibromofluoromethane(surr)	106
Toluene-d8(surr)	91
BFB(surr)	99

Q= Qualifier
ND = Not detected at the given reporting limit (RDL)
B = Also found in the associated instrument blank
J= Found below the lowest calibration point
R=Data reported according to EPA 5X blank data useability rule
Data<5X blank value
E=Data exceeded highest calibration point

Tentatively Identified Compound (LSC) summary

Operator ID: Date Acquired: 17 May 2012 14:21
Data File: C:\HPCHEM\1\DATA\0512004\05161214.D
Name: 0512004-1
Misc: Tenax Tube 1 A&B
Method: C:\HPCHEM\1\METHODS\82601207.M (Chemstation
Title: SM6200
Library Searched: C:\DATABASE\NBS75K.L

TIC Top Hit name	RT	EstConc	Units
Ethyl Chloride	3.69	22044	ng
Sulfur Dioxide	7.3	2526	ng
Carbon disulfide	10.32	9434.7	ng
Pentane, 3-methyl-	10.92	6125.2	ng
Hexane	11.68	21326.8	ng
2-Hexene	12.24	238.5	ng
Cyclopentene, 3-meth	12.85	141.8	ng
Cyclopentane, methyl	13.4	7449.7	ng
Cyclohexane	15.01	146.6	ng
Sulfuric acid, dimet	20.86	251.1	ng

RT=Retention time (minutes)

C:\HPCHEM\1\DATA\0512004\05161215.D

Volatile Sample Analysis Summary
Method 8260B

Client	Environmental Tech. & Eng.
Client ID	Tenax Tube 2 A&B
Sample Name	0512004-3&4
Data File Name	05161215.D
Data File Path	C:\HPCHEM\1\DATA\0512004\
Operator	CSM
Instrument Name	F4500
Multiplier:	1
Sample volume(mL)	1.0
Sample Type	SAmple
Sample Matrix:	air

Name	Q		Results	RDL
			ng	ng
Dichlorodifluoromethane	ND			2.57
Chloromethane		E	2370.42	4.61
Vinyl chloride	ND			1.82
Bromomethane	ND			2.67
Chloroethane	ND			3.27
Trichlorofluoromethane	ND			2.30
1,1-Dichloroethene	ND			2.61
Methylene Chloride			60.03	5.99
trans-1,2-Dichloroethene	ND			2.60
1,1-Dichloroethane	ND			1.57
cis-1,2-Dichloroethene	ND			2.21
Bromochloromethane	ND			3.37
Chloroform	ND			2.64
1,1,1,-Trichloroethane	ND			2.22
Carbon tetrachloride	ND			1.90
1,1-Dichloropropene	ND			2.76
Benzene	B		235.25	8.91
1,2-Dichloroethane	ND			1.53
Trichloroethene	ND			2.36
1,2-Dichloropropane	ND			1.96
Dibromomethane	ND			2.30
Bromodichloromethane	ND			2.40
cis-1,3-Dichloropropene	ND			2.00
trans-1,3-Dichloropropene	ND			2.00
Toluene			71.31	2.21
1,1,2-Trichloroethane	ND			1.12
Tetrachloroethylene	ND			1.61
1,3-Dichloropropane	ND			2.12
Chlorodibromomethane	ND			1.70

C:\HPCHEM\1\DATA\0512004\05161215.D

Name	Q		Results ng	RDL ng
1,2-Dibromoethane	ND			2.14
Chlorobenzene	ND			1.95
Ethylbenzene		J	1.69	1.92
1,1,1,2-Tetrachloroethane	ND			2.64
m/p-Xylene		J	5.44	2.91
o-Xylene		J	1.64	2.01
Styrene		J	4.98	1.52
Bromoform	ND			2.10
Isopropylbenzene	ND			2.25
Bromobenzene	ND			1.36
1,1,2,2-Tetrachloroethane	ND			3.34
n-Propylbenzene	ND			2.59
1,2,3-Trichloropropane	ND			2.72
2-Chlorotoluene	ND			2.31
1,3,5-Trimethylbenzene	ND			2.54
4-Chlorotoluene	ND			2.70
1,2,4-Trimethylbenzene	ND			2.39
tert/sec-Butylbenzene	ND			2.27
1,3-Dichlorobenzene	ND			1.37
p-isopropyltoluene	ND			3.41
n-Butylbenzene	ND			2.00
1,4-Dichlorobenzene	ND			2.57
1,2-Dichlorobenzene	ND			2.19
1,2-Dibromo-3-chloropropane	ND			1.60
1,2,4-Trichlorobenzene	ND			2.25
Hexachlorobutadiene	ND			2.22
Naphthalene	ND			1.61
1,2,3-Trichlorobenzene	ND			2.22

Surrogates	%Recovery
Dibromofluoromethane(surr)	100
Toluene-d8(surr)	97
BFB(surr)	89

Q= Qualifier
ND = Not detected at the given reporting limit (RDL)
B = Also found in the associated instrument blank
J= Found below the lowest calibration point
R=Data reported according to EPA 5X blank data useability rule
Data<5X blank value
E=Data exceeded highest calibration point

Tentatively Identified Compound (LSC) summary

Operator ID: Date Acquired: 17 May 2012 15:02
Data File: C:\HPCHEM\1\DATA\0512004\05161215.D
Name: 0512004-2
Misc: Tenax Tube 2 A&B
Method: C:\HPCHEM\1\METHODS\82601207.M (Chemstation
Title: SM6200
Library Searched: C:\DATABASE\NBS75K.L

TIC Top Hit name	RT	EstConc	Units
Carbonyl sulfide	3.2	5711.8	ng
Ethyl Chloride	3.77	27056.1	ng
Sulfur dioxide	7.31	2587	ng
Ethene, 1,2-difluoro	7.39	190.8	ng
unknown hydrocarbon	7.58	223	ng
Carbon disulfide	10.32	4097.2	ng
Pentane, 3-methyl-	10.91	2404.6	ng
Hexane	11.65	7824.9	ng

C:\HPCHEM\1\DATA\0512004\05161216.D

Volatile Sample Analysis Summary
Method 8260B

Client	Environmental Tech. & Eng.
Client ID	Tenax Tube 3 A&B
Sample Name	0512004-5&6
Data File Name	05161216.D
Data File Path	C:\HPCHEM\1\DATA\0512004\
Operator	CSM
Instrument Name	F4500
Multiplier:	1
Sample volume(mL)	1.0
Sample Type	SAmple
Sample Matrix:	air

Name	Q		Results ng	RDL ng
Dichlorodifluoromethane			27.78	2.57
Chloromethane		E	1059.91	4.61
Vinyl chloride		J	7.01	1.82
Bromomethane	ND			2.67
Chloroethane		J	19.28	3.27
Trichlorofluoromethane	ND			2.30
1,1-Dichloroethene	ND			2.61
Methylene Chloride			128.83	5.99
trans-1,2-Dichloroethene	ND			2.60
1,1-Dichloroethane	ND			1.57
cis-1,2-Dichloroethene	ND			2.21
Bromochloromethane	ND			3.37
Chloroform	ND			2.64
1,1,1,-Trichloroethane	ND			2.22
Carbon tetrachloride	ND			1.90
1,1-Dichloropropene	ND			2.76
Benzene	B	E	1021.66	8.91
1,2-Dichloroethane	ND			1.53
Trichloroethene	ND			2.36
1,2-Dichloropropane	ND			1.96
Dibromomethane	ND			2.30
Bromodichloromethane	ND			2.40
cis-1,3-Dichloropropene	ND			2.00
trans-1,3-Dichloropropene	ND			2.00
Toluene			406.94	2.21
1,1,2-Trichloroethane	ND			1.12
Tetrachloroethylene	ND			1.61
1,3-Dichloropropane	ND			2.12
Chlorodibromomethane	ND			1.70

C:\HPCHEM\1\DATA\0512004\05161216.D

Name	Q		Results ng	RDL ng
1,2-Dibromoethane	ND			2.14
Chlorobenzene			23.08	1.95
Ethylbenzene		J	12.31	1.92
1,1,1,2-Tetrachloroethane	ND			2.64
m/p-Xylene			98.33	2.91
o-Xylene			26.84	2.01
Styrene		J	1.73	1.52
Bromoform	ND			2.10
Isopropylbenzene			90.57	2.25
Bromobenzene	ND			1.36
1,1,2,2-Tetrachloroethane		J	9.94	3.34
n-Propylbenzene		J	3.54	2.59
1,2,3-Trichloropropane	ND			2.72
2-Chlorotoluene	ND			2.31
1,3,5-Trimethylbenzene			67.46	2.54
4-Chlorotoluene		J	9.09	2.70
1,2,4-Trimethylbenzene	ND			2.39
tert/sec-Butylbenzene		J	1.95	2.27
1,3-Dichlorobenzene	ND			1.37
p-Isopropyltoluene		J	6.64	3.41
n-Butylbenzene		J	12.79	2.00
1,4-Dichlorobenzene	ND			2.57
1,2-Dichlorobenzene	ND			2.19
1,2-Dibromo-3-chloropropane	ND			1.60
1,2,4-Trichlorobenzene	ND			2.25
Hexachlorobutadiene	ND			2.22
Naphthalene			30.27	1.61
1,2,3-Trichlorobenzene	ND			2.22

Surrogates	%Recovery
Dibromofluoromethane(surr)	95
Toluene-d8(surr)	93
BFB(surr)	93

Q= Qualifier
ND = Not detected at the given reporting limit (RDL)
B = Also found in the associated instrument blank
J= Found below the lowest calibration point
R=Data reported according to EPA 5X blank data useability rule
Data<5X blank value
E=Data exceeded highest calibration point

Tentatively Identified Compound (LSC) summary

Operator ID: Date Acquired: 17 May 2012 15:44
Data File: C:\HPCHEM\1\DATA\0512004\05161216.D
Name: 0512004-3
Misc: Tenax Tube 3 A&B
Method: C:\HPCHEM\1\METHODS\82601207.M (Chemstation
Title: SM6200
Library Searched: C:\DATABASE\NBS75K.L

TIC Top Hit name	RT	EstConc	Units
unknown hydrocarbon	3.49	1809.7	ng
unknown	4.76	112.1	ng
unknown hydrocarbon	8.21	454.4	ng
Sulfur dioxide	7.3	1824	ng
Acetonitrile	9.71	95.7	ng
Carbon disulfide	10.28	1694.8	ng
Pentane, 3-methyl-	10.89	1101.7	ng
Hexane	11.63	11222.7	ng
3-Hexene, (E)-	12.21	457.1	ng
2-Hexene, (E)-	12.69	121.5	ng
Cyclopentane, methyl	13.36	886	ng
Cyclohexene	15.91	99.1	ng
Nonane	20.19	204.5	ng
Cyclooctanone	22.49	105.4	ng

C:\HPCHEM\1\DATA\0512004\05161213.D

Volatile Sample Analysis Summary
Method 8260B

Client	Environmental Tech. & Eng.
Client ID	Tenax Blank A&B
Sample Name	0512004-7&8
Data File Name	05161213.D
Data File Path	C:\HPCHEM\1\DATA\0512004\
Operator	CSM
Instrument Name.	F4500
Multiplier:	1
Sample volume(mL)	1.0
Sample Type	SAmple
Sample Matrix:	air

Name	Q		Results	RDL
			ng	ng
Dichlorodifluoromethane	ND			2.57
Chloromethane		E	2013.58	4.61
Vinyl chloride	ND			1.82
Bromomethane			135.79	2.67
Chloroethane	ND			3.27
Trichlorofluoromethane	ND			2.30
1,1-Dichloroethene	ND			2.61
Methylene Chloride			91.01	5.99
trans-1,2-Dichloroethene	ND			2.60
1,1-Dichloroethane	ND			1.57
cis-1,2-Dichloroethene	ND			2.21
Bromochloromethane	ND			3.37
Chloroform	ND			2.64
1,1,1,-Trichloroethane	ND			2.22
Carbon tetrachloride	ND			1.90
1,1-Dichloropropene	ND			2.76
Benzene	B		51.92	8.91
1,2-Dichloroethane	ND			1.53
Trichloroethene	ND			2.36
1,2-Dichloropropane	ND			1.96
Dibromomethane	ND			2.30
Bromodichloromethane	ND			2.40
cis-1,3-Dichloropropene	ND			2.00
trans-1,3-Dichloropropene	ND			2.00
Toluene			63.22	2.21
1,1,2-Trichloroethane	ND			1.12
Tetrachloroethylene	ND			1.61
1,3-Dichloropropane	ND			2.12
Chlorodibromomethane	ND			1.70

C:\HPCHEM\1\DATA\0512004\05161213.D

Name	Q	Results ng	RDL ng
1,2-Dibromoethane	ND		2.14
Chlorobenzene	ND		1.95
Ethylbenzene	ND		1.92
1,1,1,2-Tetrachloroethane	ND		2.64
m/p-Xylene	ND		2.91
o-Xylene	ND		2.01
Styrene	ND		1.52
Bromoform	ND		2.10
Isopropylbenzene	ND		2.25
Bromobenzene	ND		1.36
1,1,2,2-Tetrachloroethane	ND		3.34
n-Propylbenzene	ND		2.59
1,2,3-Trichloropropane	ND		2.72
2-Chlorotoluene	ND		2.31
1,3,5-Trimethylbenzene	ND		2.54
4-Chlorotoluene	ND		2.70
1,2,4-Trimethylbenzene	ND		2.39
tert/sec-Butylbenzene	ND		2.27
1,3-Dichlorobenzene	ND		1.37
p-Isopropyltoluene	ND		3.41
n-Butylbenzene	ND		2.00
1,4-Dichlorobenzene	ND		2.57
1,2-Dichlorobenzene	ND		2.19
1,2-Dibromo-3-chloropropane	ND		1.60
1,2,4-Trichlorobenzene	ND		2.25
Hexachlorobutadiene	ND		2.22
Naphthalene	ND		1.61
1,2,3-Trichlorobenzene	ND		2.22

Surrogates	%Recovery
Dibromofluoromethane(surr)	97
Toluene-d8(surr)	88
BFB(surr)	81

Q= Qualifier
ND = Not detected at the given reporting limit (RDL)
B = Also found in the associated instrument blank
J= Found below the lowest calibration point
R=Data reported according to EPA 5X blank data useability rule
Data<5X blank value
E=Data exceeded highest calibration point

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Tentatively Identified Compound (LSC) summary

Operator ID: Date Acquired: 17 May 2012 13:30
Data File: C:\HPCHEM\1\DATA\0512004\05161213.D
Name: 0512004-4
Misc: Tenax Blank A&B
Method: C:\HPCHEM\1\METHODS\82601207.M (Chemstation
Title: SM6200
Library Searched: C:\DATABASE\NBS75K.L

TIC Top Hit name	RT	EstConc	Units
Ethyne, chloro-	3.2	3792.4	ng
Furan	8.57	13.2	ng
Carbon disulfide	10.33	1838.7	ng
Pentane, 3-methyl-	10.93	667	ng
Hexane	11.68	12247	ng
unknown hydrocarbon	12.25	69.2	ng
Pentane, 3-methylene	12.74	18.8	ng
Cyclohexane	13.4	274.6	ng
Nonane	20.21	12.2	ng
unknown hydrocarbon	21.04	10.7	ng

RT=Retention time (minutes)

WOHL Wisconsin Occupational Health Laboratory

Mail:
P.O. Box 7996
Madison, WI 53707-7996
Phone: (800) 446-0403

Packages:
2601 Agriculture Dr.
Madison, WI 53718
Fax: (608) 224-6213

Wisconsin State Laboratory of Hygiene
University of Wisconsin

Analytical Laboratory Report

May 10, 2012

Report ID: 9507528

MIKE HUENINK
ENVIRONMENTAL TECHNOLOGY & ENGR CORP
13000 W BLUEMOUND RD
ELM GROVE WI 53122

Company Number: 3410

ETE 4026

050312-MJH-A

Date Collected: 4/27/2012
Date Received: 5/4/2012
Date Reported: 5/10/2012

Analyst: _____
CHRISTOPHER MCSWEENY, Advanced Chemist
csm@mail.slh.wisc.edu

Reviewer: _____
STEVE STREBEL, WOHL Director
ss@mail.slh.wisc.edu

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These signatures are as valid as original handwritten signatures.
If you have any questions regarding this report please feel free to contact the laboratory via email (as listed above) or via telephone at 800-446-0403

WOHL Wisconsin Occupational Health Laboratory

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P.O. Box 7996
Madison, WI 53707-7996
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Madison, WI 53718
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Wisconsin State Laboratory of Hygiene
University of Wisconsin

Analytical Results

LAB NUMBER / FIELD NUMBER	DESCRIPTION		AIR VOLUME
1530770	H2O IMPINGER		
LF-1			
Fluorides (as F)		4500 µg/sample	
Phosphate		69 µg/sample	

COMMENTS: Impinger solution volumes were measured to the nearest 0.1 mL and were analyzed for Fluoride and Phosphate as listed. Samples contained very high concentrations of Fluoride and Sulfate (for this method) and required a 1:500 dilution prior to injection into instrument. Phosphate results are approximate due to possible interference from high concentrations of Sulfate. Analysis date: 5/8/2012.

1530771	H2O IMPINGER		
LF-2			
Fluorides (as F)		6000 µg/sample	
Phosphate		45 µg/sample	
1530772	H2O IMPINGER		
LF-3			
Fluorides (as F)		7300 µg/sample	
Phosphate		38 µg/sample	
1530773	H2O IMPINGER		
LF-BLANK			
Fluorides (as F)		<5.0 µg/sample	
Phosphate		<9.9 µg/sample	

Displayed values on report have been rounded; however all calculations are performed using raw, unrounded intermediate results. Please contact the laboratory if you have any questions regarding our result calculation or rounding. All samples were received by the laboratory in acceptable condition unless otherwise noted.

< : Less Than. The analyte, if present, is at a level too low to be accurately quantitated by the method used. The actual amount is less than the reported value.

WOHL Wisconsin Occupational Health Laboratory

Mail:
P.O. Box 7996
Madison, WI 53707-7996
Phone: (800) 446-0403

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2601 Agriculture Dr.
Madison, WI 53718
Fax: (608) 224-6213

Wisconsin State Laboratory of Hygiene

University of Wisconsin

Analytical Methodology

INORGANIC ACIDS/ACID ANIONS:
Impinger collection.

Acids were analyzed as acid anions by Ion Chromatography (IC) using WOHL method WI0021ia.12 based on NIOSH method 7903 for inorganic acids.

The samples were collected in an appropriate impinger solution. The volume of solution was measured upon return the the Laboratory. An aliquot of the solution was analyzed for inorganic ions by IC with conductivity detector.

The results are calculated and expressed and micrograms per cubic meter (mg/M3) if the air volume is given or as ug/sample if no air volume is received. Samples are not blank corrected unless noted in the analytical comments.

REPORTING LIMITS:

This table contains the WOHL determined reporting limits for the compounds specified in this report. These numbers are based on the historical statistical data for a particular analyte or are based on WOHL determined values. If no value appears for an analyte in the table, the RL value is the same as the previous value.

Analyte	Reporting Limit
Fluorides (as F) on H2O IMPINGER (Volume = 20.4ml)	4.1 µg/sample
Fluorides (as F) on H2O IMPINGER (Volume = 21.2ml)	4.2 µg/sample
Fluorides (as F) on H2O IMPINGER (Volume = 23.5ml)	4.7 µg/sample
Fluorides (as F) on H2O IMPINGER (Volume = 24.8ml)	5.0 µg/sample
Phosphate on H2O IMPINGER (Volume = 20.4ml)	8.2 µg/sample
Phosphate on H2O IMPINGER (Volume = 21.2ml)	8.5 µg/sample
Phosphate on H2O IMPINGER (Volume = 23.5ml)	9.4 µg/sample
Phosphate on H2O IMPINGER (Volume = 24.8ml)	9.9 µg/sample

Analytical Quality Control

Unless specifically noted in the report, these samples were analyzed with analyst-spiked quality control samples in lieu of blind quality control samples. These analyst-spiked quality control samples have passed the laboratory criteria for precision and accuracy unless noted. Additional quality control required by the method was performed. The results in this report conform to the high quality standards set forth at The Wisconsin Occupational Health Laboratory.

End of Analytical Report

The results in this report apply only to the samples, specifically listed above, tested at the Wisconsin Occupational Health Laboratory.
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WOHL Wisconsin Occupational Health Laboratory

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Wisconsin State Laboratory of Hygiene
University of Wisconsin

Analytical Laboratory Report

May 07, 2012

Report ID: 9506160

MIKE HUENINK
ENVIRONMENTAL TECHNOLOGY & ENGR CORP
13000 W BLUEMOUND RD
ELM GROVE WI 53122

Company Number: 3410

ETE 4026
050312-MJH-B

Date Collected: 4/27/2012
Date Received: 5/4/2012
Date of Analysis: 5/4/2012
Date Reported: 5/7/2012

Analyst: _____
BILL STEELE, Chemist
ws@mail.slh.wisc.edu

Reviewer: _____
LEROY DOBSON, Chemist Supervisor
ld@mail.slh.wisc.edu

WOHL uses only verified, secured electronic signatures on reports.
These signatures are as valid as original handwritten signatures.
If you have any questions regarding this report please feel free to contact the laboratory via email (as listed above) or via telephone at 800-446-0403

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Wisconsin State Laboratory of Hygiene
University of Wisconsin

Analytical Results

LAB NUMBER / FIELD NUMBER	DESCRIPTION		AIR VOLUME
1530766	2PYF		liters
F-1			
Total Weight		5500 µg/sample	
Silica (Percent Quartz Total)		0.83 %	
Silica (Quartz total)		46 µg/sample	
COMMENTS: Samples 1530766-768 appear to have gotten wet during sampling causing some material to seep onto the support pads. Results may be suspect. Sample 1530766 is overloaded, which may cause the result to be suspect.			
1530767	2PYF		liters
F-2			
Total Weight		4200 µg/sample	
Silica (Percent Quartz Total)		0.32 %	
Silica (Quartz total)		14 µg/sample	
1530768	2PYF		liters
F-3			
Total Weight		3300 µg/sample	
Silica (Percent Quartz Total)		0.43 %	
Silica (Quartz total)		14 µg/sample	
1530769	2PYF		
F-BLANK			
Total Weight		<53 µg/sample	Blank Value = -35 µg/sample
Silica (Quartz total)		<10 µg/sample	
COMMENTS: Gravimetric results completed 5/4/12.			

Displayed values on report have been rounded; however all calculations are performed using raw, unrounded intermediate results. Please contact the laboratory if you have any questions regarding our result calculation or rounding. All samples were received by the laboratory in acceptable condition unless otherwise noted.

< : Less Than. The analyte, if present, is at a level too low to be accurately quantitated by the method used. The actual amount is less than the reported value.

APPENDIX C

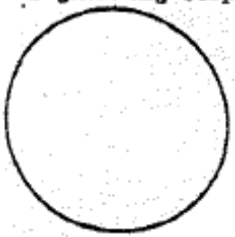
Field Data Sheets & Particulate Lab Sheets

ΔP × 7.5 = ΔH

METALS #

Environmental Technology & Engineering Corp.

PARTICULATE FIELD DATA



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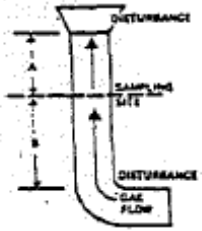

PLANT FEECO
DATE 4-27-12
LOCATION GREEN BAY
OPERATOR WJD
STACK NO. KILN OUT
RUN NO. 1
SAMPLE BOX NO. 1
METER BOX NO. 1

AMBIENT TEMPERATURE 50
BAROMETRIC PRESSURE 29.55
ASSUMED MOISTURE, % 5
PROBE LENGTH, in. 4"
NOZZLE DIAMETER, in. 3/8 (B)
STACK DIAMETER, in. 5
PROBE HEATER SETTING 250
HEATER BOX SETTING 250

METER ΔH@ 1.742
C FACTOR
PROCESS WEIGHT RATE

ORSAT RESULTS
CO2
O2
CO
N2

LEAK CHECKS
Pre OK
Pitot OK
OK Post
OK Pitot

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)		PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{IN}}$), °F	OUTLET ($T_{m_{OUT}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	1125		1055	.18		1.35		3421.00		59	250	40	2	
2	30		1058	.19		1.42		24.0		59				
3	35		1059	.20		1.50		28.0		60				
4	40		1058	.22		1.65		31.6		60				
5	45		1058	.20		1.50		35.3		62				
6	50	-.35	1059	.20		1.50		38.8		65				
7	55		1055	.19		1.42		42.3		70	250	40		
8	00		1050	.20		1.50		45.8		76				
9	05		1047	.22		1.65		49.2		82				
10	10		1048	.22		1.65		52.9		87				
11	15		1049	.22		1.65		56.5		90				
12	20		1053	.20		1.50		60.1		95			2	
	1225							3463.45				40		
								42.45						

LABORATORY DATA SHEET
PARTICULATE WITH METHOD 202 BACKHALF ANALYSIS

JOB NAME FEECO DATE OF TEST 4-27-12

JOB NO. TEST ENGINEER

RUN NO. 1 STACK

SAMPLE BOX 1 FILTER NUMBER 067

BEAKERS: FH Acetone 1 ~~BH MetCl~~ ~~BH Water~~

WATER COLLECTED

Impinger No.	Final Wt (g)	Initial Wt (g)	Water Collected (g)
1+2	139 (+50 ml) 109	100 100	39 9
3+4 knock	212 (+50 ml)	200	12 (Total Sample 262)
5	6	0	6
Sil Gel	662	648	14
		WATER TOTAL -	80

PARTICULATE COLLECTED

	Blank	Final Wt (g)	Tare Wt (g)	Net Wt Gain (g)
Filter		1.0603	.8641	.1962
FH Wash	.0012	114.2131	106.3224 (7.8907)	7.8895
			FRONT HALF TOTAL -	8.0857
Extract				
Water				
			BACK HALF TOTAL -	
			TOTAL PARTICULATE -	

Comments:

+50 reconstitute
+.100 probe rinse

HNO3 Total Sample (418)

7

143.7685
115.4323
28.3362
- .0006
28.3356

Leader only blank .0006

36.4213

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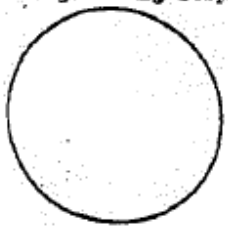
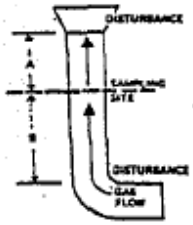


CROSS SECTION



PARTICULATE FIELD DATA

PLANT Fozo
DATE 4-27-12
LOCATION Green Bay
OPERATOR WJ
STACK NO. Kiln Out
RUN NO. 2
SAMPLE BOX NO. 2
METER BOX NO. 1

AMBIENT TEMPERATURE
BAROMETRIC PRESSURE 29.5
ASSUMED MOISTURE, % 5
PROBE LENGTH, in. 3'+
NOZZLE DIAMETER, in. 3/8 (B)
STACK DIAMETER, in. 6
PROBE HEATER SETTING 250
HEATER BOX SETTING 250

METER ΔH@ See Tab 1
C FACTOR
PROCESS WEIGHT RATE

ORSAT RESULTS
CO2
O2
CO
N2

LEAK CHECKS
Pre ok
Pitot ok
ok Post
ok Pitot

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)		PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{IN}}$), °F	OUTLET ($T_{m_{OUT}}$), F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	1330		1048	.20		1.50		3465.00		90	250	38	2	
2	35		1049	.20		1.50		68.6		90				
3	40	-.35	1045	.21		1.55		72.1		90				
4	45		1050	.22		1.65		75.6		91				
5	50		1053	.22		1.65		79.3		91				
6	55		1052	.18		1.35		83.0		91		40		
7	00		1052	.19		1.42		86.3		92				
8	05		1054	.20		1.50		89.6		94				
9	10		1053	.22		1.65		93.0		96				
10	15		1052	.22		1.65		96.5		98				
11	20		1050	.22		1.65		3500.0		100				
12	25		1050	.20		1.50		03.6		100				
	1430							3507.01			250	40		
								42.01						

LABORATORY DATA SHEET
PARTICULATE WITH METHOD 202 BACKHALF ANALYSIS

JOB NAME Feed DATE OF TEST 4-27-12

JOB NO. _____ TEST ENGINEER _____

RUN NO. 2 STACK Kiln - OA

SAMPLE BOX 2 FILTER NUMBER Q68

BEAKERS: FH Acetone 2 BH MetCl _____ ~~BH Water~~ _____

WATER COLLECTED

Impinger No.	Final Wt (g)	Initial Wt (g)	Water Collected (g)
1	140	100	40
2	133	100 +50	33
3 + knocky	204	200 +50	4 Total Sample 254
5	2	0	2
Sil Gel	695	680	7
		WATER TOTAL -	86

PARTICULATE COLLECTED

	Blank	Final Wt (g)	Tare Wt (g)	Net Wt Gain (g)
Filter		1.3778	.8667	.5111
FH Wash	.0012	110.8122	110.5568	.2542
			FRONT HALF TOTAL -	.7653
Extract				
Water				
			BACK HALF TOTAL -	
			TOTAL PARTICULATE -	

Comments:
+50 crushable
+100 probe rinse

Total Sample 473

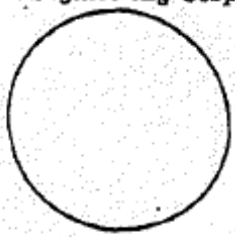
8

.0006

131.3195
103.1723
28.1472
28.1466

28.9119

Environmental Technology & Engineering Corp.



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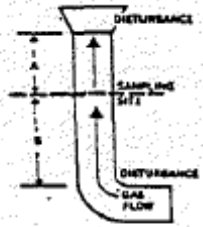


PARTICULATE FIELD DATA

PLANT Fixco
DATE 4-27-12
LOCATION Green Bay
OPERATOR WJD
STACK NO. Kiln Outlet
RUN NO. 3
SAMPLE BOX NO. 3
METER BOX NO. 1

AMBIENT TEMPERATURE
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 5
PROBE LENGTH, in. 3'+
NOZZLE DIAMETER, in. 3/8 (B)
STACK DIAMETER, in. 3
PROBE HEATER SETTING 250
HEATER BOX SETTING 250

METER ΔH@ Set Test
C FACTOR
PROCESS WEIGHT RATE

ORSAT RESULTS (Test 10)
CO2
O2
CO
N2

LEAK CHECKS
Pre ok
Pitot OK
ok Post 2.0 @ 21"
ok Pitot 3'+

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)		PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (Vm), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{IN}}$), °F	OUTLET ($T_{m_{OUT}}$), F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	1525		1058	.20		1.50		4513.00		86	250	40	2	
2	30		1060	.20		1.50		16.3		86				
3	35		1058	.22		1.65		20.0		86				
4	40	-.30	1050	.22		1.65		23.7		87				
5	45		1045	.22		1.65		27.2		89				
6	50		1048	.18		1.35		30.8		90				
7	55		1050	.18		1.35		34.1		91		40		
8	00		1047	.19		1.43		37.4		93				
9	05		1045	.21		1.55		40.8		95				
10	10		1036	.22		1.65		44.2		98				
11	15		1034	.22		1.65		47.8		100				
12	20		1032	.20		1.50		51.3		100	250			
	1620							54.76				40		
								41.76						

LABORATORY DATA SHEET
PARTICULATE WITH METHOD 202 BACKHALF ANALYSIS

JOB NAME Feeco DATE OF TEST 4-27-12

JOB NO. TEST ENGINEER

RUN NO. 3 STACK

SAMPLE BOX 3 FILTER NUMBER Q69

BEAKERS: FH Acetone BH NetCl BH Water

WATER COLLECTED

Impinger No.	Final Wt (g)	Initial Wt (g)	Water Collected (g)
1+2	140 124	100 100 +50	40 24
3+4 KMnO4	200	200 +50	8 Total Sample 250
5	2	0	2
Sil Gel	698	688	10
		WATER TOTAL -	84

PARTICULATE COLLECTED

	Blank	Final Wt (g)	Tare Wt (g)	Net Wt Gain (g)
Filter		1.5236	.8665	.6571
FH Wash	.0012	112.2752	111.9233	.3507
			FRONT HALF TOTAL -	1.0078
Extract				
Water				
			BACK HALF TOTAL -	
			TOTAL PARTICULATE -	

Comments:

+50 reconstitute
+100 probe rinse

Total Sample 464

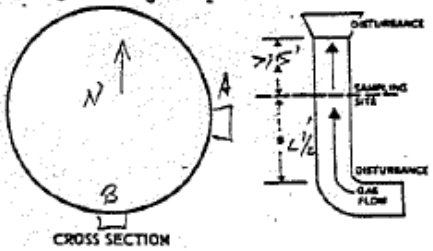
9

.0006

131.6076
102.1657
29.4419
29.4413

30.4491

Environmental Technology & Engineering Corp.



PARTICULATE FIELD DATA

PLANT FMCCO
DATE 4/27/12
LOCATION GREEN BAY
OPERATOR MJH
STACK NO. FINAL STACK
RUN NO. 1
SAMPLE BOX NO. 5A
METER BOX NO. 2

AMBIENT TEMPERATURE 55
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 3%
PROBE LENGTH, in. 4 FT 3 3
NOZZLE DIAMETER, in. 3/8" (A)
STACK DIAMETER, in. 22
PROBE HEATER SETTING –
HEATER BOX SETTING –

γ = 1.006
METER ΔH@ .722 4/25
C FACTOR Cp=.84
PROCESS WEIGHT RATE

ORSAT RESULTS
CO2
O2
CO
N2
SAME

LEAK CHECKS
Pre <.01@20"
Pitot OKC3
Post <.01@20"
Pitot OKC3

T-276 2.5 mm/pt

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s) ($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) ×8 in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	FILTER SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER F	PUMP VACUUM in. Hg gauge	VELOCITY fps
A 1	1125		78	.17	1.36		2626.00		51	(STACK)	<45	6	
2	27½		78	.19	1.52		28.7		52				
3	30		79	.16	1.28		31.6		54		<45	5½	
4	32½		79	.12	.96		34.2		54				
5	35	-.07	79	.10	.80		36.5		56		45	4	
6	37½		80	.07	.56		38.5		56				
7	40		80	.09	.72		40.3		55		45	4	
8	42½		80	.16	1.28		42.2		55				
9	45		80	.20	1.60		44.6		56		45	7	
10	47½		80	.20	1.60		47.4		58				
11	50		80	.20	1.60		50.3		60		45	7	
12	52½		79	.15	1.20		53.0		62				
B 1	55		79	.04	.32		55.5		64		47	2½	
2	57½		80	.05	.40		57.0		67				
3	1200		81	.05	.40		58.5		68		47	2½	
4	2½		82	.05	.40		60.0		68				
5	5		82	.04	.32		61.5		69		47	2½	
6	7½	-.07	82	.04	.32		62.8		69				
7	10		81	.12	.96		64.1		69		48	4½	
8	12½		80	.24	1.92		66.2		69				
9	15		80	.30	2.40		69.2		69		48	9	
10	17½		81	.42	3.36		72.4		70				
11	20		81	.37	2.96		76.2		71		49	11	
12	22½		80	.29	2.32		79.9		73				
	1225						2683.14						
							57.14						

LABORATORY DATA SHEET
PARTICULATE & WATER COLLECTED

JOB NAME FECO DATE OF TEST 4/27/12

JOB NO. TEST ENGINEER MJD

RUN NO. 1 STACK FINAL STACK

Sample Box 5A Filter 276 Wash Bottle —

Beaker No. 4

WATER COLLECTED

Impinger No.	Final Wt. g	Initial Wt. g	Collected grams
1	114	100	14
2	102	100	2
3	0	0	—
Silica	763	759	4
		TOTAL	20

PARTICULATE COLLECTED

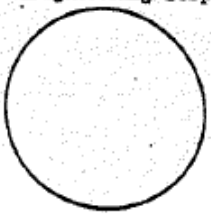
	Blk	Final Wt. g	Tare Wt. g	Collected grams
Filter	.0007	1.0784	1.0772	.0009
Washings	.0002	116.2160	116.2150	.0008
			TOTAL	.0017

WATER COLLECTED [ ] GRAMS

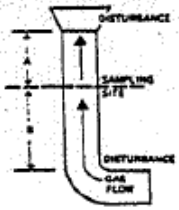
PARTICULATE COLLECTED [ ] GRAMS

NOTES:

Environmental Technology & Engineering Corp.



CROSS SECTION



PARTICULATE FIELD DATA

PLANT: FEECO
DATE: 4-27-12
LOCATION: GREEN BAY, WI
OPERATOR: MJH
STACK NO.: FINAL STACK
RUN NO.: 2 + SIZE SET "N"
SAMPLE BOX NO.: 58
METER BOX NO.: 2

AMBIENT TEMPERATURE: 55 F
BAROMETRIC PRESSURE:
ASSUMED MOISTURE, %: 3%
PROBE LENGTH, in.: 4FT 5S
NOZZLE DIAMETER, in.: 3/8" (A)
STACK DIAMETER, in.: 22"
PROBE HEATER SETTING: –
HEATER BOX SETTING: –

METER ΔH@: .722 } γ = 1.006 4/25/12
C FACTOR: Cp = .84
PROCESS WEIGHT RATE:

ORSAT RESULTS
CO2
O2
CO
N2

LEAK CHECKS
Pre <.01@20"
Pitot ok@3"
Post <.01@20"
Pitot ok@3"

2.5 min/PT

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	PSIREC SET ΔH .122 VELOCITY HEAD (ΔP_s)	($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{IN}}$), °F	OUTLET ($T_{m_{OUT}}$), F	FILTER SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	13:30		83	.04		.32		2684.00		68	(STACK)	45	2	
2	32½		84	.04		.32		85.4		66				
3	35		84	.05		.40		86.8		67		45	2½	
4	37½		85	.04		.32		88.3		67				
5	40		83	.03		.24		89.7		68		45	2	
6	42½	-.10	83	.05		.40		91.0		69				
7	45		83	.10		.80		92.5		71		46	4	
8	47½		82	.13		1.04		94.5		71				
9	50		82	.19		1.52		96.7		72		46	6½	
10	52½		83	.29		2.32		99.6		73				
11	55		83	.33		2.64		702.8		74		47	9½	
12	57½		82	.31		2.48		6.2		73				
1	1400		81	.16		1.28		9.5		73		47	5½	
2	2½		82	.16		1.28		11.9		74				
3	5		82	.13		1.04		14.3		75		47	5	
4	7½		82	.11		.88		16.5		77				
5	10		83	.07		.56		18.6		77		48	3	
6	12½		82	.04		.32		20.4		78				
7	15	-.10	82	.09		.72		21.8		78		48	3½	
8	17½		81	.14		1.12		23.7		79				
9	20		81	.17		1.36		26.1		80		49	6½	
10	22½		80	.19		1.52		28.6		82				
11	25		82	.21		1.68		31.5		83		50	8	
12	27½		82	.16		1.28		34.5		85				
	1430							2637.07						
								53.07						

SIZE = 56.5 min →

LABORATORY DATA SHEET
PARTICULATE & WATER COLLECTED

JOB NAME FECO
DATE OF TEST 4/27/12
JOB NO.
TEST ENGINEER MJH

RUN NO. 2 STACK FINAL

Sample Box 5B Filter 277 Wash Bottle -
Beaker No. 5

WATER COLLECTED

Impinger No.	Final Wt. g	Initial Wt. g	Collected grams
1	112	100	12
2	103	100	3
3	2	0	2
Silica	765	763	2
		TOTAL	19

PARTICULATE COLLECTED

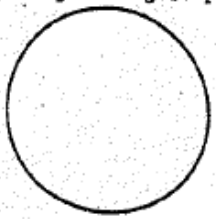
	BK	Final Wt. g	Tare Wt. g	Collected grams
Filter	.0003	1.0818	1.0804	.0011
Washings	.0002	110.4533	110.4523	.0008
			TOTAL	.0019

WATER COLLECTED [ ] GRAMS

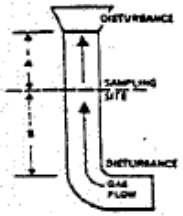
PARTICULATE COLLECTED [ ] GRAMS

NOTES:

Environmental Technology & Engineering Corp.



CROSS SECTION



PARTICULATE FIELD DATA

PLANT FEECO
DATE 4/27/12
LOCATION GREEN BAY, WI
OPERATOR MJH
STACK NO. FINAL STACK
RUN NO. 3
SAMPLE BOX NO. 5C
METER BOX NO. 2

AMBIENT TEMPERATURE 50
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 3%
PROBE LENGTH, in. 4 ft 5 S
NOZZLE DIAMETER, in. 3/8" (A)
STACK DIAMETER, in. 22"
PROBE HEATER SETTING –
HEATER BOX SETTING –

γ = 1.006
METER ΔH@ .722
C FACTOR C_p = .84
PROCESS WEIGHT RATE

ORSAT RESULTS
CO2
O2
CO
N2

LEAK CHECKS
Pre <0.1@20"
Pitot 0@3"
Post
Pitot

T-278 2.5 mm/pt

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s) ($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft^3	GAS SAMPLE TEMPERATURE AT DRY GAS METER, INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), F	FILTER SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER F	PUMP VACUUM in. Hg gauge	VELOCITY fps
81	15:25		81	.04	.32		2738.00		73	(STACK)	<45	2½	
2	27½		81	.05	.40		39.4		72				
3	30		80	.05	.40		40.8		72		45	2½	
4	32½		80	.04	.32		42.3		71				
5	35	-.08	80	.03	.24		43.7		71		45	2	
6	37½		81	.04	.32		44.9		71				
7	40		81	.11	.88		46.2		73		45	5½	
8	42½		81	.24	1.92		48.3		76				
9	45		81	.33	2.64		51.3		78		46	10½	
10	47½		82	.38	3.10		54.6		78				
11	50		82	.35	2.80		58.2		79		47	11	
12	52½		81	.23	1.84		61.6		79				
A 1	55		80	.16	1.28		64.5		78		47	7	
2	57½		81	.16	1.28		67.0		79				
3	1600		81	.14	1.12		69.4		80		47	4½	
4	2½		82	.12	.96		71.7		81				
5	5		82	.10	.80		73.9		84		48	3½	
6	7½		81	.05	.40		75.9		86				
7	10	-.09	81	.09	.72		77.2		88		49	3½	
8	12½		80	.14	1.12		79.1		89				
9	15		80	.19	1.52		81.4		90		49	6½	
10	17½		81	.21	1.68		84.0		91				
11	20		81	.19	1.52		86.8		91		50	6½	
12	22½		81	.15	1.20		89.5		92				
	1625						2791.87						
							53.87						

LABORATORY DATA SHEET
PARTICULATE & WATER COLLECTED

JOB NAME FEECO DATE OF TEST 4/27/12

JOB NO. TEST ENGINEER MJH

RUN NO. 3 STACK FINAL

Sample Box 5C Filter 278 Wash Bottle –

Beaker No. 6

WATER COLLECTED

Impinger No.	Final Wt. g	Initial Wt. g	Collected grams
1	113	100	13
2	102	100	2
3	1	0	1
Sil Gel	768	765	3
		TOTAL	19

PARTICULATE COLLECTED

	Final Wt. g	Tare Wt. g	Collected grams
Filter .0003	1.0887	1.0878	.0006
Washings .0002	108.6530	108.6513	.0015
		TOTAL	.0021

WATER COLLECTED [ ] GRAMS

PARTICULATE COLLECTED [ ] GRAMS

NOTES:

GAS SAMPLING DATA

ETE

Client	Feed
Date	4-27-12
Process	Kiln Exhaust
Run No	1A
Time	1125 - 1155

CM

MIN	%	PPM	PPM	PPM	PPM	%
	O2	CO	SO2	NOx	VOC	CO2
		27.5/48.3		50/79.6	(as CH4)	
1	11.5	37	219	57	0	5.9
2	11.5	35	221	52	0	6.0
3	11.5	34	224	54	0	5.9
4	11.5	35	225	55	0	5.9
5	11.4	31	229	56	0	6.0
6						
7						
8						
9						
10	11.4	29	227	57	0	6.1
11						
12						
13						
14						
15	11.4	26	230	56	0	6.0
16						
17						
18						
19						
20	11.4	22	241	57	0	6.1
21						
22						
23						
24						
25	11.7	19	244	57	0	5.9
26						
27						
28						
29						
30	11.6	14	255	63	0	6.1

COMMENTS:

21

GAS SAMPLING DATA

ETE

Client	FEEW
Date	4-27-12
Process	KILN OUTLET
Run No	1B
Time	1155 - 1725

MIN	% O2	PPM CO	PPM SO2	PPM NOx	PPM VOC	% CO2
1						
2						
3						
4						
5	11.7	15	256	64	0	6.1
6						
7						
8						
9						
10	11.6	14	272	65	0	6.0
11						
12						
13						
14						
15	11.6	13	284	65	0	6.2
16						
17						
18						
19						
20	11.9	14	288	64	0	6.2
21						
22						
23						
24						
25	11.6	16	310	66	0	6.1
26						
27						
28						
29						
30	11.6	16	307	69	0	6.2
		23.5		50		

COMMENTS:

Avg:	11.6	19.5	262	61	6.1

GAS SAMPLING DATA

ETE

Client	Fleeco
Date	4-27-12
Process	Kiln Outlet
Run No.	2A
Time	1330-1450

Cylinders 23.5% 5%

MIN	% O2	PPM CO	PPM SO2	PPM NOx	PPM VOC	% CO2
1	11.8	30	291	69	0	6.2
2						
3						
4						
5	11.9	39	263	63	0	6.1
6						
7						
8						
9						
10	11.5	43	285	67	0	6.2
11						
12						
13						
14						
15	11.4	45	287	67	0	6.4
16						
17						
18						
19						
20	11.4	42	289	68	0	6.3
21						
22						
23						
24						
25	11.3	34	286	70	0	6.4
26						
27						
28						
29						
30	11.4	39	275	68	0	6.4

COMMENTS:

4/

GAS SAMPLING DATA **ETE**

Client	FLECO
Date	4-29-12
Process	KILN OUTLET
Run No.	2B
Time	1400 - 1430

MIN	% O2	PPM CO	PPM SO2	PPM NOx	PPM VOC	% CO2
1	11.4	39	275	68	0	6.4
2						
3						
4						
5	11.5	45	289	67	0	6.4
6						
7						
8						
9						
10	11.4	40	263	64	0	6.2
11						
12						
13						
14						
15	11.6	37	265	63	0	6.1
16						
17						
18						
19						
20	11.5	36	283	68	0	6.2
21						
22						
23						
24						
25	11.7	38	253	59	0	6.1
26						
27						
28						
29						
30	11.6	38	255	62	0	6.2
CAL/ZERO		23.5		50		

COMMENTS:

AVGS: 11.5 40 276 66 6.3

57

GAS SAMPLING DATA

ETE

Client	Ferro
Date	4-27-12
Process	Kiln Outlet
Run No.	3A
Time	1525-1555

CO2/Zero 23.5% 4%

MIN.	% O2	PPM CO	PPM SO2	PPM NOx	PPM VOC	% CO2
1	11.4	23	295	73	300?	6.6
2						
3						
4						
5	11.6	22	300	73	–	6.4
6						
7						
8						
9						
10	11.8	20	305	74	–	6.3
11						
12						
13						
14						
15	12.1	25	310	74	–	6.3
16						
17						
18						
19						
zero 20	11.8	30	320	73	0	6.4
21						
22						
23						
24						
25	11.6	35	341	70	0	6.4
26						
27						
28						
29						
30	11.4	42	347	70	0	6.6

COMMENTS:

4/

GAS SAMPLING DATA

ETE

Client	FEED
Date	4.27-12
Process	KILN OUTLET
Run No	3B
Time	1555-1625

MIN	% O2	PPM CO	PPM SO2	PPM NOx	PPM VOC	% CO2
1	11.4	42	347	70	0	6.6
2						
3						
4						
5	11.7	49	312	68	0	6.3
6						
7						
8						
9						
10	11.9	49	289	63	0	6.0
11						
12						
13						
14						
15	11.8	54	285	68	0	6.2
16						
17						
18						
19						
20	11.8	53	285	71	0	6.1
21						
22						
23						
24						
25	11.8	54	294	71	0	6.2
26						
27						
28						
29						
30	11.9	52	274	68	0	6.0
CH/ZERO		483/0		50/0		

COMMENTS:

AVG: 11.7 39 308 70 6.3

FIELD SAMPLING DATA

Facility: Feeco
Address: Green Bay
Contact:
Test Date: 4-27-12
Witnesses:

Process Description: Kiln Duct

Stack Number: _____ Analyte: F/+ Phosphates Pump #: _____

SAMPLING DATA

IM 1.013

Sample ID	Time	Meter Rdg/ Rotameter	Flow Rate	Minutes	Volume
F-1	1245	7116.20/82 F.			
	1125	7057.62/72			
		58.58/77			
F2	1430	7176.46/76			
	1330	7116.20/82			
		60.26/79			
F-3	1625	7236.12/68			
	1525	7176.46/75			
		59.66/72			

FLOW DATA

Diam = _____
L x W = _____
Cp = _____
Est Moist _____

Point	Run 1 Del P	Run 1 Del P	Run 2 Del P	Run 2 Del P	Run 3 Del P	Run 3 Del P
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

	Run 1	Run 2	Run 3
Ps			
T			
CO2			
O2			
N2			

COMMENTS

ENVIRONMENTAL TECHNOLOGY & ENGINEERING CORP.
13000 West Bluemound Road Elm Grove, Wisconsin 53122
414-784-2434

FIELD SAMPLING DATA

Facility Feeco
Address

Contact
Test Date 4-27-12
Witnesses

Process Description Kiln Duct

Stack Number _____ Analyte VOC Species Pump # _____

YOC (spec) 2M 1.019

SAMPLING DATA

Sample ID	Time	Meter Rdg / Rotameter	Flow Rate	Minutes	Volume
F-1V	1125	6635.35/80F		NB356855-111	
	1135	6575.67/82		NB356855-112	
		39.68 L/81			
F-2V	2430	~ 6704.30/68F (6695.50 wet)		NB 356855-115	
	1330	6635.35/80		NB 356855-116	
		68.85/74F			
F-3V	1635	6784.64/57		NB356855-113	
	1535	6730.15/67		NB356855-114	
		64.49/62F			

FLOW DATA

Diam = _____
L x W = _____
Cp = _____
Est Moist _____

Point	Run 1 Del P	Run 1 Del P	Run 2 Del P	Run 2 Del P	Run 3 Del P	Run 3 Del P
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

	Run 1	Run 2	Run 3
Ps			
T			
CO2			
O2			
N2			

COMMENTS

ENVIRONMENTAL TECHNOLOGY & ENGINEERING CORP.
13000 West Bluemound Road Elm Grove, Wisconsin 53122
414-784-2434

APPENDIX D

Sample Calculations

SAMPLE VOLUME CALCULATIONS (METERED)
Pilot Kiln - Phosphate Ore
FEECO - Green Bay
4/27/2012

Test Parameter	Test	Meter Coefficient (gamma)	Meter Sample Volume (liters)	Meter Temp. (F)	Standard Sample Volume (m3)
VOC Species	1	1.019	59.68	81	0.05862
	2	1.019	68.85	74	0.06851
	3	1.019	64.49	62	0.06565
Ions Testing	1	1.013	58.58	77	0.05763
	2	1.013	60.26	79	0.05906
	3	1.013	59.66	72	0.05924

Local Barometric Pressure: 29.55

Notes: Std. Sample Volume = Meter Vol. x Meter Coeff. x 0.001 x (Barom Press/29.92) x (528/(460 + Meter Temp

SAMPLE PARTICULATE CALCULATION SHEET

TEST NO.	Sample	
BAROMETRIC PRESSURE (Pb)	29.45	IN HG
TIP DIAMETER (d)	0.305	IN
STACK DIAMETER (D)	72	IN
STACK AREA (As=PI*D^2/576)	28.274	FT2
SAMPLING TIME PER POINT	2.5	MIN
NUMBER OF POINTS	24	
METER VOLUME (Vm)	66.53	FT3
PITOT COEFFICIENT (cp)	0.84	
METER COEFFICIENT (GAMA)	0.990	
PARTICULATE COLLECTED (Mn)	0.0500	GRAMS
WATER COLLECTED (Vf-Vi)	32	ML
STATIC PRESSURE (Ps)	-0.5	IN H2O

ORSAT RESULTS

CO2	O2	CO	N2
6.40%	13.40%	0.00%	80.20%

POINT	STACK TEMP DEG F	DELTA P IN H2O	ORIFICE DEL P IN H2O	METER TEMP DEG F	VELOCITY AFPS
1	275	0.32	2.20	35	37.52
2	280	0.37	2.55	38	40.48
3	278	0.37	2.55	40	40.42
4	278	0.40	2.80	41	42.03
5	280	0.50	3.50	43	47.05
6	281	0.70	4.90	44	55.71
7	282	0.72	5.00	44	56.54
8	280	0.72	5.00	44	56.46
9	280	0.62	4.30	45	52.40
10	277	0.57	3.90	46	50.14
11	276	0.65	4.50	47	53.50
12	275	0.60	4.20	48	51.37
13	282	0.70	4.90	50	55.75
14	283	0.82	5.70	53	60.38
15	282	0.85	6.00	56	61.43
16	283	0.75	5.20	60	57.74
17	280	0.59	4.10	62	51.11
18	280	0.60	4.20	65	51.54
19	280	0.60	4.20	67	51.54
20	278	0.65	4.50	70	53.58
21	279	0.72	5.00	72	56.43
22	280	0.72	5.00	74	56.46
23	277	0.65	4.50	75	53.54
24	275	0.30	2.10	75	36.32
AVERAGE	279 (Tsavg)		4.20 (DELH)	54 (Tm)	51.23 (vsavg)

DRY STANDARD VOLUME (Vmstd)	65.51	SCF
PERCENT WATER VAPOR %H2O)	2.25	% VOL
FLOW RATE (Q)	86905	ACFM
	59651	DSCFM
	101360	M3/HR
PARTICULATE CONCENTRATION (cs)	0.0118	GR/DSCF
PARTICULATE EMISSION RATE (ER)	6.08	LB/HR
LB PART PER 1000 LB GAS (EC)	0.0219	
ISOKINETIC PERCENT (I)	102.0	

PARTICULATE SAMPLE CALCULATION FORMULA

1. **DRY MOLECULAR WEIGHT (Md)** lb/lb-mole

Md = .44*% CO2 + .32*%O2 + .28*%N2 + .28*%CO

2. **WATER VAPOR PERCENT (%H2O)**

Vw std = 0.04707*(Vf - Vi)

where: Vw std = standard cubic feet of water vapor
Vf = Final volume of impingers, ml
Vi = Initial volume of impingers, ml

%H2O = Vw std * 100/(Vm std + Vw std)

where Vm std = standard cubic feet of gas sampled

3. **WET MOLECULAR WEIGHT (Ms)** lb/lb-mole

Ms = Md*(1 - %H2O/100) + 18*%H2O/100

4. **STACK PRESSURE (Ps)** in. Hg.

Ps = Pb + Pg/13.6

where: Pb = barometric pressure (uncorrected), in. Hg
Pg = stack gauge pressure, in. H2O
13.6 = specific gravity of mercury (Hg)

5. **AVERAGE STACK VELOCITY (vs)** feet per second

Vs = Kp*Cp*DELP * (Tsavg/(Ps*Ms))^0.5

where: Kp = 85.49 unit conversion
Cp = 0.84, pitot tube calibration factor
DELP = average of square root of velocity head, in. H2O
Tsavg = average stack temperature, deg R (460+F)
Ps = stack pressure
Ms = wet molecular weight

6. **STACK GAS FLOW RATE (Qs)** std. cubic feet per minute

Qs = 60*(1 - %H2O/100)*Vs*A*(528*Ps/Tsavg/29.92)

where: A = stack area, ft2
528 = std temperature, deg R
29.92 = std pressure, in. Hg

7. **DRY GAS VOLUME (Vmstd)** dry std. cubic feet

Vm std = (GAMAC*(Pb+ DELH/13.6)/29.92) * Vm

where: GAMAC = dry gas meter calibration factor corrected for meter temperature (GAMA+(Tm-70)*.00012)
Vm = volume of dry gas metered, cubic feet
Tm = average meter temperature, degrees F
DELH = average orifice pressure drop, in.H2O

8. **PARTICULATE CONCENTRATION (cs)** grains per dry standard cubic foot

Cs = Mn * 15.43/Vm std
where: Mn = particulate captured, grams
15.43 = grains per gram

9. **EMISSION RATE (ER)** pounds per hour

PMRA = Mn*A*60/(t*An*453.6) AREA METHOD lb/hr

PMRC = Cs*Qs*60/(15.43*453.6) CONC. METHOD lb/hr

ER = (PMRA + PMRC)/2

where: An = area of sampling nozzle, square feet

10. **EMISSION CONCENTRATION (EC)** lb/1000 lb exhaust gas

EC = ER * 386700 * (1-%H2O/100)/(Qs*60*Ms)

where: 386700 = cubic feet per lb mole * 1000

11. **ISOKINETIC SAMPLING PERCENTAGE (I)**

I = PMRA/PMRC

SAMPLE CALCULATIONS
for
Single Point (non-isokinetic) Sampling

1. DRY GAS SAMPLE VOLUME (Vm m3, std), std cubic meters

Vm m3, std = GAMA*(Vm)*(Pb)/29.92*528/Tmavg*0.02832

where: GAMA = dry gas meter calibration factor
Vm = volume of dry gas metered, cubic feet
Tmavg = average meter temperature, deg R (460+F)
528 = std temperature, deg R
0.02832 = cubic meters per cubic foot factor

2. EMISSION CONCENTRATION (EC), milligrams per std cubic meter

EC = (mg-mgb)/(Vm m3, std)

where: mg = milligrams of compound found in sample, determined from comparison to a generated standard curve
mgb = milligrams of compound found in "blank" sampling media

Note: EC can be converted to parts per million (ppm) as follows:

ppm = mg/m3*(24.05/M.W.)

where: mg/m3 = the emission concentration expressed as milligrams per standard cubic meter
M.W. = molecular weight of the compound of concern

3. EMISSION RATE (ER), pounds per hour

ER = EC*(Qs)*0.02832*60*(1/453600)

where: Qs = stack gas flow rate, std cubic feet per minute
60 = minutes per hour factor
1/453600 = pound per milligrams factor

Emissions Summary
Lab Scale Thermal Beneficiation

ROTARY KILN PROJECT UNCONTROLLED EMISSIONS TONS/YEAR											Mercury Rule lb/yr
PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	SO_X	CO	CO_2	F^-	Pb	HAP	
3.01	0.24	0.11	0.01	6.69E-04	0.08	4.10E-03	12.35	0.01	1.28E-05	1.09E-03	1.02E-02

ROTARY KILN PROJECT PROJECT DESIGN EMISSIONS TONS/YEAR											Mercury Rule lb/yr
PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	SO_X	CO	CO_2	F^-	Pb	HAP	
4.12E-05	3.35E-06	1.54E-04	1.92E-03	9.17E-05	1.11E-02	5.61E-04	1.69	1.49E-03	1.75E-06	3.46E-07	1.39E-03

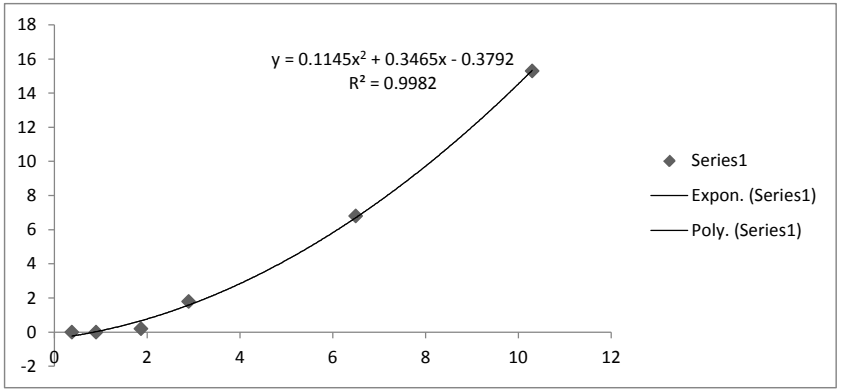
ROTARY KILN PROJECT PROJECT DESIGN EMISSIONS POUNDS/HR										
PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	SO_X	CO	CO_2	F^-	Pb	HAP
3.72E-07	1.39E-07	3.73E-07	4.41E-06	2.11E-07	2.55E-05	1.29E-06	3.89E-03	3.43E-06	4.03E-09	7.96E-10

Comparison to Modeling Thresholds
Lab Scale Thermal Beneficiation

Pollutant	Level I	Level II	Units	Project	Status
CO	15	175	PPH	1.29E-06	< L1
NO_X	1.2	14	TPY	1.92E-03	< L1
	0.2	2.4	PPH	4.41E-06	< L1
SO_2	1.2	14	TPY	1.11E-02	< L1
	0.21	2.5	PPH	2.55E-05	< L1
PM_{10}	0.22	2.6	PPH	1.40E-05	< L1
$PM_{2.5}$	0.35	4.1	TPY	1.54E-04	< L1
	0.054	0.63	PPH	3.73E-07	< L1

Particle Size Distribution Emission Factor Calculation
Lab Scale Thermal Beneficiation

Cut Size (μ)	Percent Less Than
0.38	0
0.90	0
1.87	0.2
2.90	1.8
6.50	6.8
10.3	15.3
2.5	1.9



Goal Seek	Diameter	Percent
PM 10	10.000	8.127146
PM2.5	2.499071	3.723832
PM+PM10		96.27617

GREEN BAY DATA (Uncontrolled)

$$E = k(0.0032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (pound [lb]/ton)}$$

where:

E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s) (miles per hour [mph])
M = material moisture content (%)

				lb/ton	
Where:	KPM =	0.74		**1.21E-04**	
	KPM10 =	0.35		**5.71E-05**	
	KPM2.5 =	0.053		**8.64E-06**	
	U =	1.3	MPH		(Lowest value from AP-42 for use indoors)
	M =	4.8	%		(Highest value from AP-42 - comes out of ground > 10%)

Assumptions for Calculations
Lab Scale Thermal Beneficiation

Thermal Beneficiation

1 Once the phosphate ore reaches a certain temperature, it will sustain combustion. There is no need for an additional combustion source to operate continuously.

2 Emissions sampled during the FEECO test include natural gas combustion emissions which have been used for the emissions estimate. There is no additional combustion source associated with the bench-scale test.

3 The Smoky Ore speciation numbers were only used for constituents where there was no additional information provided by Jacobs

4 Used a polynomial equation rather than the linear equation Jacobs used because it yielded a better r^2 value (based on FEECO test)

5 Moisture content of 10.5% was provided by mine for use on Dairy Syncline permitting

6 Each batch takes 2 hours

Assumptions for Calculations
Lab Scale Thermal Beneficiation

Air coming from the EMTD lab kiln will be cooled with ambient air and pulled into a baghouse.

The reason for the dilution air is two-fold. The first reason is to draw all the process gas from the kiln unit so it goes in a controlled inside the lab. There is no positive air draw on the kiln, as it does not have an integral blower. The second reason for the air flow is to get the temperature of the gas down to a point that it does not melt the ducting. Estimate gas/air temperature is as follows:

Basis:

Total: 100 cfm total air/gas flow
Kiln Gas: 5 cfm kiln gas; Molecular weight (MW) of kiln gas is CO_2 = 44#/mol; Temperature (T) of the kiln gas is 750-1,500 F,
Air Draw: 95 cfm air, MW of air = 29#/mol, Temperature of the air is 70 F

Determine mass of kiln gas: PV=nRT; n= PV/(RT);
m=n(MW); where P=pressure (psia); V=volume (cfm); R=ideal gas constant (10.73 ft3/psia/#mol R); T=Temperature (R); n=#mol; MW=molecular weight; m=mass #

m=n*(MW)=PV/RT*(MW)= (12.5 psia*5 cfm)/(10.73*(750+460))*44= 0.212 # gas/min

Determine mass of air: m=(12.5*95)/(10.73*(70+460)) * 29 = 6.056 # air/min

Total Air/Gas mass: 0.212+6.056 = 6.268 #/min

Determine Air/Gas blend temperature:

Gas mass fraction * Gas Temperature + Air mass fraction * Air Temperature
(0.212/6.268)*750 F + (6.056/6.268)*70 = 93 F blend temperature
(0.212/6.268)*1500 F + (6.056/6.268)*70 = 118 F blend temperature

Therefore, the expected range of the exit gas/air stream reporting to the baghouse is 93-118 F based on 100 cfm total flow.
The gas air flow is conservative and won't be this high (5 cfm), so temperatures are not expected to exceed this.

HAP Analysis
Lab Scale Thermal Beneficiation

Organics from FEECO Test

Constituent	(lb/hr) @ 11.5 lb/hr	(lb/ton)	TAP/HAP
Dichlorodifluoromethane	3.61E-08	6.28E-06	
Chloromethane	2.50E-07	4.35E-05	TAP/HAP
Vinyl Chloride	1.43E-08	2.48E-06	TAP/HAP
Bromomethane	8.10E-08	1.41E-05	TAP/HAP
Methylene Chloride	4.31E-08	7.49E-06	TAP/HAP
Benzene	4.13E-07	7.18E-05	TAP/HAP
Toluene	1.19E-07	2.06E-05	TAP/HAP
Ethylbenzene	6.52E-09	1.13E-06	TAP/HAP
Xylenes	6.16E-08	1.07E-05	TAP/HAP
Styrene	3.04E-09	5.29E-07	TAP/HAP
Chloroethane	1.80E-08	3.13E-06	TAP/HAP
Chlorobenzene	2.16E-08	3.76E-06	TAP/HAP
Isopropylbenzene (Cumene)	8.44E-08	1.47E-05	TAP/HAP
1,1,2,2-Tetrachloroethane	9.24E-09	1.61E-06	TAP/HAP
n-Propylbenzene	3.27E-09	5.69E-07	
1,3,5-Trimethylbenzene	6.33E-08	1.10E-05	
4-Chlorotoluene	8.50E-09	1.48E-06	
tert/sec-Butylbenzene	1.82E-09	3.17E-07	
p-isopropyltoluene	6.16E-09	1.07E-06	
n-Butylbenzene	1.20E-08	2.08E-06	
Napthalene	2.83E-08	4.93E-06	TAP/HAP
`			
TOTAL ORGANIC HAPS	1.15E-06	2.00E-04	lb/ton

Calculations

lb/hr @11.5 = ER (lb/hr $_{@\ 201.7\ lb/hr}$) x 11.5 (lb/hr)/201.7 (lb/hr)

lb/ton = ER (lb/hr $_{@\ 201.7\ lb/hr}$) X 1/0.100833 (hr/ton)

Other HAPs from FEECO
Constituent

FEECO Emission Test Data

Test Parameter	Average Emission Rate Uncontrolled (lb/hr) (@11.5 lb/hr)	Sreening Limit (lb/hr)	Status		Emission Rate Controlled (lb/hr)(@ 11.5 lb/hr)lb/hr	Status
Metals - Antimony	2.54E-06	3.30E-02	Okay		1.43E-09	OKAY
Metals - Arsenic	4.77E-05	1.50E-06	4.77E-05		2.68E-08	OKAY
Metals - Beryllium	2.69E-06	2.80E-05	Okay		1.51E-09	OKAY
Metals - Cadmium	8.61E-04	3.70E-06	8.61E-04		4.84E-07	OKAY
Metals - Chromium	5.41E-04	3.30E-02	Okay		3.04E-07	OKAY
Metals - Cobalt	4.11E-06	3.30E-03	Okay		2.31E-09	OKAY
Metals - Lead	7.30E-06	NA	NA			
Metals - Manganese	1.03E-04	3.33E-01	Okay		5.81E-08	OKAY
Metals - Mercury	1.16E-06	7.00E-03	NA	<		
Metals - Nickel	7.62E-05	2.70E-05	7.62E-05		4.28E-08	OKAY
Metals - Selenium	4.50E-05	1.30E-02	Okay		2.53E-08	OKAY
Metals - Zinc	2.94E-03	6.67E-01	Okay		1.65E-06	OKAY
Fluoride	6.22E-03	1.67E-01	Okay		3.50E-06	OKAY

TOTAL HAPS	1.08E-02	lb/hr
	1.08E-01	lb/ton

Kiln Loading/Unloading

Parameter		Value	Units	Source/Basis
Emission Unit(s) ID				
Potential Production Data				
Production Factor	=	20.1	ton/yr	= 23 (lb/2-hr)/ 2000 (lb/ton) x 8760 hr/yr x 0.40 1 load & 1 unload
Emission Data & Factors				
PM Emission Factor	=	1.21E-04	lb/ton	AP-42 13.2.4-4 (11/06)
PM_{10} Emission Factor	=	5.71E-05	lb/ton	AP-42 13.2.4-4 (11/06)
$PM_{2.5}$ Emission Factor	=	8.64E-06	lb/ton	AP-42 13.2.4-4 (11/06)

$$E = k(0.0032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (pound [lb]/ton)}$$

where:

E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s) (miles per hour [mph])
M = material moisture content (%)

Annual Emissions Calculations					
PM Potential to Emit	=	2.43E-06	TPY	= 2 x PF x EF / 2000 lb/ton	Factor of 2 supplied to cover load & unload transitions
PM_{10} Potential to Emit	=	1.15E-06	TPY	= 2 x PF x EF / 2000 lb/ton	
$PM_{2.5}$ Potential to Emit	=	1.74E-07	TPY	= 2 x PF x EF / 2000 lb/ton	

Summary of Results

Potential To Emit (Tons/Year)		
PM	**PM_{10}**	**$PM_{2.5}$**
2.43E-06	1.15E-06	1.74E-07

Kiln Loading/Unloading

Parameter		Value	Units	Source/Basis
Emission Unit(s) ID				
Potential Production Data				
Production Factor	=	2.8	ton/yr	= (23 lb/2-hr) x 1200 (hr/yr) / 2000 (lb/ton) x 0.40 1 load & 1 unload
Emission Data & Factors				
PM Emission Factor	=	1.21E-04	lb/ton	AP-42 13.2.4-4 (11/06)
PM_{10} Emission Factor	=	5.71E-05	lb/ton	AP-42 13.2.4-4 (11/06)
$PM_{2.5}$ Emission Factor	=	8.64E-06	lb/ton	AP-42 13.2.4-4 (11/06)

$$E = k(0.0032) \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (pound [lb]/ton)}$$

where:

E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s) (miles per hour [mph])
M = material moisture content (%)

Annual Emissions Calculations					
PM Potential to Emit	=	3.33E-07	TPY	= 2 x PF x EF / 2000 lb/ton	Factor of 2 supplied to cover load & unload transitions
PM_{10} Potential to Emit	=	1.58E-07	TPY	= 2 x PF x EF / 2000 lb/ton	
$PM_{2.5}$ Potential to Emit	=	2.39E-08	TPY	= 2 x PF x EF / 2000 lb/ton	

Summary of Results

Potential To Emit (Tons/Year)		
PM	**PM_{10}**	**$PM_{2.5}$**
3.33E-07	1.58E-07	2.39E-08

Calciner Potential to Emit

Parameter		Value	Units	Source/Basis	
Emission Unit(s) ID					
Potential Production Data					
Production Factor	=	20.1	ton/yr	= 23 (lb/2-hr)/ 2000 (lb/ton) x 8760 hr/yr x 0.40	To get adequate air flow and mixing only 40% of kiln is utilized
Emission Data & Factors					
PM Emission Factor	=	299	lb/ton	FEECO Test Report	Includes emissions associated with combustion source which is not part of this project
PM_{10} Emission Factor	=	24.28	lb/ton	FEECO Test Report - interpolated	
$PM_{2.5}$ Emission Factor	=	11.12	lb/ton	FEECO Test Report - interpolated	
NO_X Emission Factor	=	1.39	lb/ton	FEECO Test Report	
VOC Emission Factor	=	0.07	lb/ton	FEECO Test Report	
SO_X Emission Factor	=	8.02	lb/ton	FEECO Test Report	
CO Emission Factor	=	0.41	lb/ton	FEECO Test Report	
CO_2 Emission Factor	=	1,226	lb/ton	FEECO Test Report	
F^- Emission Factor	=	1.08	lb/ton	FEECO Test Report	
Pb Emission Factor	=	1.27E-03	lb/ton	FEECO Test Report	
HAP Emission Factor	=	1.08E-01	lb/ton	FEECO Test Report (Sum of HAPs)	= Σ organic HAPs + Σ other HAPS
Annual Emissions Calculations					
PM Potential to Emit	=	3.01	TPY	= PFxEF/2000 lb/ton	
PM_{10} Potential to Emit	=	0.24	TPY	= PFxEF/2000 lb/ton	
$PM_{2.5}$ Potential to Emit	=	0.11	TPY	= PFxEF/2000 lb/ton	
NO_X Potential to Emit	=	0.01	TPY	= PFxEF/2000 lb/ton	
VOC Potential to Emit	=	6.69E-04	TPY	= PFxEF/2000 lb/ton	
SO_X Potential to Emit	=	8.08E-02	TPY	= PFxEF/2000 lb/ton	
CO Potential to Emit	=	4.10E-03	TPY	= PFxEF/2000 lb/ton	
CO_2 Potential to Emit	=	12.35	TPY	= PFxEF/2000 lb/ton	
F^- Potential to Emit	=	0.01	TPY	= PFxEF/2000 lb/ton	
Pb Potential to Emit	=	1.28E-05	TPY	= PFxEF/2000 lb/ton	
HAP Potential to Emit	=	1.09E-03	TPY	= PFxEF/2000 lb/ton	

Kiln dimensions: 6" diam x 14 inches long.

Volume: 0.23 ft3
Density: 100 #/ft3
Mass = Vol X Density = 23 # total.
Batch Time: 2 hours; 1200 hrs/yr

Summary of Results

Potential to Emit (Tons per Year)										
PM	PM_{10}	$PM_{2.5}$	NO_X	VOC	SO_X	CO	CO_2	F^-	Pb	HAP
3.01	0.24	0.11	0.01	6.69E-04	0.08	4.10E-03	12.35	0.01	1.28E-05	1.09E-03

Calciner Controlled Emissions

Parameter		Value	Units	Source/Basis			
Emission Unit(s) ID							
Potential Production Data							
Production Factor	=	2.8	ton/yr	= (23 lb/2-hr) x 1200 (hr/yr) / 2000 (lb/ton) x 0.40	To get adequate air flow and mixing only 40% of kiln is utilized		
Emission Data & Factors							
PM Emission Factor	=	299	lb/ton	FEECO Test Report	Includes some emissions associated with combustion source		
PM_{10} Emission Factor	=	24.28	lb/ton	FEECO Test Report - interpolated			
$PM_{2.5}$ Emission Factor	=	11.12	lb/ton	FEECO Test Report - interpolated			
NO_X Emission Factor	=	1.39	lb/ton	FEECO Test Report			
VOC Emission Factor	=	0.07	lb/ton	FEECO Test Report			
SO_X Emission Factor	=	8.02	lb/ton	FEECO Test Report			
CO Emission Factor	=	0.41	lb/ton	FEECO Test Report			
CO_2 Emission Factor	=	1,226.00	lb/ton	FEECO Test Report			
F^- Emission Factor	=	1.08	lb/ton	FEECO Test Report			
Pb Emission Factor	=	1.27E-03	lb/ton	FEECO Test Report			
HAP Emission Factor	=	2.51E-04	lb/ton	FEECO Test Report (Sum of $HAP_{controlled}$ + Sum of $HAP_{uncontrolled}$)			
Annual Emissions Calculations							
PM Controlled Emissions	=	4.12E-05	TPY	= CE xPFxEF/2000 lb/ton	Assume filter efficency	99.99	Manufacturer PM & PM_{10}
PM_{10} Controlled Emissions	=	3.35E-06	TPY	= CE xPFxEF/2000 lb/ton			
$PM_{2.5}$ Controlled Emissions	=	1.54E-04	TPY	= CE xPFxEF/2000 lb/ton	Lowest from EPA-452/F-03-026		
NO_X Controlled Emissions	=	1.92E-03	TPY	= PFxEF/2000 lb/ton			
VOC Controlled Emissions	=	9.17E-05	TPY	= PFxEF/2000 lb/ton			
SO_X Controlled Emissions	=	1.11E-02	TPY	= PFxEF/2000 lb/ton			
CO Controlled Emissions	=	5.61E-04	TPY	= PFxEF/2000 lb/ton			
CO_2 Controlled Emissions	=	1.69	TPY	= PFxEF/2000 lb/ton	No control for CO_2		
F^- Controlled Emissions	=	1.49E-03	TPY	= PFxEF/2000 lb/ton			
Pb Controlled Emissions	=	1.75E-06	TPY	= PFxEF/2000 lb/ton			
HAP Controlled Emissions	=	3.46E-07	TPY	= PFxEF/2000 lb/ton	Control taken above		

Kiln dimensions: 6" diam x 14 inches long.

Volume: 0.23 ft3
Density: 100 #/ft3
Mass = Vol X Density = 23 # total.
Batch Time: 2 hours; 1200 hrs/yr

Summary of Results

Controlled Emissions (Tons per Year)										
PM	**PM_{10}**	**$PM_{2.5}$**	**NO_X**	**VOC**	**SO_X**	**CO**	**CO_2**	**F^-**	**Pb**	**HAP**
4.12E-05	3.35E-06	1.54E-04	1.92E-03	9.17E-05	1.11E-02	5.61E-04	1.69E+00	1.49E-03	1.75E-06	3.46E-07

Wisconsin Emissions Test
Lab Scale Thermal Beneficiation

FEECO Emission Test Data

Test Parameter	Test Location	Average Concentration	Average Emission Rate Uncontrolled (lb/hr)	Average Emission Rate Uncontrolled (lb/ton)
Particulate Matter	Kiln Duct	11.93 gr/dscf	30.12	298.71
Silica (quartz)	Kiln Duct	0.53 % (1)	0.16	1.59
Metals - Antimony	Kiln Duct	0.0414 mg/m3	4.46E-05	4.42E-04
Metals - Arsenic	Kiln Duct	0.778 mg/m3	8.37E-04	8.30E-03
Metals - Beryllium	Kiln Duct	0.0438 mg/m3	4.72E-05	4.68E-04
Metals - Cadmium	Kiln Duct	14.03 mg/m3	1.51E-02	1.50E-01
Metals - Chromium	Kiln Duct	8.815 mg/m3	9.49E-03	9.41E-02
Metals - Cobalt	Kiln Duct	0.0668 mg/m3	7.20E-05	7.14E-04
Metals - Lead	Kiln Duct	0.119 mg/m3	1.28E-04	1.27E-03
Metals - Manganese	Kiln Duct	1.684 mg/m3	1.81E-03	1.80E-02
Metals - Mercury	Kiln Duct	0.01887 mg/m3	2.03E-05	2.02E-04
Metals - Nickel	Kiln Duct	1.241 mg/m3	1.34E-03	1.32E-02
Metals - Selenium	Kiln Duct	0.733 mg/m3	7.89E-04	7.82E-03
Metals - Zinc	Kiln Duct	47.898 mg/m3	5.16E-02	5.11E-01
Carbon Monoxide	Kiln Duct	33 ppm	0.041	0.41
Sulfur Dioxide	Kiln Duct	282 ppm	0.809	8.02
Nitrogen Oxides	Kiln Duct	66 ppm	0.14	1.39
Total VOCs	Kiln Duct	3.4 ppm (2)	0.0067	0.07
Fluoride	Kiln Duct	101 mg/m3	0.109	1.08
Phosphate	Kiln Duct	0.87 mg/m3	0.00093	0.01

Average Feed During Test 201.6667 lb/hr

0.100833 ton/hr

$$\frac{lb}{hr} \times \frac{hr}{tons} = \frac{lb}{ton}$$