112(g) of CAA Case-By-Case Maximum Achievable Control Technology (MACT) Determination Review of PyraMax Ceramics, LLC – King's Mill Facility Construction and Operation of a New Ceramic Proppant Manufacturing Facility Located in Wrens, Georgia (Jefferson County)

NOTICE OF MACT APPROVAL

Air Quality Permit Application No. 21371
Dated August 17, 2012

Reviewing Authority

State of Georgia
Department of Natural Resources
Environmental Protection Division
Air Protection Branch
Stationary Source Permitting Program (SSPP)

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1.0 EXECUTIVE SUMMARY

PyraMax Ceramics, LLC – King's Mill Facility (hereafter "PyraMax Ceramics") submitted Air Quality Application No. 21371 proposing to construct and operate two new production lines in addition to the two already permitted production lines. The ceramic proppant manufacturing facility is located on County Road 291 in Wrens, Jefferson County, Georgia. Jefferson County is classified as "attainment" or "unclassifiable" for all criteria pollutants.

PyraMax has already been permitted for the construction of Lines 1 and 2 in Permit No. 3295-163-0035-P-01-1 issued on January 27, 2012. This Application No. 21371 is for the construction of Lines 3 and 4. With this modification, the facility will have four similar process/kiln lines. The products made will be used in the oil and natural gas industry. Each process/kiln line consists of mainly the following operations. For more facility details and process diagrams, please refer to Application No. 21371.

- **Materials Handling:** Materials handling operations include unloading, loading, distribution, storage, and packaging. Expected emissions from this operation are PM, PM_{10} and $PM_{2.5}$. Baghouses, bin filters and other measures as appropriate will be employed wherever feasible to control the emissions.

- **Slurry Preparation**: A mixer transfers milled fine clay powder into a stable suspended mixture/slurry by mixing the clay with water and a dispersant. The slurry is agitated and then pH balanced using aqueous ammonia, then stored in tanks. The slurry is then wet screened before addition of a binder agent. Air pollutant emissions from this process is negligible due to wet process.

- **Spray Drying/Pelletizing:** The slurry is fed into directly heated/fired spray dryers/pelletizers when flue is in touch with slurry. Green clay pellets form in the unit, dry under the heat, then are coated by fresh incoming slurry, and dry again, until desired bead size is achieved. Expected emissions from this process include process particulate matters and combustion byproducts (CO, NO_x, SO_2, particulate matters, VOC and GHG), and VOC when volatile organics in the additives are evaporated (mostly methanol). Methanol is an EPA- listed HAP compound. A baghouse will be used for removal of the particulate matter.

- **Green Pellet Screening**: Green pellets are separated by multiple-stack screens according to their sizes. On-sized pellets are conveyed to calciners/kilns for further processing. Oversized pellets are diverted to a cage mill for size reduction and then re-fed to the pelletizer feed bin, while undersized pellets are sent directly back to the pelletizer feed bin. Only particulate matters are emitted from this process, and controlled by baghouses and/or bin vent filters.

- **Calcining**: On-sized green pellets are metered into the charging end of each counter flow dry-process rotary calciner/kiln where they are slowly heated, dried and then calcined/sintered, releasing moisture and other impurities in the process. Each rotary kiln/calciner is closely followed by a separate rotary cooler which introduces cooling air in the discharge end of the cooler. Expected emissions from calcining include CO, NO_x, PM, PM_{10}, $PM_{2.5}$, SO_2 and VOC), green house gas (GHG), and HAPs (HCl and HF). Kiln and cooler exhaust gas streams carrying these emissions are routed to a "catalytic baghouse" for multi-pollutant control (particulate matters, acid gases and NO_x).

- **Finishing:** The calcined/sintered ceramic proppants are conveyed to final product screens. On-sized proppants are transferred to quality control bins and off-sized ones recycled back to the kiln for further processing. On-size ceramic proppants are tested for quality and those passing the testing are sent to storage silos awaiting for shipping. Each silo or bin is equipped with a vent filter to control PM, PM_{10}, $PM_{2.5}$ emissions. Finished pellets/proppants are conveyed to a rail car loading spout and into railcars for delivery to customers. Dust generated during railcar loading is controlled via pneumatic collection at transfer points and then a common baghouse.

- **Supporting:** Supporting operations include emergency diesel generators, fuel and chemical storage tanks, and two 9.8 MMbtu/hr natural gas-fired boilers.

PyraMax Ceramics will use an additive/chemical compound as disperser during the slurry preparation. This disperser contains less than 1% by weight of methanol (EPA listed HAP) as an impurity which evaporates into the atmosphere during spray drying/palletizing of the slurry. The Lines 3 and 4 have the potential to emit more than 10 tons per year of methanol and more than 25 tons per year of all HAPs combined, including mostly methanol (48.0 tpy), HCl (5.89 tpy) and HF (9.04 tpy). Because the emissions of methanol exceed major source thresholds of 10 tons per year for a single HAP, and the emissions of methanol, HCl and HF combined exceed the major source threshold of 25 tons per year for combined HAPs under 40 CFR Part 63 Subpart B, and there is no NESHAP Part 63 MACT standard for the ceramic proppant manufacturing industry, the HAPs emissions from PyraMax Ceramics are subject to a Case-by-Case MACT determination under 112(g) of CAA Amendment of 1990.

The Section 112(g)(2)(B) trigger date for Georgia is June 29, 1998. Constructed after this date and having no 40 CFR Part 63 NESHAP standard, PyraMax Ceramics is a "newly constructed major source" pursuant to Section 112(g) of the CAA Amendments of 1990, and is subject to a case-by-case MACT determination. The requirements for such case-by-case control technology reviews are codified in 40 CFR Part 63, Subpart B and are adopted by reference, with a few revisions and clarifications, into the Georgia Rules for Air Quality Control.

To satisfy the 112(g) case-by-case MACT requirements (40 CFR 63.40 through 63.44, *Control Technology Requirements in Accordance with Section 112(g)(2)(B) of the 1990 Clean Air Act Amendments*), PyraMax Ceramics submitted with the application No. 21371 a proposed case-by-case MACT determination specifying control technology intending to meet the MACT emission limitations. PyraMax Ceramics' analysis of similar facilities indicates that the case-by-case MACT should be the limitation of the potential methanol emissions to the levels as dictated by the potential usage rate of the methanol-containing additive without add-on control. PyraMax Ceramics has requested that HF and HCl emissions be limited for each process line. The Division has conducted case-by-case MACT determination for the sources subject to the 112(g) case-by-case MACT determination. Numerical MACT emission rate limits have been established for the HCl and HF emissions from each calciner/kiln plus initial and annual testing for compliance assurance.

2.0 APPLICATION INFORMATION

2.1 Application Content

The permit application No. 21371 includes the following information:

(1) SIP Air Quality Permit Application forms for the two new additional process lines;

(2) Description of the processes/operations alone each process/kiln line;

(3) Emissions inventory/calculation sheets indicating the potential emissions from the facility;

(4) Proposed BACT for CO, GHG, NO_x, PM, PM_{10}, $PM_{2.5}$, SO_2 and VOC emissions from the facility;

(5) Proposed 112(g) of CAA case-by-case MACT for methanol, hydrogen fluoride (HF) and hydrogen chloride (HCl) emissions from the facility;

(6) Analyses of air quality/ambient impact modeling for CO, NO_x, PM/PM_{10}/$PM_{2.5}$, and SO_2 emissions from the facility per PSD/NSR requirements; and

(7) Ambient impact assessments/modeling for emissions of air toxic pollutants emissions from the facility per SIP rule requirements.

2.2 Applicant Information

(1) Facility Owner:

PyraMax Ceramics, LLC.
County Road 291
Wrens, Georgia 30833

(2) Facility Information:

PyraMax Ceramics, LLC. – King's Mill facility
County Road 291
Wrens, Georgia 30833 (Jefferson County)

2.3 Authorized Representative

Don A. Anschutz
Vice President of Manufacturing
17515 Spring Cypress Road, Suite C#253
Cypress, Texas 77429

2.4 Application Submittals

August 17, 2012:	Date of initial application received and assigned as Application No. 21371
August 17, 2012:	Submitted additional information regarding the case-by-case MACT determination

3.0 BACKGROUND

3.1 Facility Location

PyraMax Ceramics will be located on County Road 291, Wrens, Jefferson County, Georgia. Jefferson County is classified as "attainment" or "unclassifiable" for all criteria pollutants.

3.2 Permit Status of Facility Operations

PyraMax Ceramics submitted the application No. 21371 applying for a SIP Air Quality Permit for the construction and operation of two additional process lines at a ceramic proppant manufacturing facility.

3.3 Project Schedule

Construction of PyraMax Ceramics' new ceramic proppant manufacturing facility began in August of 2012. The first phase of construction will be Lines 1 and 2 permitted in Permit No. 3295-163-0095-P-01-0. Application No. 21371 indicates that the entire facility (Lines 1-4) is projected to be complete in 2014-2015. The estimated startup date will be in 2015.

3.4 Proposed Operation

PyraMax Ceramics' proposed ceramic proppant manufacturing facility is a greenfield/new source. It will consist of four identical ceramic proppant process/kiln lines which can be operated independently. Operations along each process/kiln line consists of mainly material handling and storage, milling, slurry preparing, screening, spray drying/pelletizing, calcining and packaging and shipping operations. Lines 3 and 4 are supported by one (1) 500 kW stationary emergency diesel generators. All lines will also have separate and/or shared fuel and chemical storage facilities.

4.0 EMISSION RATES AND CHANGES

The methodologies used to quantify emissions from the emission units at PyraMax Ceramics' ceramic proppant manufacturing facility are summarized in the application No. 21371 dated August 17, 2012. The emission rates are estimated either based on available source specific testing data, AP42 emission factors, proposed BACT limits or requirements, or mass balance based on production records. The originally permitted Lines 1 and 2 are identical to Lines 3 and 4 and therefore emit the same total amount of HAPS. This case-by-case MACT produces the same determination as the decision made in the Preliminary Determination for Permit No. 3295-163-00035-P-01-0.

4.1 Case-by-Case MACT Applicability Under Section 112(g) of the CAA Amendment of 1990

Under the Clean Air Act (CAA) Amendments of 1990, EPA is required to regulate large or "major" industrial facilities that emit one or more of listed hazardous air pollutants (HAPs). HAPs are those pollutants that are known or suspected of causing cancer or other serious health effects, such as developmental effects or birth defects. On July 16, 1992, EPA published a list of industrial source categories that emit one or more of these hazardous air pollutants. EPA is required to develop standards for listed industrial categories of "major" sources (those that have the potential to emit 10 tons/year (TPY) or more of a listed pollutant or 25 TPY or more of a combination of pollutants) that will require the application of stringent controls, known as maximum achievable control technology (MACT).

The Section 112(g) provision is designed to ensure that emissions of toxic air pollutants do not increase if a facility is constructed or reconstructed before EPA issues a MACT for that particular category of sources or facilities. A newly constructed or reconstructed major source of HAP without a promulgated Part 63 NESHAP MACT standard will be subject to the requirements of 40 CFR 63.40 through 63.44, including a case-by-case MACT determination as described by the Section 112(g) of the 1990 Clean Air Act Amendments.

PyraMax Ceramics' new facility is considered "construction of a major source" as defined by 40 CFR 63.41 because it has the potential to emit more than 10 tons per year of any individual HAP or 25 tons per year of any combination of HAPs. Constructed after the Section 112(g)(2)(B) trigger date for Georgia of June 29, 1998 and having no promulgated 40 CFR Part 63 NESHAP MACT standard, the new ceramic proppant manufacturing facility is considered a newly constructed major source under Section 112(g) of CAA Amendment of 1990 and is subject to a case-by-case MACT determination.

Newly constructed major sources subject to Section 112(g) of CAA Amendment of 1990 would be subject to stringent air pollution control requirements, referred to as "new source MACT." Under the Clean Air Act, new source MACT control is required to be no less stringent than "the best controlled similar source". At least two questions should be answered to determine if an emission unit is similar: (1) Do the two emission units have similar emission types, and (2) Can the emission units be controlled with the same type of control technology. If the two emission units do have similar emission types and are controllable to approximately the same extent with the same control technologies, then the two emission units can be considered similar for the purposes of a case-by-case MACT determination.[1]

4.2 HAP Emissions Profile

All fuel combustion processes at PyraMax Ceramics emit gaseous and solid HAP compounds as combustion by-products. The amount of the HAP emissions depends mainly on the type and quantity of the fuel. Therefore, each boiler, spray dryer/pelletizer, calciner/kiln and emergency diesel generator at PyraMax Ceramics' facility is a source of HAP emissions. In addition, HAP compounds are released from raw materials via evaporation, i.e., the methanol emissions from spray dryers/pelletizers, and via chemical reactions at high temperature, i.e., chlorides and fluorides emissions from calciners/kilns.

Page 3 of Form 1.00, Appendix F in the application No. 21371 dated August 17, 2012 estimates the facility-wide total potential HAP emissions to be 136.04 TPY. The current and future emissions are highlighted in Table 4.2-1 also found on Page 3 of Form 1.00. There will be an increase in HAP emissions due to the addition of Lines 3 and 4. The current facility PE is attributed to emissions from the currently permitted Lines 1 and 2. Emissions after the modification will be the sum of Lines 1-4.

[1] US EPA, *Guidelines for MACT Determinations under Section 112(j) Requirements*, EPA 453/R-02-001, February 2002; http://epa.gov/ttn/atw/112j/guidance.pdf.

Table 4.2-1 HAPs Potential Emissions

Individual HAPs	Current Facility Lines 1 and 2 PE (tpy)	Modification Lines 3 and 4 PE (tpy)	Total After Modification PE (tpy)
Methane	53.51	48.00	101.51
n-Hexane	2.25	2.20	4.45
Hydrogen Flouride	9.04	9.08	18.12
Hydrogen Chloride	5.89	5.88	11.77
Other HAPs	0.10	0.09	0.19
Total HAPs	70.79	65.25	136.00

Contributing factors that affect the total emissions from Lines 3 and 4 include 48.0 TPY of methanol from spray drying/palletizing, 5.88 TPY of HCl and 9.04 TPY of HF from calcining, and 2.20 TPY of Hexane as by-product of fuel combustion. The rest of HAP emissions consist of trace amounts of various inorganic and organic compounds and elements as byproducts from fuel combustion, and insignificant in comparison with the methanol, HCl and HF emissions [2].

5.0 112(G) OF CAA CASE-BY CASE MACT ANALYSIS

A 112(g) case-by-case MACT determination is required for this facility. MACT emission limitation for new sources is defined as:

> "…the emission limitation which is not less stringent than the emission limitation achieved in practice by the best controlled similar source, and which reflects the maximum degree of deduction in emissions that the permitting authority, taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impacts and energy requirements, determines is achievable by the constructed or reconstructed major source."
> [40 CFR 63.41]

The requirements of the determination are set forth in 40 CFR 63.40 through 63.44.

5.1 MACT Technical Approach

Because EPA could not immediately issue MACT standards for all industries (and there was a potential for significant new sources of toxic air emissions to remain uncontrolled), Section 112(g) of the Clean Air Act acts as a "gap-filler" requiring MACT-level control of air toxics when a new major source of HAP is constructed or reconstructed. The facility provides basic information about the source and its potential emissions through its air quality permit application. The application also specifies the emission controls that will ensure that new source MACT will be met. The Division reviews and approves (or disapproves) the application, and provides an opportunity for public comment on the determination.

The principles of an 112(g) case-by-case MACT determination are outlined in 40 CFR 63.43(d)(1) through (4) as follows:

"……

[2] Table C-3, Attachment C, Georgia Air Quality Permit Application No. 21371 dated August 17, 2012, PyraMax Ceramics, LLC. – King's Mill Facility.

(d) *Principles of MACT Determinations.* The following general principles shall govern preparation by the owner or operator of each permit application or other application requiring a case-by-case MACT determination concerning construction or reconstruction of a major source, and all subsequent review of and actions taken concerning such an application by the permitting authority:

(1) The MACT emission limitation or MACT requirements recommended by the applicant and approved by the permitting authority shall not be less stringent than the emission control which is achieved in practice by the best controlled similar source, as determined by the permitting authority.

(2) Based upon available information, as defined in this subpart, the MACT emission limitation and control technology (including any requirements under paragraph (d)(3) of this section) recommended by the applicant and approved by the permitting authority shall achieve the maximum degree of reduction in emissions of HAP which can be achieved by utilizing those control technologies that can be identified from the available information, taking into consideration the costs of achieving such emission reduction and any non-air quality health and environmental impacts and energy requirements associated with the emission reduction.

(3) The applicant may recommend a specific design, equipment, work practice, or operational standard, or a combination thereof, and the permitting authority may approve such a standard if the permitting authority specifically determines that it is not feasible to prescribe or enforce an emission limitation under the criteria set forth in section 112(h)(2) of the Act.

(4) If the Administrator has either proposed a relevant emission standard pursuant to section 112(d) or section 112(h) of the Act or adopted a presumptive MACT determination for the source category which includes the constructed or reconstructed major source, then the MACT requirements applied to the constructed or reconstructed major source shall have considered those MACT emission limitations and requirements of the proposed standard or presumptive MACT determination.

……".

In February 2002, EPA issued *"Guidelines for MACT Determination under Section 112(j) Requirements"*[3] for a major HAP source in a source category for which EPA missed the deadline for promulgating a MACT Standard. These guidelines offer a suggested step-by-step process for making a MACT determination consistent with the above principles. The process is summarized as followings:

[3] EPA, *Guidelines for MACT Determinations under Section 112(j) Requirements*, EPA 453/R-02-001, February 2002; http://epa.gov/ttn/atw/112j/guidance.pdf.

Tier I: Making a MACT floor finding

Step 1 - Identify all the MACT affected emission unit(s). These emission points will be grouped into emission units (MACT emission units) subject to a MACT determination. When no relevant emission standard has been proposed, the MACT emission unit will be determined on a case-by-case basis.

Step 2 - Make a MACT floor finding. Using the available information provided by the EPA, other permitting authorities, and/or the permit applications, a level of HAP emission control that is equal to the MACT floor for each type of emission unit undergoing review should be calculated. Section 112(d) of CAA 1990 Amendment instructs the EPA to set emission standards for new sources based on the emissions control achieved in practice by the best controlled similar source and to set emission standards for existing sources based on an average emission limitation achieved by the best performing 12% of existing sources or best performing five sources in the source category or subcategory for categories with fewer than 30 sources. The word "average" can have several different meanings, including arithmetic mean, median, and mode.

It is not necessary for the MACT floor to be determined based on emissions information from every existing source in the source category or subcategory if such information is not available. The permitting authority, however, should check with EPA Regional Offices and EPA Headquarters for any available information that could be used in determining the MACT floor. If a MACT floor is determined, it is only necessary to complete Tier I and Tier III of the MACT analysis. If, under Tier I, the MACT floor cannot be determined or is equal to "no control", Tier II of the analysis should be completed before moving on to Tier III.

Tier II: Considering all control technologies

Step 1 – Identify all commercially available and demonstrated control technologies that are reasonably applicable to such source. Available control technologies include but are not limited to: reducing the volume of, or eliminating emissions of pollutants through process changes, substitution of materials or other techniques; enclosing systems or processes to eliminate emissions; collecting, capturing, or treating pollutants when released from a process, stack, storage, or fugitive emission point; using design, equipment, work practices, or operational standards (including requirements for operator training or certification); or, a combination of any of these methods. Each control technology should be evaluated to consider the costs, non-air quality health and environmental impacts, and energy requirements associated with using each control technology.

Step 2- Eliminate technically infeasible control technologies. A technology is generally considered technically infeasible if there are structural, design, physical or operational constraints that prevent the application of the control technology to the emission unit. A technology may also be eliminated if the permitting authority deems it unreasonable. A technology is considered unreasonable if the operational reliability and performance have not been demonstrated by approved methods under conditions representative of those applicable to the source for which MACT is being determined.

Step 3- Determine efficiency of applicable control technologies via a detailed analysis of all of the available reasonably applicable control technologies. The efficiency of each control technology in reducing overall HAP emissions should be determined. Generally, MACT has been selected based on an overall reduction of all HAP emissions.

Tier III - Identifying MACT

Step 1 - Identify the maximum emission reduction control technology. When a MACT floor finding is made, the permitting authority will need to use available information to identify the control technology(s) that reduce HAP emissions from the MACT emission units to the maximum extent considering the factors in Section 112(d)(2) of the Act and to a level that is at least equal to or greater than the MACT floor. As in Tier II, the permitting authority should conduct an analysis to eliminate any technically infeasible control technologies, to determine the efficiency of applicable control technologies and at the same time take into consideration "the cost of achieving such emission reduction, and any non-air quality health and environmental impacts and energy requirements" [section112(d)(2)].

Step 2 - Conduct an impacts analysis. The control technology that achieves the maximum degree of HAP emission reductions with consideration to costs, non-air quality health and environmental impacts, and energy requirements is MACT. The Act does not provide direction on the significance of one consideration to another. The EPA believes that it is inappropriate to provide specific guidance for determining the amount of consideration that should be given to any one factor. Such decisions will need to be made based on the information available at the time of the MACT determination.

Step 3 -- Establish the MACT emission limitation. The MACT emission limitation established by the permitting authority is based on the degree of emission reduction that can be obtained by the affected source if MACT is applied and is properly operated and maintained.

However, the Guideline also states that "This process is presented here as suggested guidance in determining MACT. Permitting authorities are free to use the process with which they are most familiar to determine MACT"[4].

5.2 Potential Control Options Review

HAP emissions from the two additional Lines 3 and 4 at PyraMax Ceramics include natural gas-fired spray dryers/pelletizers, natural gas-fired rotary ceramic calciners/kilns, and stationary emergency diesel generators. They are grouped into the following source categories:

- Reciprocating Internal Combustion Engines & Stationary Internal Combustion Engines: one (1) 350 kW stationary emergency diesel generator.
- Calciners/Kilns Nos. 3 and 4.
- Spray Dryers/Pelletizers Nos. 3 and 4.

The generator is listed in EPA's Source Category List under 112(c) of CAA Amendment of 1990, as revised on June 30, 2005.[5] But neither spray dryers/pelletizers nor calciners/kilns are listed as a source category in the List. Both are direct heating process units where flue gases are in touch with materials being heated/processed. Spray dryers/pelletizers remove physically-bound water and volatile organic substances from clay slurry via evaporation in hot air, and thus emit most if not all the methanol discussed previously. Calciners/kilns further drive off residue physically-bound water and volatile organic substances from semi-dried slurry/kiln feed/green pellets and then remove chemically-bond water from the kiln feed/clay to produce ceramic proppants via sintering at a much high temperature. Because of the high temperature (>3,000°F), calciners/kilns can readily oxidize/burn most of the organic and inorganic compounds contained in the calciner/kiln feed, and turn them into water, CO_2 and other oxidizers including CO, NO_x, and SO_2. With regard to the HAP emissions, the calciners/kilns release chlorides and fluorides contained in the clay into the air mainly in forms of acidic gases (HCl and HF), plus less amounts of solid chlorides and fluorides which are also EPA listed HAPs. Because the significant differences in the process and emission nature and characteristics between the spray dryers/pelletizers and the calciners/kilns at PyraMax Ceramics facility, they are considered as two source categories with regard to this 112(g) case-by-case MACT determination.

All the stationary emergency diesel generators at PyraMax Ceramics are subject to the promulgated NESHAP/MACT standard, 40 CFR Part 63, Subpart ZZZZ - *National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines [RICE]*. They are not subject to this case-by-case MACT determination.

No currently promulgated NESHAP MACT Standards under 40 CFR Part 63 has been identified to be applicable to the rest of the HAP emissions source categories (spray dryers/pelletizers and calciners/kilns). Therefore, these sources are the subjects of this case-by-case MACT determination per 40 CFR 63.40 through 63.44.

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[4] Page 3-5, *"Guidelines for MACT Determinations under Section 112(j) Requirements"*, EPA 453/R-02-001, February 2002; http://epa.gov/ttn/atw/112j/guidance.pdf.

[5] *Federal Register*, Volume 70, No. 125, June 30/Notices; http://www.epa.gov/fedrgstr/EPA-AIR/2005/June/Day-30/a12942.htm

5.3 Technical Feasibility Review

A control method or technology is considered available if it can be obtained through commercial channels or applied within the common sense meaning of the term. An available control technology is applicable if it can reasonably be installed and operated. A technology that is both available and applicable is technically feasible. EPA has identified the potential control options in the proposed MACT standard as being available and applicable.

5.4 Case-by-Case MACT Determination for Spray Dryer/Pelletizer

Tier I: Making a MACT floor finding

<u>Step 1: Identify the Case-by-Case MACT – Affected Emission Unit</u>

The clay slurry injected into each of the spray dryers/pelletizers contains an additive with less than 1% by weight of methanol, which is assumed to be driven off in the spray dryers/pelletizers since the operating temperature of these sources is above the boiling point for methanol. The methanol content is an impurity in the additive. The potential methanol emission rate is estimated at 5.48 lbs/hr or 24 TPY for each spray dryer/pelletizer[6]. Both spray dryers/pelletizers are considered as "new sources" under Section 112(g) of CAA Amendment of 1990. Lines 1-4 all are required to follow the same MACT finding. The MACT decision for Lines 1 and 2, made by Division for Permit No. 3295-163-0035-P-01-0 and approved by EPA, is repeated here for spray dryer/pelletizers for Lines 3 and 4.

<u>Step 2: Make a MACT Floor Finding</u>

According to Section 112(d) of the CAA Amendment of 1990, the MACT floor for a new source is the level of HAP emission control achieved in practice by the best controlled similar source. EPA's RBLC database indicates that no source similar to PyraMax Ceramics' spray dryers/Pelletizers (Process Code 90.017, Calciners & Dryer and Mineral Processing Facilities) has add-on control for VOC (Methanol is also considered as a VOC compound), as indicated by Table 5.4-1.

Table 5.4-1: Best Methanol/VOC Control Technology Determination for Spray Dryers

Facility Name	Agency	Database	Process Type	Permit Date	Process Description	Controls/Type	Emission Limits/Description
Dalitalia LLC	OK, DEQ	RBLC	90.017	10/05	Spray Dryers	Pollution Prevention/Good Combustion Techniques	0.25 lbs/ton material
Dalitalia LLC	OK, DEQ	RBLC	90.017	10/05	Vertical Dryers	Pollution Prevention/Good Combustion Techniques	4.26 lbs/hr
Dalitalia LLC	OK, DEQ	RBLC	90.009	10/05	Vertical Dryers	Pollution Prevention/Good Combustion	5.1 lbs/hr

[6] Table C-3, Attachment C, Georgia Air Quality Permit Application No. 21371 dated August 17, 2012, PyraMax Ceramics, LLC. – King's Mill Facility.

Facility Name	Agency	Database	Process Type	Permit Date	Process Description	Controls/Type	Emission Limits/Description
						Techniques	
Dalitalia LLC	OK, DEQ	RBLC	90.009	10/05	Vertical Dryers	Pollution Prevention/Good Combustion Techniques	5.1 lbs/hr
Carbo Ceramics, Inc.- Toomsboro Plant	GA, EPD	N/A	90.017	12/09	Spray Dryers/ Pelletizers	Pollution Prevention	0.12 lbs. methanol/ton kiln feed not to exceed 10.04 tons methanol per kiln per 12-rolling months

An information search also confirms that there are no known cases of add-on VOC control being utilized for similar calciners/kilns. Therefore, the MACT floor for the methanol emissions from PyraMax Ceramics' spray dryers/pelletizers is equal to "no control" since the group of similar sources on which the MACT floor determination is based on is not currently controlling HAP emissions. Consequently, a more detailed analysis is required in order to determine the appropriate level of control. Tier II of the analysis is required before moving on to Tier III.

The Division concurs.

Tier II: Considering all control technologies

Step 1 – Identify all commercially available and demonstrated control technologies that are reasonably applicable to such source

For controlling the methanol emissions from the spray dryers/pelletizers, regenerative thermal oxidation (RTO), catalytic oxidation, biofiltration using a biotrickling filter, quencher/scrubber system (direct contact condensation) and pollution prevention/substitute material are being considered as possible control technology options as listed in Table 5.4-2 and the Division agrees.

Table 5.4-2: Evaluated Control Options for Methanol Emissions from Spray Dryers/Pelletizers

Control Option No.	Control Technology	Estimated Control Efficiency, % wt.	Reference
1	Quencher/Scrubber System (Direct Contact Condensation)	various	EPA/625/6-91/014
2	Carbon Adsorption	98	EPA/625/6-91/014
3	Regenerative Thermal Oxidation (RTO)	95-99	EPA-452/F-03-021
4	Catalytic Oxidation	95	EPA/625/6-91/014
5	Biofiltration	60-99	EPA-456/R-03-003
6	Pollution Prevention & Substitute Material	N/A	N/A

Step 2- Eliminate technically infeasible control technologies.

Option 1. Quencher/Scrubber System (Direct Contact Condensation): In theory, the methanol emissions from PyraMax Ceramics' spray dryers/pelletizers can be reduced by chilling the exhaust gas streams from the spray dryers/pelletizers. As the temperature of the exhaust gas streams is lowered, a portion of the methanol in the exhaust gas streams could be condensed and thus removed. Nevertheless, the methanol concentration in each of the exhaust gas streams from PyraMax Ceramics' spray dryers/pelletizers as estimated by the company is less than 100 ppm by volume, substantially below the low bound of the concentration range (1,000 ppm by volume) for VOC condensation control technology to be effective[8]. In addition to the low VOC/methanol concentration, the spray dryers/pelletizers' exhaust gas streams are rich in water vapor. Condensation of large quantity of water would make the operation of the condensation system even less cost-effective and practical. Based on these findings, condensation is deemed technically infeasible and not considered further for this MACT analysis and the Division agrees.

Step 3- Determine efficiency of applicable control technologies

The Division agrees with the following control/removal efficiencies of the remaining evaluated control options for the methanol emissions from PyraMax Ceramic's spray dryers/pelletizers listed in Table 5.4-3 below:

Table 5.4-3: Efficiency of the Evaluated Applicable Control Options for Methanol Emissions from PyraMax Ceramics' Spray Dryers/Pelletizers

Control Option No.	Control Technology	Control Efficiency % wt.
2	Carbon Adsorption	98
3	Regenerative Thermal Oxidation (RTO)	95-99
4	Catalytic Oxidation	95
5	Biofiltration	60-99
6	Pollution Prevention & Substitute Material	N/A

Tier III - Identifying MACT

Step 1 - Identify the maximum emission reduction control technology

The technologies listed in Table 5.4-3 are sufficient for greater than 90% control of methanol emissions. A description of them can be found on page 6-12 of Application 21371 and also the preliminary determination 3295-163-0035-P-01-0. But the technologies have not been proven on similar sources to effectively control methanol emissions. Option 6 is already being used since the additive materials used by the facility in the mixture preparation process contain a minimum amount of volatiles. The Division agrees with this finding.

Step 2 - Conduct an impact analysis

Application No. 21371 dated August 17, 2012, included a cost impact analysis of each of the applicable control technologies discussed above, assuming a 95% removal efficiency for all the add-on control technologies evaluated and an estimated methanol emissions of 24 tons per year for each spray dryer/pelletizer. The Division has reviewed this information and concurs. The cost data indicate that the use of options 2, 3, 4 and 5 to control the methanol emissions from PyraMax Ceramics' spray dryers/pelletizers would impose a significant economic impact. The cost impact analyses are detailed in Appendix D of Application No. 21371.

[8] Page 6-13, Georgia Air Quality Permit Application No. 21371 dated August 17, 2012, PyraMax Ceramics, LLC. – King's Mill Facility.

Step 3 -- Establish the MACT emission limitation.

Due to the relatively small quantity of methanol emissions emitted from each spray dryer/pelletizer compare to the large exhaust gas flow of each of the spray dryers/pelletizers (Exhaust gas flow rate generally dictates the size of the control system and thus the cost of the system), option 2, 3, 4 and 5 are economically infeasible and would pose a significant cost impact. As such, "no control" based on pollution prevention remains as the MACT floor for the methanol emissions from PyraMax Ceramics' spray dryers/pelletizers. As proposed by PyraMax Ceramics, the corresponding numerical MACT emission limits are 24.0 tons of methanol emissions for each spray dryer/pelletizer or process/kiln line during each period of 12-consecutive months and 0.23 lbs methanol per ton of calciner/kiln feed for each process/kiln line (monthly average). The second limit is necessary because it ensures the HAP emission performance or cleanness of the sources to be maintained at the designed level, i.e. the basis of this case-by-case MACT determination. Pollution Prevention option includes exclusive use of natural gas and appropriate use of methanol containing additive.

The Division concurs with this determination.

5.5 Case-by-Case MACT for Natural Gas-Fired Ceramic Calciners/Kilns

Tier I: Making a MACT floor finding

Step 1: Identify the Case-by-Case MACT – Affected Emission Unit

Each of the natural gas-fired dry process rotary ceramic calciner/kiln Nos. 3 and 4 is considered as a "new source" under 112(g) of CAA Amendment of 1990. According to the application No. 21371 dated August 17, 2012, each calciner/kiln has potential to emit approximately 7.87 TPY of HAPs, including 2.94 TPY of HCl, 4.52 TPY of HF, 0.51 TPY of Hexane and 0.02 TPY of other trivial volatile and solid HAPs. Since the HAP emissions are estimated to be the same for each line, Lines 1-4 all are required to follow the same MACT finding. The MACT decision for Lines 1 and 2, made by Division for Permit No. 3295-163-0035-P-01-0 and approved by EPA, is repeated here for spray dryer/pelletizers for Lines 3 and 4.

Step 2: Make a MACT Floor Finding

According to Section 112(d) of the CAA Amendment of 1990, the MACT floor for a new source is the level of HAP emission control achieved in practice by the best controlled similar source. EPA's RBLC database indicates that no source similar to PyraMax Ceramics' calciners/kilns (Process Code 90.017, Calciners & Dryer and Mineral Processing Facilities) has add-on control for HF and HCl), as indicated by Table 5.5-1.

Table 5.5-1: Best HF/HCl Control Technology Determination for Calciners/Kilns

Facility Name	Agency	Process Type	Permit Date	Process Description	Controls/Type	Emission Limits/Description	
Carbo Ceramics, Inc. (McIntyre)	GA EPD	90.008	10/2005	Kiln	Good Combustion Techniques/Wet Scrubber	HCl	0.036 lb/ton kiln feed (6.26 tpy)
						HF	0.21 lb/ton kiln feed (36.3 tpy)
Carbo Ceramics, Inc.	GA EPD	---	10/2005	Kiln	Pollution Prevention/Good	HCl	0.099 lb/ton kiln feed (8.7 tpy)

Facility Name	Agency	Process Type	Permit Date	Process Description	Controls/Type	Emission Limits/Description	
(Toomsboro)					Combustion Techniques	HF	0.433 lb/ton kiln feed (37.92 tpy)
Carbo Ceramics, Inc. (Millen)	GA EPD	---	04/2012	Calciner	Pollution Prevention/Good Combustion Techniques	HCl	1.98 lb/hr (10.04 tpy)
						HF	8.70 lb/hr (37.92 tpy)
Dalitalia LLC	OK, DEQ	90.008	10/2005	Kiln	Wet Scrubber	HCl	0.082 lb/ton Tile[4]
						HF	0.082 lb/ton Tile
PyraMax Ceramics, LLC (Allendale, SC)	SC, DHEC	90.008	02/2012	Calcining/ Sinistering Kiln	Catalytic Baghouse	HCl	0.29 lb/ton kiln feed (2.94 tpy)
						HF	0.044 lb/ton kiln feed (4.52 tpy)
Endicott Clay Products	NE DEQ	90.009	04/2008	Plant 3, Kiln1	None	Flourides	5.22 lb/hr (3-hr avg.)
Dalitalia LLC (Muskogee)	OK, DEQ	90.009	10/2005	Kiln	Wet Scrubber	HCl	0.080 lb/ton
						HF	0.080 lb/ton
General Shale Products Corporation, LLC	---	90.017	---	Kiln, Aggregate	---	SO_2	1.10 lb/hr 4.9 ton/yr
Celite Corporation	Santa Barbara APCD	90.017	06/2007	Diatamaceous Earth Calciner	Venturi Scrubber	SO_2	0.05 lb/min

Carbo Ceramics, Inc.'s McIntyre Plant in Georgia is using a wet scrubber to control SO_2 as well as HCl and HF emissions from a ceramic proppant calciner/kiln. This case is considered a MACT floor for the same emissions from similar sources because it would achieve the maximum reduction/control efficiency among all the feasible control technologies for the emissions. Since the "catalytic baghouse" control system proposed by PyraMax Ceramics will reportedly achieve the same level of control as a wet scrubber among all the feasible control technologies identified, the use of the "catalytic baghouse" control system will represent the use of the maximum emission reduction technology available for the HCl and HF emissions. Therefore, as the MACT floor for controlling the HCl and HF emissions has been established, and the control technology representing the MACT floor has been accepted by PyraMax Ceramics, proceed to Tier III of the analysis. Good Combustion techniques include the exclusive use of natural gas for fuel. This is included in the MACT determination.

Tier III - Identifying MACT

Step 1 - Identify the maximum emission reduction control technology

PyraMax Ceramics proposed to use "catalytic baghouses" to control the SO_2 emissions from the calciners/kilns as written on page 5-13 of Application No. 21371. This control technology consists of an upstream dry powdery alkaline sorbent injection system followed by a downstream capture system for particulate matters, i.e., the "catalytic baghouse", and is expected to achieve 90% of removal efficiency. EPD has determined in the BACT analysis that this control technology is BACT for controlling the SO_2 emissions which is contained in Section 4.1 of the Preliminary Determination of Permit No. 3295-163-0035-P-01-1. Because the "catalytic baghouse" can simultaneously remove other acid gases, e.g., HCl and HF from the same kiln exhaust gas stream with 90% or more efficiency, it was proposed by PyraMax Ceramics as MACT for the control of HCl and HF emissions from the same sources.

Step 2 - Conduct an impact analysis

As stated previously the catalytic baghouse has been selected as MACT for the control of HCl and HF emissions. The Division agrees that no other controls have been identified as the MACT floor for these HAPs and therefore an impact analysis is not necessary.

Step 3 -- Establish the MACT emission limitation.

EPD has not identified any beyond-the-MACT-floor technology which could provide an HF and HCl emission control efficiency higher than that of the "catalytic baghouse".

Therefore, EPD has concluded that the case-by-case MACT for the HAP emissions from PyraMax Ceramic's natural gas–fired rotary ceramic calciners/kilns consists of:

- Use only natural gas and propane as fuel;
- Use the "catalytic baghouse" to reduce the HF and HCl emissions at a control efficiency of no less than 90% by weight and to no more than 0.029 pounds of HCl emitted per ton of kiln feed and 0.044 pounds of HF emitted per ton of kiln feed); and
- Use the "catalytic baghouse" to reduce the HF and HCl emissions from each calciner/kiln to no more than 4.49 TPY and 2.96 TPY respectively.

PyraMax Ceramics will be required to conduct an initial performance test on each of the calciners/kilns to demonstrate compliance with the case-by-case MACT HCl and HF emission limits respectively, and subsequently, a similar test for HCl and HF emissions respectively on each calciner/kiln every 12 months to demonstrate continuous compliance with the MACT limits.

5.6 Summary of Preliminary MACT Determination

The 112(g) case-by-case MACT determinations are summarized in Table 5.7-1 below for easy reference:

Table 5.6-1: Section 112(g) Case-by-Case MACT Determinations for PyraMax Ceramics, LLC. – King's Mill Facility

Affected Source	Pollutant	Control Technology	Proposed 112(g) Limit	Compliance Method	Averaging Time

Affected Source	Pollutant	Control Technology	Proposed 112(g) Limit	Compliance Method	Averaging Time
Each Spray Dryer/Pelletizer	Methanol	(1) Use only natural gas with propane as back-up Appropriate use of methanol-containing additive(s)	24.0 tons per 12-month rolling period for each spray dryers/ process line	Mass balance based on material usage records and additive MSDS sheets	12-month rolling
			0.23 lbs/ton kiln feed spray dryers/each process line		Monthly
Each Calciner/Kiln	HCl	Use only natural gas with propane as back-up Controlled by the "catalytic baghouse" consisting of upstream injection of powdery sodium bicarbonate and downstream ceramic tube/baghouse unit	2.96 tons per year	Mass balance calculation based on annual testing result & production records	12-month rolling
			0.029 lbs/ton kiln feed and 90% reduction	Method 26 or 26A of 40 CFR Part 60, Appendix A or Method 320 of 40 CFR Part 63, Appendix A	Average of at least three 1-hour test runs
	HF		4.49 tons per year	Mass balance calculation based on annual testing result & production records	12-month rolling
			0.044 lbs/ton kiln feed and 90% reduction	Method 26 or 26A of 40 CFR Part 60, Appendix A or Method 320 of 40 CFR Part 63, Appendix A	Average of at least three 1-hour test runs

To demonstrate compliance with the case-by-case MACT limits, PyraMax Ceramics shall maintain fuel and HAP-containing materials usage records necessary for tracking the amount and type of HAP-containing additives used at least on a monthly basis. All the records shall be kept for a period of five years from the date of record.

Initial performance tests are required for each calciner/kiln to demonstrate compliance with the HCl and HF emission limits. Same performance tests are required every 12 months thereafter. Pyramax is required to submit the results of all initial and required periodic performance testing within 60 days of the test for Division's review. Any excess emissions, exceedances, or excursions as described in the Air Quality Permit No. 3295-163-0035-P-01-1 of the MACT emission limits and/or operating parameter limitations shall be reported during the quarterly reporting period.

6.0 AIR QUALITY ANALYSIS

Following the procedures as specified in the *"Guidelines for Ambient Impact Assessment of Toxic Air Pollutant Emissions"*, ambient impact modeling conducted by both the Division and the company indicate that the maximum ground level concentrations for the potential HAPs emissions involved in this 112(g) case-by-case MACT determination emitted from PyraMax Ceramics' facility are below the acceptable ambient concentrations. The toxic impact assessment (TIA) is addressed in the *Prevention of Significant Deterioration Preliminary Determination* and with Application No. 21371 dated August 17, 2012. Please refer to Part 7.0 of the Preliminary Determination for the discussion of the TIA and associated modeling.