Department of Environmental Protection

Jeb Bush
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Colleen M. Castille
Secretary

December 3, 2004

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Gary Sauer, President of Cement and Calcium Group
155 East 21st Street
P.O.Box 4667
Jacksonville, FL 32201

Re: Request for Additional Information
DEP File No. 0010087-013-AC (PSD-FL-350)
Proposed New Kiln at the Thompson S. Baker Cement Plant in Alachua County, Florida

Dear Mr. Sauer:

On November 5, 2004, we received from Koogler and Associates your application for an air construction permit for a new kiln at the Thompson S. Baker Portland cement plant located at 4000 NW County Road 235, Newberry, Alachua County. Also, on November 5th we received the correct PSD permit processing fee from the firm of Oertel, Hoffman, Fernandez, and Cole.

Pursuant to Rule 62-4.055, F.A.C., Permit Processing, the Department requests submittal of additional information prior to processing the application. For responses to any of the items below that require new calculations, please submit the new calculations, assumptions, reference material and appropriate revised pages of the application form.

1. Provide manufacturer's certification that will confirm the maximum design capacity of the kiln in tons per hour of dry feed and in tons per hour of clinker produced. Provide a similar certification for heat input for the kiln and precalciner burners. Rule 62-4.070, F.A.C.
2. Provide details on the kiln burner and describe where air and fuel will be introduced and how they are staged to minimize NO_X formation. Please indicate the type of burner that will be used. Rules 62-212.400 and 62-4.070(1), F.A.C.
3. Describe the manner in which the precalciner vessel(s) will operate at FRI Newberry. Advise how the operation will change to accommodate petroleum coke and high carbon flyash. Indicate where and how tires and flyash will be combusted in the MSC device while maintaining the Low NO_X conditions of the design. Submit the test results from Air Construction Permit 0010087-012-AC. Rules 62-212.400 and 62-4.070(1), F.A.C.
4. Please assess the possibility of lowering CO emissions by employment of the PYROTOP technology or equivalents (if available) from Polysius or other manufacturers. Rule 62-212.400, F.A.C.
5. Please assess the use of "high-efficiency bag filter, outfitted with teflon-coated fiberglass bags" and/or HEPA filters as secondary controls of particulate matter from the kiln system. What percentage, if any, of the collected fines will be recycled into the process? Rule 62-212.400, F.A.C.

24. Provide operation and maintenance plans for all major process and pollution control equipment. Form 62-210.900(1), F.A.C.

Since the application is not complete, an *incomplete application* has been provided to the Federal Land Manager in accordance with Rule 62-212.400(4)(a)2., F.A.C. Federal Land Manager Participation. The FLM is responsible for demonstrating to the Department whether emissions from the facility will have an adverse impact on the air quality-related values (AQRVs including visibility) of the Federal Class I Area. The Department must consider such a demonstration in its Preliminary Determination if it is received within 30 days after the Department sends a complete application to the FLM.

We will forward any comments received from other agencies as soon as we receive them. Rule 62-4.050(3), F.A.C. requires that all applications for a Department permit must be certified by a professional engineer registered in the State of Florida. This requirement also applies to responses to Department requests for additional information of an engineering nature. Permit applicants are advised that Rule 62-4.055(1), F.A.C. now requires applicants to respond to requests for information within 90 days. If there are any questions, please call Bobby Bull at 850-921-9585. Matters regarding modeling issues should be directed to Cleve Holladay at 850/921-8986.

Sincerely,

James K. Pennington, Administrator
North Permitting Section

JKP/rlb

Chris Horner, Plant Manager, FRI Newberry Plant
Chris Kirts, Florida DEP- NED
Chair, Alachua County Board of County Commissioners
Mayor, City of Newberry
Chris Bird, Alachua County EPD
Steve Cullen, P.E., Koogler and Associates
John Koogler, P.E.
John Bunyak, NPS
Jim Little, EPA

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GAINESVILLE, FLORIDA 32609
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January 14, 2005

RECEIVED
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BUREAU OF AIR REGULATION

James K. Pennington, P.E.
Administrator, North Permitting Section
Division of Air Resource Management
Department of Environmental Protection
2600 Blair Stone Road, MS #5505
Tallahassee, Florida 32399-2400

Subject: Response to Request for Additional Information Dated December 3, 2004
DEP File No. 0010087-013-AC (PSD-FL-350)
Proposed New Kiln at the Thompson S. Baker Cement Plant
Alachua County, Florida

Dear Mr. Pennington:

This letter and its attachments respond to your request for additional information dated December 3, 2004. Your information request items are reproduced, preserving your numbering. Responses follow each item.

I trust that this information is responsive to the Department. Please do not hesitate to contact me if you require further information.

Sincerely,

SEAL

Steven C. Cullen, P.E.
Koogler & Associates

Consultant to Florida Rock Industries, Inc.

Enclosures: Response Letter
Attachment A: Letter from Polysius Corp.
Attachment B: Typical Raw Materials and Fuels Analyses
Attachment C: Startup, Shutdown & Malfunction Plan
Attachment D: Updated Modeling (CD)
Attachment E: Paved Road Silt Sampling Locations
Attachment F: O&M Plans

Copies to: Segundo Fernandez – Oertel, Fernandez, Cole & Bryant
Henry Gotsch – Florida Rock
Chris Horner – Florida Rock
Gary Sauer – Florida Rock

1. Provide manufacturer's certification that will confirm the maximum design capacity of the kiln in tons per hour of dry feed and in tons per hour of clinker produced. Provide a similar certification for heat input for the kiln and precalciner burners. Rule 62-4.070, F.A.C.

Response: Please see the letter from Polysius Corp., included with this response as Attachment A.

2. Provide details on the kiln burner and describe where air and fuel will be introduced and how they are staged to minimize NO_X formation. Please indicate the type of burner that will be used. Rules 62-212.400 and 62-4.070(1), F.A.C.

Response: The main kiln burner for the FRI project will be a low NOx burner supplied by Polysius, Pillard, Unitherm or equivalent. The burner will be indirectly fired.

Low NOx burners are multi-channeled burners. Typically fuel (oil, pulverized coal or pulverized petroleum coke) is fired with minimal combustion air through a central channel. The pressure of the primary air is controlled to obtain optimum exit momentum and ignition distance. Additional primary air is introduced through one or more channels to provide a fuel-rich combustion zone in which the initial fuel combustion occurs. Because of the fuel-rich characteristics of this zone (i.e. low oxygen), thermal NOx formation is minimized. The amount and pressure of the primary air controls the flame shape and flame intensity as required for desired heat and flame shape distribution in the kiln. Secondary air from the clinker cooler is introduced downstream to provide sufficient oxygen for the complete burn-out of the fuel.

The staging of the primary and secondary combustion air and the total amount of combustion air controls thermal NOx formation. To minimize thermal NOx emissions, cement kilns are typically operated with 1-2 percent oxygen in the gases leaving the kiln. With add-on NOx control technology such as SNCR, the oxygen in the gases leaving the kiln can be increased to 3-4 percent. This has a tendency to improve kiln stability and reduce material build up in the riser duct and in the calciner.

3. Describe the manner in which the precalciner vessel(s) will operate at FRI Newberry. Advise how the operation will change to accommodate petroleum coke and high carbon flyash. Indicate where and how tires and flyash will be combusted in the MSC device while maintaining the Low NO_X conditions of the design. Submit the test results from Air Construction Permit 0010087-012-AC. Rules 62-212.400 and 62-4.070(1), F.A.C.

Response: To accommodate the combustion of petroleum coke and the introduction of high-carbon flyash below the preheater, the plant will be built with a separate combustion chamber in the calciner. This will enhance the ability of the Polysius multi-stage combustion kiln to burn petroleum coke. The fuel fired into the calciner (either pulverized coal or pulverized coke) will be fired through a burner that will allow efficient combustion under either oxidizing or reducing conditions. Hot combustion air will be supplied downstream of the combustion chamber to provide complete burn-out of the fuel and for the oxidation of carbon monoxide.

The high carbon flyash (up to 50 percent or more carbon) will be introduced directly into the combustion chamber. In the combustion chamber, the carbon content of the flyash will burn, increasing the thermal efficiency of the kiln system. The mineral content will exit with the combustion gases, combine with the raw meal from the preheater and become a part of the clinkering minerals introduced to the kiln.

The multi-stage combustion design of the Polysius kiln will be accomplished by controlling the oxidizing/reducing conditions throughout the calciner including the combustion chamber. Multi-stage combustion will be accomplished by staging combustion air rather than by staging fuel except in the case when whole tire-derived fuel is used. Strong reducing conditions (for the reduction of NOx) can be created by burning the fuel in the combustion chamber under reducing conditions and by introducing secondary and tertiary air in stages approximately 0.5-1.0 seconds downstream of the reducing zone. A kiln inlet burner will not be employed.

Provisions will be made to fire whole tire-derived fuel through an air-lock feeding system onto the feed shelf of the kiln. This arrangement will be similar to that employed on the FRI Kiln No. 1. Whole tire-derived fuel, when used, will provide up to 15 percent of the heat input to the pyroprocessing system. This will reduce the amount of fuel fired into the combustion chamber in the calciner. The firing of whole tire-derived fuel will reduce the oxygen content of the gas stream leaving the kiln and entering the calciner. This will have the tendency to reduce NOx formed in the kiln. The use of whole tire-derived fuel will result in the staging of fuel as well as the staging of air in the functioning of the Polysius Multi-Stage Combustion design.

In summary, the separate combustion chamber will allow the combustion of fuels such as pulverized petroleum coke and for high-carbon flyash to bypass the preheater. The combustion chamber will also allow efficient combustion of the residual carbon in the flyash. Combustion in this chamber can be controlled to either oxidizing or reducing conditions. Whole tire-derived fuel, when used, will provide a second firing point for fuel in the calciner system and will reduce the oxygen content (and hence the NOx concentration) in the gas stream leaving the kiln. This gas stream will then combine with the gas stream from the combustion chamber. Hot gases from the kiln and hot tertiary combustion air will subsequently be introduced to assure the burn-out of the fuel and the oxidation of carbon monoxide. The oxygen concentration in the various gas streams in and around the calciner system will be balanced for kiln stability. NOx generation/reduction will be managed through the oxidizing/reducing characteristics of combustion in the combustion chamber (and the combustion of tire-derived fuel, when used), by SNCR or by a combination of the two. The utilization of an SNCR system downstream of the point where tertiary air is added will allow more flexibility in balancing the oxygen content of the gas stream leaving the kiln and calciner for kiln stability and NOx control.

Florida Rock expects to test the co-fueling of flyash and petroleum coke with ground coal during January/February 2005. The fuels will be blended with coal and fired through existing burners. No additional fueling ports will be used.

4. Please assess the possibility of lowering CO emissions by employment of the PYROTOP technology or equivalents (if available) from Polysius or other manufacturers. Rule 62-212.400, F.A.C.

Response: The Pyrotop® technology referenced by the Department is the trade name of the proprietary technology of KHD Humboldt Wedag. Basically, the technology provides residence time and turbulence in the calciner. The Polysius system designed for the FRI Kiln No. 2 provides these features by duct design between the combustion chamber outlet and the bottom stage cyclone of the preheater (the Stage 1 Cyclone).

The Polysius technology incorporated on the FRI Kiln No. 1 and the Suwannee American Cement kiln used a deflection chamber to provide this residence time. The Polysius design for the proposed FRI Kiln No. 2 will eliminate the deflection chamber; with the residence time and turbulence provided through a redesigned and reconfigured calciner.

5. Please assess the use of "high-efficiency bag filter, outfitted with teflon-coated fiberglass bags" and/or HEPA filters as secondary controls of particulate matter from the kiln system. What percentage, if any, of the collected fines will be recycled into the process? Rule 62-212.400, F.A.C.

Response: The application of a baghouse downstream of an ESP is of questionable benefit. Data presented in response to Item No. 6 (following), show that actual PM concentrations in gas streams discharged from both baghouses and ESPs are in the range of 0.004 grains per dry standard cubic foot (gr/dscf). Regarding the expected performance of membrane-coated bags, GE/BHA has stated that a typical guarantee for membrane coated bags is no better than 0.01 gr/dscf.[1] Thus, there appears to be no incentive to convert from an ESP to a baghouse or to follow the proposed ESP with a baghouse; even a baghouse with membrane-coated bags, as secondary control.

A cement kiln would require a huge HEPA unit since each 1-foot by 2-foot filter handles only 2,000 acfm (an air-to cloth ratio of 1000 as opposed to a ratio of 4-5 for typical baghouse design). There are no HEPA filters on any cement kiln in North America or on any cement kiln of the customers GE/BHA services in numerous other countries.[1]

All of the particulate matter control devices in the existing Kiln No. 1 system and in the proposed Kiln No. 2 system return their catches back to the process. There is 100% recycling.

6. Please advise whether fabric filters or an ESP would provide better control of emissions, particularly air toxics. How do particulate emissions from ESPs (on emissions from kilns and coolers) compare with emissions from baghouses during startups, shutdowns, and malfunctions?

Response: A baghouse or an ESP, when properly designed, will provide similar filtration efficiency. Neither will filter toxins that are in a gaseous form, such as furans or dioxins.[2]

[1] E-mail correspondence, GE/BHA Team, December 2004.
[2] E-mail, GE/BHA.

Particulate matter emissions from Portland cement plant kiln/raw mill systems and Portland cement plant clinker coolers at modern preheater/precalciner plants in Florida are controlled by both electrostatic precipitators and baghouses. At the Rinker Miami Cement Plant, the kiln/raw mill and cooler all discharge through a baghouse for particulate matter control. At the Suwannee American Cement Plant, particulate matter emissions from the kiln/raw mill are controlled with a baghouse while particulate matter emissions from the clinker cooler are controlled with an electrostatic precipitator, and at the FRI Thompson S. Baker Cement Plant, particulate matter emissions from both the kiln/raw mill and from the clinker cooler are controlled by separate electrostatic precipitators.

To assess the relative efficiencies of baghouses and electrostatic precipitators, particulate matter emission data reported to the Department by the three aforementioned cement plants were reviewed. The three plants combined, reported ten sets of particulate matter emission data from kiln/raw mill systems controlled by electrostatic precipitators, seven sets of data from clinker coolers controlled by electrostatic precipitators, and eight sets of data from kiln/raw mills or kiln/raw mills/coolers controlled by baghouses. Each data set consisted of three 1-2 hour test runs.

The average particulate matter concentration in the ten gas streams discharged from electrostatic precipitators controlling particulate matter emissions from kiln/raw mills averaged 0.0047 grains per dry standard cubic foot while the average particulate matter concentration from the eight sets of kiln/raw mill or kiln/raw mill/cooler data with emissions controlled by baghouses averaged 0.0038 grains per dry standard cubic foot. Using statistical procedures in 40 CFR 60, Appendix C, there is no significant difference in these particulate matter discharged concentrations.

If all of the particulate matter emissions data from kiln/raw mills and coolers controlled by electrostatic precipitators are combined (17 data sets), the average particulate matter discharge concentration is 0.0038 grains per dry standard cubic foot; identical to the particulate matter concentration from kiln/raw mill/cooler systems controlled by baghouses.

Based on these data, it is evident that baghouses (fabric filters) and electrostatic precipitators control particulate matter from kiln/raw mill/cooler systems equally well under normal operating conditions. Likewise, during plant start ups and shut downs, there will be no significant difference in the performance of the two technologies. Regarding malfunctions, both technologies have the potential for malfunctions, but they are manifested in different ways. With an ESP, operating at temperatures that are too high or too low can result in caking or coating on the collector plates, resulting in a reduced collection efficiency, and electrical trips of sections of collector plates can reduce overall ESP efficiency. These upsets are generally transient and short-term. With baghouses, operating at temperatures that are too high or too low can result in permanent thermal damage to the bags or the blinding (plugging) of bags. Problems can also be encountered with the bag cleaning mechanisms and ruptured bags. With either ESPs or baghouses, adherence to the O/M plan of the manufacturer will minimize malfunctions and assure efficient operations. With either type of collector, any serious, long-term malfunction will result in the shut down of the plant until the malfunction can be corrected. The O/M plan

provided to the Department as a requirement of the MACT standard also addresses the operation and maintenance of control devices; ESPs in the case of the FRI kiln/raw mill and cooler.
If particulate matter emissions are used as a surrogate for metallic air toxics (as in the Portland cement plant MACT Standards), it can be concluded that baghouses and electrostatic precipitators will control metallic air toxics equally well. In the case of gaseous air toxics (dioxins/furans, for example), neither baghouses nor electrostatic precipitators are significantly effective. It can be concluded, therefore, that baghouses and electrostatic precipitators control both particulate matter emissions and air toxics emissions from kiln/raw mill/cooler systems equally well.

7. Please provide information on CO control options, and why CO will require a higher emission limit than is currently permitted.

Response: Carbon monoxide is formed during the combustion process in the kiln and calciner sections of the pyroprocessing system and by the roasting of organics contained in raw materials passing through the preheater. In general, the carbon monoxide formed in the pyroprocessing system is most effectively controlled by the introduction of sufficient hot combustion air into the calciner and by allowing sufficient residence time for this carbon monoxide to be oxidized; a residence time in the range of 3-5 seconds.

Carbon monoxide formed by the roasting of organics contained in the feed to the preheater can most effectively be controlled by controlling the carbon content of the raw materials as no combustion follows the preheater. Add-on control technology for carbon monoxide has not proven to be cost effective for Portland cement plants in Florida.

Regarding the control of carbon monoxide emissions, the Polysius design provides adequate residence time and turbulence following the introduction of combustion air into the calciner and prior to the bottom stage cyclone of the preheater (Stage 1) to assure burnout of the carbon monoxide formed in the pyroprocessing system (kiln and calciner). Coincidentally, it is into this same section of the calciner that ammonia is injected for the SNCR system proposed by FRI.

Richard Erpelding of Polysius has described competing reactions between the reduction of NOx with an SNCR system and the oxidation of carbon monoxide (*Latest Developments in NOx Reduction Technology in the Cement Industry*, Cement Plant Environmental Handbook 2003). For the ammonia from the SNCR system to react with NOx (primarily NO), it must first be converted to the $NH_2^{\bullet}$ radical. This occurs when ammonia reacts with $OH^{\bullet}$ radicals present where there is excess oxygen. Once the $NH_2^{\bullet}$ radical is formed, it reacts with NOx to produce elemental nitrogen (N_2) and water. It is the same $OH^{\bullet}$ radicals that react with carbon monoxide (CO) to form CO_2. Thus, because of the competing reactions, there is a potential for CO emissions from the pyroprocessing systems to increase when SNCR is employed.

In the referenced paper, Erpelding reports that at an ammonia/NOx mole ratio of approximately 0.8, carbon monoxide emissions will increase between 50 and 250 milligrams per normal cubic meter (up to approximately 1.15 pounds of carbon monoxide per ton of clinker). It is for this reason that FRI is requesting a carbon monoxide emission limit of 3.6 pounds per ton of clinker.

Regarding carbon monoxide emissions from organics in raw materials, the limestone, sand and clay mined and used by FRI is naturally very low in organics; thus minimizing the generation of CO emissions in the preheater from these materials. FRI is also careful to assure that the organic carbon content of raw materials obtained offsite are low to assure there is no significant carbon monoxide (nor hydrocarbon) formation in the preheater.

The one raw material that can potentially contain significant organic carbon is flyash. To assure that the use of high carbon flyash does not cause carbon monoxide (or hydrocarbon) emission problems, FRI is requesting in this permit application, the option of introducing the high carbon flyash directly into the combustion chamber of the calciner to assure the efficient combustion of this carbon and the oxidation of any resulting carbon monoxide by the introduction of combustion air downstream of the combustion chamber as described elsewhere herein.

8. Submit a projected chemical analysis of the raw materials and additives likely to be used at this plant. Provide a proximate and ultimate analysis of the fuels proposed. Rule 62-4.070(1), F.A.C

Response: The requested analyses are included as Attachment B to this response. Regarding raw materials, the analyses are of typical raw materials currently in use at the cement plant. The submittal of these analyses should not be construed as limitations on suitable raw materials for use in cement manufacture. The raw materials proposed for use at the cement plant include, but are not limited to, the materials analyzed.

9. Please indicate if you intend to add any storage tanks meeting the applicability requirements under 40 CFR 60, Subpart Kb.
Rule 62-4.070(1), F.A.C.

Response: No. Subpart Kb applies to storage vessels that are 75 cubic meters (approximately 19,800 gallons) or larger and used to store volatile organic liquids. The largest storage tank used at the existing cement plant is a 10,000-gallon, diesel-fuel storage tank.

10. Describe the primary fuel firing scenarios and describe the ratio of heat input at various fuel mixtures. Detail why heat input ratios might change under normal operating conditions and emissions. Provide an estimate of pollutant emissions under each scenario. Define the combustion practices that will be used to control CO and VOC. Rule 62-4.070(1), F.A.C.

Response: In general, the heat released in the kiln and calciner is determined by the feed rate to the calciner and the burnability of the raw materials. Increases in the feed rate will obviously require an increase in the heat input to the pyroprocessing system and hard-to-burn raw materials will require an increase in the heat input. The preheater feed rate is dependent upon the design of the kiln system and the burnability is dependent upon the chemistry of the materials mined on site, the raw materials procured off site, and the fineness to which the raw materials are ground in the raw mill.

Under normal operating conditions, the heat input to the pyroprocessing system is normally split with 40-60 percent of the fuel being fired through the kiln burner and 60-40 percent of the fuel fired in the calciner. If whole tire-derived fuel is utilized, it can provide up to 15 percent of the total heat input to the pyroprocessing system; reducing the fuel fired to the combustion chamber in the calciner to 35-45 percent of the total pyroprocessing system heat input.

Under normal conditions, the fuel fired through the kiln burner will be pulverized bituminous coal or a mixture of coal and petroleum coke. The fuel fired to the calciner will typically be pulverized coal, pulverized petroleum coke, or a mixture of the two fuels. Optional fuels will include natural gas, fuel oil and (if considered a fuel) high-carbon ash. These fuels may be fired alone or in combinations. When used, whole tire-derived fuel will be fired through an air-lock feeder directly onto the feed shelf of the kiln. Changes in the heat input ratios and/or the types of fuel used could result from changes in the chemistry of raw materials, changes in fuel characteristics, the availability of fuels, and the necessity to maintain a stable operating kiln.

Changes in heat input ratios and/or in fuels fired to the pyroprocessing system are not expected to have significant effects on emissions from the kiln system. With particulate matter, it was previously stated that emissions will average about 0.004 grains per dry standard cubic foot regardless of normal operating conditions, fuel use, or heat input ratios. The control of carbon monoxide was previously discussed. Regardless of heat input ratios or fuels, carbon monoxide generated during fuel combustion will be controlled to approximately the same discharge concentration by providing adequate turbulence and residence time after the introduction of combustion air following the combustion chamber. Hydrocarbon emissions generated during fuel combustion will be controlled by the same mechanism as carbon monoxide. (Carbon monoxide and hydrocarbon emissions resulting from organics in raw materials fed to the preheater are not a function of fuel type or heat input ratios.) Sulfur dioxide generated during the combustion of fuels reacts with alkalis in the raw materials in the preheater system. If sufficient alkali is present in the raw materials, this sulfur exits the kiln system with clinker and becomes a component of finished cement. Sulfur dioxide emissions that are observed from cement plants result from sulfur in the fuel that is in excess of alkalis in the feed and/or from sulfur (normally pyritic sulfur) in raw materials fed to the preheater. Sulfur dioxide emissions resulting from pyritic sulfur are not a function of heat input ratios or fuel types and, fortunately, have not been an issue with raw materials used in most Florida cement plants, including the FRI Thompson S. Baker Cement Plant. The effect of sulfur in petroleum coke will be evaluated during the petroleum coke firing tests in January/February 2005. These results will be provided to the Department when they are available.

Under start up conditions, the amount of fuel consumed will be considerably higher than during normal operations as no heat can be recovered from the clinker cooler system and introduced as secondary and tertiary combustion air. Additionally, operations will be unstable and transient as the kiln system is heated and raw materials are first introduced through the preheater. The duration of start up under normal conditions is typically in the range of 5-7 hours. Even under these transient and unstable conditions, data from the Continuous Emission Monitoring Systems on the No. 1 Kiln at the FRI Thompson S. Baker Cement Plant have demonstrated that the mass (pounds per hour) emission limits for sulfur dioxide, nitrogen oxides, and hydrocarbons have not been exceeded. It is also expected that the particulate matter emission limit and carbon monoxide emission limit (expressed as pounds per hour) will not be exceeded during start up.

11. Please explain the significant increase in SO2 emissions in the kiln/raw mill. Provide information on the increase of SO2 by co-firing petroleum coke and flyash with the coal in the kiln. Consider the possibility of hydrated lime injection for added SO2 control when the raw mill is off, or raw material with higher sulfur is encountered, or if excess SO2 from burning high sulfur fuel breaks through the calciner. Rule 62-4.070(1), F.A.C.

Response: The use of hydrated lime for SO_2 control has been demonstrated to be technically effective. Suwannee American Cement conducted tests in 2004 and reported to the Department that the introduction of hydrated lime into the preheater feed was effective for reducing sulfur dioxide emissions. Also, F. L. Smidth has reported (*Emissions Audit During Hydrated Lime Addition Trials*, St. Mary Cement Company, Bowmanville, Ontario, Canada, August 10-12, 2004) similar results with the introduction of hydrated lime into the preheater feed. F. L. Smidth reported SO_2 reductions with molar ratios of lime to SO_2 in the range of 3.4-5.4; with SO_2 reductions up to 92 percent at the higher molar ratio.

Regarding SO_2 emissions from dry process Portland cement plants, Robert Shenk of F. L. Smith stated during a seminar presented to FDEP on December 17, 2004 in Tallahassee, Florida that most SO_2 emissions from dry process Portland cement plants resulted from sulfur released in the preheater; not from sulfur in fuels. This, of course, is dependent on the fuel sulfur to feed alkali ratio. If the sulfur in the fuel exceeds the alkali in the feed, sulfur will condense in the tower or be released as SO_2. The petroleum coke firing tests that the Department authorized for FRI in January/February 2005 will allow FRI to assess the effect of coke on SO2 emissions. Because of potentially higher SO2 emissions with coke, FRI has requested the higher SO2 emission limit.

Shenk's reference was to sulfur that would typically be present as pyritic sulfur contained in raw materials fed to the preheater. These compounds would be broken down and the sulfur oxidized to SO_2 as the raw feed was heated during passage through the preheater. Approximately four years of operating experience with Kiln No. 1 has demonstrated (with continuous SO_2 monitoring) that SO_2 emissions from Kiln No. 1 have always been extremely low. This demonstrates that the raw materials that have been used by FRI, and the raw materials that will continue to be used by FRI, have virtually no organic or pyritic sulfur; and hence, the potential for any significant SO_2 emissions from this source is virtually nonexistent. The effect of higher levels of sulfur in fuels will be evaluated during the January/February 2005 tests, as will the efficacy of the proposed SO2 emission limit.

12. Provide the volume and residence time of material in the calciner with the production rate of 125 tons per hour for the new kiln.

Response: The planned volume of the calciner is estimated to be 326 cubic meters (approximately 11,500 cubic feet). This volume includes the combustion chamber (68 cubic meters) and 258 cubic meters between the combustion chamber and the Stage 1 (bottom) preheater cyclone.

The hot raw meal from the Stage 2 cyclone will be split and introduced tangentially with the combustion air entering the combustion chamber. The tangential inlets are at 180 degrees to one another. The material residence time in the calciner loop will be approximately 4.5 seconds at a clinker production rate of 125 tons per hour.

13. Estimate the impact of mercury deposition in the vicinity of this facility. Please provide reasonable assurance that the 175 lb/year of mercury emissions will not be exceeded. Also, provide reasonable assurance that the lead PSD significance levels will not be exceeded. Advise of any methods that will be undertaken to minimize mercury emissions such as raw material selection or transferring some baghouse dust straight to product. Rule 62-4.070(1), F.A.C.

Response: Reports describe several forms of mercury detected in the emissions from cement kilns. Primarily, these include elemental mercury [Hg(0)] and reactive mercury [Hg(II)]. The two types of mercury species are expected to behave quite differently once emitted from the stack. Hg(0), due to its high vapor pressure and low water solubility, is not expected to deposit close to the facility. Hg(II), because of differences in these properties, is expected to deposit closer to the emission source. Most of the mercury in the atmosphere is elemental mercury vapor, which circulates in the atmosphere for up to a year, and hence can be widely dispersed and transported thousands of miles from likely sources of emission. The reactive form of mercury, when either bound to airborne particles or in a gaseous form, is removed from the atmosphere by precipitation and is also dry deposited.

Existing annual deposition of mercury in the vicinity of the facility was estimated from a nearby monitoring station. Annual deposition resulting from stack emissions of the proposed plant was estimated by using the ISC3 model. The background deposition rate is compared to the estimated wet deposition rate.

The National Atmospheric Deposition Program/National Trends Network (NADP/NTN) is a nationwide network of precipitation monitoring sites. The network is a cooperative effort between many different groups, including the State Agricultural Experiment Stations, U.S. Geological Survey, U.S. Department of Agriculture, and numerous other governmental and private entities. The purpose of the network is to collect data on the chemistry of precipitation for monitoring of geographical and temporal long-term trends. The precipitation at each station is collected weekly according to strict clean-handling procedures. It is then sent to the Central Analytical Laboratory where it is analyzed.

The National Atmospheric Deposition Program has expanded its sampling to include the Mercury Deposition Network (MDN), which was formed in 1995 to collect weekly samples of precipitation which are analyzed by Frontier Geosciences for total mercury. The objective of the MDN is to monitor the amount of mercury in precipitation on a regional basis. The nearest NADP/MDN Monitoring Location is Station FL05 at the Chassahowitzka National Wildlife Refuge in Citrus County, Florida. This station is approximately 65 miles from the Florida Rock plant. The monitoring station has been in operation from 7/1/1997 – present.[3]

[3] http://nadp.sws.uiuc.edu/nadpoverview.asp

Data from this station were used to estimate the background wet deposition of mercury in the vicinity of the Florida Rock site. The annualized weekly average total mercury deposition for the period of record is 20 $\mu g/m^2$.

The program used to model the transport and deposition of mercury was the ISC3 gas deposition model, obtained from USEPA's Support Center for Regulatory Air Models (SCRAM) website. The model has a gas dry deposition component as well as a gas wet deposition component and both wet and dry particle deposition components.

Hg(II) was considered in the air dispersion modeling. At the point of stack emission and during atmospheric transport, the contaminant is partitioned between two physical phases: vapor and particle-bound. These contaminants can be removed from the atmosphere by both wet deposition and dry deposition. For the present analysis, the speciation of emitted mercury was based on the Mercury Study Report to Congress RELMAP modeling. These data have speciation percentages for Portland cement manufacturing of 80% elemental mercury, and 10% each for vapor and particle Hg(II).

An aerosol particle size distribution based on data collected by Whitby (1978) was used. This distribution is split between two modes: accumulation and coarse particles. The geometric mean diameter of several hundred measurements indicates that the accumulation mode dominates particle size, and a representative particle diameter for this mode is 0.3 microns. The coarse particles are formed largely from mechanical processes that suspend dust and soil particles in the air. A representative diameter for coarse particles is 5.7 microns. The fraction of particle emissions assigned to each particle class is approximated based on the determination of the density of surface area of each representative particle size relative to total surface area of the aerosol mass. Using this method, approximately 93% and 7% of the total surface area is estimated to be in the 0.3 and 5.7 micron diameter particles, respectively. In this analysis, nitric acid vapor was used as a surrogate for Hg vapor based on their similar solubilities in water. In ISC, the dry deposition of divalent mercury vapor was modeled by calculating a dry deposition velocity for each hour using the assumptions made for nitric acid.

Wet deposition was estimated assuming that the wet deposition rate is characterized by a scavenging coefficient that depends on precipitation intensity and particle size. For particles, the scavenging ratios used were from Jindal and Heinold (1991) (see Figure A-1). For the vapor phase fraction, a scavenging coefficient is also used, based on a 0.1μ particle size.[4]

Based on the maximum proposed stack emissions of 175 pounds per year of mercury for the new plant, the estimated average annual wet deposition from Hg(II) particles and vapor at the facility boundary is 3.5 $\mu g/m^2$, which is less than 20% of the background deposition rate. The total wet and dry deposition of mercury at the boundary of the facility resulting from emissions of the new plant is estimated to be 7.7 $\mu g/m^2$.

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[4] Mercury Study Report to Congress: Overview. http://www.epa.gov/oar/mercover.html

The following information provides reasonable assurance that the 175 lb/year of mercury emissions will not be exceeded. Because more than 85% of the feed material is normally derived from the FRI mine, because the minor feed materials and fuels are from long-term suppliers whose materials we have scrutinized, and because the types of fuels and materials consumed are consistent, it is unlikely that mercury fed to the kiln will vary greatly from one month to the next. Sampling is done to screen proposed materials or suppliers not previously used.

Each month, samples of every raw material and of every fuel are analyzed by an independent lab for total mercury. This enables FRI to identify any change in mercury content by source and to calculate potential mercury emissions from the plant. Three emission tests over the past five years have confirmed the low, mercury emission rate that monthly material sampling demonstrates. Feed- and fuel-material types used at FRI are consistent and not subject to high variability. However, when two supplies of the same feed or fuel are available, the one with less mercury will be chosen as often as possible.

The concept of transferring ESP dust directly to finished cement could be effective but it would have an affect on cement quality. Because of this, the concept is of limited use until ASTM and/or DOT change their specification limits.

The following information provides reasonable assurance that the lead PSD significance levels will not be exceeded. Table 212.400-2: Regulated Air Pollutants – Significant Emission Rates, from Rule 62-212, F.A.C. provides the significance level for lead as 1200 pounds per year. Table 11.6-9: Summary Of Noncriteria Pollutant Emission Factors For Portland Cement Kilns, from AP-42 Section 11.6, provides an emission factor for lead, with ESP control, of 0.00071 pounds per ton of clinker. Using this factor for the proposed plant, lead emissions can be estimated as 777 pounds per year.

14. How many startup and shutdown events will normally occur each year? Describe the nature and duration of emissions, particularly from the in-line kiln/raw mill and clinker cooler, during startup and shutdown. Describe procedures used to minimize excess emissions during these events. Rules 62-4.070(1) and 62-210.700, F.A.C.

Response: In the first half of 2004, there were 286 shutdowns involving the roller mill and/or kiln. For each shutdown, there was a subsequent startup.

Among the combustion gases for which continuous monitoring is done, THC and SO2 are negligible during startups and shutdowns; NOx on a per-ton-of-clinker basis drops as production is increased. Regarding particulate matter, startups and shutdowns have little effect upon clinker cooler opacity. Opacity from the kiln/roller-mill stack may result from particulate-matter-emission increases during shifts between direct to compound modes of operation. If excess opacity results from startups or shutdowns, the durations are typically no longer than 12 minutes.

The procedures of the existing Startup, Shutdown, and Malfunction Plan provide details for the various modes of operation. This plan is provided as Attachment C. Because nearly all opacity excursions from the kiln/roller-mill stack occur as results of startups, shutdowns, and malfunctions of the roller mill or ESP, actions to minimize excess opacities include adjustments to the operation of the gas-conditioning tower, verifying exhaust-gas damper positions, minimizing the draft through the roller mill, and reducing or stopping feed flows.

15. Please provide manufacturer, model numbers and design specifications for the fabric filters, ESPs, continuous monitoring systems used for these systems. Rules 62-4.070 and 62-212.400, F.A.C.

Response: The manufacturer, model number and design specifications for each fabric filter and electrostatic precipitator and for the continuous monitoring systems used for each of these control systems (when applicable) can only be provided when plant design is completed. When this information is available, but prior to start up of Kiln No. 2, FRI will provide this information to the Department.

It can be stated at this time, however, that the baghouses, electrostatic precipitators, and continuous monitoring systems selected for Kiln No. 2 will be similar to the fabric filters, electrostatic precipitators, and continuous monitoring systems already employed on the Kiln No. 1 system. The existing plant (the Kiln No. 1 system) has operated well within permit limits for approximately four years and the results of these operations have been provided to FDEP. This performance record is presented to the Department as assurance that the control systems, monitoring systems, and operation of the Kiln No. 2 system will be equally as effective as those for Kiln No. 1.

16. Based on the facility's past performance and evaluation of the SNCR testing that is being conducted by FRI in the next few weeks, a re-evaluation of the NO_x BACT proposal and emission limits will be necessary. Based on these test results, reasonable assurance must be given to show that the limit proposed for NOx is the Best Available Control Technology for this project. Submit the test results from Air Construction permit 0010087-011-AC. Rule 62-4.070, F.A.C.

Response: The SNCR testing authorized by permit 0010087-011-AC was conducted during the approximate period December 6-11, 2004. In general the testing demonstrated SNCR will effectively reduce NOx emissions, however the data have not been completely analyzed. The results of the testing will be provided to the Department when available as required by the above referenced permit. FRI requests that the Department proceed with the review of the information provided herein prior to receipt of the SNCR test data.

17. Has Florida Rock Industries or its parent company had any violations of Department regulations at any of their facilities? Please provide all documentation in relation to these violations. Rule 62-4.070(5), F.A.C.

Response: Pursuant to discussions with FDEP staff, this response addresses outstanding or unresolved FDEP investigations or cases alleging violations of Department regulations at any of the facilities of "Florida Rock Industries, Inc. or its parent company." To the best of our knowledge, there are presently no such outstanding or unresolved FDEP investigations or cases concerning Florida Rock Industries, Inc. Florida Rock does not have a parent company.

18. Whether or not the 24-hour PSD PM_{10} increment is exceeded is based on the highest-second highest modeled impact value over 5 years, not the highest sixth high over 5 years. Based on the modeling results you provided to us, the highest-second highest PM_{10} increment impact in the Class II area is 32.69 ug/m^3, which is greater than the 24-hour Class II PSD increment of 30 ug/m^3. Please evaluate ways to reduce the PM_{10} impacts and remodel to obtain results below the increment. Also provide the master PM_{10} inventory from which the PM_{10} 20-D inventory was developed.

Response: PM10 impacts were reduced by reducing proposed allowable emissions for certain existing and proposed emission points, as follows:

- Existing finish mill, N09: 0.007 grains/dry standard cubic foot (gr/dscf), 5.56 lb/hour
- Existing finish mill, N12: 0.007 grains/dry standard cubic foot (gr/dscf), 1.39 lb/hour
- Proposed finish mill, 2N93: 0.007 grains/dry standard cubic foot (gr/dscf), 6.43 lb/hour
- Proposed finish mill, 2N94: 0.007 grains/dry standard cubic foot (gr/dscf), 1.64 lb/hour
- Existing clinker cooler K15: 0.07 pounds/ton clinker, 7.70 lb/hour
- Proposed clinker cooler 2K15: 0.07 pounds/ton clinker, 8.75 lb/hour

All other existing baghouses remain at 0.0085 gr/dscf and all other proposed baghouses remain at 0.008 gr/dscf, except for coal mills and coal bins, new and existing, at 0.01 gr/dscf.

These parameters were remodeled and results were obtained below the increment. The impact of the highest-second-high for 1989, with the inventory sources, was 29.9 $\mu g/m^3$. The updated modeling files for 1989 are provided on a CD with this submittal, as Attachment D. For other years, the previously-submitted modeling results showed highest-second-high results of less than 30 $\mu g/m^3$.

The CD also provides the master PM10 inventory from which the PM10 20-D inventory was developed.

19. Please provide data supporting a silt loading factor of 0.14 g/m^2 in the paved road emissions estimation inputs for use the PM_{10} modeling. In addition, have all quantifiable fugitive emissions other than paved road emissions been included in the PM_{10} modeling analysis?

Response: AP-42 Section 13.2.1: Paved Roads was used to estimate PM_{10} emissions from vehicle travel over paved road surfaces. This version of the paved road emission factor equation estimates particulate emissions from resuspended road surface material. In general terms, resuspended particulate emissions from paved roads originate from, and result in the depletion of, the loose material present on the surface (i.e., the surface loading).

Dust emissions from paved roads have been found to vary with what is termed the "silt loading" present on the road surface as well as the average weight of vehicles traveling the road. The term silt loading (sL) refers to the mass of silt-size material (equal to or less than 75 micrometers [µm] in physical diameter) per unit area of the travel surface. The total road surface dust loading consists of loose material that can be collected by broom sweeping and vacuuming of the traveled portion of the paved road. The silt fraction is determined by measuring the proportion of

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the loose dry surface dust that passes through a 200-mesh screen, using the ASTM-C-136 method. Silt loading is the product of the silt fraction and the total loading, and is abbreviated "sL".

At the Newberry facility, the sampling and analysis of such material was conducted in accordance with AP-42 Appendices C.1 and C.2, on July 14, 2004. For the relatively short road, from County Road 235 to the cement silos at the plant, it was recommended to collect at least one sample for each 0.5 miles length. The road is approximately 0.5 miles long, and three samples were collected. The three sample locations are shown on a drawing included as Attachment E.

As the road is lightly loaded with particulate matter, due to frequent vacuum/sweeping, long sample areas and vacuum sample collection were utilized. Using suitable markers, personnel marked a 20-foot long (#1) and two 25-foot long (#2 & #3) portions across the road (24.5 feet wide). This is a road surface area of 159.3 square meters (m^2).

Paved road samples were collected by cleaning the surface with a vacuum cleaner with "tared" (i. e., weighed before use) filter bags. Personnel vacuumed the collection area using a portable vacuum cleaner. Personnel carefully removed the bags from the vacuum sweeper and checked for tears or leaks. The bags were given to Florida Rock laboratory personnel for analysis in accordance with Appendix C.2: Procedures For Laboratory Analysis Of Surface/Bulk Dust Loading Samples.

Sample splitting was not necessary for this analysis. The samples were not oven dried because vacuum filter bags were used to collect the samples. The samples were recovered by dissection of the bags for silt analysis. The basic procedure for silt content determination was mechanical, dry sieving. The vacuum swept dust was weighed in the bags of the vacuum, which were tared before sample collection. The samples were weighed to calculate total surface dust loading on the traveled lanes. The dust from the individual vacuum bags was composited for silt analysis. The total weight of the vacuum bags, less the tared bag weight, was 132.81 grams. The total weight of the composited sample recovered from the bags for the silt analysis was 125.25 grams. For conservatism, all of the sample loss (7.56 grams) was considered to be silt (minus #200 sieve).

The appropriate sieve sizes were selected, 3/8 in., No. 4, No. 10, No. 20, No. 40, No. 100, No. 140, No. 200, and a pan. A mechanical sieving device was then used. After sieving, the weight of the catch in each sieve was recorded. The mass less than the 200 mesh screen (75 micrometers [μm]) was determined to be 14.46 grams. The sample loss described earlier was added to this mass, resulting in a total mass less than the #200 sieve of 22.02 grams. This is the silt content.

The silt content (22.02 grams) was divided by the surface area (159.3 m^2), resulting in the silt loading of 0.14 grams/m^2.

Reasonably quantifiable fugitive emissions other than paved road emissions have been included in the PM10 modeling analysis. Volume source B03 for the proposed plant, as well as volume

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source I4 from the existing plant, address primary crushing, raw material transfers, and raw material unloading.

20. The preferred ambient background concentrations for the NAAQS compliance demonstration should be the maximum annual and short-term concentrations measured at a representative monitoring location. The highest-second highest (HSH) can be used for short term values. An average of the highest concentrations over several monitors is not appropriate for this assessment. Rules 62-4.070(1) and 62-212.400, F.A.C.

Response: The representative monitoring location is the NW 53rd Avenue site in Gainesville. The following table shows data from 1999 through the middle of 2004.

PM10 MONITOR DATA FOR BACKGROUND CONCENTRATIONS

YEAR	MONITOR LOCATION	Concentration (μg/m³) 2nd High	Arithmetic Mean
1999	Gainesville: NW 53rd Avenue	33	19
2000	Gainesville: NW 53rd Avenue	36	20
2001	Gainesville: NW 53rd Avenue	41	20
2002	Gainesville: NW 53rd Avenue	32	21
	Gainesville: NW 53rd Avenue	37	15
2003	Gainesville: NW 53rd Avenue	44	16
2004*	Gainesville: NW 53rd Avenue	48	19
		24-hour maximum = **48**	Annual maximum = **21**

*Partial year for 2004

Reference: FDEP QUICK LOOK Reports

The meteorological data for 1989 generated the highest 24-hour and annual impacts, as addressed in response to Item 18. The previously-submitted ambient impact analysis showed that the fine-grid receptors did not change the maximum impacts. The following table shows that the NAAQS are not exceeded when the above background values are used.

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NAAQS ANALYSIS

1989		
PM_{10}	Annual H1H < 50 μg/m^3 Background = 21	4.79 at (347006, 3285369) + 21 = 25.8 μg/m^3
	24-Hour H6H < 150 μg/m^3 Background = 48	25.10 at (347061, 3285452) + 48 = 73.1 μg/m^3

21. The next two comments are paraphrased from comments provided by the federal land manager. Please address them. The first comment applies to the use of 30 day rolling average emission limits for short term modeling analyses in the Class I areas. "Florida Rock has proposed BACT emission limits of 2.0 lb NOx/ton clinker and 0.28 lb SO_2/ton clinker, both on a 30-day rolling average. The federal land manager found no short term (24-hour or 3-hour) emission limits discussed for either pollutant. It appears that the grams/second emission rates for each pollutant used in the modeling analyses are direct calculations from these 30-day rolling average limits and the 125 tons clinker/hour capacity for the new line. In order to evaluate potential impacts to short term standards and increments (i.e., 3-hr and 24-hr SO_2), and visibility (analyzed on a 24-hr basis, and looking mainly to SO_2, NOx and particulate emissions), it is important to use emission rates that are reflective of the potential to emit of the units over a similar averaging time. A 30-day rolling average emission rate smoothes out days with high emissions and therefore may underestimate the predicted visibility impacts. Further, the short term emission rates that are used in the modeling analyses need to be written as enforceable limits in the permit. The applicant should provide FDEP with proposed short-term 3-hr and 24-hr SO_2 and 24-hr NOx emission limits, and perform modeling using these limits for analyzing impacts to short-term Class I standards and visibility. And, these limits should become part of the BACT determination in the PSD permit action." Please provide those estimates at least on the basis of lb/hour if not lb/ton.

Response:
<u>Sulfur Dioxide</u>
FRI has proposed a BACT SO_2 emission limit of 0.28 pounds per ton of clinker; or a mass SO_2 emission rate of 35.0 pounds per hour at a clinker production rate of 125 tons per hour. These limits are 30-day rolling averages. There could be periods of time when sulfur might be encountered in raw materials (see Response No. 11) or there could be kiln upsets and/or problems encountered with firing the petroleum coke that would result in higher short-term SO2 emissions; especially if the raw mill is not operating. Under these conditions, should they occur, a 3-hour or 24-hr averaging time would not allow FRI to react. Again, these events, should they occur, will be short-term and infrequent. As a result, there will not be a serious issue with Class I impacts, including visibility.

Considering these various factors and the fact that the proposed SO_2 emissions are very low, a 30-day averaging time is reasonable. Demonstrating compliance with such a limit is not an issue as the proposed plant will be equipped with a CEMS for SO2

Nitrogen Oxides

A NOx emission limit with an averaging time of less than 30-days is not reasonable considering the stringency of the proposed FRI limit. This is quite evident to FDEP and plant operators based on the experience of other plants operating with stringent NOx limits with averaging times shorter than 30-days

Even with SNCR, and with the injection of flyash into the calciner, there will be plant upsets and there will be SNCR system downtime when short-term NOx emission rates in excess of 2.0 pounds per ton of clinker will occur. Trying to average out emissions in excess of 2.0 pounds per ton of clinker in a 24-hour period is not possible.

Considering the impracticality of operating with a tight NOx emission limit with an averaging time less than 30-days, the fact that the Ambient Air Quality Standard for NOx is based on an annual average and the fact that many other cement plants around the country (see NOx BACT Analysis in permit application) have NOx emission limits based on annual average emissions, FRI is proposing a 30-day rolling average for the NOx emission limit.

It might be pointed out that FRI has found that Kiln No. 1, without SNCR, can be operated with NOx emissions around 2.45 pounds per ton of clinker. Therefore, if the SNCR system did fail, short-term NOx emissions would not exceed this rate significantly except for relatively short periods of time immediately following the malfunction or upset. It should also be pointed out that the modeling to evaluate the impacts of NOx emissions in Class II areas was done at an emission rate of 2.6 lb/ ton of clinker. Hence, even with this emission rate, modeling has demonstrated there are no problems with Class II impacts. Similarly, modeling conducted for Class I areas shows compliance with the visibility requirements at NOx emission rates up to 2.4 lb/ton clinker (300 lb/hour). Again, chances of an NOx emission rate of 2.4-2.6 pounds per ton of clinker being exceeded for any significant short-term period of time has quite a low probability.

22. This is the second comment from the federal land manager and concerns the use of incremental cost analysis to eliminate BACT alternatives. "Florida Rock's SO_2 BACT analysis showed that use of a wet scrubber in conjunction with balancing alkali and sulfur in the process would yield an emission rate of 0.03 lb SO_2 per ton of clinker, and would cost $481 per ton of SO_2 removed. However, the applicant eliminated the wet scrubber based upon an incremental cost analysis between using the alkali/sulfur balance alone and using a wet scrubber as well. The resulting BACT limit is proposed as 0.28 lb SO_2/ton clinker - ten times as high. Reliance on the incremental cost of adding a wet scrubber to eliminate this control alternative that is otherwise well within the normal range for total cost analyses may be inappropriate. The applicant should better explain the baseline SO_2 emission scenario that it uses in its control cost effectiveness calculations. (i.e., is the "Inherently Lower-Emitting Process: Alkali/Sulfur Balance in Pyroprocessing System" the base case, or is something different? The "Baseline" case in Table 19-Control Technology Ranking is shown in the text as representing the total SO_2 available for liberation, and the calculations show that all sulfur in the coal and raw meal would be converted to SO_2. Is this realistic considering the raw materials that this line will utilize?) The applicant should then better justify, in comparison to other incremental cost analyses for similar applications, if available, and considering other factors, why it believes that adding a wet scrubber to the alkali/sulfur balance process approach is not BACT.

Response: Sulfur dioxide emissions have been discussed elsewhere in responses to this RAI. First, the sulfur dioxide emissions from any dry process Portland cement plant are primarily the result of sulfur contained in raw materials fed to the preheater. F. L. Smidth and others have stated and demonstrated that most sulfur contained in fuels, even high sulfur petroleum coke, is absorbed in the pyroprocessing system (depending on the sulfur/alkali balance) and exits the pyroprocessing system with the clinker. Four years of operating experience with Kiln No. 1 at the FRI Thompson S. Baker Plant has demonstrated that the raw materials available to FRI have very low pyritic and organic sulfur contents. Based on this, and continuously monitored SO_2 emissions, actual SO_2 emissions from the FRI Kiln No. 1 have typically been less than 5.0 pounds per hour. Therefore, it is not reasonable to consider add-on control technology for SO_2 emission control.

Should SO_2 emissions become an issue at FRI because of the use of higher sulfur fuels or other reasons, information provided elsewhere in responses to this RAI has demonstrated that the introduction of hydrated lime into the preheater feed is technically effective for SO_2 control. FRI will evaluate this alternative for reducing SO2 emissions as well as other alternatives; including discontinuing the use of high sulfur fuel.

23. Provide a description of the stack sampling facilities. Form 62-210.900(1), F.A.C.

Response: The facilities provided for sampling the vertical stacks of the kiln/roller-mill, clinker cooler, and finish mill will resemble those provided for the existing cement plant and will meet the safe-access requirements of the Mine Safety and Health Administration, 30 CFR 56, Subpart J, and the following requirements of Rule 62-297.310(6), F.A.C.:

The facilities will be permanent. Stairways will be installed; if any ladder more than 15 feet in length is installed, it will have safety cages or fall arresters with at least three safety harnesses available for use by sampling personnel. (If a ladder is used to reach a platform, it will have a hinged floor-opening cover or a hinged safety rail at the platform.) The stacks will have circular cross-sections and the platforms will encircle the larger of those stacks which have four sample ports; smaller stacks with two sample ports will have walkways extending at least 110° around the stack. All walkways over free-fall areas will be equipped with safety rails and toeboards. Work platforms will be at least 24 feet square in area and at least 3 feet wide. Safety rails will be permanently installed; a section of each safety rail directly in line with each sampling port will be removable so that no obstruction exists in an area 14 inches below each sample port and 6 inches on either side of the sampling port, to allow for movement of the sampling rig in and out of the stack. Two 120-volt AC, 20-amp outlets will be provided at the sampling platform within 20 feet of each sampling port; additional electricity, if needed, would be provided by the plant staff using electrical cords.

Sampling ports will all have a minimum diameter of 3 inches and be capable of being sealed with flanged covers when not in use. The sampling ports will be located in the stack at least two stack diameters downstream and at least ½ stack diameter upstream from any fan, bend, constriction, or other flow disturbance. At least two sampling ports will be provided for stacks smaller than 10 feet in diameter.

A complete monorail arrangement for the sampling rig will be provided above each sampling port.

24. Provide operation and maintenance plans for all major process and pollution control equipment. Form 62-210.900(1), F.A.C.

Response: The operation and maintenance plans for the existing facility are included with this response as Attachment F. These plans will be used as templates to prepare plans for the proposed process and pollution control equipment.

Attachment A
Letter From Polysius Corp.

Polysius Corp.
A **ThyssenKrupp** Technologies Company

180 Interstate North Parkway
Atlanta, Georgia 30339-2194
Phone: (770) 955-3660 Fax: (770) 955-8789

Mark S. Terry
President

December 14, 2004

Florida Rock Industries
155 East 21st street
Jacksonville, Florida 32201

Attention: Mr. Gary Sauer
President

Dear Gary:

In response to the FLDEP letter, dated December 3, 2004, Point 2, I would like to address their concerns regarding the maximum design capacity of the proposed new line at your Newberry facility. At Polysius, we are quite conservative in our system sizing and design. This is essential in our business as we must achieve our guaranteed figures quickly. As you are well aware, we must achieve several values at the rated capacity; i.e. power, heat consumption, etc. This leaves further system reserve which is inevitably exploited by our clientele once we have handed over the facility. In fact, our clients often produce up to 20% above our guaranteed capacity within five years of takeover. By optimizing mix designs, fuel specifics and operating parameters, your plant personnel should be able to process as much as 3,000 stpd clinker (5,000 stpd raw feed) through the new line. Sustainability and product quality will be your primary concerns at the higher capacities, especially as you approach the 3,000 stpd mark.

With regard to the main equipment, you are mechanically protected at these higher throughput rates. Structurally, the preheater tower is designed for catastrophic process conditions, whereby the normal cyclone loads are considered, plus the possible plugging of the largest cyclone. Your system is also protected by gamma level detectors in the lower stages. The cyclones and gas ducts themselves are designed for low pressure drop at nominal capacity so you will have to relinquish that benefit in order to force more material and gas flow through these vessels. The same applies somewhat to the calciner, but to a lesser extent. In the calciner, the concern is more related to the maximum thermal load in that reactor. The calciner is designed to handle, albeit as a maximum, the maximum heat input from the fuel system. That work that cannot be completed in the calciner is handled by the kiln anyway, which is good news. Since you have a two-support, conventional roller station kiln, the diameter is generous in relation to the length; thus the cross-sectional thermal load will still be well within acceptable limits at maximum throughput.

Mechanically, the kiln is stout enough to handle up to a 10% fill level in the inlet zone and up to 15% in the hotter sections. Of course, this is a function of density and kiln speed (revolutions/min.), but you have ample flexibility in that drive arrangement to achieve kiln speeds in excess of 4.0 rpm, if need be.

The clinker cooler is also mechanically capable of handling 3,000 stpd clinker throughput, but even with the extra reserve in the cooling air fans you will have to contend with elevated outlet temperatures. The specific grate loading is quite high at maximum production rates.

As previously mentioned, sustainability and product quality will be your primary concerns at maximum throughput rates. Realistically, we feel that 3,000 stpd clinker (approximately 205-209 stph preheater feed rates) should be seen as your short-term maximum – for periods of an hour or so. 2,850 stpd clinker should be sustainable for periods of approximately three hours. 2,800 stpd clinker is a reasonable goal for your 24-hour "catch-up period", when you come up after an unplanned outage.

As to the product quality and maximum production sustainability beyond our estimates, I leave to you and your years of experience in mix optimization and plant operations.

Should you have any further questions regard this or any other matter, please contact me directly.

Best regards,

POLYSIUS CORP.

Mark S. Terry
President

MT/pw

Attachment B
Typical Raw Materials and Fuels Analyses

Florida Rock Industries
Thompson S. Baker Cement Plant
Typical Analyses

Raw Material Chemistry
Data is from raw material testing at the FRI Newberry cement manufacturing facility

	Quarry Mix	Limestone	KF 250	Iron Ore	Mill Scale	Fly Ash	Sand
SiO_2	8.79	2.81	69.47	17.16	5.14	47.60	91.75
Al_2O_3	1.42	0.47	16.64	7.61	2.18	25.29	1.45
Fe_2O_3	0.46	0.41	0.99	51.53	90.03	6.01	2.08
CaO	36.60	52.87	1.88	8.83	0.72	2.84	2.43
MgO	0.69	0.48	0.00	5.94	0.15	0.91	0.00
SO_3	0.00	0.17	0.00	2.65	0.17	0.84	0.06
Na_2O	0.00	0.00	5.52	0.94	0.15	0.37	0.00
K_2O	0.00	0.00	4.46	0.58	0.03	1.87	0.00
TiO_2	0.00	0.00	0.00	0.23	0.01	1.32	0.16
P_2O_5	0.24	0.18	0.00	0.29	0.02	0.29	0.11
LOI	51.54	42.58	0.76	0.15	0.00	12.17	0.00
Total	99.74	99.97	99.72	95.91	98.60	99.51	98.04
Moisture as Received	12.67	11.39	4.38	4.50	2.49	29.39	6.03
% Oil	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

Florida Rock Industries, Inc.
Thompson S. Baker Cement Plant
Typical Analyses

Natural Gas
Data is from the "Cement Manufacturer's Handbook" by Kyrt E. Peray, page 42

	Natural Gas
CH_4	77.73
C_2H_6	5.56
C_3H_8	2.4
C_4H_{10}	1.18
C_5H_{12}	0.63
CO_2	5.5
N_2	0
H_2S	7
Total	100
Density (lb/ft^3)	0.0562
BTU/ft^3	1,061

Florida Rock Industries, Inc.
Thompson S. Baker Cement Plant
Typical Analyses

Petroleum Coke
Analysis from Construction Technology Laboratories, Inc. of available material located in the midwest

	Petroleum Coke
Proximate Analysis	
Ash Weight %	0.66
Sulfur as %S	5.93
Volatile	12.48
Fixed Carbon	82.14
BTU/lb	14,153
Ultimate Analysis	
Ultimate C	91.74
Ultimate H	3.64
Ultimate N	1.71
Ultimate S	5.5
Ultimate O	0
Ash Chemistry Components	
SiO_2	0.72
Al_2O_3	0.36
Fe_2O_3	< 0.01
CaO	0.14
MgO	0.17
SO_3	11.04
Na_2O	0.06
K_2O	< 0.01
TiO_2	0.02
P_2O_5	0.02
Cl	0.01
Mn_2O_3	0
Moisture as Received	2.46%
Hardgrove Grindability Index	50

Florida Rock Industries, Inc.
Thompson S. Baker Cement Plant
Typical Analyses

High Carbon Fly Ash
Data is from fuel testing at the FRI Newberry cement manufacturing facility

Ash Chemistry Components

SiO_2	27.02
Al_2O_3	12.74
Fe_2O_3	5.58
CaO	1.84
MgO	0.99
SO_3	8
Na_2O	0.3
K_2O	1.31
TiO_2	0.606
V_2O_5	0.446
LOI	40.8
Moisture as Received	20%

Florida Rock Industries, Inc.
Thompson S. Baker Cement Plant
Typical Analyses

Tire Derived Fuel

Proximate/ultimate analyses from the EPA Publication, "Burning Tires for Fuel and Tire Pyrolysis: Air Implications" page 1-6

Proximate Analysis

Ash Weight %	4.78
Sulfur as %S	1.23
BTU/lb	15,500

Ultimate Analysis

Ultimate C	83.87
Ultimate H	7.09
Ultimate N	0.24
Ultimate S	1.23
Ultimate O	2.17

Data is from fuel testing at the FRI Newberry cement manufacturing facility

Ash Chemistry Components

SiO_2	34.1
Al_2O_3	28.6
Fe_2O_3	0.605
CaO	0.897
Na_2O	0.773
K_2O	0.338
TiO_2	28.2
P_2O_5	0.378
ZnO	6

Florida Rock Industries, Inc.
Thompson S. Baker Cement Plant
Typical Analyses

Coal
Data is from fuel testing at the FRI Newberry cement manufacturing facililty

	Coal
Proximate Analysis	
Ash Weight %	8.01
Sulfur as %S	0.98
Volatile	33.68
Fixed Carbon	58.32
BTU/lb	13,248
Ash Chemistry Components	
SiO_2	55.70
Al_2O_3	28.20
Fe_2O_3	7.70
CaO	1.81
MgO	1.19
Na_2O	0.43
K_2O	2.67
TiO_2	1.40
P_2O_5	0.27
Cr_2O_3	0.13
Moisture as Received	4.72%

<u>Attachment C</u>
Startup, Shutdown & Malfunction Plan

Start Up, Shut Down and Malfunction Plan

For

Florida Rock Industries, Inc.'s

Thompson S. Baker Cement Plant

Location: Newberry, Florida

Date: February 3, 2004

CONTENTS

I. Start Up, Shut Down and Malfunction Plan

A. Statement of Environmental Compliance.

The Start up, Shut down and Malfunction Plan (SSMP) is developed and implemented by the management of Florida Rock Industries, Inc., for the Thompson S. Baker Cement Plant. It describes, in detail, procedures for operating and maintaining the facility during periods of start ups, shut downs, and malfunction of control regulated emissions. It also describes a program of corrective action for malfunctioning conditions, air-pollution control, and emission-monitoring equipment.

At all times, including periods of start up, shut down and malfunction the facility will operate and maintain air pollution control equipment and emission-monitoring equipment, in a manner consistent with responsible environmental practices.

This plan will be revised as necessary to improve its effectiveness. Each revision will be submitted for approval to the air-permitting office of the Florida Department of Environmental Protection prior to its implementation.

B. Portland Cement Manufacturing Process

Portland cement is made from a carefully proportioned mixture of raw materials containing calcium (typically limestone), silica, alumina (typically clay, shale, and/or sand), and iron (typically mill scale or iron ore). These materials are ground to a fine powder, homogenized, and heated to a very high temperature to produce a cement "clinker" product. The raw feed material, known as raw meal, raw mix, or kiln feed, is preheated and precalcined and then sintered in a kiln. A diagram of the overall cement manufacturing process is provided in figure 1.

A suspension preheater / precalciner consists of a vertical tower containing a series of cyclone vessels and an auxiliary firing system. Raw meal is introduced at the top of the tower. Hot gases from the kiln and calciner pass counter current through the downward moving meal to heat and precalcine the meal prior to introduction into the kiln. The meal is separated from the kiln flue gases in each cyclone, and then dropped into the next stage.

The precalciner system utilizes a auxiliary firing system to further increase the raw materials' temperature prior to introduction into the kiln. By precalcining the raw meal, the capacity of the kiln is increased.

Kiln systems are operated in a "counter-current" configuration. Gases and solids flow in opposite directions through the kiln, providing for more efficient heat transfer. The raw meal is fed at the upper, or "cold" end, and the slope and rotation cause the meal to move toward the lower, or "hot" end. The kiln is fired at the hot end, with coal as the primary fuel. As the meal moves through the kiln it undergoes thermal reactions to form clinker.

The clinker is removed from the kiln at the hot end. It then enters a short cooling area where the clinker melt begins to solidify. The clinker leaves the kiln at a temperature of approximately 2,000 degrees Fahrenheit (F), and falls into a clinker cooler. The cooler is typically a moving grate onto which the clinker sits. Cooling air is blown through the grate. The cooled clinker consists of gray colored nodules of variable diameters, up to 2 inches. The clinker is blended with the gypsum and ground in a ball mill to produce cement.

The cement is conveyed from the finish mill to storage silos. Where it can then be withdrawn from the storage silos for distribution.

Thompson S. Baker Cement Plant Description:

The TSB Cement plant is a four stage preheater / with in-line precalciner utilizing a vertical roller mill for raw material grinding and a ball mill for clinker grinding.

Limestone, sand and clay are mined on the property and transported via conveyors to covered storage prior to be reclaimed and conveyed to the raw mill. Fly ash and mill scale are delivered to the property and stored under cover. These materials are proportioned prior to raw material grinding to create a mix with the required chemistry to produce portland and masonry cement. Gypsum is delivered to the property and used in the finish grinding process.

Raw materials conveyed by belt conveyor contain moisture in excess of 10%, thus eliminating fugitive dust at material transfer points.

This is a modern facility using state-of-the-art process and monitoring equipment. All particulate matter is capture by fabric filter dust collectors and high efficiency electrostatic precipitators. The dust captured by these devices is returned to the process via enclosed material handling systems.

The raw meal grinding circuit is capable of running in either direct or compound operation. In compound operation, exhaust gases from the kiln system are drafted through the raw mill to utilize the heat for the raw material drying. The raw mill consists of two high efficiency cyclones to separate the raw meal from the gas stream. The moisture in the feed to the mill also helps captures the particulate matter exhausted from the kiln system.

The preheater tower utilizes five oversized high efficiency cyclones for raw meal preparation.

When the system is in "direct" operation, gas way dampers are adjusted to divert the kiln exhaust gases away from the roller mill and directly to the RM ESP. In order to cool these gases and provide sufficient moisture to the system, a gas-conditioning tower is utilized.

Gas analyzers are located at the kiln inlet, stage 3 cyclone, and the induced draft fan to insure proper operating conditions. Additionally, continuous emissions monitors are located on the main exhaust stack and clinker cooler vent stack for monitoring purposes.

C. Plan Overview

This plan concentrates on potential environmental excursions as a result of start up, shut down or malfunction of equipment or procedure. Although the cement plant has numerous starts and stops of various equipment only certain occurrences or situations have a potential impact on plant emissions.

Potential emissions points likely to be impacted are:

A. Kiln/Raw Mill Precipitator

B. Clinker Cooler Precipitator

C. Kiln/Raw Mill Main Stack

D. Clinker Cooler Vent Stack

E. Fabric Filters

The Plan evaluates the potential problems and their affect on either opacity (PM) or gaseous emissions such as NO_X, SO_2, or THC. Additionally corrective actions to abate the emission problems are provided.

This approach provides a definitive description as it applies to the emissions points.

D. List of Collection Devices and Emission Points.

	Emission Control Units	Equip. No.	Equip. Type
1	Kiln/Raw Mill Stack	E19-01	ESP
2	Clinker Cooler Stack	K13-01	ESP
3	Finish Mill (W)	N09-01	Bag house
4	Finish Mill (E)	N12-01	Bag house
5	Finish Mill (S)	N91-01	Bag house
6	Aeropol	E28-01	Bag house
7	Homogenizing Silo Inlet	G07-01	Bag house
8	Kiln Feed System	H08-01	Bag house
9	Coal Mill Vent, North	S17-01	Bag house
10	Coal Mill Vent, South	S17-01	Bag house
11	Coal Mill Vent, East	S21-01	Bag house
12	Clinker Conveyor	LO3-01	Bag house
13	Clinker Silo No. 1	LO6-01	Bag house
14	Clinker Silo No. 2	LO8-01	Bag house
15	Limestone/Gypsum Transfer Point	MO8-01	Bag house
16	Cement Silo Input Vent (E)	Q25-01	Bag house
17	Cement Silo Input Vent (W)	Q26-01	Bag house
18	Truck Load-out (N)	Q14-01	Bag house
19	Truck Load-out (S)	Q17-01	Bag house
20	Railcar Load-out	Q21-01	Bag house
21	Packing Plant	R12-01	Bag house

E. Operational Issues Affecting Plant Emissions on Start Up, Shutdown and Malfunction.

The equipment that can have an adverse affect on permit limits during either start up, shut down or malfunction have been identified as follows:

Raw Mill Operation (Roller Mill)

Kiln Operation (Including Preheater/Precalcier)

Clinker Cooler

Electrostatic Precipitators

Note that the fabric filters or bag house plan for abatement is described in the operational and maintenance procedures and serves as the sole document for this purpose.

Roller Mill

Heat up condition

If the roller mill has been down for an extended period of time, prior to introducing raw material, it is necessary to heat the mill to operating temperatures. This allows for the metal to expand and lubricating fluids to reach design temperatures.

During this process, the kiln, roller mill, and gas way dampers are adjusted to circulate hot gases from the kiln through the roller mill. If required, an auxiliary air heater is available to assist in the heating process. This mode of operation is referred to as "compound".

In the event the opacity of the kiln/RM ESP exhaust stack approaches the permit limit, plant operators are instructed to check the following items or conditions: (1) Inlet temperature to roller mill ESP should be less than or equal to 250° F. (2) Roller Mill induced draft fan damper should not be open greater than 1%. (3) Roller mill exit temperature should be no greater than 270° F. (4) Roller mill inlet temperature should be no greater than 700°F. (5) Gas conditioning tower exit temperature should be no greater than 300° F. (6) Roller mill gas way bypass damper should be no less than 90% open. (7) Roller Mill ESP inlet pressure should be no greater than 2.3 inches w. (8) Air pressure at gas conditioning tower must be 10 psi greater than water pressure for atomization. (9) Check system for false air. (10) If plant air pressure is insufficient, start RM auxiliary air compressor. (11) Refer to Roller mill ESP O & M trouble-shooting guide for issues directly related to the ESP.

In the event the previous system checks are consistent with operating parameter the following corrective actions are to be taken: (1) Increase water volume to conditioning tower to reduce the Roller mill ESP inlet temperature in 20° F intervals. (2) Increase conditioning tower air pressure by reducing other loads to meet air requirements. (3) Reduce draft on preheater system. (4) Stop Roller mill heat up by reverting to direct operation. (5) Begin kiln shut down procedures.

Start Up Condition

Once the Roller Mill is brought to operating temperatures and feed is introduced to the mill, opacity limits are continually monitored. In the event opacity approaches permit limits, systems checks are to be made as follow: (1) Inlet temperature to Roller Mill ESP should be less than or equal to 250° F. (2) Roller Mill exit temperature should be no greater than 225° F. (3) Roller Mill inlet temperature should be no greater than 725° F. (4) Monitor Roller Mill by pass damper to maintain proper air flow and inlet pressure to Roller Mill not to exceed -2.3 inches w.g. (5) Check for false air into system. (6) Refer to Roller Mill/Kiln ESP O & M troubleshooting guide.

In the event the previous system checks are consistent with operating parameters, the following corrective actions are to be taken: (1) Adjust mill feed rate and air heater set point to maintain Roller mill outlet temperature below 220° F. (2) Decrease compound operation temperature set point to reduce inlet temperatures to Roller Mill. (3) Stop Roller Mill and revert to direct operation. (4) Begin kiln shut down procedures.

Shut Down Condition

Scheduled/unscheduled shut downs of the Roller Mill are required for preventive/predictive maintenance or caused by malfunction. Before RM shutdown, visually check GCT panel to ensure it is in automatic mode and operating normally. Start RM auxiliary air compressor. In the event opacity approaches the permitted limit, the following system checks are to be made: (1) Verify roller mill condition is in direct mode with a gas conditioning exit temperature set point of 225° F. (2) Inlet temperature to the Roller Mill ESP should be less than 230° F. (3) Gas Conditioning Tower is to have sufficient air pressure (Check GCT panel for error readings associated with air pressure.) (4) Exit temperature at the top of the Preheater Tower should be less than 800° F. (5) Check GCT panel for error readings associated with water delivery system. (6) Confirm that air pressure is 10 psi higher than water pressure at GCT nozzles. (7) Inlet pressure to RM ESP should be less than or equal to - 2.3 inches w.g. (8) Visually inspect gas way damper positions. (9) Refer to ESP O & M troubleshooting guide.

In the event the previous system checks are consistent with operating points the following actions should be taken: (1) Lower direct-operation temperature setpoint at bottom of GCT until compliance is reached. (2) Reduce the auxiliary air users until sufficient air pressure is achieved. (3) Reduce induced draft of preheater tower to reduce ESP inlet temperature. (4) In the event the remote system is not responding to efforts to reduce ESP inlet temperatures bypass GCT panel for manual operation. (5) Adjust gas way dampers via local controls as required. (6) Consult O & M troubleshooting guide for ESP malfunctions. (7) Return to compound operations if possible. (8) Begin kiln shut down procedures.

Rotary Kiln/Preheater

Heat Up Condition

Prior to introducing material to the preheater/kiln system it must be adequately heated. This allows for the refractory lining and metal components to expand to their operating point and create an environment for improved heat exchange.

In the event the opacity approaches the permitted limit the following checks need to be preformed: (1) Check for false air into the system. (2) Verify gas way damper positions.

(3) Inlet temperature to precipitator should be below 250° F. (4) Kiln hood pressure should be between –0.01 and –0.26 inches w.g. (5) Refer to ESP O & M troubleshooting guide.

In the event the previous system checks are consistent with operating parameter the following corrective action are to be taken: (1) Seal all sources of false air. (2) Manually open or close gas way dampers if incorrect. (3) Adjust gas conditioning tower conditions to meet desired set point. (3) Adjust clinker cooler fan and/or cooler vent fan to maintain proper hood pressure. (4) Consult ESP O & M troubleshooting guide. (5) Stop kiln/preheater heat up process.

Start Up (Operating) Condition

The procedures to maintain system compliance follow the same methods as those utilized during roller mill off or direct mode operations.

Shut Down Condition

Kiln shut downs occur on either a planned or unplanned basis. A planned shut down provides the facility more time to methodically follow the shut down procedure. An unplanned stop follows the same methodology but at a more rapid pace. The procedure in either case follows that described in the roller mill shut down section. Since the preheater/kiln system operates at temperatures above 1500° F every effort is made to meet permit limits without damage to the equipment.

Preheater/Kiln Emissions Other than Opacity (No_x, SO_2 and THC)

In the event the continuous emissions monitoring system detects values related to emissions other than opacity that approaches the permitted limits, the following checks will be conducted to better assess the reason and subsequent actions to correct the exceedance state: (1) Oxygen readings throughout the system detection. (2) Location and intensity of Nox detection. (3) Location and intensity of carbon monoxide (CO.) (4) Chemical analysis of fuel and of raw materials.

Corrections to bring the system back into compliance comprises of several adjustments related to the aforementioned checks. This ranges from an adjustment of fuel firing conditions to raw materials. Each and every possibility will be evaluated. If the correction is not made in a reasonable time, the kiln system will be stopped.

Clinker Cooler Electrostatic Precipitator

If opacity approaches the permitted limit, the following checks are to be made: (1) Inlet temperature to ESP should be less than 600° F. (2) Inlet pressure should be approximately –1" w.g. (3) Kiln hood pressure should be between –0.01 and –0.26 in w.g. (4) Clinker Cooler system spray nozzles are to be evaluated for required water and air.

In the event the previous system checks are consistent with operating parameters the following corrective actions are to be taken: (1) Reduce volume of air to ESP by reducing the air out put from the clinker cooler fans. (2) Refer to the O & M manual troubleshooting guide. (3) Begin Kiln shut down procedures.

Plant Air System

The plant air system is required for proper operation of the facility. A minimum of 60 psig is required to properly operate the various control devices. In the event the plant air pressure drops below 75 psig the flowing checks and subsequent corrective actions should be taken: (1) Start the RM auxiliary air compressor. (2) Check for air leaks in the plant. (3) Turn off all non-essential uses. (4) Stop equipment not related to the areas in question. (5) Begin shut down of affected area.

Plant Power Supply

In the event of power interruption, the plant employs a back up generator designed to protect equipment and people that might experience damage.

No methods are available to control excursions during this event, but every effort to restore power quickly will be made.

III. Operational and Maintenance procedures for electrostatic precipitators (ESP)

This section outlines the procedures used for shutdown of precipitators at Florida Rock Industries, Inc's., Thompson S. Baker Cement Plant for off line inspections or maintenance. All procedures other than emergency assume the Kiln has been taken down and cooled properly before the precipitator is taken down.

I. Emergency shutdown

To shut down the transformer/rectifier completely, open the circuit breaker

II. Brief Period Shutdown

When the precipitator is to be off line for a brief period of time (less than 48 hours) and we do not plan on going into the collection area of the box, use the following Preliminary procedure:

a. Confirm the kiln system is shut down

b. Close the fan isolation gates

c. Turn off all fields, except the outlet field

d. Rap down collector plates for at least 4 hours, using the clean down program #2

e. After the rappers are turned off, continue to operate the dust removal equipment for at least two hours

f. Shut off all equipment

III. Opening the Penthouse

Before opening the penthouse or allowing any personnel to enter, perform the following:

a. Confirm completion of a-f of shutdown procedure

b. Turn off the penthouse heaters. To allow the area to cool, keep the blower operating.

c. Follow all appropriate lockout procedures for grounding the T/Rs

d. Open the access doors in the penthouse roof

e. Follow plant confined space entry procedure

IV Extended Period Shutdown

When the precipitator is to be off line for an extended period (more than 48 hours) and plans are made to go into the collection area for a dirty inspection:

a. Confirm the kiln system has been shut down and cooled properly

b. Shut down ID fans

c. Close isolation gates, preventing particulate and gas from exiting the precipitator

d. Turn off all fields

e. Shutdown Rappers

f. Run the dust removal equipment for at least two hours

g. Follow the O*pening the Penthouse Procedure*

h. Allow the penthouse to cool to acceptable temperatures for entry

i. Check for hazardous gases and verify that sufficient oxygen is present in the precipitator. Continue with Plant confined space entry procedure

j. Enter and install all high voltage bus bar grounding devices

k. Open one hot roof door to check for hot material .If any is present, SHUT DOOR IMMEDIATELY AND EXIT PENTHOUSE. Restart equipment to cool out

l. If no hot material is present continue opening doors checking each one carefully

m. After all doors are open, exit the penthouse

n. Mark all doors to prevent unauthorized entry

o. Work may begin

V. Opening Hooper Doors

Before opening any hopper doors the person should understand and be familiar with hazards of hot dust. If proper shut down procedure was followed the hoppers should be completely empty but before personnel enter the hopper area it is crucial the following procedures are completed.

a. Verify from the top with a light that no dust is built up in the hoppers

b. Strike the hopper door with a hammer. If the hopper is empty, you will hear a resounding ring. If it is full, the dust on the surface will muffle the blow.

c. If the hopper appears empty ,open the outer door leaving the interlock in place to prevent the door from springing open

d. If or after any dust spills out, close the door and unlock the interlock

e. Open the door away from you

f. Proceed to opening the inner door by use of the "U" shaped bar and bracket (this arrangement is designed to prevent the door from falling into the screw and any heavy buildup of dust from flushing out.

g. Remove door after all the dust has come out and proceed with this procedure on the other doors

h. Follow all plant entry and lockout requirements including ground cables before entering the hopper. (During cleaning the dust should be removed from outside the precipitator whenever possible)

i. Work may begin after

Attachment D
Updated Modeling

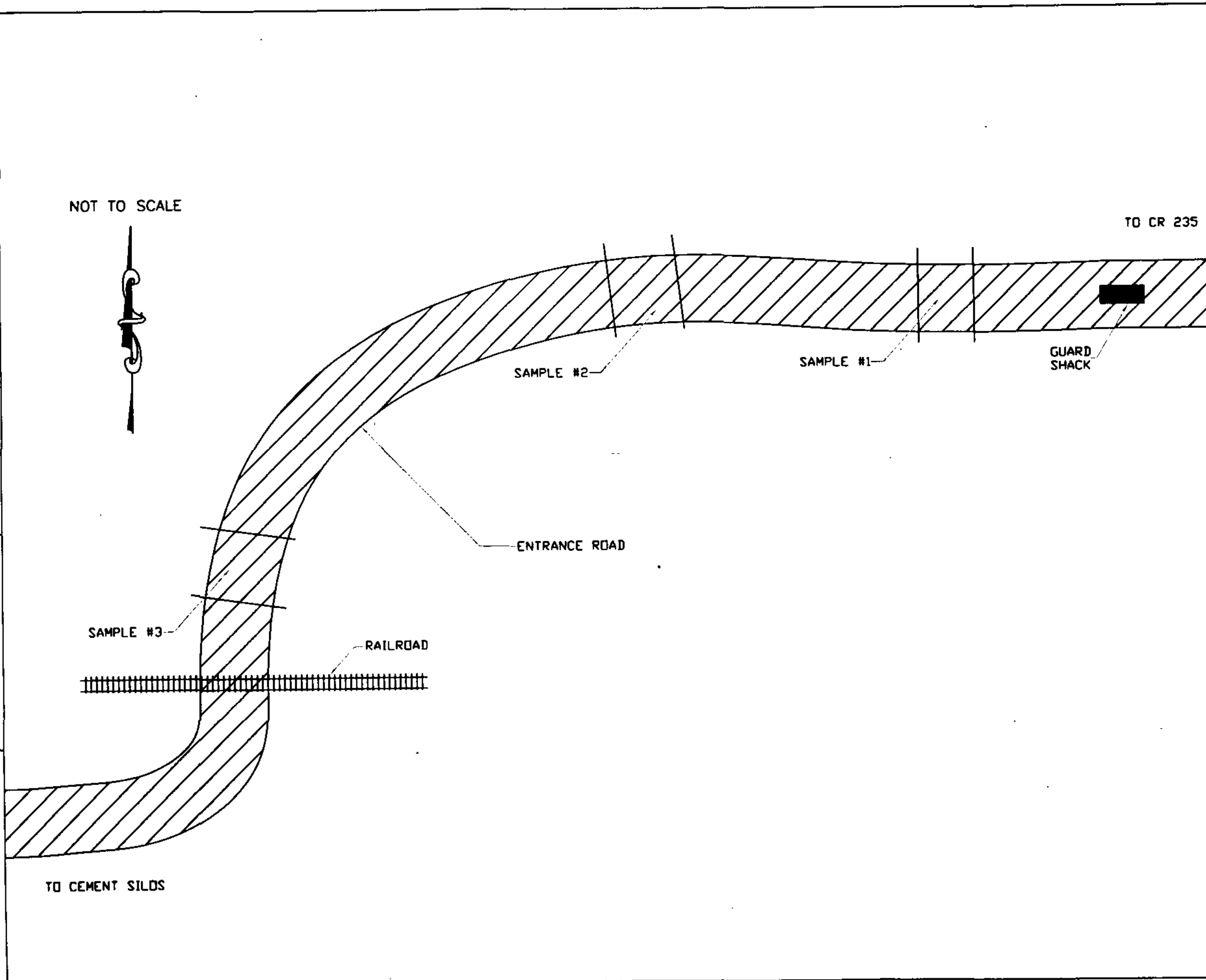
Attachment F

O&M Plans

FLORIDA ROCK CEMENT PLANT
NEWBERRY, FLORIDA

ENTRANCE ROAD SAMPLE SITES

DATE: JULY 2004



Attachment E
Paved Road Silt Sampling Locations

Florida Rock Industries, Inc.
Newberry, Florida

ELECTROSTATIC PRECIPITATOR OPERATION AND MAINTENANCE PLAN

May 6, 2003

File: ESP O&M Plan.doc

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1. Introduction

Florida Rock Industries, Inc. (FRI) operates a limestone quarry and a cement production facility at this location. Limestone is mined and stockpiled. It is then mixed with other raw materials that provide an additional source of mainly iron and aluminum, in designed proportions. The mixture is ground to produce kiln feed. The additional raw materials used will include fly ash, sand and mill scale. The kiln feed will have sufficient chemical properties to produce clinker when subjected to the high temperatures in the preheater stages, precalciner and rotary kiln. The clinker produced by the pyroprocess process is ground into finished cement. As the clinker is introduced into the finish (grinding) mill a small percentage of gypsum is added to produce Portland cement.

FRI is committed to operating the facility in a manner that will comply with applicable federal, state, and local environmental regulations and in harmony with the surrounding community. FRI expects to operate at this location for many years. To accomplish this, FRI has made regulatory compliance a corporate commitment. This commitment is vigorously disseminated throughout the company from the top down.

2. Purpose

The purpose of this plan is to effectively operate and maintain Electrostatic Precipitators (ESP) so as to minimize process emissions and in a manner to meet or exceed the requirements of federal state and local environmental regulations.

It is a regulatory requirement for FRI to develop and implement an ESP Operations & Maintenance Plan (O&M Plan) to ensure the effective operation of the Kiln/Raw Mill and Clinker Cooler ESP's. The routine monitoring and maintenance of emission control units is essential for the optimum performance/capture efficiency of the units. The O&M plan will describe the measures and procedures that FRI has implemented to ensure that the emission control units will achieve their designed operating efficiency throughout the life of the ESP.

3. Electrostatic Precipitator Operating Principle

An ESP, from an operational standpoint, is a relatively simple device comprised of an insulated shell (box), discharge electrodes, collection plate, transformer/rectifiers and electrodes rappers and a collection hopper. Dust laden gas, with positively and negatively charged particles, passes through the box via a fan; forced draft (FD) or induced draft (ID). The airflow is channeled into the box through a dispersion plate; for even distribution of the gas stream. The discharge electrodes are centered between the collection plates and are negatively charged. The collection plates are earth grounded and considered to positive. They will act as a magnet for negatively charged particles. Electrons emitted by the discharge electrode migrate toward the collection plates and attach to dust particles in the gas stream and imparting a negative charge. Any remaining positively charged particles will be collected by the discharge electrode. Each group of discharge electrodes and collection plates are attached to connecting rod, through the top of the ESP, too a rapper (magnetic hammer). On a predetermined sequence, each rapper is actuated remove accumulated dust from the collection plates and electrodes. This dust collects in the hopper of the ESP and the material is returned to the process via an enclosed material transport system.

The ability of a particle to attract and hold a charge is termed the resistivity of the particle and is dependent upon the gas properties, size of the particles, physical and chemical properties of the particle and the relative humidity/moisture content of the gas stream. In the kiln/raw mill ESP, this moisture is provided by a gas-conditioning tower (GCT) in direct operation and by the raw mill and the GCT, if needed, in compound operation. In the clinker cooler ESP, moisture content is provided by the clinker cooler water sprays.

The maintenance requirements for the mechanical and electrical aspects of the ESP and the associated material handling devices are incorporated into the plant wide preventative maintenance (PM) program. This program has been established based on manufacturer's suggested maintenance and the process experience of FRI personnel.

4. Electrostatic Precipitator Arrangement

Each ESP is composed of a single chamber with 23 gas passages on 16-inch centers and has four (4) mechanical and electrical fields that are independently powered and monitored. The mechanical fields contain twenty four (24) collecting surfaces that are 38 feet X 10.625 feet, which provides a 42.5 ' long treatment zone with 74,290 square feet of collection surface (see Figure 1.). The discharge electrodes are 38 feet long and 1.5 inch in diameter. There are 644 discharge electrodes with a total effective length of 24,472 feet.

5. Gas Conditioning

The gas-conditioning tower (GCT) is a spray tower for gross particle removal and evaporative cooling of the gas stream. This evaporative cooling is essential for temperature control and for the addition of moisture to the gas stream. The GCT system utilizes high pressures water pumps, compressed air, spray lances and specialized nozzles to deliver atomized water into the kiln system exhaust gases. Due to a velocity decrease and the effects of the evaporative cooling, in the tower, a significant removal of particles also takes place at this point. The material that collects in the GCT is returned to the process via an enclosed material transport system. When in operation, the volume of water added to the GCT system is automatically regulated by the temperature feed back from the inlet and outlet temperature sensors.

Figure 1. Typical ESP Arrangement

6. ESP Gas Flow

The ESP's are equipped with suction or induced draft (ID) fans, where the fan is downstream of the baghouse. The ID fan system is preferable because it maintains a negative pressure (vacuum) on the entire system upstream of the fan and air is drawn into the system at any point of potential leakage. Where the forced draft system will blow air/dust out at any point of leakage, downstream of the fan.

Gas flow through the box is relatively low velocity at ~2.5 – 3.0 feet per second and a pressure drop of ~1.0" wg., or less, to allow for efficient collection the dust particles.

7. Particle Collection

The discharge electrodes are of negative polarity, while the collecting surfaces are at ground potential and considered positive polarity. At and above a specified voltage, a corona discharge forms near the surface of the discharge electrode. This corona is a visible indication that positive and negative ions are being discharged into the gas near the discharge electrode. The positively and negatively charged gas ions are attracted to surfaces of opposite polarity. While moving toward these surfaces, the ions attach themselves to the solid or liquid particles entrained in the gas stream. This process charges the particles either positive or negative.

Because the ionization takes place near the discharge electrode, the negative ions have a greater distance to travel, which in turn, charges more particles negative than positive. This causes in a greater volume of particle collection on the collection plates (+) than on the discharge electrode (-).

Upon reaching the collecting surface, the particles give their charge and serve as conductors for additional deposition of charged particles. The collection plate groups (see Figure 2.) and discharge electrodes groups (see Figure 3.) are connected to rappers for particle removal. After a sufficient layer of particles has accumulated on the collection surfaces, the rappers dislodge the dust buildup, which falls into the hopper. The dust removal system continually removes the dust from the hoppers and returns it to the process.

The four fields will progressively clean the gas stream. The first field (Field No. 1) will collect the larger particles and will build dust layer quicker than successive fields. Therefore, the inlet field will need to be cleaned (rapped) more often the successive fields (2, 3 & 4). If the dust cake is allowed to get to thick, it will electrically insulate the collection surfaces and reduce the efficiency of the field. The smaller particles migrate slower and collect on the remaining fields. The smaller particles do not form a good dust cake that falls apart very easily. Sometime this will occur on the last field and the re-entrain dust will cause a momentary increase in opacity.

Figure 2. Collection Plates

Figure 3. Discharge Electrodes

8. Rappers

Rappers serve as the cleaning device for the collection plates and discharge electrodes. The rappers are single impact magnetic induced piston and anvil type mechanisms with a microprocessor based controller to establish the rapping cycles. Rappers are individually, controlled to permit adjustment of rapping intensity and cycle time for each field.

Figure 4. Rapper Assembly

9. Power Supply

An ESP typically requires 480 VAC to the transformer/rectifier set (T/R) of each field. The T/R reduces the line voltage to 120 VAC for control power, primary/secondary voltage and primary/secondary current required for particle collection. Each T/R set is equipped with a logic controller to manage the power supply and provides readout and feedback on the electrical operation of the ESP. The primary voltage for ESP operation is 480 VAC with a secondary voltage of 70 KV and the controller. These voltages, as well as the corresponding primary and secondary current, will vary with inlet loading and gas properties.

Figure 4. High Voltage – T/R Set

10. ESP Inspection & Maintenance

The maintenance discussed in the following section is preventative maintenance. The goal of the plan is to maintain the long-term performance of the ESP and to minimize the failure of various components that effect ESP performance. An important aspect of the preventive maintenance is scheduled inspection and PM of the ESP, both internally and externally. These inspections include daily, weekly, monthly, quarterly, semiannually, and annually. Semiannual and annual inspections are conducted during scheduled outages.

11. Daily ESP Inspections/Preventative Maintenance (PM)

The purpose of daily inspections/PM is to identify the existence of and correct any operating conditions and/or function that may develop into malfunctions or failures.

The ESP is continuously monitored for inlet temperature, corona power levels (secondary Kv and mA levels) and hopper levels. Activated alarm conditions, in the control room, will alert the operator to a loss of power, high temperatures and high hopper levels. This information is stored in the plant's data acquisition system (Polcid) for seven days and provides data/trends for unit performance evaluation and troubleshooting.

Along with the continuous monitoring, daily visual inspections of the ESP are also conducted. (see Attachment 1, PM #E490-DY-A). The daily inspection/PM consists of following:

- Check T/R oil temperatures. Listen for sounds of arcing around the T/R set. Check the corona power readings. Verify that the DOC II controllers are working properly.
- Verify the accuracy of the continuously monitored electrically data points.
- Verify that the penthouse blower is operating properly and that belts are in a good operating condition.
- Verify that the penthouse heater is operating properly
- Verify rapper operation
- Verify the T/R sets are leak free and if there is a leak, that it is properly addressed
- Visually check expansion joints and structure are leak free and in good operating condition.

12. Weekly ESP Inspections/Preventative Maintenance

A weekly inspection/PM of the units is conducted verify the electrical performance and operational effectiveness. Weekly inspection/PM (see Attachment 2, PM E490-WK-A) will consist of:

- Reviewing of daily information, attempting to identify any apparent trends in the key operating parameters, to determine whether changes are needed in the operating practices or maintenance procedures. In addition, this review will confirm that all requested work orders have been satisfactory scheduled and/or completed in a timely manner.

- Visual and thermo check of all motor bearings for high temperature and signs of excessive wear or vibration

- Verify that all blower filters are clean and in place. Check all belts for condition and tension. Inspect the condition and operation of all rappers. Inspect condition of all T/R sets

- Inspections of the integrity of the access doors/seals and note any signs of in leak, for follow up.

- V/I analysis (see Attachment 3, PM EK50-WK-B) which will be recorded and filed for use in continuous ESP performance evaluation and improvement

13. Quarterly Inspections/Preventative Maintenance

Quarterly inspection (see Attachment 4, PM EK50-3M-C) of the ESP will be an in depth evaluation of all major operational component. The quarterly inspection/PM will include:

- The penthouse/roof equipment

- Inside the upper treatment area

- Inside the lower treatment area

- The collection and disposal zone of the ESP

- Internal inspection maybe postponed until the semiannual shutdown if no potential problems are noted by the daily or weekly inspection/PM

14. Semiannual Inspections/Preventative Maintenance

Semiannual inspection (see Attachment 5, PM E490-6M-A) consists of a compressive internal inspection of the ESP and will include:

- Penthouse/roof equipment
- Inside the upper treatment area
- Inside the lower treatment area and the collection
- Dust removal system

15. Annual Inspections/Preventative Maintenance

Annual inspection (see Attachment 6, PM E490-1Y-A) consists of a compressive internal inspection of the ESP and the electrical system. The annual inspection/PM will include:

- Penthouse/roof equipment
- Inside the upper treatment zone, collection plate and electrode condition & alignment
- Inside the lower treatment zone, collection plate and electrode condition & alignment
- Dust removal system
- T/R's and High Voltage controller and evaluation of the plate thickness of the plates and degree of corrosion
- This inspection may include the services of vendor experienced in ESP operation, performance and maintenance

16. Corrective Measures

The opacity limit for the kiln/raw mill and clinker cooler stacks is 10% for a six (6) minute average and this should be maintained during normal operation. In the event the opacity is greater than 10% for six-minute period, you must begin the process of determining the cause of the exceedance, refer to the Startup Shutdown & Malfunction Plan, and if the opacity is not reduced to less than-10% within a two (2) hour period, the process may have to be shut down. Due to the process and the high temperatures involved, shut down will not take place immediately. Under a controlled shut down, the units should remain in operation if they are in an electrical and mechanical condition to do so. The ID fan for either the; kiln/raw mill ESP and/or the clinker cooler ESP must operate until the process is sufficiently cooled to prevent heat related damage to the system.

In an effort to correct, the exceedence associated with the ESP of either stack, the operator should at a minimum:

1. Check the unit inlet temperature
2. Verify the electrical operation of each field for the unit
3. Check the primary voltage and current for the unit
    a. The primary voltage and current of the fields will vary with the inlet loading and there should be ascending levels from field 1 – 4.
4. Check operation of the GCT, compressed air and water pressure at the spray lances, water flow rate and the GCT control panel for errors (on kiln/raw mill ESP)
5. Check the operation of the clinker cooler water sprays system, compressed air and water pressure at the spray lances and water flow rate

If these measures do not correct the exceedance, refer the Troubleshooting Flow Chart (see Attachment 7), Troubleshooting Guide (see Attachment 8)and Startup, Shutdown & Malfunction Plan.

The loss of one field in the clinker cooler ESP may still allow operation within the compliance limit. However, In the event of the loss of one field in the kiln/raw mill ESP kiln feed rate will be reduced until compliance is achieved. The operator will have to make the appropriate process adjustments for temperature/water flow rate related causes.

Electrical malfunction; must be immediately relayed to the electrical department. The electrical department will review previous troubleshooting efforts and follow the electrical troubleshooting procedures (see Attachment 9) to correct electrical malfunction.

Florida Rock Industries, Inc.

Newberry, Florida

FABRIC FILTER (BAGHOUSE) OPERATION AND MAINTENANCE PLAN

June 15, 2003

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Attachments

1. Introduction

Florida Rock Industries, Inc. (FRI) operates a limestone quarry and a cement production facility at this location. Limestone is mined /stockpiled and then mixed with other raw materials that provide an additional source of iron and aluminum, in designed proportions, to produce a ground mixture of kiln feed. The additional raw materials used will include coal ash, sand and mill scale. The kiln feed will have sufficient chemical properties to produce clinker when it is subjected to the high temperatures in the preheater stages, precalciner and rotary kiln. The clinker produced by the pyroprocess process is ground into finished cement. As the clinker is introduced into the finish (grinding) mill a small percentage of gypsum is added to produce Portland cement.

FRI is committed to operating the facility in a manner that will comply with applicable federal, state, and local environmental regulations and in harmony with the surrounding community. FRI expects to operate at this location for many years. To accomplish this, FRI has made regulatory compliance a corporate commitment. This commitment is vigorously disseminated throughout the company, from the top down.

2. Purpose

The purpose of this plan is to effectively operate and maintain baghouse; emission control systems to meet or exceed the requirements of federal state and local environmental regulations.

It is a regulatory requirement for FRI to develop and implement a baghouse Operations & Maintenance Plan (O&M Plan) to ensure the effective operation of the fabric filter emission control systems throughout the facility. The routine monitoring and maintenance of emission control units is essential for the optimum performance/capture efficiency of the units. The O&M plan will describe the measures and procedures that must be followed to ensure that the emission control units will achieve their designed operating efficiency throughout the life of the units.

The facility has several permitted point sources (emission points), the majority of which are fabric-filter dust collectors (baghouses). Baghouses are designed to capture fine dust particles in various process gas streams and potential emissions from material handling operations. Each baghouse system has been designed with sufficient cloth area, airflow and captures velocities to control emission at specific locations throughout the facility. While there are several mechanisms involved in removing dust from the gas stream, the primary removal mechanism is filtration. Particles are filtered from the gas stream by the filter fabric and a thin layer of dust is formed on the surface of the fabric. The dust that accumulates on the fabric is periodically removed or cleaned from the surface of the filter bags. Dust captured in the emission control units is returned to the process by totally enclosed conveying mechanisms.

The maintenance required for the mechanical aspects of the baghouse, and the associated material handling devices, is incorporated into the plant wide preventative maintenance (PM) program. This program has been established based on manufacturer's suggested maintenance and the process experience of FRI personnel.

3. Baghouse (Dust Collector) Operating Principle

Baghouses work on the principle of filtration and they are mechanically straight foreword in design. Conceptually, baghouses operate with a "clean side" and a "dirty side" in terms of air handling. Keep them separate and the unit will perform up to its maximum efficiency. Baghouses have a typical collection efficiency of 99+%. The dirty side of the bag is the side exposed to the incoming gas stream as it enters the unit and the clean side is the side of the bag exposed to the gas stream, as it exists the bag/unit. The filtered/clean air is discharged to the atmosphere.

As the dust-laden gas enters the unit, the gas stream slows down and a baffle causes dispersion of the particles and turbulence in the gas stream. Larger particle will settle out due to velocity reduction, impingement, and directional changes. The finer dust particles will follow the gas stream and impact on the filter bag *outer surface* of the bags. The primary and most efficient filtering of the gas stream is accomplished by a thin dust coating on the surface of the bag, not the bag itself. For this reason, new filter bags can initially have an excess emission or "bleed through" of sub-micron size particles even with proper start-up procedures. However, this bleed through will typically be short lived and will decrease as a dust cake is formed on the filtering surface of the bag. This thin layer of dust cake will not, and should not, be removed during the normal cleaning process. Excessive cleaning may partially remove this dust cake and cause bleed through of sub-micron size particles.

All of the baghouses in the facility are pulsejet type units (Figure 10.) Pulsejet type units clean the bags by allowing a jet of compressed air to blow through a tube (blow tube) with outlet holes that are centered above each bag in the row of bags along the tube. The jet of air enters the bag through a venturi, which increases the velocity of the air. The jet of air expands/flexes the bag, in a wave motion, down the length of the bag causing accumulated dust to be dislodged from the bag's surface. There is some additional cleaning of dust-laden surfaces caused by the sonic and ultrasonic sound produced by the jet of compressed air. The compressed air is supplied through a header attached to the blow tubes. The blow tube/header connection has a diaphragm that controls the release of compressed air into each blow tube, via a timer. The on and off time of the cleaning cycles and the duration of the pulsejet for each row of bags, is controlled by a timer and solenoids. This method of cleaning is continuous and only the row(s) being cleaned are momentarily offline.

Figure 1. Pulsejet Baghouse Components

4. Gas/Air Flow

Gas/air is moved through a dust collector by either of two methods, suction or pressure. In a suction system, a fan is installed downstream of the baghouse to draw or induce gas flow through the dust collector from the ventilated source(s). In a pressure system, a fan immediately upstream of the baghouse draws air from the ventilated point(s) and forces (forced draft) the gas through the dust collector. FRI baghouses are equipped with suction or induced draft (ID) fans, where the fan is downstream of the baghouse. The ID fan system is preferable because it maintains a negative pressure (vacuum) on the entire system upstream of the fan and air will be drawn into the system at any point of potential leakage. Where the forced draft system will blow air/dust out at any point of leakage, downstream of the fan.

5. Cleaning Cycle

The cleaning cycle is very important to the effectiveness of a dust collector. If the bags of a dust collector are not periodically cleaned the dust collector will gradually lose its ability to capture emission as the airflow through the system decreases. All of the baghouses at the facility are self-cleaning, pulsejet type units. Through this self-cleaning capability, the equipment is able to operate continuously, without losing collection efficiency, because, only a row or a limited number of rows, at any given time, will be off-line during the cleaning cycle. When the cleaning cycle is initiated, the pulse valve/diaphragm on one or more rows opens to inject a short blast of compressed air through blow tubes and down into the bags from the clean airside. This pulse of compressed air sends shock wave along the length of the filter bag surfaces, flexing and expanding each bag to break loose accumulated dust on the outer surface. The duration of this pulse is extremely brief, typically less than 100 milliseconds.

The cleaning cycle will continue from row to row, preferably non-sequentially, until all rows have been cleaned. The frequency with which the cleaning cycle is repeated is a function of settings made at the timer and of the external controls connected to the timer. The row(s) out of service during the cleaning cycle will be out of service for only milliseconds. The other rows remain in operation and the filtering process continues without interruption. The total time that is required to clean a complete dust collector is dependent upon the number of rows in the baghouse and the time interval between the cleaning of each row or rows. The frequency of cleaning cycle will be a function of the system air volume, process conditions, characteristics of dust and grain loading. After the baghouse has operated, with factory setting, in its normal environment, the differential pressure gauge (Magnehelic or Photohelic) should be observed for correct pressure drop. The timer on/off setting may be adjusted as necessary to obtain the desired results. A typical range of operating pressure drop is two (2") inches to ten (10") inches across the baghouse. However, there are, many process variables that may cause the baghouse to operate out side this range and still effectively control emissions.

6. Timer & Differential Pressure Gauges

The function of the timer is (1) to automatically sequence the cleaning of the rows in the dust collector, (2) to control the time-period that a pulse valve is open and (3) to control the time interval between cleaning cycles. In performing its function, the timer activates the solenoid(s), which controls a pulse valve, on a predetermined time-period.

The timer can be connected to operate in either of two modes: (1) On a continuous cycling basis (std), or in conjunction with a differential pressure switch. In the first mode, the timer operates on a predefined cycle, continuously, as long as power is applied to the timer.

In the second mode, the cleaning cycle is controlled by a differential pressure switch (Photohelic), which determines when the cleaning cycles is activated and deactivated based on the pressure drop of the unit. The cleaning cycle is activated whenever the pressure drop across the dust collector exceeds a preset value (high set point) on the photohelic. The cleaning cycle will continue until the differential pressure across the baghouse is sufficiently lowered to close the contacts of the low set point. This cycle will be repeated each time the high set point contacts are closed.

The taps for the connections of either type of gauge, negative and positive, are located directly above and below the tube sheet of the baghouse. Tubing is used to connect these taps to the gauges and indicate the differential during operation. These gauges can indicate unusual differential pressure conditions, which may be the first signal of unit operational problems. The Magnehelic gauge is an indicator only; it has no capacity to control the operation of the timer/cleaning cycle.

7. Differential Pressure Switch

A differential pressure switch or gauge/switch combination device (Photohelic) is installed on two of baghouses for the coal grinding operation. The Photohelic is equipped with dual set points, a high and a low. It will automatically activate the timer to initiate a cleaning cycle whenever the differential pressure (Delta P) across the dust collector reaches high set point and activates the time/cleaning cycle and deactivate the timer when the Delta P reaches the low set point. Once activated the timer will function to clean rows of the unit until the specified low-pressure differential is reached and high set point contacts open to shut off the timer. A switch of this type is normally used when the dust loading is intermittent, not heavy enough to require continuous cleaning or when the unit also functions as a material surge bin. The Merrick baghouses on the coal grinding system are equipped with Photohelic gauges.

8. Pulse Valve/Diaphragm

The pulse valve, of a pulsejet baghouse, introduces the blast of compressed air through the blow tube and into the clean airside of the bags to dislodge the dust from the outer surface of the bags. The timer determines on/off cycling of the valve and the duration of the pulse. The pulse valve is an internally ported diaphragm valve. Control air acts on the larger, upper surface of the diaphragm to keep the valve closed against the air from the compressed air manifold. When the solenoid is energized, the control air on the topside of the valve is vented to the atmosphere and the force is no longer sufficient to hold the valve closed against the air acting from below. The diaphragm is forced to the open position and the air blasts through the valve into the blow tube. When the timer de-energizes the solenoid, the topside of the valve is no longer vented, so the pressure immediately increases to close the diaphragm and stop the flow of compressed air through the blow tube. The operation takes place in a fraction of a second. Solenoids that control the pulse valves are typically located in a common junction box or boxes.

9. Compressed Air Header

The function of the compressed air header is to distribute an adequate supply of compressed air to the blow tubes when the pulse valve opens. The header for each unit has been designed to be compatible, in size, with the compressed air demand for each unit and is located as close as possible to the pulse valves to minimize the pressure drop from the header to the points of use. The air header is equipped with a pressure gauge and a drain valve. Compressed air supply for the header should be relatively dry and at approximately 80 - 100 psi.

10. Blow tube

The blow tube is a length of pipe located at the discharge side of the pulse valve/air header, centered above a row of bags, with orifice holes spaced equally along the pipe the under side of the pipe at the approximate center of each bag. When the pulse valve diaphragm opens, a surge of compressed air is expelled into the blow tube and discharges through the orifice holes at high velocities. This high velocity air from each orifice sets up an induced secondary airflow as it passes through the venturi. The airflow into the bag causes a combination of an instantaneous shock wave and reverse airflow down the length of the bag releasing the collected dust. In a top-access dust collector, the blow tubes are removable to permit installation or removal of the filter bags and cages.

11. Initial Baghouse Start-Up (With New Filter Bags)

After an inspection of the baghouse system has verified that all bags are installed, covers, doors, access hatches are in place, the compressed air is supplied is on and the ID (induced draft) is operable; the start-up sequence may begin. The baghouse materials handling devices should be started first. Where the system is equipped with dampers, inlet and or outlet, the flow should be controlled to no more than 25% of design, if practical, but no more that 50% percent open during start-up. This will allow the bags to gradually build a dust cake and prevent impingement of dust particles into the fabric and excessive bleed through, due the low resistance to flow of the new bags. When the Delta P across the baghouse reaches one (1) to two- (2) inches pressure drop, the dampers may gradually opened to the full open or desired position.

The use of dampers or blast gates would be the desired method of airflow reduction even if they must be installed. Furthermore, a dust collection system with multiple and/or remote pick-up points may require such devices to balance the air flow(s) for maximum capture efficiency. Obviously, this procedure would need to be completed under low process material flow/output conditions. The start-up sequence may be completed prior to process start-up by manually introducing a pre-coat material into the system immediately up stream of the of the baghouse inlet.

During either of the above start-up sequences, the timer should be turned off until desired pressure drop is achieved and the unit is operating at the expected flow rate. If the bags have been pre-coated, the baghouse system would not require any stepped sequence for start-up other than those associated with process/operation start -up sequence.

12. Baghouse Shut Down Sequence

The shut down sequence is the reverse of the start-up. The process/material flow should be shut down first and baghouse system is shut down last. Under a controlled shut down, when the potential for process emissions have sufficiently diminished the baghouse should be allowed to run, with the cleaning cycle turned off, for approximately one (1) hour, where the is system venting an operation that has the potential to produce a steam plum and approximately 15-minutes on other units, where practical. This will allow the system sufficient time to evacuate any moisture-laden gases that may cause condensation and possible bag damage and/or increased pressure. If a prolonged shut down period is anticipated, material-conveying devices should be emptied.

13. Filter Bag Replacement

Filter bags, in the correct application, may have a useful life of one (1) to four (4) years, depending on the chemical and physical nature on the gas stream. However, bag wear is usually gradual and through routine inspections, you must establish the expected bag life for specific baghouse units. Premature bag failure is usually attributable to either chemical attack, degradation due to high temperature, physical damage or imperfection in the bag material. Abnormal wear can be caused by a number of factors. It may be due to vary abrasive materials, excessive cleaning, or incorrect fabric type. Operating a baghouse with broken/failed bags will not only allow excess emission into the atmosphere, it will also cause abrading/failure of adjacent bags and may damage the ID fan. Once the expected bag life of each unit has been determined, through operating experience, the bags in the units can be changed out on a predetermined schedule to minimize the potential of bag failure due to age alone. Prior to a scheduled bag change out, of the entire unit, damaged or broken bags will changed/replaced as needed.

Established safety precautions should always be taken during the replacement of bags and/or baghouse entry. Precautions must be taken to minimize employee exposure to potential hazards.

13.1. Pulse Jet Baghouse – Bag Replacement

The pulsejet baghouses have top entry/access for the inspection and/or replacement of filter bags. To inspect for bag leakage or bag replacement the doors/covers at the access point of the unit must be opened or removed for access to the bags.

To remove and/or replace a bag the blow tube must be removed. When a bag is replaced, care must be taken to insure that the bag collar is properly seated in the tube sheet (see Figure 2, Top-Access) to prevent dust leaks during operation. In the pulse jet units, the edge of the opening in the tube sheet must fit firmly into the groove in the bag collar. Each bag is seated in the tube sheet by a snap ring that is sewn into the bag collar. This snap ring must be flexed inward to remove or replace a bag. The bag cage for the pulse jet units, which keeps the bag from collapsing, has a built in venturi. The cage must be removed to replace the bag. When a bag is installed, the bag is inserted into the hole of the tub sheet and slowly fed down until the collar of the bag is at the tube sheet opening.

The new bag is flat when it is unrolled and should be folded together to minimize scraping the surface of the bag on the edges of the tube sheet opening, as you feed it into the hole. When the collar of the bag reaches the tube sheet, flex the snap ring inward to allow the collar to fit into the hole of the tube sheet, however, you should always set the seam of the bag against the tube sheet when the snap ring is flexed. The snap ring has a small grove that must mate with the edge of the tube sheet as you release the flex in the snap ring (see Figure 3). The collar of the bag must fit snugly against the entire circumference of the tub sheet opening, if not the dirty air will leak through to the clean air side/plenum. The snap ring-tube sheet interface is the dirty air seal between the baghouse interior and the clean air plenum. If the snap ring does not fit snugly against the tube sheet, (has a small bulge in the snap ring) tap on the inside surface of the snap ring with your hand or a small rubber mallet to force the snap ring against the tube sheet.

After the bag(s) is installed and properly seated in the tube sheet the cage may be inserted into the bag (see Figure 4 & 5). If the cage is difficult to insert into the bag it is likely that the snap ring is not properly seated and the opening at the bag collar is too small for the cage to fit. When the cage is installed, lower the cage gently into the bag until the flange of the cage is in contact with the tube sheet.

Figure 2. Typical Bag Installation

Figure 3. Snap-In Pulsejet Bag Installation

Figure 4. Typical Cage w/Venturi Assembly

Figure 5. Filter Bag/Cage Installation

14. Weekly Baghouse Inspection

The units should be checked a minimum of once weekly for performance and operation effectiveness. At a minimum, the inspection should include noting the differential pressure (Delta P) across the baghouse, operation of timer sequence, solenoid operation, diaphragm valve operation, hopper discharge, and stack visible emissions (VE). During the inspection, also listen for the pulsing of the blow tubes to verify diaphragm operation. You should also listen for unusual noises and/or vibration from the fan. A zero Delta P reading on an operating baghouse may be an indication of a plugged line, typically on the dirty side of the baghouse, the upstream or underside of the tub sheet. When both lines are clear and the gauge is, operating normally there will be a slight positive deflection in the reading each time a row is cleaned/pulsed.

During the inspection also check the pressure at the compressed air header, bleed/drain the compressed air header, and verifying that the hopper is empty. Hoppers without a bindicator/level indicator must be sounded by tapping on the hopper/access door with a metal object to determine the presence of material build up. If the unit is insulated you may sound the area of the hopper discharge, screw conveyor inlet point, or check the flop gates (where applicable).

15. Monthly Baghouse Check

At least once monthly, you should check the access doors/hatches for leaks, check air lines and fittings for leaks, and verify the operation of the rotary airlock, screw conveyor or other associated dust removal devices. Since these are typically enclosed systems, check to see that the airlock/motor is turning and the tilt or flop gates are allowing material removal from the hopper. Check the screw conveyor and drive motor for operation. Where practical, you should check the screw conveyor at both ends to verify that a shaft or coupling is not broken, although such a condition may be indicated by an over heating or high Amp condition of the drive motor.

16. Yearly Baghouse Check

The baghouse should be checked yearly for leaks and/or corrosion of the housing (interior and exterior), check the tube sheet for material build up and deterioration, condition of bags, alignment of blowpipe, dampers and the condition and tension of drive belts on the fan and material removal devices. You should also verify the cleaning cycle of the baghouse, i.e. is each solenoid firing and that each row in the unit is being cleaned.

Make a general check of the baghouse support structure, access ladders/cages, the platforms/baghouse roof, and the handrails.

17. Visible Emission/Opacity

A baghouse system will usually lack sufficient moisture/water vapor to cause a steam plume and should otherwise have virtually no visible emissions (VE) from the baghouse discharge point. However, even with low moisture, hot stacks gas, relative to ambient conditions, there can be a detached steam plume during conditions of low ambient temperature and sufficient humidity. Otherwise, the baghouse discharge will remain clear (no VE) unless there is a failure in the filter medium or a leak occurs between the clean and dirty sides of the unit.

The opacity/visible emission (VE) allowable for all baghouses is five (5) percent. Opacity is essentially a measurement or indication of the amount of light obscured/scattered by particles in the exit gas stream. The measurement of opacity is made either by an in stack-monitoring device or by the unaided human eye, for baghouse opacity determinations it will be the latter. Opacity is measured over a range of zero (0) to one hundred (100) percent. A trained observer can make opacity determinations over a wide percentage range. However, observations in the ten (10) percent and below range can be very subjective. Furthermore, when observing opacity in the low ranges factors such as sunlight, background color, and the position of the observer relative to the source can greatly bias the results.

Compliance of a point source with an opacity standard is determined by averaging six-minute observations, over a ½ or 1 hour period, taking a reading at a rate of four per minute, which will allow the observer to detect potential changes in opacity due to process variations and/or cleaning events. Particularly for pulse jet baghouses, it is not out of the ordinary to see an increase in opacity after a cleaning event takes place even with the system in good condition. However, this increase sometimes may not be perceptible by the observer.

18. Corrective Measures

When a baghouse is continuously over the opacity limit (5%) it is imperative that it and the process it controls is taken off line as soon as possible, so that the source of the problem can be determined and corrected. In the cement manufacturing process, due to the particle size of the material captured, a one-quarter (1/4) inch hole is a single bag can cause an opacity that is excess of 5%. When a unit is out of compliance, it should be taken off line within thirty (30) minutes, where the process conditions allow.

With the top-entry type of baghouse, the general area of the bag(s) failure may be determined, relatively quickly, by a visual inspection of the tube sheet. The area of the failure may be indicated by an unusual accumulation of dust on the tube sheet. Failures that produce opacity in the 5% range may not be easily detected with a visual inspection of the tube sheet. You may need a trace dye and a black light to pinpoint less obvious/minor bag leaks and dirty side to clean side breaches. The trace dye must be introduced into the baghouse, upstream of the unit, while it is in operation. Before or immediately after the baghouse and/or the associated process are taken off-line, the Production Manager and/or the Plant Manager should be notified.

Once the decision is made to take the unit off-line the appropriate amount of trace dye should introduced into the inlet ductwork of the baghouse (see trace dye instructions). For the best results, the typical recommended usage for the trace dye is 0.1 lbs. for every 100 square feet of filter cloth or 1 lbs./1000 ft^2 of cloth. Then you may initiate the associated process shut down. Baghouse operation should continue until the process emissions have ceased/stabilized. When process emissions are minimized, the baghouse can be shut down to perform a check of the clean side of the tube sheet, using the black light. With the black light, you may see traces of the dye over a significant area if the bag leak is a large one. However, by shining the black into the bags or along the bag surface, the bag (s) with the leak/hole will have substantial coating/glow from the trace dye at a hole or breach. When the bag(s)/cage(s) with the indicated leak have been removed, any accumulated dust near the tube sheet cell opening should be pushed into the opening(s) or otherwise removed. It is recommended that the remainder of the dust on the tube sheet be vacuumed up prior to closing the unit for start up. Be sure to remove all old bags and any other objects and materials used during the bag change out to avoid the potential of something being pulled into the fan or plugging material outlets. Before the doors are closed, make sure that the seal areas for the doors are free of dust build up and channels between door areas are cleaned.

With the bags replaced and the clean up activities complete, the baghouse may be closed. The baghouse mapping forms are then updated for future reference (Attachment 1.) Be sure to tighten all of the hold-downs for the doors and covers. When the baghouse is brought back on line the doors and hatches should be checked for signs of leakage. When the process is back on line, allow the system to run approximately one (1) hour, if the unit is not obviously out of compliance, to allow the new bags to become coated and clear out any remaining dust, from the initial leak, downstream of the baghouse. At this point, if the opacity at the baghouse exit is not continuously greater than 5% you should then conduct a ten- (10) minute VE observation. If the unit is in compliance, other than documenting the event and notifying the appropriate manager(s), no further action is needed. If the unit is not in compliance, you must repeat the corrective measures.

19. Troubleshooting (Quick Reference) (Attachment 1)

The main indicator of potential baghouse problems is the Magnahelic (differential pressure) gauge. Depending on factors such as grain loading, gas temperature, and air-to-cloth ratio, the operating rage for pressure drop across the unit will typically be two (2) to six (6) inches of pressure drop. In most cases, a Delta P outside this range will be an indication that an operational may problem exists. However, a baghouse with new bags or very low grain loading may have a differential pressure of less than one (1). The following is a brief summary of items or condition to check when a baghouse is not functioning as it should.

A. Excessive Pressure Drop

- Check the line connections at the differential pressure gauge and at the baghouse.
- Clean out the lines by blowing compressed air through the lines.
- Check the timer for proper operation/initiation of the cleaning cycle(s).
- Check compressed air header for correct pressure (80 to 100 PSI)
- Check solenoid valves for function and sequencing
  a. Check for loose wiring
  b. Check for dirt in solenoid valve
  c. Check diaphragm valve for dirt or ruptured diaphragm
- Check for excessive moisture in the compressed air system or in the gas steam from condensation or ambient sources (rain or high humidity).
- Check the temperature of the baghouse. Operating below the dew point of

the gas stream will cause condensation.

B. Extremely Low Pressure Drop

- Check the line connections at the differential pressure gauge and at the baghouse.
- Clean out the lines by blowing compressed air through the lines.
- Check the fan for proper operation and flow
- Check for leaks in the system, particularly on the clean airside.
- If the VE on the stack/exit point is in question or excessive, there may be broken bag(s) in the unit or improperly installed bags.

C. Secondary Dusting (Dirty Exhaust Air/Visible Emissions)

- At initial start up, if the unit is not brought online by the prescribed procedure; there may be secondary dusting for several hours after start up. This condition will subside as the dust cake is established on the bags.
- Check bags for proper installation and or broken bags.

For Additional Troubleshooting Measures

See attached maintenance troubleshooting section

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Mr. Gary Sauer, President of
Cement and Calcium Group
155 East 21st. Street
Post Office Box 4667
Jacksonville, Florida 32201

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X D Hardy ☐ Agent ☐ Addressee

B. Received by (Printed Name) C Hardy C. Date of Delivery 12-6-04

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? *(Extra Fee)* ☐ Yes

2. Article Number *(Transfer from service label)* 7000 1670 0013 3110 2059

PS Form 3811, August 2001 Domestic Return Receipt 102595-02-M-1540

U.S. Postal Service
CERTIFIED MAIL RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)

7000 1670 0013 3110 2059

Postage	$	Postmark Here
Certified Fee		
Return Receipt Fee (Endorsement Required)		
Restricted Delivery Fee (Endorsement Required)		
Total Postage & Fees	$	

Sent To: Mr. Gary Sauer, President of Cement & Calcium Group
Street, Apt. No.; or PO Box No.: 155 East 21st. Street Post Office Box 4667
City, State, ZIP+4: Jacksonville, Florida 32201

PS Form 3800, May 2000 See Reverse for Instructions