TECHNICAL EVALUATION

AND

PRELIMINARY DETERMINATION

FLORIDA ROCK INDUSTRIES, INC.
NEWBERRY, ALACHUA COUNTY, FLORIDA

Portland Cement Manufacturing Facility
Production Increase and Finalization of Emission Limits

DEP File Nos. 0010087-006-AC
PSD-FL-228C

Department of Environmental Protection
Division of Air Resources Management
Bureau of Air Regulation

November 19, 2002

TECHNICAL EVALUATION AND PRELIMINARY DETERMINATION

I. APPLICANT NAME AND ADDRESS

Florida Rock Industries, Inc
400 NW CR 235
Newberry, Florida 32669
Authorized Representative: Mr. Cary O. Cohrs, Vice President – Operations

II. FACILITY INFORMATION

A. FACILITY LOCATION

Florida Rock Industries, Inc. (FRI), owns and operates the Thompson S. Baker Cement Plant in Newberry, Alachua County. The plant is currently permitted to produce 2300 tons per day and is located off of Alachua County Road 235, 2.5 miles northeast of Newberry, Florida. The UTM coordinates of the Florida Rock facility are Zone 17, 346.8 km East and 3287.0 km North.

B. FACILITY CLASSIFICATION CODE (SIC)

Major Group No. 32, Clay, Glass, and Concrete Products
Industry Group No. 324 Cement, Hydraulic
Industry No. 3241 Cement, Hydraulic

C. FACILITY CATEGORY

FRI's Cement Plant directly emits more than 100 tons per year (TPY) of several regulated air pollutants and is, therefore, classified as a "Major Source of Air Pollution or Title V Source," per the definitions in Rule 62-212.200, Florida Administrative Code (F.A.C.).

This industry is listed in Table 212.400-1, "Major Facilities Categories", Section 62-212.400, F.A.C. Therefore, stack and fugitive emissions of over 100 TPY of carbon monoxide (CO), volatile organic compounds (VOC), sulfur dioxide (SO_2), nitrogen oxides (NO_X), or particulate matter (PM/PM_{10}) characterize the existing installation as a Major Facility per the definitions in Rule 62-210.200, F.A.C. and subject to applicability review for the requirements of Prevention of Significant Deterioration (PSD) per Rule 62-212.400, F.A.C. Accordingly, the original FRI project was subject to New Source Review (NSR) including the PSD provisions.

Per Table 212.400-2, "Regulated Air Pollutants – Significant Emission Rates", any further modifications at the facility resulting in emissions increases greater than 40 TPY of NO_X or SO_2, 7 TPY of sulfuric acid mist (SAM), 25/15 TPY of PM/PM_{10}, 3 TPY of fluorides, 1200 pounds per year (lb/yr) of lead or 200 lb/yr of mercury require review per the PSD rules and a determination for Best Available Control Technology (BACT) per Rule 62-212.400, F.A.C.

The facility is also subject to a number of industry regulations and permit specific conditions enumerated in the Title V Operation Permit issued January 11, 2002. Among these is designation as a major source of hazardous air pollutants (HAPs) and applicability of the major source provisions of 40 CFR 63, Subpart LLL – National Emission Standards for Hazardous Air Pollutants From the Portland Cement Manufacturing Industry. FRI must submit an application to revise the present Title V operation permit to incorporate the conditions of the proposed air construction permit prior to its' expiration.

III. ORIGINAL PROJECT

The Florida Department of Environmental Protection ("Department") issued a permit to FRI in December 1996 to construct the existing facility. The plant employs the modern dry process technology including a preheater and calciner along with indirect firing. The dry process preheater/calciner (PH/C) kiln is the most fuel-efficient cement pyroprocessing technology currently in use in the United States.

The originally authorized plant was permitted to make 2300 tons per day (TPD) of clinker. An hourly production rate of 95.83 TPD was included in the permit. An annual production limit of 712,500 TPY was also included.

The major equipment at the plant includes the PH/C kiln, a clinker cooler, raw mill, finish mill, silos, conveyers, and particulate control/dust collection and recycling equipment. The cement product is stored in silos and is shipped in bags or in bulk by rail or truck.

A more complete project and process description was provided in the Technical Evaluation and Preliminary Determination issued for the project in September 1995. FRI completed construction of the basic plant in late Fall of 1999. Compliance tests were conducted during mid-2000. Following is a photograph of the constructed plant taken in 2001. Some additional components are visible on the ground that are related to a subsequent project to convert the calciner to a multi-stage combustion (MSC) calciner to facilitate NO_X control and tire introduction.

Florida Rock Industries' Cement Plant in Newberry, Florida

IV. PREVIOUS PERMIT MODIFICATION

The original construction permit issued in December 1996 set an initial limit for NO_X emissions of 3.8 pounds per ton (lb/ton) of clinker. It provided for a two-year optimization period and installation of additional control equipment to insure compliance with a lower limit of 2.8 lb/ton by the end of the period (by January 2002). The permit also allowed the Department to further lower the NO_X and SO_2 limits and to set SAM and beryllium limits after evaluation of future stack testing or continuous emission monitoring results.

The permit was revised in August 2001 to modify the kiln in accordance with the final configuration chosen by FRI to reliably meet the lower NO_X limit. The revision added a requirement to: continuously monitor total hydrocarbons (THC); provide reasonable assurance of compliance with the VOC limit; set a final limit for SAM emissions; and specify additional stack testing for beryllium emissions. The presently applicable requirements are summarized in Table 1.

Table 1. Allowable Emissions – Florida Rock Industries, Newberry, Alachua County

Pollutant	BACT Emission Limit		Emission Rate *		Basis
	lb/ton clinker	lb/ton dry feed	lb/hr	ton/yr	
PM (kiln)	0.31	0.20	30.00	110.50	BACT
PM_{10} (kiln)	0.26	0.17	25.50	93.93	BACT
PM (cooler)	0.16	0.10	14.99	55.70	BACT-NSPS
PM_{10} (cooler)	0.13	0.09	12.71	47.34	BACT
SO_2 (kiln)$^+$	0.28	0.18	28.82	108.55	BACT
NO_x (kiln)**	2.80	1.80	268.30	1018.00	BACT
H_2SO_4 (kiln)	0.0025	0.0016	0.25	1	BACT
CO (kiln)	3.60	2.30	346.38	1288.60	BACT
VOC (kiln)	0.12	0.08	11.55	42.90	BACT
Beryllium	TO BE DETERMINED BY FUTURE STACK TESTS				BACT

Notes:

* The kiln emission rate includes fuel oil combustion emissions from the raw mill air heater.

** After startup and until December 31, 2001, the kiln shall not exceed a NO_X limit of 3.8 lb/ton clinker and 2.8 lb/ton clinker thereafter (30-day rolling average). A compliance demonstration with the 2.8 lb/ton limit for the first 30-day period following December 31 (January 1-30, 2002) shall be submitted by Florida Rock to the Northeast District Office by February 15, 2002. The Department may revise the limit to less than 2.8 lb/ton clinker (30-day rolling average) based on continuous emission monitoring data covering the period January 1-March 31, 2002 to be submitted by Florida Rock to the Department's Northeast District by April 15, 2002.

\+ The Department may revise the SO_2 limit to less than 0.28 lb/ton clinker based on compliance test and continuous monitoring data.

In November 2001 FRI completed a conversion of the calciner to the "PREPOL®-MSC calciner system" for the reduction of NO_X emissions and co-firing of tires as fuel. The MSC calciner can reduce NO_X emission by staggered introduction of fuel, tertiary air, and raw meal. This causes the combustion to take place in several stages. In the first stage, burning fuel near the kiln inlet reduces some of the NO_X generated in the sintering zone of the rotary kiln. The fuel is injected against the direction of flow of the kiln gases and is pyrolized in its gas phase. In the reducing atmosphere that is formed, some of the NO_X is converted into nitrogen.

In order to prevent new NO_X from being generated in the calciner, the calcining fuel also has to be burned under reducing conditions. This is achieved by staggered introduction of combustion air such that fuel is first burned under reducing conditions, then additional fuel is burned under oxidizing conditions. This minimizes the generation of additional NO_X in the calciner and further reduces the nitrogen oxides coming from the rotary kiln.

FRI can use tires as the fuel burned under reducing conditions in the lower section of the MSC calciner. Coal is burned under subsequent oxidizing conditions in the higher section of the MSC calciner. Additional tertiary air from the clinker cooler insures good burnout and conversion of most CO to carbon dioxide (CO_2) without significant NO_X formation. Finally by spreading the thermal load toward the lower temperatures of the calciner and from the higher temperatures of the kiln burner, the overall potential for NO_X formation is further lowered.

V. PRESENT PERMIT REQUEST

The Department began reviewing data submitted by FRI in early 2002 in order to set the final limits for NO_X, beryllium, and SO_2 as required by the present permit. Prior to completion of the effort, FRI submitted a permit application on June 14, 2002 to increase clinker production to 2650 TPD and to propose the final emission limits.

The key requests in the application are as follows:

- Increase daily and annual clinker production limits by approximately 12 percent and peak (hourly) production by approximately 20 percent.
- Set (lower) the final NO_X limitation at 2.45 lb/ton of clinker.
- Set (lower) the final SO_2 limitation at 0.16 lb/ton of clinker.
- Revise other emission limitations downward to avoid significant increases in allowable annual emissions.
- Following completion of the quarterly testing program, remove the beryllium limit in accordance with guidance from EPA that removed beryllium as a pollutant regulated under the PSD program.
- In a response to a request for additional information, FRI proposed final continuous emission monitoring and reporting protocols to complement the proposed NO_X and SO_2 limitations.

VI. PRESENT SITUATION AND EMISSIONS

As of this time, all physical construction required to make cement at the permitted production limit is complete. Facilities have been installed to burn tires as a supplementary fuel. A Title V Operation Permit was issued in January 2002. Compliance testing has been conducted. Table 2 presents the results of stack tests or first quarter 2002 continuous monitoring data from the plant for pollutants of interest in this evaluation.

Table 2. Stack Test and Continuous Monitoring Data Results

Pollutant	Permit Limit	Result
SO_2	0.28 lb/ton clinker	~ 0.01 lb/ton clinker (single stack test)
NO_X	2.8 lb/ton clinker (30-day avg.)	2 – 2.6 lb/ton of clinker (30-day avg. - CEMS)
Beryllium	None (to be determined)	~ 5 x 10^{-7} lb/ton clinker (five stack tests)

Based on the results, it is clear that emissions of SO_2 are much less than permitted. Based on the single test, emissions during normal operations might be as little as a few tons per year. That would be less than the significant emission rate of 40 TPY that triggered the requirement to establish a limit based on BACT. The low emissions are confirmed by the upgraded continuous emissions monitoring system (CEMS) installed at the stack.

The reason for the low SO_2 emissions is that the dry preheater/calciner process provides an opportunity for self-scrubbing of the exhaust gases by finely-divided lime. Therefore virtually all fuel sulfur is removed in this manner. The raw materials fed into the preheater apparently contain minimal sulfur (such as pyrites). Therefore SO_2 emissions from "roasting" in the upper stages of the preheater are minimal.

Emissions of NO_X are lower than permitted and are based on three months of continuous monitoring data. Testing during one stack test consisting of three runs resulted in emissions of 2 lb/ton clinker with a fuel mix that included 18 percent tires. It is possible that even lower emissions can be achieved at times (with or without operation of the MSC calciner). However the present range from 2.0 to 2.8 lb/ton clinker is achieved comfortably and without elevated emissions of CO.

FRI conducted five stack tests for beryllium emissions between July 2000 and December 2001. The tests indicated emission rates for beryllium ranged from 5.2 x 10^{-6} lb/hr to a maximum of 8.1x10^{-5} lb/hr. The average was 4.2x10^{-5} lb/hr, which equates to approximately 4.9x10^{-7} lb/ton of clinker. The average and the maximum emission rates during the five tests would equate to annual emission rates of 0.00018 and 0.00035 TPY. Both values are less than the significant emission rate for beryllium of 0.0004 TPY that applied at the time of initial permitting. The Department recognizes that beryllium is no longer regulated as a "PSD pollutant." The pollutant is now regulated under industry-specific rules pursuant to Title III of the Clean Air Act. The Maximum Achievable Control Technology (MACT) rules applicable to cement kilns regulate beryllium at kilns that (unlike FRI) burn hazardous waste.

For reference, according to an EPA review for setting the cement industry MACT standard emissions of beryllium from 24 kilns ranged from 0.05 to 2.2 micrograms per cubic meter ($\mu g/m^3$) at 7 percent oxygen. The average is approximately 0.56 $\mu g/m^3$. The average beryllium concentration based on the five stack tests conducted by FRI is 0.12 $\mu g/m^3$ at 7% O_2. This value is well below the average and is towards the low end of the data considered by EPA.

According to the BACT determination that accompanied the FRI permit issued in 1996, the emission limit for beryllium was "as controlled by the PM BACT (ESP)." In other words, the electrostatic precipitator (ESP) that controls PM emissions is the physical control equipment for the control of beryllium as well.

The Department concludes that emissions of beryllium are inherently low and adequately controlled by the ESP. Annual emissions are less than the values that would even require a BACT determination based on the previous rule. Beryllium is regulated at cement kilns that (unlike FRI) burn hazardous waste. The Department has, therefore, determined that it is not necessary to set a limit for beryllium and will modify the requirement as requested by FRI.

VII. KILN PRODUCTION CAPACITY

The kiln has been producing clinker at its authorized production limit of 2300 tons per day and within the annual limit of 712,500 tons. It was the first kiln constructed in the United States in approximately 12 years. Typically, there is additional capacity above and beyond the guarantees provided by the manufacturer, Polysius.

FRI believes that the plant can make substantially more clinker than allowed by the present production limitations. The modifications to the calciner during the MSC calciner project added 13.2 percent volume to the calciner system, improved airflow, and increased retention time in the preheater. FRI believes that the kiln now has further production capacity aside from the inherent "overdesign" of the original configuration.

Mr. Fred Cohrs, recently retired from FRI and formerly president of Polysius USA, is an acknowledged expert in cement manufacturing. He submitted a report with the application attesting to the proposed production capacities while meeting lower emission limits per unit of production. Based on Mr. Cohr's report and as set forth below, the Department has reasonable assurance that the plant is physically capable of meeting the proposed production rates.

Mr. Cohrs attests also that the plant operates more efficiently at the higher production rate. The result is that less fuel is combusted per unit of clinker produced. Therefore emissions per ton of clinker produced will also tend to be lower. While the Department does not necessarily concur with the premise, there is reasonable assurance that the facility can, at the higher production rates, comply with lower emission limits (per ton of clinker) than presently in effect. The Department also believes FRI can meet the limit while operating at lower rates based on the past testing discussed above and the 30-day averaging period applicable to this source.

VIII. METHOD OF ESTIMATING EMISSION INCREASES AND DECREASES

As a major source, a physical modification or change in method of operation of this facility resulting in **no significant net emissions increases** is not subject to PSD review. It is clear that the production increase is a physical change or change in method of operation because it involves relaxation of a federally enforceable production limit. Significant net emissions increase is defined in Rule 62-212.400, F.A.C as follows:

*Significant Net Emissions Increase – A significant net emissions increase of a pollutant regulated under the Act is a **net emissions increase** equal to or greater than the applicable significant emission rate listed in Table 212.400-2, Regulated Air Pollutants – Significant Emission Rates.*

The significant emission rates are included in Table 3. The meaning of a net emissions increase is given in Rule 62-212.400, F.A.C. as:

*Net Emissions Increase - A modification to a facility results in a net emissions increase when, for a pollutant regulated under the Act, the sum of all of the contemporaneous creditable increases and decreases in the **actual emissions** of the facility, including the increase in emissions of the modification itself and any increases and decreases in quantifiable fugitive emissions, is greater than zero.*

The definition of actual emissions is given in Rule 62-210.200, F.A.C. (definitions) as follows:

Actual Emissions - The actual rate of emission of a pollutant from an emissions unit as determined in accordance with the following provisions:

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

(b) The Department may presume that unit-specific allowable emissions for an emissions unit are equivalent to the actual emissions of the emissions unit provided that, for any regulated air pollutant, such unit-specific allowable emissions limits are federally enforceable.

(c) For any emissions unit (other than an electric utility steam-generating unit specified in subparagraph (d) of this definition) which has not begun normal operations on a particular date, actual emissions shall equal the potential emissions of the emissions unit on that date.

The modification to achieve the lower NO_X limit of 2.8 lb/ton of clinker (previously 3.8 lb/ton of clinker) was completed in late 2001. The Department does not consider the operation prior to 2002 to represent "normal operation under the present configuration and emission limits." Therefore the Department will

not rely upon emissions that occurred during the two-year period as "representative of normal operations" described in paragraph (a) above.

The Department will rely on paragraph (b) above in estimating actual emissions and presumes that these are equal to the federally-enforceable emission limits allowed by the present permit. Future emissions will be calculated in accordance with part (c) above based on allowable emissions proposed by the Department for the facility in association with the requested production increase.

IX. PROPOSED EMISSION LIMITS

The following table lists the emission limits proposed by the Department for comparison with the previously listed emission limits applicable to the plant.

Table 3. Proposed Emissions – Florida Rock Industries, Newberry, Alachua County

Pollutant	Allowable Emissions (2000 - 2001)		Allowable Emissions (Effective 2002)		Proposed BACT Emissions Limit		TPY Change from Allowable Emissions [1]		SER
	lb/ton clinker	TPY [2]	lb/ton clinker	TPY [2]	lb/ton clinker	TPY [2]	2000/01	2002	TPY
PM (kiln)	0.31	110	0.31	110	0.23	94	-16	-16	25
PM_{10} (kiln)	0.26	94	0.26	94	0.20	80	-14	-14	15
PM (cooler)	0.16	56	0.16	56	0.14	56	0	0	25
PM_{10} (cooler)	0.13	47	0.13	47	0.12	47	0	0	15
SO_2 (kiln) [3]	0.28	109	0.28	109	0.16	64	-45	-45	40
NO_X (kiln) [4]	3.80	1353	2.80	1018	2.45	980	-373	-38	40
H_2SO_4 (kiln)	0.0025	1	0.0025	1	0.0025	1	0	0	7
CO (kiln)	3.60	1289	3.60	1289	2.5	1000	-289	-289	100
VOC (kiln)	0.12	43	0.12	43	0.11	43	0	0	40
Beryllium (kiln)	No emissions limit; Emissions ~ 5×10^{-7} lb/ton clinker				No emission limit proposed		~ 0.00002		0.0004 [5]

Notes:

[1] Change compared to allowable annual emissions in place during the period 2000 to 2001 and to the present allowable annual emissions (effective 2002) for comparison with Significant Emission Rates (SER) listed in Table 212.400-2, F.A.C.

[2] The kiln emission rate includes fuel oil combustion emissions from the raw mill air heater.

[3] Represents revised SO_2 limit (24-hour rolling average) based on compliance tests and continuous monitoring data.

[4] Represents revised NO_X limit (30-day rolling average) based on continuous monitoring data covering the period January 1 – March 31, 2002.

[5] Previous regulatory Significant Emission Rate for beryllium is not applicable.

X. PSD AND BACT APPLICABILITY DETERMINATION

The Department concludes that there will not be a significant net emissions increase associated with the proposed production increase. Therefore PSD does not apply and another BACT determination is not required. Although a new BACT determination is not required, the revised limits proposed in conjunction with the production increase are all more stringent than previous BACT determinations for the plant. Additionally, the values are, by and large, more stringent than many of the determinations made for new cement plants since the construction of the FRI facility.

The Department notes this PSD applicability determination applies strictly to this project and the exact circumstances and does not constitute guidance for any other project. The Department makes these determinations on a case-by-case basis.

XI. CONCLUSION

The Department concludes that the respective final limitations for SO_2 and NO_X are 0.16 and 2.45 lb/ton clinker respectively. These lower limits together with the reductions in limits proposed by FRI for PM/PM_{10}, CO, and VOC insure that the project will not trigger new PSD and BACT requirements. The requested values are well within the ranges of the most recent BACT determinations made in the United States. The Department concludes as well that it is not necessary to set a limit for beryllium and will modify the requirement as requested by FRI.

The Department has reasonable assurance that the proposed emission rates can be maintained at the increased operation levels requested by FRI. Conditions incorporating the proposed changes and detailing compliance demonstration requirements are shown in the attached draft permit for this modification.

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New Source Review