Department of Environmental Protection

Jeb Bush
Governor

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

Colleen M. Castille
Secretary

PERMITTEE

Suwannee American Cement, LLC
Post Office Box 410
Branford, Florida 32008

SAC Branford Cement Plant
DEP File No. 1210465-011-AC
Permit No. PSD-FL-259F

PROJECT DESCRIPTION

This is a portland cement manufacturing facility that uses raw materials such as limestone, clay, iron ore, bauxite, mill scale, fly ash, etc. in a coal-fueled pyroprocessing system to make clinker. The clinker is subsequently cooled, milled, combined with gypsum and shipped in bulk or bags as cement. The applicant proposes to: inject some of the fly ash directly into the calciner; install a selective non-catalytic reduction system (SNCR); increase production from 105 to 120 tons per hour; increase CO emissions by 99 tons per year; take a 30-day NO_X limit of 2.4 lb/ton of clinker; and take a 3-hour SO_2 limit of 0.20 lb/ton of clinker.

The manufacturer, Polysius submitted a letter attesting to structural integrity of the system; inherent overdesign, and to the possibility of increased production by operational changes. Based on tests conducted under temporary permits allowing temporary production increase, SNCR, and fly ash injection, SAC demonstrated they can achieve a production rate of at least 115 TPH while meeting their permitted emission factors (BACT limits). The information provided, including the planned projects, provides reasonable assurance that they can achieve the emission limits at the requested production rate.

Overall pollution equipment includes or will include: a baghouse on the kiln and an electrostatic precipitator on the clinker cooler for particulate control; inherent scrubbing augmented by hydrated lime injection for sulfur dioxide control; staged combustion under reducing conditions in the calciner or SNCR for NO_X control; and raw materials selection, tertiary air injection, and injection of fly ash into the calciner for carbon monoxide and volatile organic compounds control.

SAC submitted a report summarizing the results of the test program with the application.

I HEREBY CERTIFY *that the air pollution control engineering features described in the above referenced application and subject to the proposed permit conditions provide reasonable assurance of compliance with applicable provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Chapters 62-4 and 62-204 through 62-297. However, I have not evaluated and I do not certify aspects of the proposal outside of my area of expertise (including but not limited to the electrical, mechanical, structural, hydrological, and geological features).*

Alvaro A. Linero, P.E. (Date) 2/7/05
Registration Number: 26032

Department of
Environmental Protection

Jeb Bush
Governor

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

Colleen M. Castille
Secretary

February 16, 2005

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Tom Messer, Plant Manager
Suwannee American Cement, LLC
Post Office Box 410
Branford, Florida 32008

Re: DEP File No. 1210465-011-AC (PSD-FL-259F)
Production Increase, Fly Ash Injection, SNCR Installation
Suwannee American Cement Plant – Branford, Suwannee County

Enclosed is one copy of the Draft Air Construction Permit Modification for the Suwannee American Cement Plant on Highway U.S. 27, Branford, Suwannee County. The Department's Intent to Issue Air Construction Permit Modification, the Technical Evaluation and Preliminary Determination, and the "Public Notice of Intent to Issue Air Construction Permit" are also included.

The "Public Notice" must be published one time only as soon as possible in a newspaper of general circulation in the area affected, pursuant to the requirements of Chapter 50, Florida Statutes. Proof of publication, such as a newspaper affidavit, must be provided to the Department's Bureau of Air Regulation office within seven days of publication. Failure to publish the notice and provide proof of publication within the allotted time may result in denial of the permit modification.

Please submit any written comments you wish to have considered concerning the Department's proposed action to A.A. Linero, Program Administrator, at the letterhead address. If you have any questions regarding this matter, please contact Mr. Linero at (850)921-9523.

Sincerely,

Trina L Vielhauer

Trina Vielhauer, Chief
Bureau of Air Regulation

TLV/aal

Enclosures

Matter of:

Suwannee American Cement, LLC
Post Office Box 410
Branford, Florida 32008

DEP File No. 1210465-011-AC (PSD-FL-259F)
Production Increase, Fly Ash Injection, SNCR
Suwannee American Cement Plant
Suwannee County

INTENT TO ISSUE AIR CONSTRUCTION PERMIT MODIFICATION

The Department of Environmental Protection (Department) gives notice of its intent to issue an air construction permit modification (copy of DRAFT Permit Modification attached) for the proposed action, detailed in the Technical Evaluation and Preliminary Determination, for the reasons stated below.

The permittee, Suwannee American Cement LLC (SAC), applied on April 26, 2004 to install a fly ash injection system. SAC applied on July 28, 2004 to increase clinker production. SAC modified the previous requests and added a request to install a selective non-catalytic reduction system in a consolidated application received by the Department on January 10, 2005.

The Department has permitting jurisdiction under the provisions of Chapter 403, Florida Statutes (F.S.), and Chapters 62-4, 62-210, and 62-212 of the Florida Administrative Code (F.A.C.). The proposed changes are not exempt from permitting procedures. The Department has determined that a modification of the original air construction permit is necessary for the described permit changes requested by SAC.

The Department intends to issue this air construction permit modification based on the belief that the permittee has provided reasonable assurances to indicate that operation of these emission units as indicated herein will not adversely impact air quality, and the emission units will comply with all appropriate provisions of Chapters 62-4, 62-204, 62-210, 62-212, 62-213, 62-296, and 62-297, F.A.C.

Pursuant to Section 403.815, F.S., and Rule 62-110.106(7)(a)1, F.A.C, you (the permittee) are required to publish at your own expense the enclosed Public Notice of Intent to Issue Air Construction Permit Modification. The notice shall be published as soon as possible one time only in the legal advertisement section of a newspaper of general circulation in the area affected. Rule 62-110.106(7)(b), F.A.C., requires that the permittee cause the notice to be published as soon as possible after notification by the Department of its intended action. For the purpose of these rules, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of Sections 50.011 and 50.031, F.S., in the county where the activity is to take place. If you are uncertain that a newspaper meets these requirements, please contact the Department at the address or telephone number listed below. The permittee shall provide proof of publication to the Department's Bureau of Air Regulation, at 2600 Blair Stone Road, Mail Station #5505, Tallahassee, Florida 32399-2400 (Telephone: 850/488-0114; Fax 850/922-6979). You must provide proof of publication within seven days of publication, pursuant to Rule 62-110.106(5), F.A.C. No permitting action for which published notice is required shall be granted until proof of publication of notice is made by furnishing a uniform affidavit in substantially the form prescribed in Section 50.051, F.S. to the office of the Department issuing the permit. Failure to publish the notice and provide proof of publication may result in denial of the permit pursuant to Rules 62-110.106(9) & (11), F.A.C.

The Department will issue the final permit modification with the attached conditions unless a response received in accordance with the following procedures results in a different decision or significant change of terms or conditions.

The Department will accept written comments concerning the proposed permit action for a period of 14 (fourteen) days from the date of publication of Public Notice. Written comments should be provided to the Department's Bureau of Air Regulation at 2600 Blair Stone Road, Mail Station #5505, Tallahassee, FL 32399-2400. Any written comments filed shall be made available for public inspection. If written comments received result in a significant change in the proposed agency action, the Department shall revise the proposed permit modification and require, if applicable, another Public Notice.

The Department will issue the permit modification with the attached conditions unless a timely petition for an administrative hearing is filed pursuant to sections 120.569 and 120.57, F.S., before the deadline for filing a petition. The procedures for petitioning for a hearing are set forth below.

A person whose substantial interests are affected by the proposed permitting decision may petition for an administrative proceeding (hearing) under sections 120.569 and 120.57, F.S. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida, 32399-3000. Petitions filed by the permittee or any of the parties listed below must be filed within fourteen days of receipt of this notice of intent. Petitions filed by any persons other than those entitled to written notice under section 120.60(3), F.S., must be filed within fourteen days of publication of the public notice or within fourteen days of receipt of this notice of intent, whichever occurs first. Under section 120.60(3), F.S., however, any person who asked the Department for notice of agency action may file a petition within fourteen days of receipt of that notice, regardless of the date of publication. A petitioner shall mail a copy of the petition to the permittee at the address indicated above at the time of filing. The failure of any person to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under sections 120.569 and 120.57, F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will be only at the approval of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205, F.A.C.

A petition that disputes the material facts on which the Department's action is based must contain the following information: (a) The name and address of each agency affected and each agency's file or identification number, if known; (b) The name, address, and telephone number of the petitioner, the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests will be affected by the agency determination; (c) A statement of how and when petitioner received notice of the agency action or proposed action; (d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate; (e) A concise statement of the ultimate facts alleged, including the specific facts the petitioner contends warrant reversal or modification of the agency's proposed action; (f) A statement of the specific rules or statutes the petitioner contends require reversal or modification of the agency's proposed action; and (g) A statement of the relief sought by the petitioner, stating precisely the action petitioner wishes the agency to take with respect to the agency's proposed action.

A petition that does not dispute the material facts upon which the Department's action is based shall state that no such facts are in dispute and otherwise shall contain the same information as set forth above, as required by Rule 28-106.301, F.A.C.

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above.

In addition to the above, a person subject to regulation has a right to apply for a variance from or waiver of the requirements of particular rules, on certain conditions, under Section 120.542, F.S. The relief provided by this state statute applies only to state rules, not statutes, and not to any federal regulatory requirements. Mediation is not available in this proceeding. Applying for a variance or waiver does not substitute or extend the time for filing a petition for an administrative hearing or exercising any other right that a person may have in relation to the action proposed in this notice of intent.

The application for a variance or waiver is made by filing a petition with the Office of General Counsel of the Department, 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida 32399-3000. The petition must specify the following information: (a) The name, address, and telephone number of the petitioner; (b) The name, address, and telephone number of the attorney or qualified representative of the petitioner, if any; (c) Each rule or portion of a rule from which a variance or waiver is requested; (d) The citation to the statute underlying

(implemented by) the rule identified in (c) above; (e) The type of action requested; (f) The specific facts that would justify a variance or waiver for the petitioner; (g) The reason why the variance or waiver would serve the purposes of the underlying statute (implemented by the rule); and (h) A statement whether the variance or waiver is permanent or temporary and, if temporary, a statement of the dates showing the duration of the variance or waiver requested.

The Department will grant a variance or waiver when the petition demonstrates both that the application of the rule would create a substantial hardship or violate principles of fairness, as each of those terms is defined in Section 120.542(2) F.S., and that the purpose of the underlying statute will be or has been achieved by other means by the petitioner.

Persons subject to regulation pursuant to any federally delegated or approved air program should be aware that Florida is specifically not authorized to issue variances or waivers from any requirements of any such federally delegated or approved program. The requirements of the program remain fully enforceable by the Administrator of the EPA and by any person under the Clean Air Act unless and until the Administrator separately approves any variance or waiver in accordance with the procedures of the federal program.

Executed in Tallahassee, Florida.

Trina Vielhauer, Chief
Bureau of Air Regulation

CERTIFICATE OF SERVICE

The undersigned duly designated deputy agency clerk hereby certifies that this Intent to Issue Air Construction permit Modification (including the Public Notice, Technical Evaluation and Preliminary Determination, and the Draft Permit Modification) was sent by certified mail (*) and copies were mailed by U.S. Mail before the close of business on 2/17/05 to the person(s) listed:

Tom Messer*
Celso Martini, SAC
Dan Fritz, SAC
Joe Horton, SAC
Larry Sellers, Esq.*
John Koogler, P.E.
Frank Darabi, P.E.
Chris Kirts, DEP NED
Jim Little, EPA
John Bunyak, NPS
Jim Stevenson
Tom Workman, DEP
Mark Latch, DEP
December McSherry
Svenn Lindskold
Tom Greenhalgh*
Dave Bruderly
Chris Bird, Alachua Co. DER
Chair, Alachua Co. BCC*
J. Calvin Gaddy
Patrice Boyes, Esq.*
Kathy Cantwell
Ralph Ashodian
Virginia Seacrist
Bob and Lynn Milner
Linda Pollini
Helen Beaty
Bessie Robinson
Craig Pittman, St. Pete Times
Chuck Yagel*

Clerk Stamp

FILING AND ACKNOWLEDGMENT FILED, on this date, pursuant to §120.52, Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

(Clerk) (Date) 2/17/05

PUBLIC NOTICE OF INTENT TO ISSUE AIR CONSTRUCTION PERMIT MODIFICATION

Florida Department of Environmental Protection

Suwannee American Cement LLC
Suwannee American Cement Plant - Branford
Suwannee County

DEP File No.: 1210465-011-AC (PSD-FL-259F)

The Florida Department of Environmental Protection (Department) gives notice of its intent to issue an Air Construction Permit Modification to Suwannee American Cement LLC (SAC) to increase production, inject fly ash into the calciner, and install additional nitrogen oxides controls at the cement plant located on U.S. Highway 27, in Suwannee County. A new Best Available Control Technology (BACT) determination was not required. The permittee's name and address are: Suwannee American Cement LLC (SAC), Post Office Box 410, Branford, Florida 32206.

The plant started up in February 2003, is presently operating at or near full capacity under the provisions of its active construction permit, and has demonstrated compliance with the current BACT limitations. The company submitted an application for a Title V Operation Permit that is being processed by the Department.

Raw materials include sources of calcium, silica, aluminum, and iron such as limestone, sand, bauxite, clay, fly ash, iron ore, and mill scale. Allowable fuels are natural gas for startup, coal, tires, and petroleum coke. Tires and petroleum coke have not yet been burned at the facility. At the present time, the plant production capacity is limited to 105 tons per hour (TPH) of clinker.

SAC requests an increase in its hourly clinker production limit from 105 to 120 TPH and in annual production from 839,500 tons per year (TPY) to 965,425 TPY. SAC also proposes to inject fly ash directly into the calciner instead of introducing all of it with other raw materials at the preheater. This will make it possible to increase the amount of total raw materials entering the process, thus producing more clinker. The fuel use limit will be increased from 364 to 458 million Btu per hour.

Pollution control equipment consists of a fabric filter system (baghouse) for particulate emissions from the kiln; an electrostatic precipitator on the clinker cooler; absorption of sulfur compounds and metals into the product; raw materials selection and combustion controls for volatile organic compounds (VOC) and carbon monoxide (CO); indirect firing, multiple burn points and a staged combustion calciner for nitrogen oxides (NO_X); and baghouses for particulate emissions from other process emission units. SAC will add an SNCR system to inject ammonia solutions into the calciner exhaust gases to provide additional NO_X control flexibility.

The Department previously issued permits to SAC to conduct clinker production, fly ash injection and SNCR tests. The tests were conducted during the last quarter of 2004. The results of the test programs were submitted to the Department in support of the present request.

The Department is already required by the previous construction permit to set final emission limits for sulfur dioxide (SO_2) and NO_X. The final limit proposed for NO_X of 2.4 lb/ton of clinker (30-day basis) is one of the lowest in the country. The 24-hour NO_X limit of 2.9 lb/ton of clinker will be maintained. The 3-hour SO_2 limit of 0.20 lb/ton of clinker is also one of the lowest limits issued to-date in the country. It reflects the use of raw materials that are inherently low in sulfur, very efficient scrubbing of combustion gases by finely divided lime in the calciner, and injection, as needed, of hydrated lime into the preheater.

The company proposes to reduce the CO emission limit from 3.6 to 3.34 lb/ton clinker; however the annual emission limit will increase by 99 tons. There may be small increases in PM/PM_{10} emissions due to increased production. Actual test data indicate that emissions are much less than presently allowed and SAC has proposed decreases in the PM/PM_{10} limits from 0.13/0.11 to 0.11/0.09 lb/ton of feed to the preheater. The PM/PM_{10} emission limits from the clinker cooler will also be reduced from 0.07/0.06 to 0.06/0.05 lb/ton of feed. The proposed production increase will not result in significant net emissions increases and a new evaluation under the rules for the Prevention of Significant Deterioration (PSD) is not required.

SAC has continuous emission monitoring systems (CEMS) for NO_X, SO_2, visible emissions, control equipment temperature, and total hydrocarbons with real-time transmission to the Department. Key data are available at: www.suwanneecement.com

Following are the net annual emission limit increases and decreases from the kiln and cooler compared with the original permit.

Pollutant	Permitted Emissions (TPY)	Proposed Emissions (TPY)	Net Emission Increases (Decreases) (TPY)	PSD Significant Emission Rate (TPY)
PM (kiln)	93	93	0	25
PM_{10} (kiln)	78	78	0	15
PM (cooler)	50	50	0	25
PM_{10} (cooler)	43	43	0	15
SO_2	114	97	(17)	40
NO_X	1218	1159	(59)	40
CO	1511	1610	99	100
VOC	50	58	8	40

The Department will issue the Final Permit Modification with the attached conditions unless a response received in accordance with the following procedures results in a different decision or significant change of terms or conditions. The Department will accept written comments concerning the proposed permit action for a period of fourteen (14) days from the date of publication of this Public Notice of Intent to Issue Air Construction Permit Modification. Written comments should be provided to the Department's Bureau of Air Regulation at 2600 Blair Stone Road, Mail Station #5505, Tallahassee, FL 32399-2400. Any written comments filed shall be made available for public inspection. If written comments received result in a significant change in the proposed agency action, the Department shall revise the proposed permit and require, if applicable, another Public Notice.

The Department will issue the Permit Modification with the attached conditions unless a timely petition for an administrative hearing is filed pursuant to Sections 120.569 and 120.57, F.S., before the deadline for filing a petition. The procedures for petitioning for a hearing are set forth below. Mediation is not available in this proceeding.

A person whose substantial interests are affected by the proposed permitting decision may petition for an administrative proceeding (hearing) under Sections 120.569 and 120.57, F.S. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida, 32399-3000. Petitions must be filed within fourteen (14) days of publication of this Public Notice of Intent to Issue Air Construction Permit Modification. Under Section 120.60(3), F.S., however, petitions submitted by person(s) who asked the Department for notice of agency action must be filed within fourteen (14) days of receipt of that notice or the date of publication of the public notice whichever occurs first. A petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. The failure of any person to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under Sections 120.569 and 120.57, F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will be only at the approval of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205, F.A.C.

A petition that disputes the material facts on which the Department's action is based must contain the following information: (a) The name and address of each agency affected and each agency's file or identification number, if known; (b) The name, address, and telephone number of the petitioner, the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests will be affected by the agency determination; (c) A statement of how and when petitioner received notice of the agency action or proposed action; (d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate; (e) A concise statement of the ultimate facts alleged, including the specific facts the petitioner contends warrant reversal or modification of the agency's proposed action; (f) A statement of the specific rules or statutes the petitioner contends require reversal or modification of the agency's proposed action; and (g) A statement of the relief sought by the petitioner, stating precisely the action petitioner wishes the agency to take with respect to the agency's proposed action.

A petition that does not dispute the material facts upon which the Department's action is based shall state that no such facts are in dispute and otherwise shall contain the same information as set forth above, as required by Rule 28-106.301, F.A.C.

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above.

A complete project file is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at:

Department of Environmental Protection
Bureau of Air Regulation
111 S. Magnolia Drive, Suite 4
Tallahassee, Florida, 32301
Telephone: (850) 921-9523
Fax: (850) 922-6979

Department of Environmental Protection
Northeast District Office
7825 Baymeadows Way, Suite 200B
Jacksonville, Florida 32256-7590
Telephone: (904) 807-3233
Fax: (904) 448-4363

The complete project file includes the Draft Air Construction Permit Modification, Technical Evaluation and the information submitted by the responsible official, exclusive of confidential records under Section 403.111, F.S. Interested persons may contact the Program Administrator for the South Permitting Section, Bureau of Air Regulation, at 111 South Magnolia Drive, Suite 4, Tallahassee, Florida 32301, or call 850/921-8968 for additional information. The draft permit modification as well as original permit and BACT determination and any other permitting actions to-date can be viewed at www.dep.state.fl.us/air/permitting/construction/suwannee.htm

Month day, 2005

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Tom Messer, Plant Manager
Suwannee American Cement
Post Office Box 410
Branford, Florida 32008

Re: DEP File No. 1210465-011-AC (PSD-FL-259F)
Production Increase, Fly Ash Injection, SNCR
Cement Plant – Branford, Suwannee County, Florida

Dear Mr. Messer:

The Florida Department of Environmental Protection ("the Department") reviewed your applications and subsequent submittals requesting a modification of the original air construction permit. The requests are to increase production capacity, inject fly ash into the calciner, and install a selective non-catalytic reduction (SNCR) system. The details of our review are discussed in the Technical Evaluation and Preliminary Determination issued on February 11, 2005.

This facility was originally authorized and constructed pursuant to Permit No. PSD-FL-259 issued on June 1, 2000. This permit action supplements Permit No. PSD-FL-259 and the changes dated November 8, 2002, January 16, 2003, May 6, 2003, October 18, 2004, and December 23, 2004 to that permit. Unless otherwise specified, this permit action does not alter any requirements of the original permit or its subsequent modification.

Additions are underlined; deletions are strikethrough.

SECTION III. EMISSIONS UNITS SPECIFIC CONDITIONS

SUBSECTION B.

STATE REQUIREMENTS

OPERATIONAL REQUIREMENTS

1. Fuels: Fuels fired in the pyroprocessing system (kiln and calciner) shall not exceed a total maximum heat input of ~~364~~ 458 million Btu per hour (mmBtu/hr) and shall consist only of natural gas, coal, petroleum coke, whole tires and tire derived fuel. Usage of tires and tire derived fuel shall be in compliance with the following limits and conditions:

   The remainder of Condition 1 is unchanged.

4. Process Rate Limitations: The kiln shall not process more than ~~178~~ 210 tons per hour of dry preheater feed and dry fly ash fed directly to the calciner ~~per hour~~ and shall not produce more than ~~105~~ 120 tons of clinker per hour. The facility shall not produce more than 150 tons of cement per hour. Process and production rates shall be further limited to ~~1,427,880~~ 1,684,578 tons of dry preheater feed and dry fly ash in any consecutive 12-month period, ~~839,500~~ 965,425 tons of clinker in any consecutive 12-month period, and 1,191,360 tons of portland cement in any consecutive 12-month period.

   The clinker production rate identified in the above paragraph shall be determined by the following equation:

   Clinker Production = [(Feed) (Kiln Feed LOI Factor) + (Fly Ash Injection) (Fly Ash LOI Factor)]

   Where:

   • Kiln feed is determined by the Poldos control system.

   • Fly ash is determined from the rotary feed system or equivalent.

   • LOI for the kiln feed and fly ash is based on a 30 operating-day block average of daily measurements. For purposes of this requirement, an operating day is any day that the kiln produces clinker or fires fuel.

   [Rule 62-210.200, F.A.C., Definitions - potential to emit (PTE)]

COMBUSTION AND PROCESS CONTROL TECHNOLOGY

11. Combustion and Process Control Technology: The owner or operator shall install and operate - multistage combustion, with a separate line combustion chamber at the precalciner, for control of NOx emissions. The owner or operator shall control emissions of CO and VOC through control of the combustion process. The owner or operator shall control emissions of SO_2 through design and control of the clinker production process.

    The owner or operator may install and operate a selective non-catalytic reduction (SNCR) system, including a tank, pumps, piping, and metering equipment to inject ammonia solutions (including ammonia < 19 percent strength, urea, etc.) between the lowest cyclone and the calciner to control NOx emissions. The ammonia injection rate shall not exceed 450 liters per hour (1-hour block for a solution containing 19% ammonia) in order to minimize ammonia emissions (slip). To demonstrate compliance, the owner or operator shall continuously monitor and record the ammonia injection rate.

    {Note: the maximum ammonia injection rate is equivalent to an NH_3/NOx molar ratio of 1.0 presuming baseline uncontrolled NO_X emissions of 4 lb/ton of clinker.}

    [Rules 62-4.070(3) and 62-212.400, F.A.C., and BACT]

14. Emissions Unit 002: Emissions unit 002 shall have the following emission points:

EMISSION POINT	DESCRIPTION
E-28	Dust collector – Aeropol at the homogenizing silo
E-34	Dust collector for off-spec feed handling
G-07	Dust collector for homogenizing silo inlet
H-08	Dust collector for homogenizing silo outlet
H-08A-01	Dust collector for hydrated lime silo E-30-01
U-02-01	Dust collector for fly ash silos U-01-01

This permit modification allows the use on a permanent basis of the following equipment for the injection of fly ash into the calciner: fly ash silos, baghouse, control system and associated ductwork. Fly ash may be injected into the calciner in addition to previously permitted introduction via the top of the preheater. The remainder of Condition 14 is unchanged

EMISSION LIMITATIONS AND PERFORMANCE STANDARDS

15. Emissions Unit 004: Emissions unit 004 shall have one emission point, the stack of the in-line kiln/raw mill, designated by the applicant as E-21. Particulate matter emissions from this emissions unit shall be controlled by a baghouse.

Emissions from emissions unit 004, the in-line kiln/raw mill, shall not exceed the following limits for the following pollutants: [Emissions from the natural gas fired air heater are included in the limits below]

POLLUTANT	EMISSION LIMIT		AVERAGING TIME	BASIS
PM	~~0.13~~ 0.11 lb/ton of dry preheater feed	23.1 lb/hour	3 hours [3]	BACT
PM_{10}	~~0.11~~ 0.093 lb/ton of dry preheater feed	19.6 lb/hour	3 hours [3]	BACT
SO_2	~~0.27~~ 0.20 lb/ton of clinker	~~28.4~~ 24.0 lb/hour	3 hours [4]	BACT
NO_X	2.9 lb/ton of clinker [1]	304.5 lb/hour [1]	24 hours [4]	BACT
	2.4 lb/ton of clinker [1]	288 lb/hour [1]	30 days [4]	
CO	~~3.6~~ 3.34 lb/ton of clinker	~~378.0 lb/hour~~ 400.3 lb/hour	3 hours [5]	BACT
VOC	0.12 lb/ton of clinker [2]	~~12.6 lb/hour~~ [2] 14.4 lb/hour [2]	30 days [6]	BACT
VE	10% opacity		6 minutes [7]	BACT

[1] NOx emissions shall not exceed 3.8 lb/ton of clinker and 399.0 lb/hour during the first 12 months after initial startup. After 12 months after initial plant startup, emissions of NOx shall not exceed the limits shown in the table. Emissions of NOx up to 600 lb/hr for up to one hour in duration shall be allowed for each startup of the pyroprocessing system which occurs when there is no material in the kiln.

Malfunction of the SNCR system is defined as any unavoidable mechanical and/or electrical failure that prevents introduction of ammonia-based solutions into the kiln system. In accordance with the following limits, the exclusion of NOx data collected during periods of malfunction and/or repair of the SNCR system is allowed when demonstrating compliance with the 24-hour NOx standard: no more than 6 hours per calendar day and no more than 30 hours in any 30 operating-day block. Within one working day of occurrence, the permittee shall notify the Department's Northeast District office of any malfunction of the SNCR system.

If SNCR is added, a permanent tank for the storage of ammonia-based solutions shall be installed. During construction of the permanent tank, temporary storage tanks may be used. An additional 4 hours of NOx data exclusion is allowed for each switch between temporary storage tanks. This 4-hour data exclusion is in addition to the data exclusion allowed above for each calendar day and for each 30 operating-day block. No more than 12 hours of NOx data in any 30

operating-day block shall be excluded due to switching between temporary tanks. Within one working day of occurrence, the permittee shall notify the Department's Northeast District office of each switch between temporary storage tanks. Once the permanent ammonia storage is complete, no NOx data shall be excluded due to switching between temporary tanks.

All valid NOx hourly averages shall be included into the 30 operating-day block average.

No changes in Note 2

[4] The averaging time for the short-term NOx limit shall be a 24-hour rolling average computed in accordance with specific condition 18 of this subsection. The averaging time for the long-term NOx limit shall be a 30 operating-day block average computed in accordance with specific condition 18 of this subsection. The averaging time for SO_2 shall be a 3-hour rolling average computed in accordance with specific condition 18 of this subsection.

No changes in Notes 5-7

[Note: These emission limits, along with annual production limits, effectively limit annual emissions to: PM, 92.8; PM10, 78.4; SO2, ~~113.4~~ 96.5; NOx, ~~1217.5~~ 1158.5; CO, ~~1511.1~~ 1610.1; and VOC, ~~50.4~~ 58.0 tons per year. First year NOx emissions are effectively limited to 1595.4 tons per year. NOx emissions are estimated assuming that two startups as specified occur per year, each resulting in maximum allowable excess emissions. Mercury introduced into the pyroprocessing system is limited pursuant to specific condition 13 of this subsection of this permit; annual emissions of mercury are effectively limited by this condition to 97 pounds per year.]

[Rules 62-4.070(3) and 62-212.400, F.A.C., and BACT]

The remainder of Condition 15 is unchanged

16. Emissions Unit 005: Emissions unit 005 shall have one emission point, the stack of the clinker cooler, designated by the applicant as K-15. Particulate matter emissions from this emissions unit shall be controlled by an electrostatic precipitator.

Emissions from emissions unit 005, the clinker cooler, shall not exceed the following limits for the following pollutants:

POLLUTANT	EMISSION LIMIT		AVERAGING TIME	BASIS
PM	~~0.07~~ 0.06 lb/ton of dry preheater feed	12.5 lb/hour	3 hours [1]	BACT
PM_{10}	~~0.06~~ 0.051 lb/ton of dry preheater feed	10.7 lb/hour	3 hours [1]	BACT
VE	10% opacity		6 minutes [2]	BACT

The notes and remainder of Condition 16 is unchanged

COMPLIANCE MONITORING AND TESTING REQUIREMENTS

18. **Continuous Emission Monitoring Systems**: The owner or operator shall install, calibrate, maintain, and operate a continuous emission monitoring (CEM) system in the in-line kiln/raw mill stack to measure and record the emissions of NO_X, SO_2, and VOC from the in-line kiln/raw mill, in a manner sufficient to demonstrate compliance with the emission limits of this permit. The CEM system shall express the results in units of pounds per ton of clinker produced, and pounds per hour.

    a. *Compliance Demonstration*: Compliance with the short-term emission limit for NO_X shall be based on a 24-hour rolling average that shall be recomputed after every valid hour as the arithmetic average of that hourly average and the preceding 23 valid hourly averages. Compliance with the emission limit for SO_2 shall be based on a rolling 3-hour average that shall be recomputed after every valid hour as the arithmetic average of that hourly average and the preceding two valid hourly averages. Compliance with the emission limits for VOC and long-term NOx shall be based on a 30 operating-day block average that shall be computed as the arithmetic average of all valid hourly averages occurring within each 30 operating-day block. For purposes of the VOC and long-term NOx limits, an operating day is any day that the kiln produces clinker and/or fires fuel.

    Conditions 18b through 18g remain unchanged.

    [Rule 62-4.070(3), F.A.C., and BACT]

    [Note: Continuous opacity monitor (COM) systems shall be installed, operated, and maintained at the kiln/raw mill baghouse stack and the outlet of the clinker cooler ESP pursuant to 40 CFR 60.63. A continuous emission monitor for emissions of total hydrocarbon is required pursuant to 40 CFR 63.1349 and 63.1350 ~~63.1450~~. A continuous monitor for the temperature at the inlet to the in-line kiln/raw mill baghouse is required pursuant to 40 CFR 63.1349 and 63.1350 ~~63.1450~~.]

SUBSECTION C.

OPERATIONAL REQUIREMENTS

2. Process Rate Limitation: The coal mill shall not crush more than ~~10,658~~ 13,360 tons of coal and petroleum coke in any month.
   [Rule 62-210.200, F.A.C., Definitions – potential to emit (PTE)]
   [Note: This monthly limit corresponds to an annual limit of ~~127,896~~ 160,300 tons per year.]

A copy of this letter shall be filed with the referenced permit and shall become part of the permit.

Any party to this permitting decision (order) has the right to seek judicial review of it under Section 120.68 of the Florida Statutes, by filing a notice of appeal under Rule 9.110 of the Florida Rules of Appellate Procedure with the clerk of the Department of Environmental Protection in the Office of General Counsel, Mail Station #35, 3900 Commonwealth Boulevard, Tallahassee, Florida, 32399-3000, and by filing a copy of the notice of appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The notice must be filed within thirty days after this order is filed with the clerk of the Department.

Executed in Tallahassee, Florida

Michael G. Cooke, Director
Division of Air Resource Management

CERTIFICATE OF SERVICE

The undersigned duly designated deputy agency clerk hereby certifies that this PERMIT MODIFICATION was sent by certified mail (*) and copies were mailed by U.S. Mail before the close of business on _____ to the person(s) listed:

Tom Messer, SAC*
Celso Martini, SAC*
Dan Fritz, SAC*
Joe Horton, SAC
Larry Sellers, Esq.*
Steve Cullen, P.E.
John Koogler, P.E.
Chris Kirts, DEP NED
Jim Little, EPA
John Bunyak, NPS
Frank Darabi, P.E

Jim Stevenson, DEP
Tom Workman, DEP
Mark Latch, DEP
December McSherry
Svenn Lindskold
Tom Greenhalgh*
Dave Bruderly
Chris Bird, Alachua Co. DER
Chair, Alachua Co. BCC*
J. Calvin Gaddy

Patrice Boyes, Esq.*
Kathy Cantwell
Ralph Ashodian
Virginia Seacrist
Bob and Lynn Milner
Linda Pollini
Helen Beaty
Bessie Robinson
Craig Pittman, St. Pete Times
Chuck Yagel*

Clerk Stamp

FILING AND ACKNOWLEDGMENT FILED, on this date, pursuant to §120.52, Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

_____ _____
(Clerk) (Date)

TECHNICAL EVALUATION

AND

PRELIMINARY DETERMINATION

SUWANNEE AMERICAN CEMENT, LLC
BRANFORD, SUWANNEE COUNTY

Portland Cement Manufacturing Facility
Permit Modification to Increase Production, Inject Fly Ash into Calciner
Install a Selective Non-Catalytic Reduction System

DEP File Nos. 1210465-011-AC (PSD-FL-259F)

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

February 16, 2005

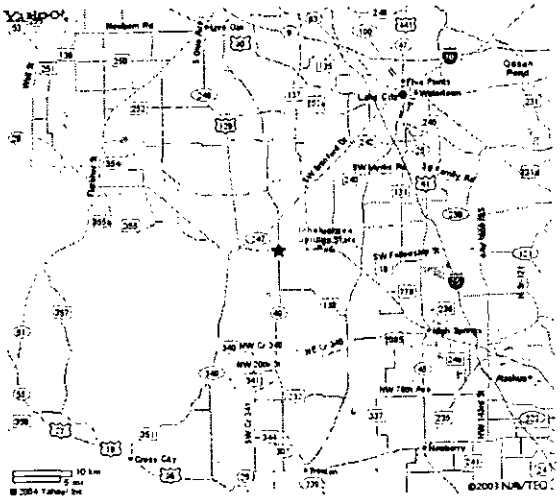
I. APPLICANT NAME AND ADDRESS

Suwannee American Cement LLC
Post Office Box 410
Branford, Florida 32008
Authorized Representative: Mr. Celso Martini, Plant Manager

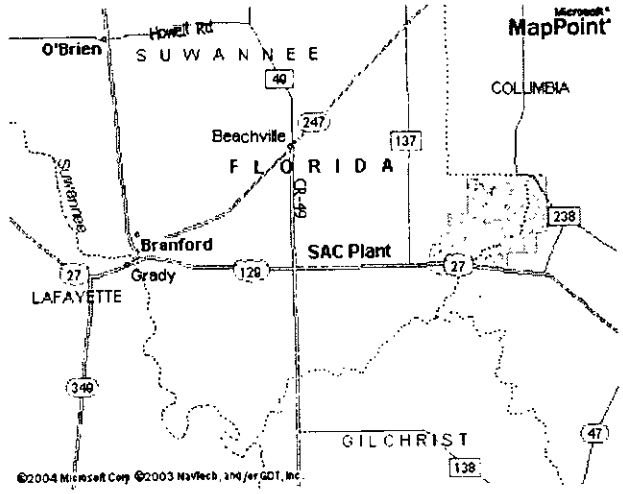
II. FACILITY INFORMATION

A. FACILITY LOCATION

Suwannee American Cement, LLC (SAC), owns and operates the cement plant located at U.S. Highway 27 and County Road 49 in Branford, Suwannee County. The UTM coordinates of the facility are Zone 17; 321.4 km East and 3315.9 km North.



Regional Map Showing Branford Area



Suwannee American Cement Plant Location

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

SAC's Cement Plant 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 it to applicability review for the requirements of Prevention of Significant Deterioration (PSD) per Rule 62-212.400, F.A.C. Accordingly, the original SAC project was subject to New Source Review (NSR) including the PSD provisions and requirement to conduct a determination of Best Available Control Technology (BACT).

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-specific regulations and permit specific conditions. 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.

III. ORIGINAL PROJECT

The Florida Department of Environmental Protection ("Department") issued a permit to SAC in June 2000 to construct the existing facility. The plant employs the modern dry process technology including a preheater and calciner (PH/C kiln) along with indirect firing.

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 by truck.

The following diagram is of a PH/C kiln that approximates the one installed at SAC.

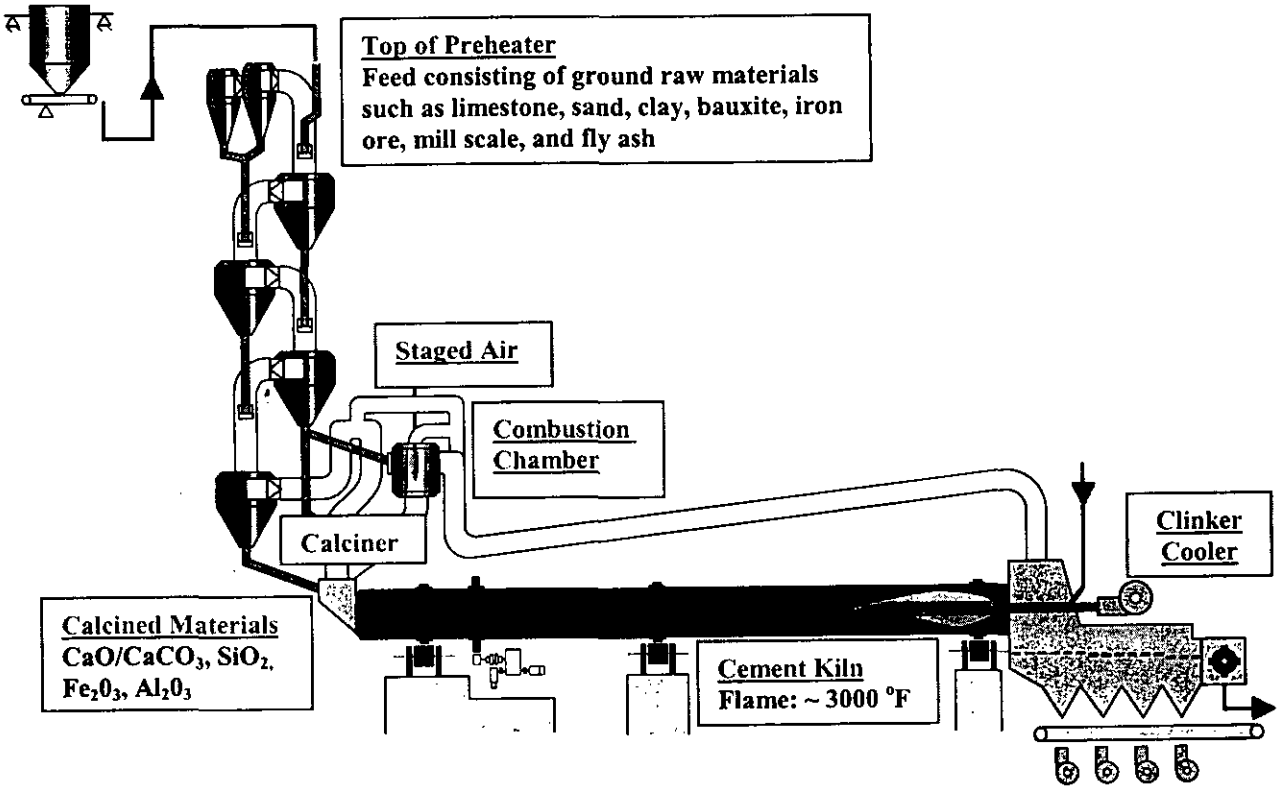


Figure 1. Diagram of Dry Process Cement Kiln with Preheater and Staged Air Calciner

Raw meal is finely divided dried material that includes sources of calcium, silica, iron and aluminum. These sources can include limestone, sand, clay, bauxite, iron ore, mill scale, and fly ash. It is continuously weighed on feed scales and introduced at the top of the preheater tower as shown in the diagram. As it falls through the preheater it is contacted and progressively heated by exhaust gases from the calciner and kiln.

The calciner has a burner in a separate combustion chamber that provides the necessary heat to drive off carbon dioxide from the limestone converting it to free lime ($CaCO_3 = CaO + CO_2$). The calciner operates at a temperature of approximately 2000 degrees F and burns coal.

The calcined materials enter the kiln where they are further heated and transformed into nodules of clinker. These exit the kiln near the main kiln coal burner that operates at approximately 3000 °F. The clinker falls into the cooler where it is cooled by ambient air.

The heated air from the clinker cooler is used as secondary air to support combustion at the kiln burner and is also conveyed along a tertiary air duct to support combustion in and near the calciner combustion chamber.

Cooled exhaust gases leaving the preheater go through the raw mill (not shown) where the remaining heat is used to dry incoming coarse raw materials. As the raw materials are ground they are lifted by the exhaust gas flow and conveyed to the main baghouse (not shown) that also serves the purpose of a particulate control device. The finely divided dry material in the baghouse is conveyed to storage silos and then weighed and introduced into the process at the top of the preheater as discussed above.

The facility has been constructed and began operation in February 2003. Several photographs of the plant are shown below. SAC has conducted compliance tests and applied for a Title V Operation Permit. At this time, it is operating at or near its full capacity.

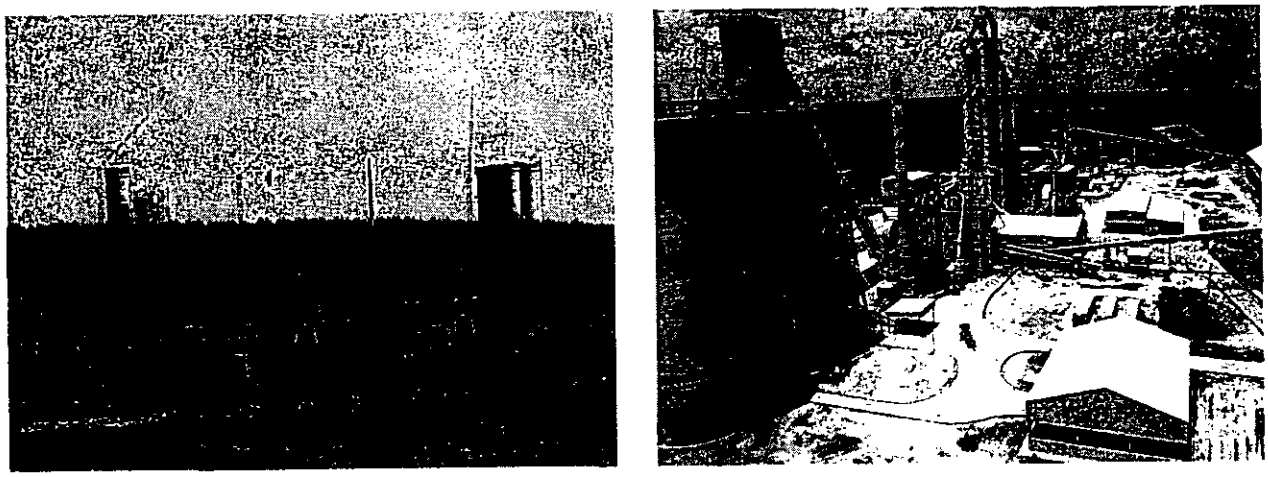


Figure 2. Photographs of Cement Plant Under Construction and Completed Cement Plant

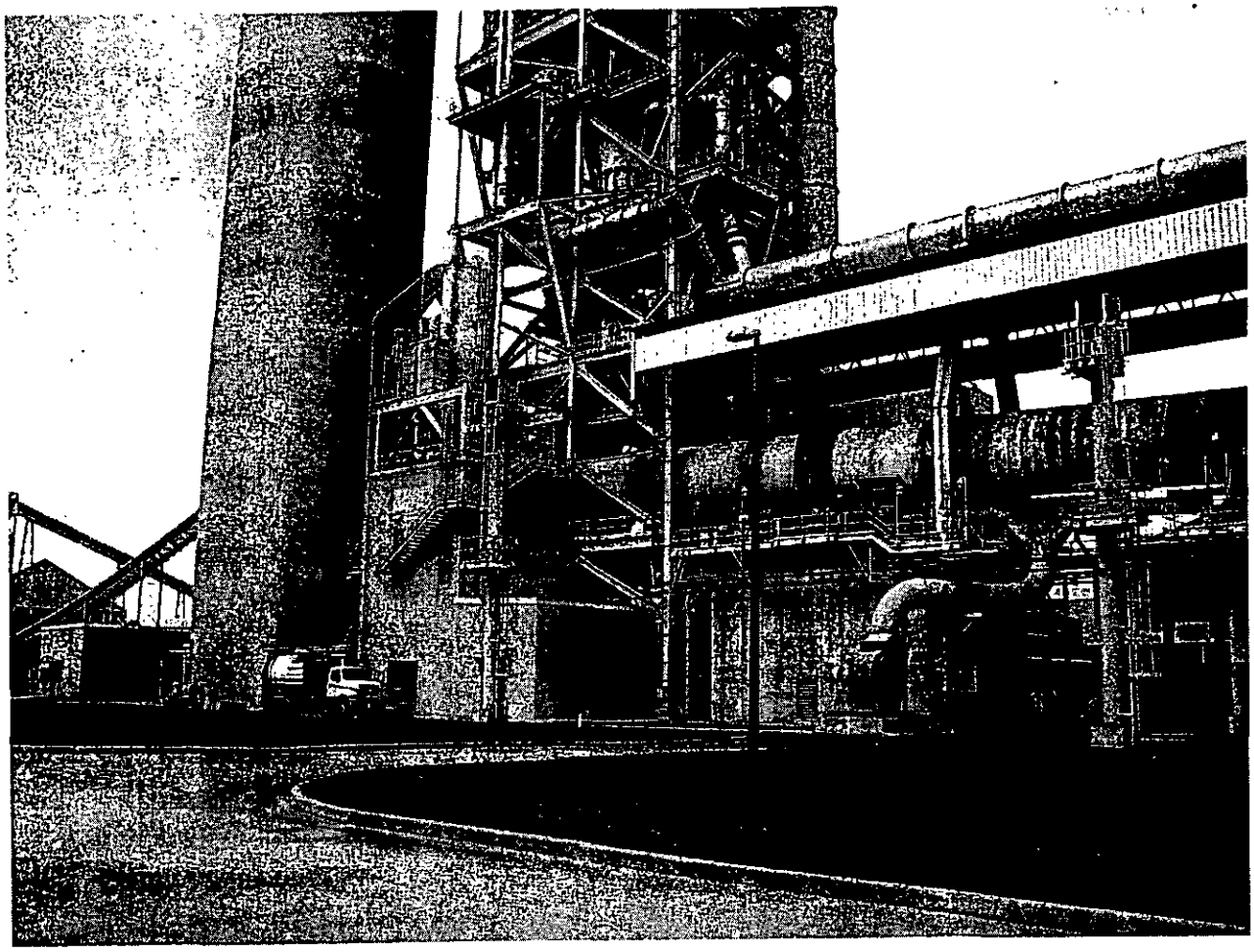


Figure 3. Kiln Inlet, Main Stack, Lower Preheater, Calciner, and Tertiary Air Ducts

IV. ADDITIONAL PROJECTS

SAC requested an air construction permit to:

- Add capability to introduce fly ash directly to the calciner in addition to the top of the preheater; and
- Increase clinker production.

The Department advised SAC that it will be necessary to conduct tests to demonstrate the efficacy of fly ash introduction to the calciner and higher production while meeting the Department's emission limitations. The Department issued a permit to SAC on September 24, 2004 to conduct production testing during 120 operating days over a six month period.

Subsequently, SAC requested to test ammonia injection for the purpose of additional flexibility to control nitrogen oxides (NO_X). The Department issued a permit to SAC on October 5, 2004 to temporarily install a selective non-catalytic reduction system (SNCR) to conduct tests in conjunction with the production capacity tests.

V. FLY ASH INJECTION

Fly ash is the finely divided residue from the combustion of ground or powdered coal and is usually obtained from electric power plants. Typical fly ash contains silica, aluminum, and iron compounds and even some calcium. High quality fly ash (for example low in ammonia and carbon) can be substituted for cement in certain types of concrete. Fly ash can also be used as a raw material in lieu of other potential sources such as clay, sand, bauxite, iron ore, etc.

Fly ash is currently mixed with the other raw materials prior to being dried and ground to form the feed. The fly ash constitutes approximately 8-10 percent of the material mix and helps to provide the chemical composition of kiln feed required to produce clinker.

SAC presently introduces fly ash with the rest of the feed at the top of the preheater tower where the temperature is in the range of 750-800°F. From that point, the feed travels downward through the preheater tower, increasing in temperature until it reaches the calciner where the temperature is in the range of 1500 to 1700 °F. During the progression of the feed down through the preheater, carbonaceous material in the fly ash can volatilize and cause the release of organic compounds (THC/VOC) and carbon monoxide (CO) to the atmosphere.

SAC proposes to inject fly ash directly into the calciner where the carbonaceous material can be completely combusted along with the fuel fired to the calciner. SAC believes that more complete combustion of the carbonaceous material will occur while still contributing the mineral components of the fly ash. Therefore less THC, VOC, and CO will be produced, and the emission of these gases to the atmosphere will be minimized.

Additional silos are required to store and introduce fly ash into the calciner. Following is the layout and a picture of work in progress that was authorized during the test program.

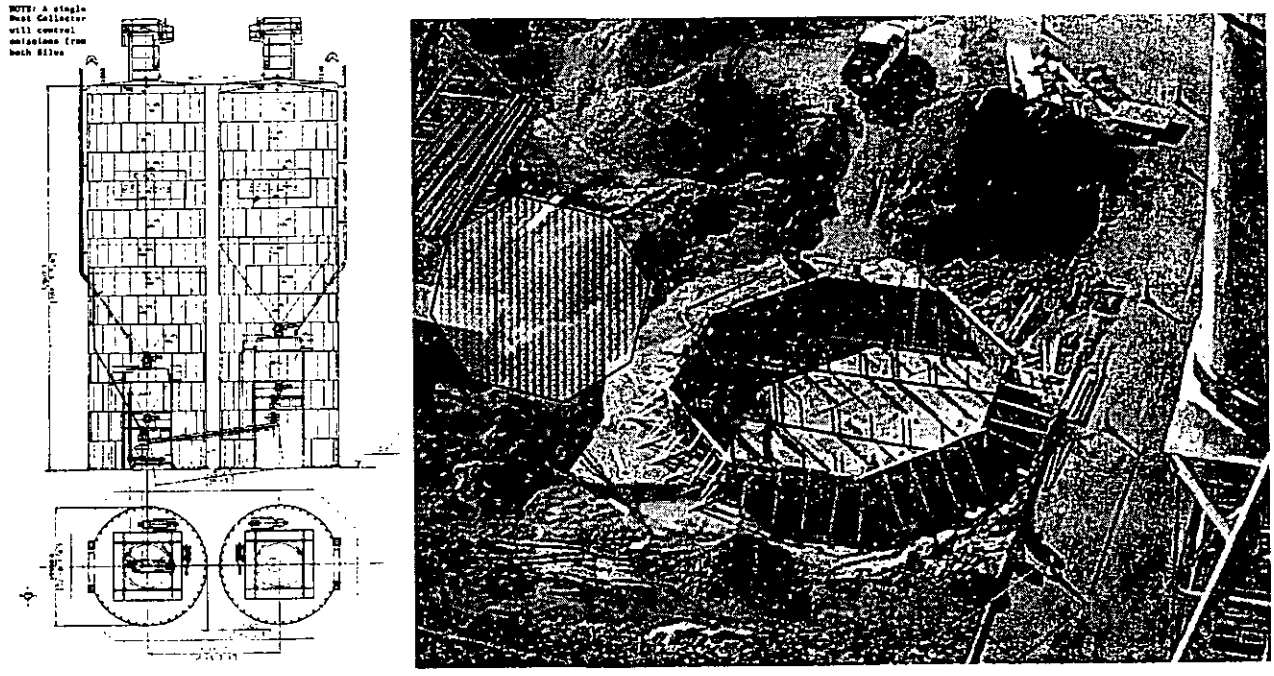


Figure 4. Diagram of Fly Ash Silos. Sites of Approved and Proposed Additional Silo

VI. PRODUCTION INCREASE

The existing permit limits the introduction of feed at the preheater to 178 tons per hour (TPH), clinker production to 105 TPH, and fuel use to 364 million Btu heat input per hour (mmBtu/hr). SAC requests to increase the feed rate to 210 TPH (including fly ash feed to the calciner), increase clinker production to 120 TPH of clinker and fuel use to 458 mmBtu/hr.

Increasing clinker production requires various physical projects or operational improvements. The increases can be facilitated by inherent manufacturer overdesign of equipment such as burners, fans, the kiln, cooler, etc. Otherwise such equipment must be upgraded. The issue of inherent overdesign was addressed by Mr. Mark Terry, the president of Polysius USA; the company that supplied the pyroprocessing system to SAC. Mr. Terry's letter dated December 12, 2004 states: [1]

> "As you are well aware, our plant engineers are generally quite conservative in our design and are so to enable us to quickly achieve our guaranteed figures. It is quite normal, as plant operators become more familiar with the equipment and raw materials, that they find ways to operate their new plants at capacities up to 20% in excess of the normal capacity rating. Indeed, your plant could be safely operated to achieve capacities up to 2,850 by refining your mix and your operating procedures. In fact, I believe you have even demonstrated and sustained this capacity here recently (under DEP approved capacity testing program)*. For throughput increases beyond the 2,850 stpd clinker, I can assure you that the pyro system is designed to *mechanically* withstand higher throughput rates. In specific terms, the tower structure is designed for catastrophic process conditions whereby the normal cyclone loads are considered plus the possible plugging of the largest cyclone. Your system of course is protected by the gamma detector levels in the lower cyclone stages. *(parenthetical note added by DEP)
>
> "The kiln itself is stout enough to mechanically handle up to a 10% fill level in the inlet zone and up to 15% in the hotter sections. This is of course a function of material density and kiln speed. You have ample flexibility in the design of the drive system to achieve kiln speeds in excess of 4.0 rpm. The clinker cooler will also mechanically support and convey clinker beyond the 2,850 stpd, but at increased outlet temperatures since the specific grate loading is quite high.
>
> "In summary, the system you have at your Branford facility can indeed safely handle capacity increases up to 20% above the nominal rating and even beyond; however I cannot speak to the quality of the product. I leave that to you and your proven skills at mix optimization and plant operation."

By injecting fly ash directly into the calciner instead of introducing it into the raw mill and ultimately at the top of the preheater, it is possible to increase the amount of limestone and other raw materials entering the process. That is the key to the proposed production increases at SAC. The second relates to changes in the NO_X control strategies that presently make it difficult to sustain even the present production rate without operational difficulties.

VII. SELECTIVE NON-CATALYTIC REDUCTION

The selective non-catalytic reduction (SNCR) project is for the purpose of NO_X control. This technology is already in use at numerous power plants and waste-to-energy facilities in the United States. Although there is a lot of recent experience with application of SNCR to cement plants in

Europe, there is little experience with this technology in the United States. Prior to reviewing the technology, it is useful to describe the original NO_X control strategy at SAC.

Present Staged Combustion NO_X Technology at Suwannee American Cement

The process design shown in Figure 1 is an example of *staged air* combustion practiced as practiced at SAC. The calciner burner is vertically oriented in a separate combustion chamber of the type typically used to burn difficult fuels such as petroleum coke. In this case it is used to burn calciner fuel in a reducing atmosphere to destroy NO_X contained in the kiln exhaust.

Exhaust gas leaving the kiln is characterized by excess air and high temperature that is less than required to sinter cement but greater than required to calcine raw meal.

Equation 1. Calcination of limestone occurs at approximately 900 degrees Celsius (°C) and liberates carbon dioxide to produce lime according to the following endothermic reaction:

$$CaCO_3 \rightarrow CaO + CO_2$$

This reaction tends to rapidly cool the kiln exhaust gas. The additional heat supplied by the calciner burner(s) and tertiary air sustains the reaction. This tends to limit the temperature of exhaust gases in and leaving the calciner to temperatures less than 900 °C. Combustion in the calciner proceeds as follows.

Equation 2. Fuel, such as a volatile coal, is heated and pyrolyzed releasing hydrocarbon radicals. These, in turn, *catalytically* react with NO to form hydrogen cyanide according to:[2]

$$CHi^* + NO \rightarrow HCN + ...$$

Where:

$i = 1, 2, 3$

Equation 3. Ammonia-like radicals are also released during pyrolysis and, under reducing conditions in the presence of raw meal, destroy NO according to:[3]

$$NHi^* + NO \rightarrow N_2 + ...$$

This reaction suppresses formation of NO by the pyrolyzed fuel nitrogen and reduces NO_X in a manner that looks similar to the mechanisms of SNCR and SCR.

Other reactions involving carbon monoxide (CO) or hydrogen (H_2) are also *catalytically* driven and destroy NO_X in this reducing atmosphere. In the subsequent burning of soot and char, the NO_X reducing reactions proceed much more slowly and some of the remaining fuel nitrogen can form additional NO_X.

The source cited for Equation 2 states, "the temperature is kept between 925-1050 °C or as high as possible without getting any encrustations in the kiln riser and the reduction zone". The source of Equation 3 states, "to maximize the reduction potential, the temperature is maintained as high as possible in the reducing zones ..... the reducing atmosphere is initiated in the kiln inlet housing where the temperature is 1150 °C, or more". Thus it is not enough to specify Staged Combustion in the Calciner (SCC) or MSC, or Low NO_X Calciner. What is actually sought is SCC with high temperature raw meal catalysis in a reducing atmosphere. Therefore SCC for NO_X reduction must specify or qualify the conditions under which it will operate.

Interactions Between SCC and the Internal Sulfur Cycle

Sulfur dioxide (SO_2) formed by burning fuel in the main kiln burner can be efficiently scrubbed out by reactions with alkali species (Na and K) or with CaO in the kiln to form stable sulfate compounds that are incorporated into the clinker.

Equation 4. Kiln SO_2 reaching the calciner and all SO_2 from burning fuel in the calciner are completely scrubbed out at the temperatures prevailing in the calciner as follows: [4]

$$CaO + SO_2 \leftrightarrow CaSO_3 \text{ or } CaO + SO_2 + 0.5O_2 \leftrightarrow CaSO_4$$

At 1,045°C, the formation and decomposition reactions for $CaSO_4$ are at equilibrium at normal oxygen levels. At higher temperatures, $CaSO_4$ will tend to decompose. As raw materials move through the high temperature regime in the kiln, the $CaSO_4$ can break down per the above reaction releasing the SO_2 or it can fuse/react with the alkali sulfates and other species to form stable compounds that depart with the clinker.

The concentrations and flows of SO_2 build up within the internal cycle of the kiln and calciner. One of the key design and operational objectives is to manage this cycle so that solid sulfur containing compounds do not form coatings and blockages. According to one author, "NO_X abatement rates of up to 50 percent can generally be achieved with staged combustion. However the processes are critical with high circulating sulfur and alkali systems in conjunction with the reducing mode of operation and the operation can be seriously affected by the formation of coating".[5]

If there is already insufficient alkali to balance the sulfur in the system, the recirculating flow of SO_2 is greater. The graphic and the microscopic photo in Figure 5 are from a Taiyeho Cement presentation, and depict the formation of coating that might result under such circumstances whether or not reducing conditions are not encountered in the calciner.[6] The last photo is from the kiln inlet at SAC. Reducing conditions do not necessarily increase SO_2 emissions but can create considerable process problems due to sulfate deposits at the kiln inlet, in the riser duct, and cyclones.[7] Creating a higher temperature near the kiln inlet to promote NO_X reduction would tend to release SO_2 per the above reactions or could cause sintering of the coatings. Also it could cause or aggravate coating tendencies in the riser and lower cyclones.

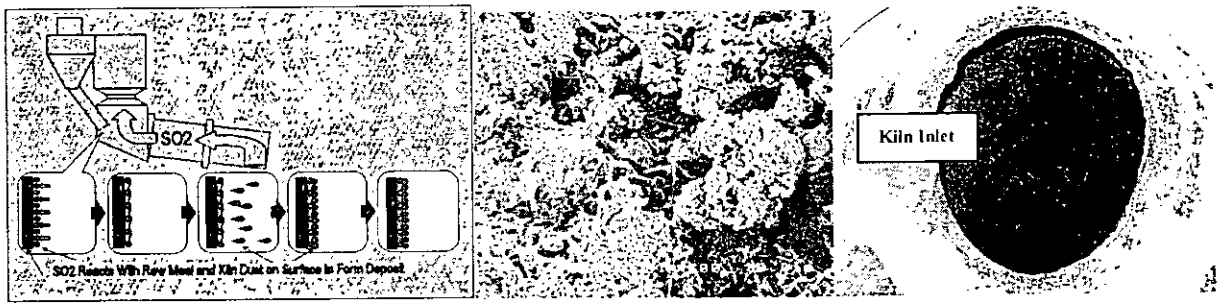


Figure 5. Coating Formation near Kiln Inlet and Microscope Photo. Nearly Choked Kiln Inlet.

Raw materials in Florida are low in alkali and sulfur. Because of sulfur in the coal, there can easily be an imbalance between the two species. SAC partially copes with coating problems by use of air cannon and cardox charges to free plugs and blockages caused by such coatings.

Mechanisms of Selective Non-Catalytic Reduction (SNCR)

Ammonia (NH_3) in the form of ammonia water or urea is injected at a point in the process characterized by a suitable temperature window between 850 and 1050 °C depending on residence time, turbulence, oxygen content, and a number of other factors specific to the given gas stream. SNCR destroys NO_X by a two-step process as follows:

Equation 5. Ammonia reacts with available hydroxyl radicals to form amine radicals and water per the following theoretical equation:

$$NH_3 + OH^* \rightarrow NH_2^* + H_2O$$

Equation 6. Amine radicals combine with nitrogen oxides to form nitrogen and water.

$$NH_2^* + NO \rightarrow N_2 + H_2O$$

Equation 7. The two steps are typically expressed as a single "global reaction".

$$4NO + 4NH_3 + O_2 \rightarrow 4N_2 + 6H_2O$$

The simplified equation does not convey the kinetics. But it suggests that, theoretically, SNCR will function best in an oxidizing atmosphere.

Equation 8. In a reducing atmosphere, CO competes with ammonia for available OH radicals

$$CO + OH^* \rightarrow CO_2 + H^*$$

Figure 6 shows that the necessary temperature window exists at least between the kiln inlet and the bottom cyclone that receives the exhaust from the calcination section. The physical extent of the window for oxidizing conditions depends on the damper positions for the tertiary air branches for the shown calciner design. In selecting a level (or levels) for ammonia injection there must be some optimization of temperature and oxygen.

Based on the foregoing, ammonia should be injected after introduction of tertiary. There may also be favorable injection points closer to the kiln inlet if oxidizing conditions exist in the calciner.

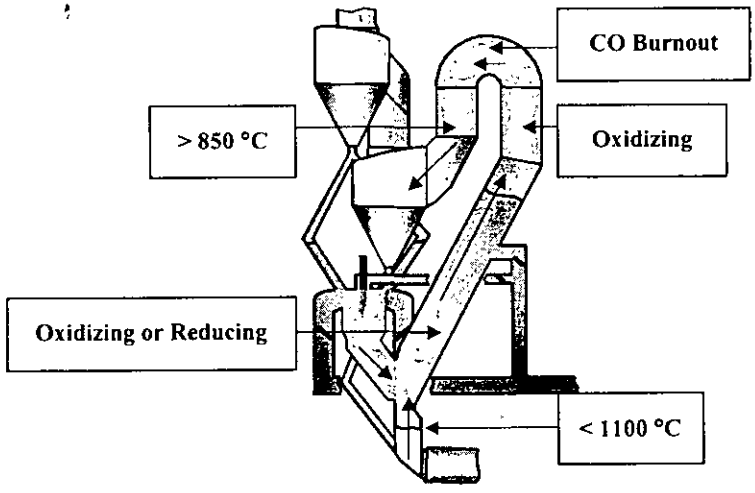


Figure 6. Temperature and Oxidizing Windows for SNCR in a Staged Combustion Calciner.

SNCR Testing at SAC

Following the experiences with plugging while achieving low NO_X limits by staged combustion, SAC obtained a permit from the Department to conduct SNCR tests. During part of the program ammonia injection was conducted while operating in conjunction with staged combustion in a reducing atmosphere. SAC also decided to test SNCR with the SCC calciner operating in an oxidizing atmosphere. The tests were conducted in November 2004. Some of the equipment used is shown in the following figure:

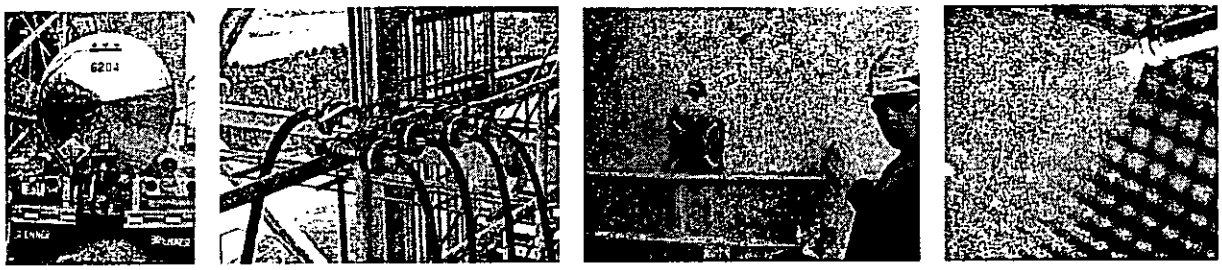


Figure 7. Ammonia, Compressed Air, One of Four Ports, Environmental Director, Injector(s)

Not shown is the metering system or the additional continuous emission monitoring equipment. Referring back to Figure 6, four ports were installed after the bend in the duct work following the top air injection branch for tertiary air.

Figure 8 is a graph of the clinker production time series. The series on the left hand side reflects operation of the kiln under staged combustion with a reducing atmosphere. The one on the right hand side reflects operation of staged combustion with an oxidizing atmosphere.

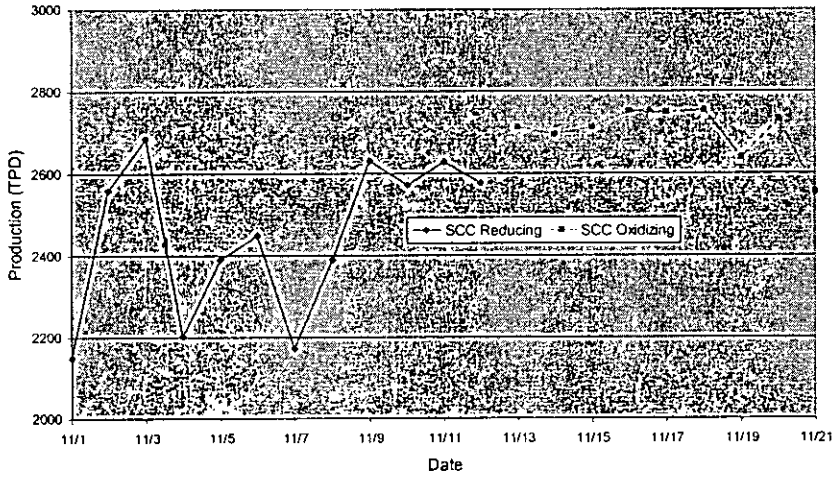


Figure 8. Production Time series During SNCR Tests at SAC. November 2004.

Operating the calciner in an oxidizing atmosphere rather than a reducing atmosphere caused less coating formation, plugging and stoppages. Daily production was sustained at a significantly higher level by operating the calciner in an oxidizing atmosphere. In fact SAC was able to sustain the 115 TPH clinker rate authorized by the test permit. It is clear that operating the calciner in an oxidizing rather than a reducing atmosphere and use of SNCR to maintain low NO_X values are two important measures demonstrated to increase production with the pyroprocessing equipment provided by the manufacturer.

SAC has proposed a long term NO_X limit of 2.4 lb/ton on a 30 day basis while maintaining the present limit of 2.9 lb/ton on a 24-hour basis. The present limit is already attained by staged combustion in a reducing atmosphere and was readily attained by SNCR whether or not the calciner was operated in an oxidizing or reducing atmosphere. The requested NO_X limit can also be achieved using staged combustion in a reducing atmosphere and without SNCR. However, the production problems previously discussed would make it difficult to achieve and maintain the present clinker production limit.

Use of the SNCR system can facilitate use of the combustion chamber to burn petroleum coke blends as already allowed while meeting permitted NO_X limits. SNCR without staged combustion in a reducing atmosphere and combined with the fly ash injection into the calciner will allow SAC to achieve greater production in a manner consistent with the manufacturer's statement.

VIII. MEASURED EMISSIONS DURING PRODUCTION TESTS

SAC monitored their emissions of NO_X, SO_2, VOC (THC), and CO continuously using their CEMS or process monitors. The following table is a summary of their emissions for various clinker production rates during the second half of October and early November 2004. For reference, the present clinker production rate is 105 TPH except for this testing program.

Table 1. Summary of Emissions for Different Production Ranges at Suwannee American Cement

	Clinker Production		
	75 to 105 Tons per Hour	105 to 110 Tons per Hour	110 to 115 Tons per Hour
Valid Operating Hours	194	173	98
NO_X Limit (lb/hr)	**304.5**	**304.5**	**304.5**
Avg. NOx (lb/hr)	243.1	232.8	240.6
NO_X Limit (lb/ton)	**2.9**	**2.9**	**2.9**
Avg. NOx (lb/ton)	2.47	2.17	2.13
SO_2 Limit (lb/hr)	**28.4**	**28.4**	**28.4**
Avg. SO_2 (lb/hr)	2.138	2.436	1.764
SO_2 Limit (lb/ton)	**0.27**	**0.27**	**0.27**
Avg. SO_2 (lb/ton)	0.022	0.023	0.016
THC Limit (lb/hr)	**12.6**	**12.6**	**12.6**
Average THC (lb/hr)	7.022	8.033	7.730
THC Limit (lb/ton)	**0.12**	**0.12**	**0.12**
Avg. THC (lb/ton)	0.072	0.075	0.069
Avg. CO (ppm)	460	545	368

The data show that SAC can comply with the present and the proposed permitted emission limits at production rates greater than permitted. There are no meaningful differences at the various production rates on a long term averaging basis with the exception of NO_X. It actually appears that emissions are reduced on the basis of lb/ton of clinker. This observation is consistent with recent tests conducted at Rinker Cement in Miami.

Based on Condition 12 of the facility construction permit, the Department may adjust NO_X and SO_2 values on the basis of CEMS data.

The data show that a NO_X lower value can be achieved in the long term. The Department will set a 30-day limit of 2.4 lb/ton to be achieved by the present staged combustion technology but will leave the present 24-hour limit of 2.9 lb/ton unchanged. SAC is allowed to install the SNCR system as an additional control option and to help provide more stable kiln operation and production.

The Department will lower the 3-hour SO_2 limit from 0.27 to 0.20 lb/ton. This is sufficient to make this kiln a minor source of SO_2.

IX. 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 in conjunction with the fly ash project is a physical and operational change. It also 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 2. 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 plant started up in February 2003, but only operated 2,458 hours that year due to low demand. Work on the pyroprocessing system to achieve the present NO_X limit of 2.9 lb/ton of clinker (previously 3.8 lb/ton of clinker) was completed in February 2004 when operation of the staged air combustion system under a reducing atmosphere was implemented. The Department does not consider the operation prior to February 2004 to represent "normal operation under the present configuration and emission limits." The subsequent 11 months are not considered by the Department as sufficient to establish normal operation for this project. Therefore the Department will not rely upon emissions that occurred during the two-year period since startup of the kiln 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.

X. PROPOSED EMISSION LIMITS

The following table lists the proposed technology based limits and annual emission estimates for comparison with the previously listed limits and to determine PSD applicability.

Table 2. Proposed Emissions – Suwannee American Cement, Branford, Suwannee County

Pollutant	Allowable Emissions (2003)		Allowable Emissions (2004)		Future Emissions (2005 beyond)		TPY Change from Allowable Emissions [1]		SER
	lb/ton [2]	TPY	lb/ton [2]	TPY	lb/ton [2]	TPY	2003	2004	TPY
PM (kiln)	0.13	93	0.13	93	0.11	93	0	0	25
PM_{10} (kiln)	0.11	78	0.11	78	0.093	78	0	0	15
PM (cooler)	0.07	50	0.07	50	0.06	51	0	1	25
PM_{10} (cooler)	0.06	43	0.06	43	0.05	42	0	-1	15
SO_2 (kiln) [3]	0.27	114	0.28	114	0.20	97	0	-17	40
NO_X (kiln) [4]	3.80	1595	2.90	1218	2.9/2.4	1159	-436	-59	40
CO (kiln)	3.60	1511	3.60	1511	3.34	1610	0	+99	100
VOC (kiln)	0.12	50	0.12	50	0.12	58	0	+8	40

[1] Change compared to allowable annual emissions in place during 2003 and to the present allowable annual emissions (effective 2004) for comparison with Significant Emission Rates (SER) listed in Table 212.400-2, F.A.C.

[2] Figures represent lb/ton of preheater feed for PM/PM_{10} and lb/ton clinker for NO_X, VOC, SO_2 and CO.

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

[4] Future annual NO_X emissions are based on a new limit of 2.4 lb/ton (30 operating-day block average) determined on continuous monitoring data covering the period February 2004 – January 2005. Present 24-hour limit is maintained as 2.9 lb/ton clinker.

XI. PSD AND BACT APPLICABILITY DETERMINATION

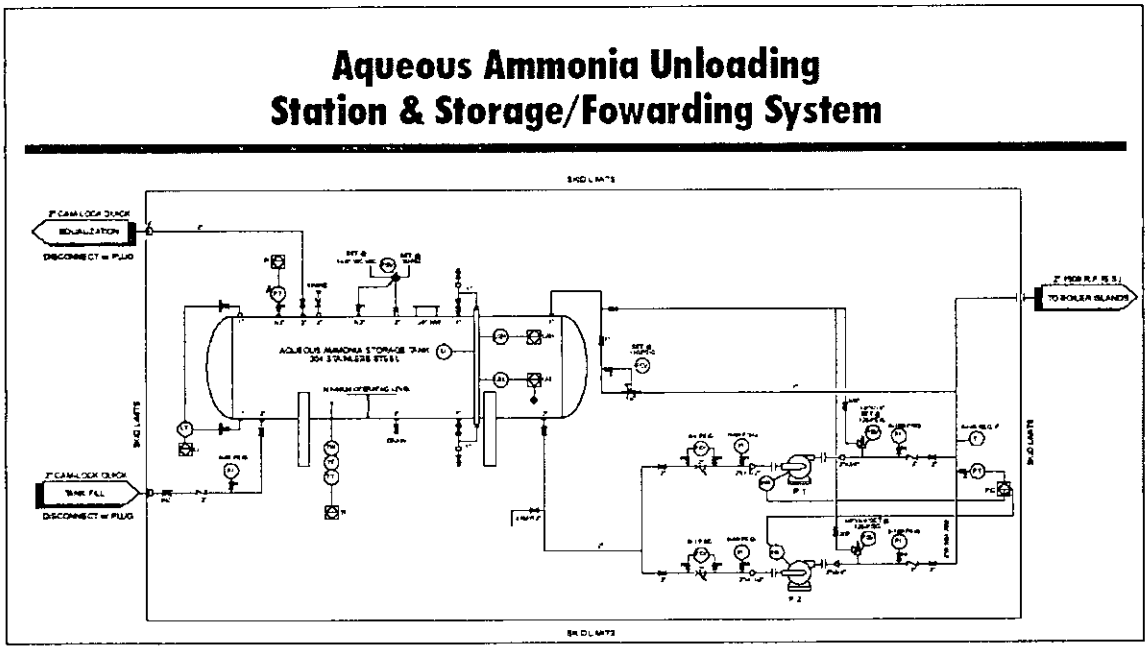
The Department concludes that there will not be a significant net emissions increase associated with the proposed production increase. Therefore PSD does not apply and another BACT determination is not required. Although a new BACT determination is not required, the revised limits proposed in conjunction with the production increase are all at least as stringent on a lb/ton basis as previous BACT determinations for the plant. Additionally, the values are more stringent than the determinations made throughout the country for new cement plants since the permitting of the SAC facility.

The Department notes this PSD applicability determination applies strictly to the facts and circumstances of this project. The Department makes these determinations on a case-by-case basis.

XII. SPECIAL CONDITIONS FOR SNCR

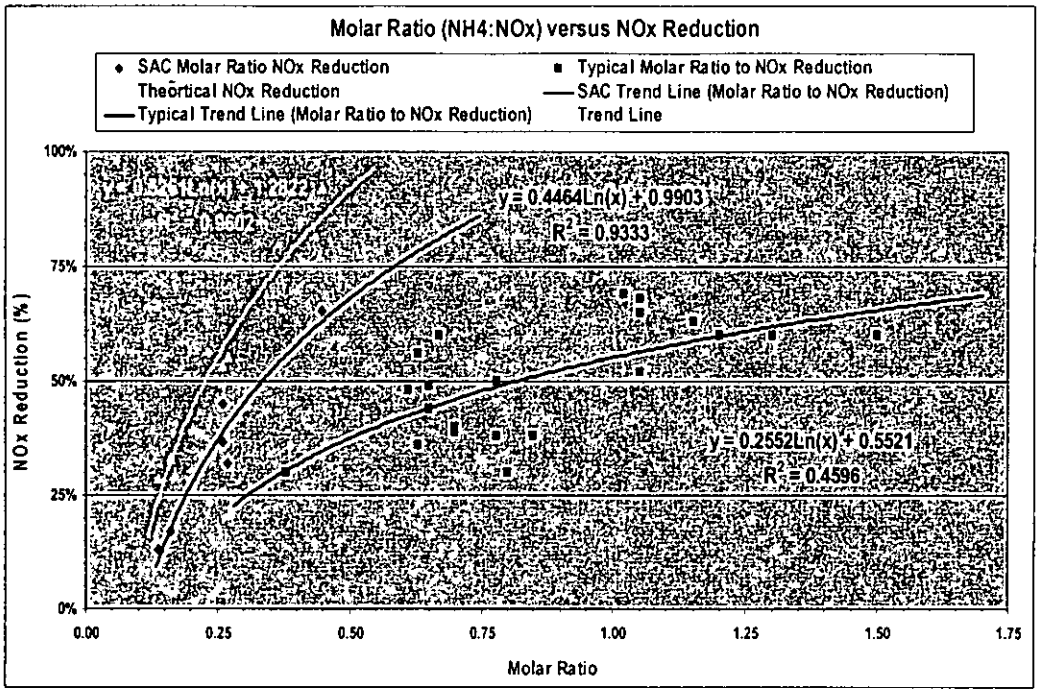
Use of SNCR to control NO_X can cause NH_3 emissions. NH_3 is not listed as a PSD pollutant or as a hazardous air pollutant (HAP). It is regulated under the Clean Air Act Section 112r when it is stored in concentrated form (20% or more by weight). NH_3 can contribute to formation of particulate emissions emitted from processes and to particulate formation in the environment. Therefore the Department typically limits emissions of NH_3 in PSD permits.

The following diagram shows the key pieces of gear needed for the permanent NH_3 solution storage and piping. Initially SAC will use tanker trucks for storage.



NH_3 emissions are normally low when used to control NO_X under the proper conditions (e.g. temperature, oxygen, CO, reaction time, etc.) as long as no more NH_3 is injected than the theoretical amount needed to react with all NO_X. The complete reaction is theoretically possible when one mole of ammonia is used for every mole of NO_X in the exhaust gas stream (molar ratio ($NH_3/NO_X = 1$).

The following figure was provided by SAC. It demonstrates that at SAC, there is excellent utilization of NH_3.



According to the curve for SAC, the molar ratio required to reduce uncontrolled NO_X emissions from 4 lb/ton to 2.4 lb/ton (40%) is roughly 0.25. SAC and the Department are evaluating the reasons why such a low molar ratio is required to achieve such a high reduction. There may be some synergistic effects related to CO increases when NH_3 solutions are used.

Because SO_2 emissions are minimal from cement kilns in Florida, very little particulate matter can be formed by reaction with excess NH_3 emissions (slip). Although there is no reason to inject as much NH_3 as it takes to react with all NO_X, the Department will limit the maximum NH_3 injection rate to that level. Therefore NH_3 use will be limited to a molar ratio of 1.0. This equates to 250 liters per hour of 19% ammonia solution.

SAC will use the SNCR at its option and is still required to retain the staged combustion calciner and the capability of operating in a reduced atmosphere in accordance with the original permit. SAC has requested data exclusion for malfunctions related to the SNCR system or when they switch NO_X control strategy from SNCR to staged combustion with a reducing atmosphere.

The following provision is proposed in Section III, Condition 15 of the accompanying draft permit modification:

Malfunction of the SNCR system is defined as any unavoidable mechanical and/or electrical failure that prevents introduction of ammonia-based solutions into the kiln system. In accordance with the following limits, the exclusion of NO_X data collected during periods of malfunction and/or repair of the SNCR system is allowed when demonstrating compliance with the 24-hour NO_X standard: no more than 6 hours per calendar day and no more than 30 hours in any 30 operating-day block. Within one working day of occurrence, the permittee shall notify the Department's Northeast District office of any malfunction of the SNCR system.

If SNCR is added, a permanent tank for the storage of ammonia-based solutions shall be installed. During construction of the permanent tank, temporary storage tanks may be used. An additional 4 hours of NO_X data exclusion is allowed for each switch between temporary storage tanks. This 4-hour data exclusion is in addition to the data exclusion allowed above for each calendar day and for each 30 operating-day block. No more than 12 hours of NO_X data in any 30 operating-day block shall be excluded due to switching between temporary tanks. Within one working day of occurrence, the permittee shall notify the Department's Northeast District office of each switch between temporary storage tanks. Once the permanent ammonia storage is complete, no NO_X data shall be excluded due to switching between temporary tanks.

All valid NO_X hourly averages shall be included into the 30 operating-day block average.

XIII. CONCLUSION

The Department concludes that the respective final limitations for SO_2 and NO_X are 0.20 and 2.40 lb/ton clinker respectively. These lower limits together with the reductions in lb/ton limits proposed by SAC 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 has reasonable assurance that the proposed emission rates can be maintained at the increased operation levels and with the SNCR and fly ash projects proposed by SAC. Conditions incorporating the proposed changes and detailing compliance demonstration requirements are shown in the attached draft permit modification.

A. A. Linero P.E.
Program Administrator
South Permitting Section

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[1] Letter. Terry, Mark S., President Polysius Corporation to Martini, Celso, Plant Manager, Suwannee American Cement. Operating SAC Branford Facility at an Increased Capacity. December 14, 2004.

[2] Thomsen, K.; Jensen, L.S.; Schomberg, F. "FLS-Fuller ILC-Low NO_X Calciner Commissioning and Operation at Lone Star in St. Cruz in California," *Zement Kalk Gips International,* 1998, 10, 542-550.

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[4] Miller, F. M.; Hawkins, G. J. "Formation and Emission of Sulfur Dioxide from the Portland Cement Industry" in *Proceedings of the 93rd Air and Waste Management Association Conference.* 2000. San Diego, CA.

[5] Xeller, H. "New Developments in NO_X Abatement in the Cement Industry, Part 2", *Zement Kalk Gips International,* 1998, 4, 208-218.

[6] Presentation. Waste Management Technologies in Japanese Cement Industry. Taiyeho Cement, Taiyeho Engineering, CTI/Industry Joint Seminar, February 2004.

[7] Reference 4.

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