TECHNICAL EVALUATION
&
PRELIMINARY DETERMINATION

APPLICANT

Tarmac American, LLC
455 Fairway Drive, Suite 200
Deerfield Beach, Florida 33441

Pennsuco Complex
Standard Industrial Classification Code No. 3241
Facility ID No. 0250020

PROJECT

Project No. 0250020-035-AC
Application for Minor Source Air Construction Permit
Revisions to Tires, Raw Materials and Emissions Limit Conditions

COUNTY

Miami-Dade County, Florida

PERMITTING AUTHORITY

Florida Department of Environmental Protection
Division of Air Resource Management (DARM)
Office of Permitting and Compliance
2600 Blair Stone Road, MS#5505
Tallahassee, Florida 32399-2400

February 7, 2014

1. GENERAL PROJECT INFORMATION

1.1. Facility Description and Location

Tarmac America, LLC. (through various subsidiaries or affiliates) operates the Pennsuco Facility in Medley located at located at 11000 NW 121 Way in Miami-Dade County, Florida. The UTM coordinates are Zone 17, 562.3 kilometers (km) East and 2861.7 km North. The existing facility consists of a dry process portland cement plant, an aggregate plant, two batch "ready-mix" concrete plants, and a cement block plant. Figure 1 identifies the physical location of the facility.

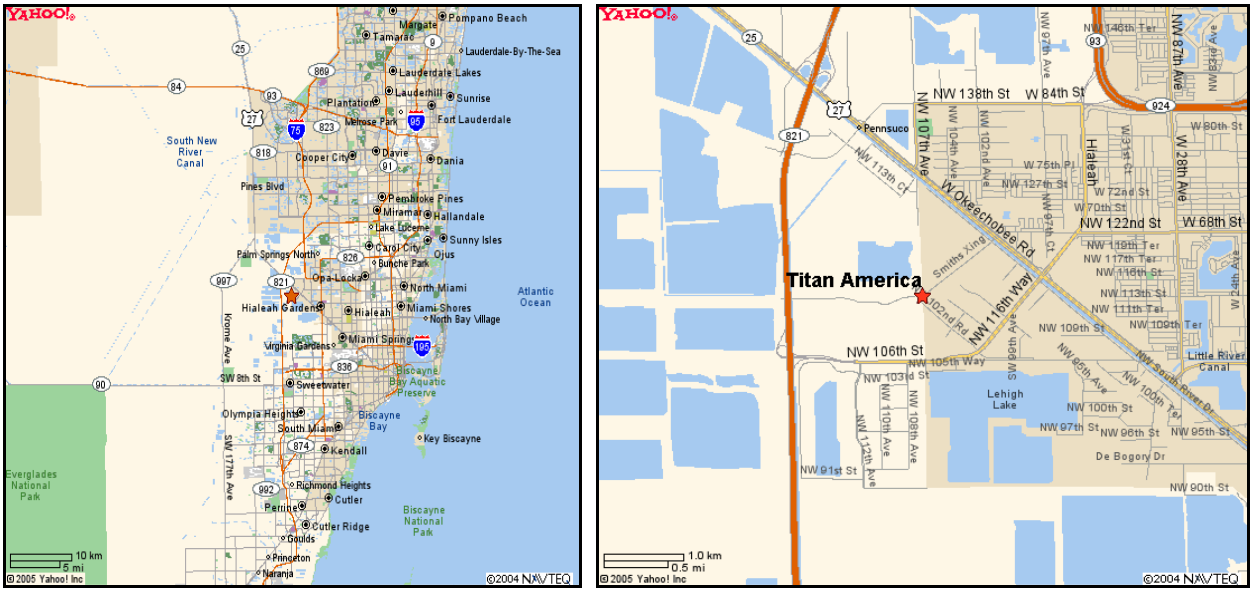

Figure 1. Titan/Tarmac Pennsuco Facility Location in Medley, Miami-Dade County

Figure 2 is a picture of existing Kiln 5 that replaced older wet process Kilns 2 and 3 in 2004. Kiln 1 was shut down in the 1980's and Kiln 4 never operated. Kilns 1-4 have all been dismantled.

Figure 2. Tarmac Pennsuco Portland Cement Plant Dry Process Kiln No. 5

1.2. Process Description Preheater/Calciner Kiln with In-Line Raw Mill

This section describes only the pyroprocessing of raw materials to make clinker (prior to grinding and blending to make cement). Detailed descriptions, including raw materials and fuel handling, clinker handling, finishing, storage and shipping are discussed in other Division of Air Resource Management (DARM) documents including one that authorized an increase in Kiln 5 production to its present capacity. Link to Evaluation of Kiln 5 Increase.

Figure 3 is a very simplified process flow diagram of a preheater/calciner kiln. The Kiln 5 calciner differs in at least one key aspect that is an important emission control measure. As shown in the insert, fuel is injected in the riser below the level where the tertiary air enters near the base of the calciner.

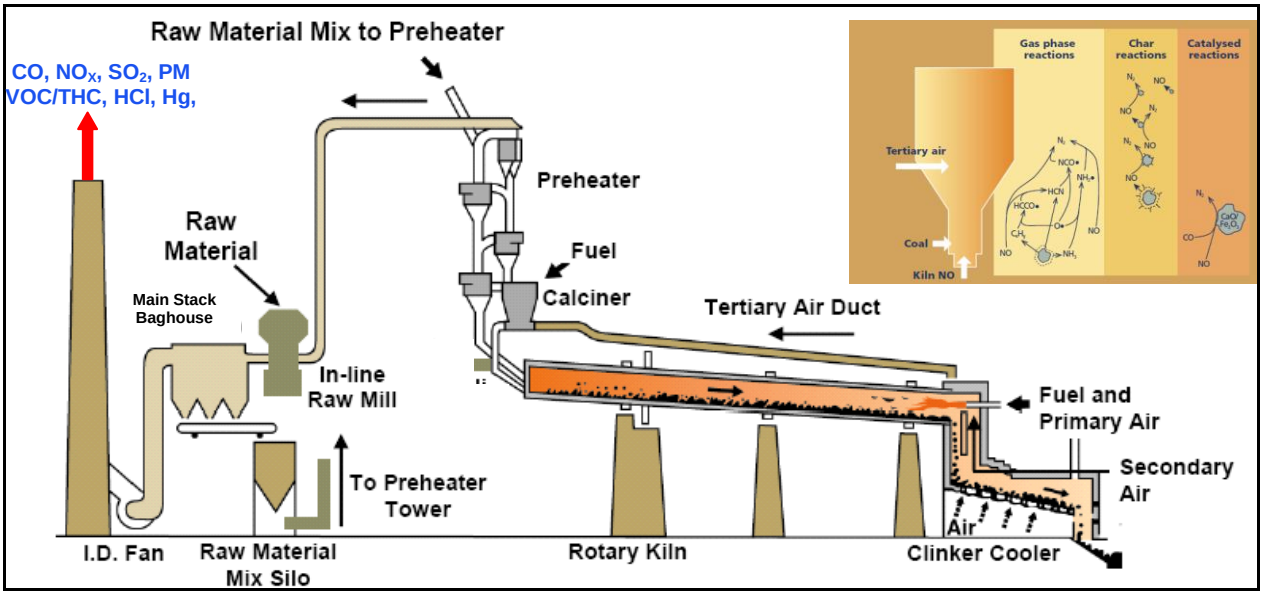

Figure 3 - Process Diagram of Dry Process Preheater/Calciner Pyroprocessing System

Pyroprocessing includes all of components that emit through the main stack shown on the left hand side of the above diagram. The emissions unit consists of the coal mill (not shown), raw mill, feed silo, preheater, calciner, kiln, clinker cooler, and the kiln dust system.

Raw materials from the limestone and mineral aggregates feed bins enter the raw mill, where the material is ground to size and the moisture content is reduced. Heat for drying within the raw mill is supplied from the calciner/kiln/cooler exhaust gas after passing through the preheater. From the raw mill, the material is blown to a series of mechanical cyclones that recover most of the material. Dust captured after the cyclones, in the main stack baghouse, is conveyed to a storage bin. From the storage bin, the kiln dust is returned to the process in an enclosed system or is loaded out to truck.

The exhaust from the cyclones passes through the main particulate matter control device, which is the main stack baghouse. The gases are drawn through the induced draft fan and discharged to the 410-foot main stack that is adjacent to the preheater as shown in Figure 2. When the raw mill is off, exhaust gas leaving the preheater is bypassed to a conditioning tower that cools the gases and then to the main baghouse. Pictures of the main stack baghouse and the raw mill building are shown in Figure 4.

The properly milled and sized raw material (known as raw meal) is pneumatically conveyed to the preheater feed silo, which is controlled by a baghouse. Raw meal from the preheater feed silo is then conveyed to and introduced at the five-stage preheater tower. The conveying system is also controlled by baghouses.

The raw meal passes through the preheater/calciner/kiln system. Initially, fixed moisture is released from the raw meal. Then the raw meal is calcined (conversion of limestone fraction to lime). Finally the calcined meal is sintered in the kiln to produce clinker nodules.

Figure 4 - Lower Preheater, Main Kiln Stack Baghouse and Ducting from Raw Mill Cyclones

The kiln is a two-pier, 65-meter horizontally oriented cylinder and is 5 meters in diameter. The plant has a permitted clinker production limit of 250 tons/hour of clinker on a 24-hour basis, which is equal to 2,190,000 tons/year.

Fuels are fed to both the medium-temperature calciner burner and the high-temperature kiln burner to provide heat for the process. Hot air from the kiln hood and clinker cooler provides secondary combustion air to the main kiln burner and tertiary air to the calciner to support calcination and complete burnout. Use of alternative solid fuels (ASF) was authorized pursuant to permit No. 0250020-031-AC. Link to ASF Permit. Link to ASF Evaluation. Use of whole tires was authorized through Miami-Dade permit No. 0250020-029-AC. Link to Tire Permit.

The key pollutants from the process are particulate matter (PM), carbon monoxide (CO), nitrogen oxides (NO_X), volatile organic compounds (VOC), total hydrocarbons (THC), sulfur dioxide (SO_2) and small amounts of hydrogen chloride (HCl) and mercury (Hg). Continuous emission monitoring systems (CEMS) in the main kiln/raw mill stack measure and record emissions of NO_X, SO_2, CO and THC, which also serves as a surrogate for VOC emissions. There are also process monitors for CO. Because very low SO_2 emissions have been recorded since commissioning of Kiln 5 (roughly 5 to 15 tons/year), the Department recently removed the requirements to operate the SO_2 CEMS. Link to SO_2-CEMS Final Permit. Link to SO_2-CEMS Evaluation.

A continuous opacity monitoring system (COMS) measures and records the opacity of the flue gas exhaust in the in-line raw mill/kiln stack. The baghouse inlet temperature is continuously measured and maintained at a level less than that of the most recent compliance stack test to prevent de-novo dioxin/furan formation.

Table 1 identifies the permitted emissions units (EUs) affected or established by the application.

Table 1 – List of Emissions Units Affected or Established at the Tarmac America LLC Facility

EU No.	Brief Description
013	Finish Mill System: Finish Mill No. 4
027	Clinker Handling and Storage System
028	Pyroprocessing/Raw Mill System (Kiln 5)
034	Transloading of Cementitious Material
040	Open Clinker Storage Pile and Conveyor (New Regulated EU)

1.3. Air Pollution Control Equipment

Process cyclones and the main kiln baghouse collect raw meal swept from the raw mill for return to the process. The baghouse further controls emissions of PM from the PH/C kiln exhaust. Judicious selection of raw materials and combustion design are the key to control of all other pollutants. These are the specific controls for CO, VOC/THC and organic hazardous air pollutants (HAP) such as dioxin and furan. NO_X emissions are further controlled by indirect firing, multiple burn points, and fuel/air staging in the calciner. Acid gases such as SO_2 and hydrogen chloride (HCl) are further controlled by limestone scrubbing by raw materials and by contact with the finely divided hot lime in the calciner. Mercury (Hg) is also controlled by judicious selection and sampling of Hg content in raw materials.

1.4. Facility Regulatory Categories

- The facility is an existing major stationary source in accordance with Rule 62-212.400, Florida Administrative Code (F.A.C.) for the Prevention of Significant Deterioration (PSD) of Air Quality. Only CO emissions have been previously reviewed for PSD and a determination of best available control technology (BACT) for Kiln 5. Kilns 1-4, which were shut down and replaced by Kiln 5, were subject to PSD reviews and BACT determinations when constructed or when subsequently modified to fire coal. Decreases from the shutdown units were used in a netting analyses to avoid PSD review for other pollutants.
- The facility is an existing Title V major source of air pollution in accordance with Chapter 213, F.A.C.
- The facility is a major source of hazardous air pollutants (HAP) subject to the applicable provisions in the National Emission Standards for Hazardous Air Pollutants (NESHAP) of Title 40 of the Code of Federal Regulations, Part 63 (40 CFR 63), including Subpart A (General Provisions) and Subpart LLL (Portland Cement Plant Manufacturing Industry). Link to Cement NESHAP.
- The facility includes affected sources subject to the applicable New Source Performance Standards (NSPS) of 40 CFR 60, including Subpart A (General Provisions) and Subpart F (Portland Cement Plants). Link to Cement NSPS.

1.5. General Project Description

The Department received an application from Tarmac America, LLC on April 22, 2013. Link to Application. In the cover letter, the applicant described the requested projects and permit revisions as follows (with slight paraphrasing and renumbering):

1. Modify the kiln NOx limit to reflect the basis of the limit – PSD avoidance. Specifically, remove the following NOx limits: 2.17 lb/ton clinker based on an annual average and 720 lb/hour based on a 24-hour block average.
2. Clarify that whole tires in addition to shredded tire and tire-derived fuel that may be used in the pyroprocessing system under the authority of permit No. 0250020-031-AC. Remove existing tire feed rate established in permit No. 0250020-029-AC. Clarify that 0250020-031-AC regulates the tire feed rate.
3. Revise condition 3.B.5 in permit No. 0250020-025-AC, which limits the use of water treatment plant residuals as a raw material supplement to certain suppliers (e.g., Miami-Dade County water treatment plants).
4. Replace the Finish Mill No. 4 dust collector (Baghouse No. F-432) with two existing but unused Mikropul dust collectors (Nos. F-603 and F-604).
5. Authorize construction of a conveyor to allow the injection of stored off-specification clinker pile materials into the clinker cooler system.

6. Address insignificant emissions including use of an on-site laboratory dust collector and railcar painting.
7. Add requirements for portable transloading operation in EU-034.

1.6. Processing Schedule

04/22/13 Received application.

05/10/13 Sent request for additional information (RAI) to applicant. Link to RAI

08/02/13 Received RAI response from Koogler and Associates. Link to RAI Response

08/30/13 Sent a request for additional information (RAI) to applicant.

11/27/13 Received RAI response from Koogler and Associates.

2. BACKGROUND

2.1. Previous Permits Related to Construction of Kiln 5 and NO_X

In 1999, the Miami-Dade County Department of Environmental Resource Management (the predecessor of MD-RER) issued non-PSD permit No. 0250020-008-AC to construct a dry process cement line with a capacity of **160 tons of clinker per hour**. Link to 1999 Permit and Correspondence. The project required the shutdown of two old wet-process kilns with a combined total capacity of approximately 112.5 tons/hour. At the rated capacity, the new kiln (Kiln 5) could have produced 1,401,600 tons/year if operating 8,760 hours /year. The issued permit stated that the replacement kiln (Kiln 5) would be capable of producing only 1,240,000 tons/year, which was equal to approximately 88.5 percent (%) of its theoretical capacity. Refer to Table 2 on following page.

According to the application for the 1999 permit and underlying vendor or consultant information, the first kiln proposed could achieve 3.15 lb NO_X/ton clinker on a long-term basis. This value was less than the 3.6 lb NO_X/ton clinker BACT limit (30-day basis) that applied to Florida Rock (now Vulcan) Kiln 1 when it started up in December 1999 and a little greater than the 2.8 lb/ton clinker limit that applied to the same Florida Rock kiln effective late 2000. At the time, suppliers did not provide lower NO_X guarantees on kilns using combustion controls and U.S. operators would not consider add-on NO_X control systems such as ammonia-based selective non-catalytic reduction (SNCR).

Prior to commencement of construction of Kiln 5, MD-RER issued permit 0250020-010-AC in 2001, which reflected the plans of the new owner (Titan America) to construct a larger **250 tons of clinker per hour** line. The issued permit limited operation to 7,884 hours/year, which effectively limited clinker production to 1,642,500 tons/year although it could have theoretically produced 2,190,000 tons/year of clinker operating 8,760 hours/year. Link to 2001 Permit and Correspondence. By this time, vendors FLSmidth (eventually awarded the contract) and Polysius were willing to provide lower NO_X guarantees. The applicant requested a limit of 2.38 lb NOx/ton of clinker on an annual basis allowing greater production. The request was supported by the vendor guarantees.

The line was started up in 2004. On December 2, 2005, the Department issued permit 0250020-017-AC (PSD-FL-360). Link to Dec 2005 Permit. This permit removed the annual clinker production restriction based on 7,884 hours per year and 250 tons/hour. The removal of the operation limitation allowed Kiln 5 to produce 2,190,000 tons/year, which is about 75% greater production than allowed by the original MD-RER permit and more than double the allowable production of Kilns 2 and 3 that were shut down due to commencement of operation of Kiln 5.

Refer to Table 3 taken from Section III, Specific Condition 9 of permit 0250020-017-AC. The permit included BACT limits for CO emissions of 2.0 lb/ton clinker on a 30-day rolling average and 576 lb/hour on a 24-hour basis. NO_X limits (of 2.17 lb/ton clinker on a 12-month rolling basis and 720 lb/hour on a 24-hour basis were requested in the application and included in the permit. Compliance with the NO_X limits was specified by use of CEMS. Rule 62-4.070(3), F.A.C., Reasonable Assurance, was cited at the bottom of the table in permit 0250020-017-AC (and shown below) as a regulatory basis.

Table 2 – Kiln 5 Production and Emission Limits from Previous Permits

Permit (Agency)	Capacity			24-hour NO_X Limits		Annual NO_X Limits	
	tons/hour	hours/year	tons/year	lb/ton	lb/hour	lb/ton	tons/year
0250020-008-AC (RER)	160	8,760	1,240,000 [1]	4.5	720 [2]	3.15	1,953 [3]
0250020-010-AC (RER)	250 [4]	7,884	1,642,500 [4]	3.46/2.88 [5]	720 [6]	2.38 [8]	1,953 [7]
PSD-FL-360 (DARM) [9]	250	8,760	2,190,000 [10]	None [11]	720 [12]	2.17 [13]	2,376 [14]

1. Referenced permit, Subsection C – "The proposed Pyroprocessing system will be capable of producing 160 tons/hour and 1,240,000 tons/year of clinker".
2. (160 tons clinker/hour)x(4.5 lb NO_X/ton clinker) = 720 lb/hour ~ approximately the same as allowed for old Kilns 2 and 3.
3. (1,240,000 tons/year)x(3.15 lb NO_X/ton clinker) = 1,953 tons/year. This is the potential to emit that ensures that future emissions will be less than past actual emissions (from Kilns 2 and 3 plus 40 tons/year).
4. Referenced permit, Condition B.19 – "The maximum production of clinker shall not exceed 250 tons/hour on a 24-hour block average and 1,642,500 tons/year". These maximum values were taken from application prepared by Brooks and Associates. Annual hours of operation were limited to 7,884 hours/year in accordance with the application to limit annual PTE.
5. 3.46 lb NO_X/ton of clinker at 208 tons clinker/hour and 2.88 lb NO_X/ton of clinker at 250 tons clinker/hour.
6. The value 720 lb NO_X/hour was carried over from the previous permit and was given in the application submitted by Brooks and Associates as potential emissions. It was calculated as (3.46 lb NO_X/ton)x(208 tons/hour) = 720 lb NO_X/hour.
   Also, (2.88 lb NO_X/ton)x(250 tons/hour) = 720 lb NO_X/hour ~ approximately the same as allowed for old Kilns 2 and 3.
7. The value 1,953 tons NO_X/year was carried over from the previous permit and was given in the application submitted by Brooks and Associates as potential emissions.
8. The value 2.38 lb NO_X/ton was specifically requested as a limit per on an annual basis per the application submitted by Brooks and Associates. It was used by Brooks and by MD-RER to calculate annual PTE of 1,973 tons NO_X/year.
   (2.38 lb NO_X/tons clinker)x(208 tons clinker/hour)x(7,884 hours/year) (ton/2000 lb) = 1,973 tons NO_X/year.
   FLSmidth provided a guarantee to Tarmac to meet that value on an annual basis. It was accepted by MD-RER as reasonable assurance.
9. DARM permit PSD-FL-360 is also permit 0250020-017-AC.
10. The capacity was increased by increasing the annual hours of operation from 7,884 to 8,760 hours.
11. DARM did not set a 24-hour lb NO_X/ton of clinker limit.
12. The value 720 lb/hour was carried over from the previous permit and was specifically requested as a 24-hour allowable limit in the application submitted by Golder Associates.
13. The application submitted by Golder requested a limit of 2.1 lb NO_X/ton clinker. DARM increased the limit to 2.17 lb NO_X/ton clinker. DARM reviewed operational data from Kiln 5 and data from similar FLSmidth calciners in the U.S. and concluded there was reasonable assurance that Kiln 5 could comply with the new limit of 2.17 lb NO_X/ton clinker.
14. The application submitted by Golder included an updated calculation of past actual emissions which allowed greater annual emissions from Kiln 5. The application requested 2,300 tons NO_X/year. DARM recalculated past actual emissions using the most recent years of operation and determined that annual emissions can be 2,376 tons/year without triggering PSD. The limit of 2.17 lb NO_X/ton clinker and continuous operation at the permitted production rate limits annual PTE for NO_X.
    (2.17 lb NO_X/tons clinker)x(250 tons clinker/hour)x(8,760 hours/year)x(ton/2000 lb) = 2,376 tons/year.

Table 3 – Pyroprocessing/Raw Mill Permitted Emission Limits Applicable at Kiln 5 Main Stack

Parameter	Emissions Limit	Averaging Time	Compliance Method	Limit Basis
Opacity [6]	10 Percent	6 minute block	COMS, Method 9	PTE, Avoid PSD 40 CFR 60, Subpart LLL
PM [6]	0.067 lb/ton of dry kiln feed	3 hours [5]	Annual Method 5	PTE, Avoid PSD 40 CFR 60, Subpart LLL
	28.5 lb/hr			
PM_{10} [6]	0.056 lb/ton of dry kiln feed	3 hours [5]	Annual Method 5	PTE, Avoid PSD 40 CFR 60, Subpart LLL
	23.9 lb/hr			
SO_2	0.50 lb/ton of clinker	30 days [2]	CEMS	PTE, Avoid PSD
	320 lb/hour	24 hours [1]		
NO_X (as NO_2)	2.17 lb/ton of clinker	12-months [3]	CEMS	PTE, Avoid PSD
	720 lb/hour	24 hours [1]		
CO	2.0 lb/ton of clinker	30 days [2]	CEMS	BACT
	576 lb/hour [1]	24 hours [1]		
VOC [4]	0.16 lb/ton of clinker [2]	30 days [2]	CEMS	PTE, Avoid PSD
	40 lb/hour	24 hours [1]		
Mercury (Hg)	229 lb/yr (base + 199 lb/yr)	12-month	Fuels, Materials [8]	PTE, Avoid PSD
Temperature [7]	Baghouse Temperature (T) $\leq$ T during Dioxin/Furan Tests	Continuous		40 CFR 63, Subpart LLL
Dioxin/Furan	0.2 ng TEQ/dscm (T$\geq$204 ^oC)	3 hours	30 Months, Method 23	40 CFR 63, Subpart LLL
	0.4 ng TEQ/dscm (T<204 ^oC)			

1 Compliance with the short-term emission limit for SO_2, NO_X, CO, and VOC shall be based on a 24-hour block average computed in accordance with Specific Condition 14. Compliance with lb/hr SO_2 emissions limitations in this condition will insure compliance with Miami-Dade County Code, Section 24-17(2)(a) limiting emissions to 1.2 lb SO_2/MMBtu heat input when solid fuel is fired, or 0.8 lb SO_2/MMBtu heat input when liquid fuel is fired, based on a 24 hour average

2 Compliance with the long-term emission limit for SO_2, CO, and VOC shall be based on a 30 operating-day block average computed in accordance with Specific Condition 14.

3 Compliance with the long-term emission limit for NO_X shall be based on 12 month rolling average computed in accordance with Specific Condition 14.

4 VOC emissions shall be expressed as propane.

5 The averaging times for PM and PM_{10} correspond to the required length of sampling for the initial and subsequent emission tests. Compliance demonstration with these limits shall be conducted pursuant to 40 CFR 63.1349(b)(1).

6 Compliance with the Opacity, PM and PM_{10} permit limits given for in-line kiln/raw mill will insure compliance with applicable limits from 40 CFR 63, Subpart LLL for the in-line kiln/raw mill, and clinker cooler, and 40 CFR 60, Subpart Y for the coal mill.

7 The temperature requirements for the operation of in-line kiln/raw mill are in accordance with 40 CFR 63.1344(a) & (b), and 63.1349(b)(3)(iv).

8 Determined by raw materials and fuels entering the process. Refer to Condition 10.

[Applicant BACT information for CO and request to escape PSD for other criteria pollutants; **Rules 62-4.070(3)** and 62-212.400, F.A.C.; 40 CFR 63.1343 and 63.1345; Application received April 18, 2005 and revised September 30, 2005]

The NO_X limits and compliance methods were designed to limit the potential-to-emit (PTE) of NO_X and ensure that the project did not trigger PSD and BACT.

(2.17 lb NO_X/ton clinker)(250 tons clinker/hour)(8,760 hours/year)(ton/2000 lb) = 2,376 tons NOx/year.

Since issuance of the 2005 permit, there have been a few small revisions including a slight lowering of the PM/PM_{10} limits and replacement of CEMS with periodic stack testing for SO_2 emissions. Otherwise, the table is the same as those in the subsequent construction and Title V permits issued by DARM and MD-RER.

2.2. Previous Permits Related to Firing of Whole Tires and Tire-Derived Fuel (TDF)

MD-RER issued permits 0250020-022-AC and 0250020-028-AC in 2008 and 2010, respectively to conduct trial burns to fire whole tires. Link to 2008 Tire Permit. Link to 2010 Tire Permit. The initial trials were conducted with a manual system shown in Figure 5. Tires are fed through a double-lock system at a point in the area of the riser between the kiln and the calciner.

Figure 5 - Whole Tires and the Existing Manual Whole Tire Introduction System into Kiln 5 Riser

On May 25, 2011 MD-RER issued permit 0250020-029-AC. Link to 2011 Tire Permit. This permit authorized permanent burning of whole tires at the rate of 1.65 tons/hour and re-authorized installation of an automatic tire feeding system that consists of "a trailer tipper, bottom hopper, rotating disk separator, roller conveyers, hook elevator, vertical moving with attached hook and an inclined feeding scale; or equivalent system". The feed rate was based on successful trial burn of whole tires. The permit also included authorization for another trial firing whole tires at a greater rate than 1.65 tons/hour and required submission of a trial burn summary report and another application to authorize permanent whole tire firing greater than 1.65 tons/hour. The permit was extended through May 24, 2015 by a letter from RER dated March 29, 2013.

On August 8, 2011 the Department issued DARM permit 0250020-031-AC to Tarmac to burn a variety of alternative solid fuels (ASF). Link to 2011 ASF Permit. The project authorized installation of equipment in the "upper precalciner section of the pyroprocessing kiln system" including a pneumatic feed system, a mechanical feed system (bucket elevator), and grinding and sizing equipment. This permit also authorized installation of a new multi-fuel main kiln burner system, with final details to be provided. Tire-derived fuel (TDF) was included as one of the newly authorized fuels. TDF (reference Section 3, Specific Condition 4) was described in the permit as, "includes shredded used tires with steel belt material, shredded used tires without steel belt material and tire fluff". This permit also recognized that firing of whole tires in the precalciner (meaning lower calciner or riser duct) was already authorized (by the previous MD-RER permits) as a fuel in addition to coal, petcoke, natural gas, No. 2 fuel oil, No. 6 fuel oil and on-specification used oil. The expiration date for the DARM permit 0250020-031-AC (ASF project) is November 1, 2014.

On April 1, 2013 MD-RER issued permit 0250020-034-AV. The permit incorporated the authorization to fire 1.65 tons/hour of whole tires. Link to Title V Permit. It did not incorporate the conditions for additional trial burns or the installation of the automatic tire feeding system. This permit did not incorporate the ASF project, which is still under construction.

2.3. Previous Permits Related to Use of Calcium Carbonate ($CaCO_3$) Residuals

On November 6, 2009, MD-RER issued permit 0250020-024-AC to conduct a trial burn (actually test) when using $CaCO_3$ residuals from a potable water treatment plant as a raw material supplement to limestone (also a form of $CaCO_3$). Link to 2009 $CaCO_3$ Trial Permit. On November 22, 2010 MD-RER issued permit 0250020-025-AC that, in addition to several other authorizations, permanently authorized use of $CaCO_3$ residuals "from the lagoons of the Miami-Dade County Water Treatment Plants as a raw material supplement …" Link to 2010 $CaCO_3$ Permit. The conditions of this permit were incorporated in the facility Title V permit mentioned above.

2.4. Previous Permits Related to Finish Mill No. 4 and Clinker Conveyance

Finish Mill No. 4 (EU-013) dates back to the old wet process. It was described in some early permits as having five Fuller or Mikropul baghouses, Nos. F-430, F-432, F-603, F-604 and F-605. A so-called O-Sepa Cement Separator was installed on Finish Mill No. 4 in the late 1990s along with Mikropul baghouse F-732. Baghouse Nos. F-603, 604 and 605 were removed from the EU description. By the time Kiln 5 started up and until present, the three operating baghouses are Nos. F-430, F-432 and F-732 as described in the Title V permit 0250020-034-AV issued by MD-RER.

The present request is to replace Mikropul baghouse No. 432 with a flow rate of 17,000 actual cubic feet per minute (acfm) and a cloth-to-air ratio of 6.8 feet/minute with two of the previously described Mikropul baghouses Nos. F-603 and F-604 having a combined capacity of 16,000 acfm and a cloth-to-air ratio of 5.6 feet/minute.

Clinker conveyance EU-027 is part of the Kiln 5 Line and replaced EU-002 that served the old Lines 2 and 3 that were shut down. This EU was initially defined in DARM permit 0250020-016-AC issued May 5, 2005. Link to May 2005 Permit.

3. EVALUATION OF APPLICANT REQUESTS

3.1. Modify the Kiln NO_X Limit to Reflect the Basis of the Limit – PSD Avoidance

Applicant Request. According to page 4 of the application:

"The current NO_X limit and monitoring, as stated in the current Title V permit, is only required due to the PSD program and related netting of emissions. Because the limitation is based only on the PSD program, Tarmac is requesting that the NO_X limit be based on the correct averaging basis to determine compliance with the PSD program – a ton per year basis. Tarmac believes that FDEP rule requires that compliance to the PSD program be based on 2,376 tons per year (12-month period) of NO_X emissions. This limit is equivalent to the current limit of 2.17 lb of NO_X per ton of clinker at capacity [sic] 2.19 million tons clinker per year and is more restrictive than the current limit of 720 lb/hour at 8,760 hours per year (3,153 tons/year)."

Permit Applicable NO_X and CO Limits. The current Title V permit issued by MD-RER on April 1, 2013 references the 2005 DARM permit 0250020-017-AC (PSD-FL-360) and duplicates the emissions limits given therein (those in Table 3 above). The underlying permit was issued only after reasonable assurance was established in accordance with Rule 62-4.070(3), F.A.C. as shown underneath Table 3 taken from permit PSD-FL-360. This provision, (which is part of the Standards of Issuing or Denying Permits; Issuance; Denial) states:

"The Department may issue any permit with specific conditions necessary to provide reasonable assurance that Department rules can be met".

A high level of reasonable assurance was required to issue permit PSD-FL-360 permit given that the manufacturer guarantee was 2.38 lb NO_X/ton clinker and that the applicant requested that the limit be lowered to 2.1 lb NO_X/ton to allow additional production from the constructed kiln. Six months of production and CEMS based NO_X and CO data were provided by the applicant in support of the request. The data added additional assurances that the NO_X limit could be achieved.

The Department advised that the applicant's request to lower the CO limit from 1.77 to 1.33 lb/ton was not feasible in the long-run based on planned future operation of the kiln system. Instead, the Department issued a higher PSD/BACT value of 2.0 lb CO/ton of clinker in conjunction with a NO_X limit of 2.17 lb/ton of clinker (slightly greater than requested). The greater than requested CO limit provided an additional degree of freedom when optimizing operation to achieve the more critical NO_X emission limit.

The 24-hour mass emission limit of 720 lb NO_X/hour is a short term limitation established in MD-RER permits that equated to the 24-hour lb/ton emission limits given in the same permits and approximately the same as the combined hourly emission limits from Kilns 2 and 3 destined for shutdown (as discussed below). For example, 4.5 lb/ton of clinker (24-hours) at a production rate of 160 tons/hour of clinker (1999 permit) equals 720 lb/hour and 2.88 lb/ton of clinker (24-hours) at a production rate of 250 tons/hour (2001) also equals 720 lb/hour. This 24-hour limit of 720 lb/hour was not intended to limit annual emissions to 3,153 tons/year or to 2,376 tons/year.

Further review indicates that Kilns 2 and 3 that were shut down when Kiln 5 started up were subjected previously to PSD review and BACT determinations. The most recent one for Kiln 2 was DARM permit PSD-FL-142 issued on February 27, 1991 that established limits of 113.8 lb/hour and 4.55 lb/tons of clinker. Link to 1991 Kiln 2 PSD Permit.

The most recent one for Kiln 3 was EPA permit PSD-FL-050 issued on June 2, 1980. That permit authorized conversion of Kilns 1, 2 and 3 to coal. Link to 1980 Kilns 1-2-3 PSD Permit. It established PSD/BACT NO_X limits of 118 lb/hour and 4.73 lb/ton clinker on both Kilns 1 and 2 and also established PSD/BACT limits of 592 lb/hour and 6.77 lb/ton clinker on Kiln 3. Only Kilns 2 and 3 operated during the 1990's and until 2004. Note that the sum of allowable NO_X emissions from Kilns 2 and 3 was 710 lb/hour, which is very close to the value subsequently allowed in all of the Kiln 5 permits.

DARM and MD-RER sought to preserve the allowable lb/hour limits of the previous PSD permits for Kilns 2 and 3 without establishing a lower 24-hour allowable mass emission rate to match the PTE of NO_X needed to avoid triggering PSD for Kiln 5.

Compliance Methodology. Values for demonstration of compliance with the 12-month 2.17 lb/ton clinker limit are calculated in accordance with the algorithm established in DARM permit PSD-FL-360, Section III, Specific Condition 14. As follows:

c. *Compliance with the long-term NO_X emissions limit:* Compliance with the long-term NO_X emission limit shall be based on a 12 month rolling average that shall be recomputed each month as the arithmetic average of that month and the preceding 11 months. Each monthly average shall be computed by averaging **all valid hourly averages** occurring within each calendar month. The first 12 month period shall commence on January 1, 2006. (Emphasis added)

d. *Valid Hourly Averages*: Each hourly average shall be computed as the arithmetic average of the data points generated by the CEM system. Data points must be generated at least once per minute. For an hourly average to be considered valid, at least two data points separated by a period of 15 minutes or more must be used to compute the hourly average.

- Hours during which there is no preheater feed and no fuel fired to the kiln systems are not valid.
- Hours during which the plant is firing fuel but producing no clinker are valid, but **these hours are excluded from the production-normalized emission rate computation** (pounds per ton of dry preheater feed or pounds per ton of clinker). These hours are included in any pollutant mass emission rate computation (pounds per hour).

Exclusion of the values when fuel is fired and no clinker is produced avoids inclusion of individual hourly lb/ton values with zero (0) divisors but does not affect the function of the 2.17 lb NO_X/ton limit as an enforceable value that limits the annual potential to emit at 8,760 hours of operation and the maximum production rate of 250 tons/hour (24-hour basis).

Recent NO_X Emissions. Figure 6 is a scatter chart of the hourly data recorded by the NO_X CEMS during 2012. Note that the 720 lb/hour limit presently applies on a 24-hour average basis. During 2012, all individual hourly values were less than 720 lb/hour. All 24-hour values, if calculated and graphed, would be well below 720 lb/hour. The blue data points indicate hourly emissions when clinker was produced. The red data points represent hourly emissions when fuel was fired but no clinker was produced. Emissions during clinker production are much greater than emissions when fuel is burned without clinker production. In fact, the hours when fuel was fired with no clinker production accounted for roughly 20 tons in 2012.

Figure 7 is a summary of the monthly and the 12-month rolling lb NO_X/ton clinker averages calculated for the period January 2008 through June 2013.[1] There were 10 entire months between January 2008 and June 2013 during which the kiln was down. There is not a monthly lb/ton value for each of those months and they were not included when calculating rolling 12-month averages.

Between 2008 and late 2011, the 12-month rolling averages of lb NO_X/ton clinker hovered near 2 lb/ton. A single relatively high monthly value of 2.7 lb/ton pulled the rolling 12-month average to 2.15 lb/ton. Thereafter operational measures may have been employed to progressively reduce the rolling value and it is now less than 2.0 lb/ton of clinker. In calculating the 12-month values, the company computes that average as the arithmetic average (of valid hourly lb/ton CEMS measurements, then averaged daily, then monthly, then running 12-monthly, rolled monthly) from the most recent 12 **operating** months.

At the end of 2012, the reported rolling 12-month value was 1.93 lb/ton clinker. This value was computed by using data from the 10 months in 2012 during which the kiln actually operated and averaging in the last two operating months from 2011 to complete a 12-month operating series. The two values included from 2011 actually caused the rolling 12-month value calculated at the end of December 2012 to be greater than it would have been if only the data from 2012 were used. If only the 10 months within 2012 that the kiln actually operated had been used in making the calculation, the rolling value would have been 1.83 lb NO_X/ton.

For reference, the Department calculated a lower value of 1.56 lb NO_X/ton clinker by simply dividing the total tons of NO_X emitted from Kiln 5 by the total tons of clinker based on the Annual Operating Report (AOR) filed by Tarmac. This calculation included all NO_X emitted whether or not clinker was produced.

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[1] Electronic mail from Muhammad Khan, Titan America/Tarmac to A.A. Linero, Florida DEP. August 23, 2013.

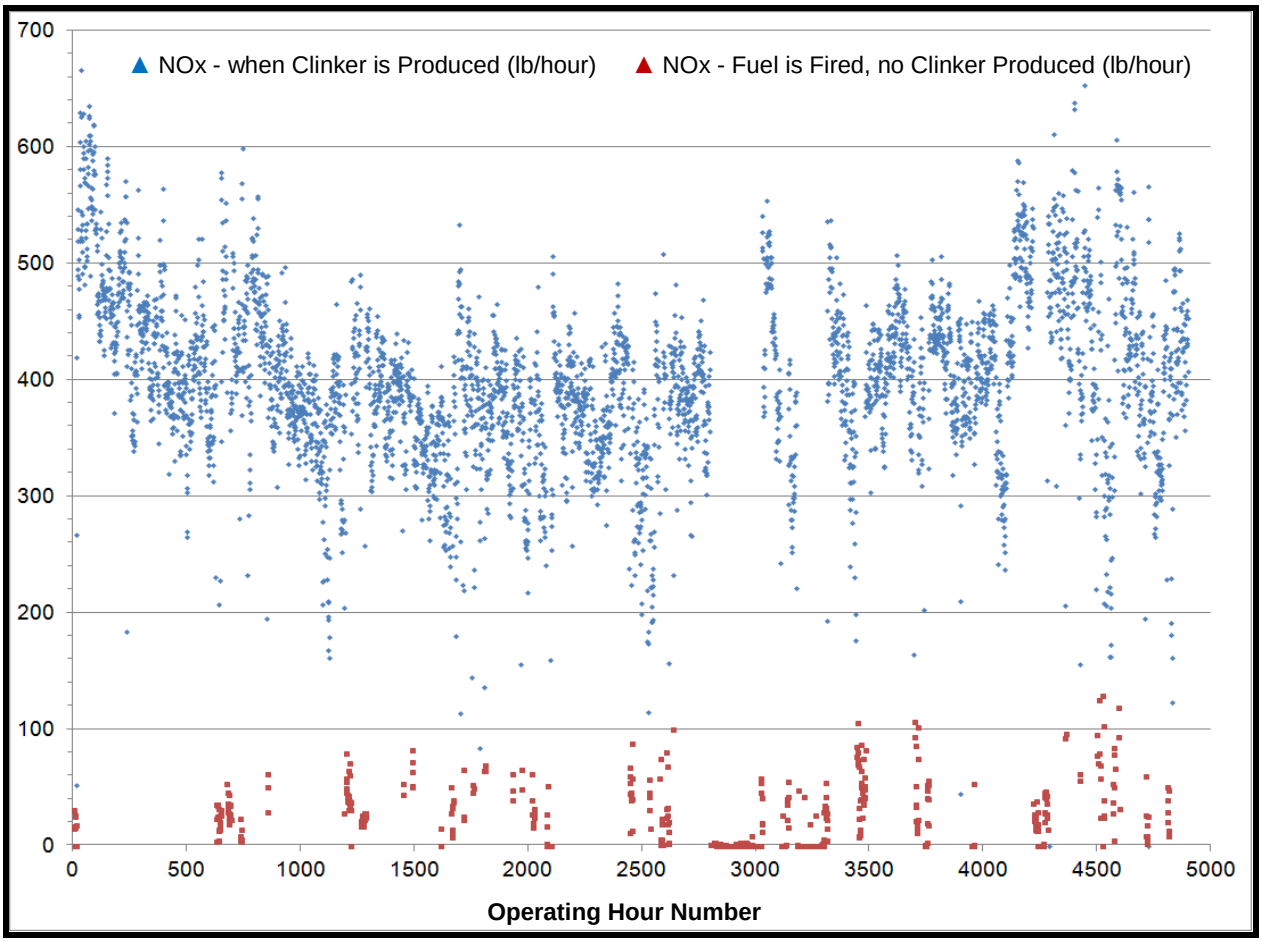


Figure 6 – Scatter Chart of Hourly NO_X–CEMS Emissions Data (lb/hr) from Kiln 5 during 2012

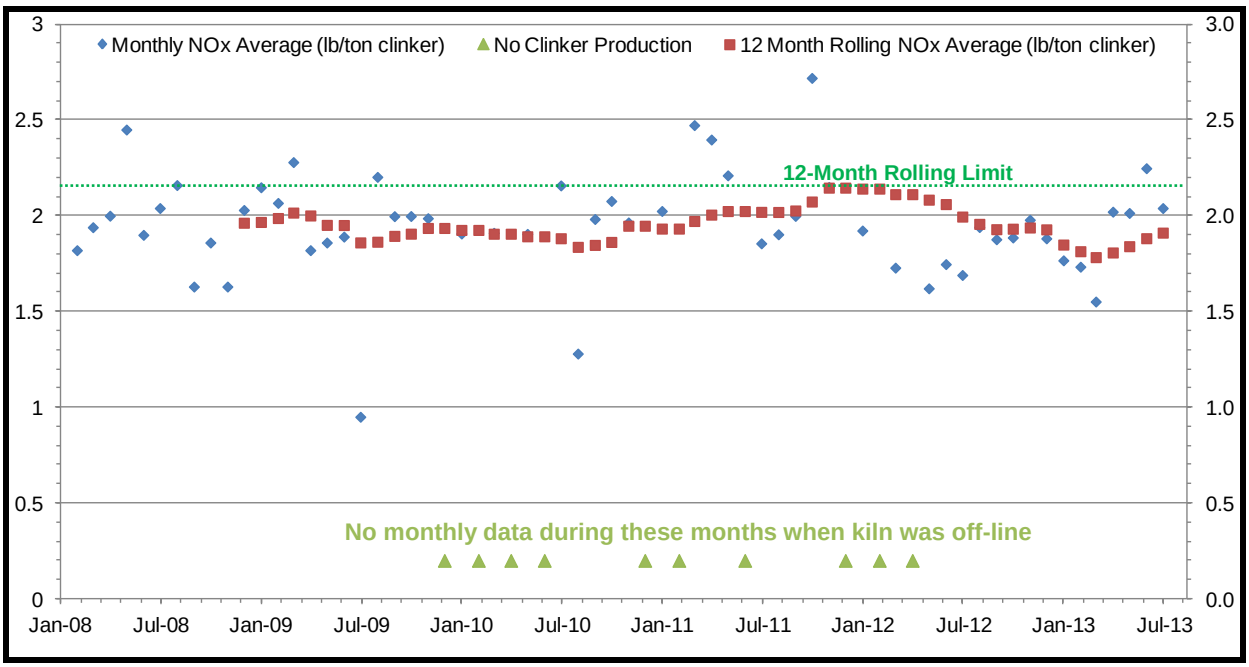


Figure 7 – Monthly and Rolling 12-Month NO_X Emissions from Tarmac Kiln 5 (1/2008 – 7/2013)

Department Review. According to the applicant regarding some of the more recent rolling 12-month lb/ton values within Figure 7, *"... it is apparent from the data that the monthly values approach the long term limit ... this is the result of short operation periods during those months. Obviously, without knowledge of how the plant will operate in future months, the plant must consider this long-term limit when monthly high numbers occur and consider not operating accordingly*". (Underlined emphasis made by Department.)[2]

The Department does not dispute the underlined statement, but notes that over the past year, the 12-month rolling average is less than the limit with some room to spare. A decision not to operate during a month of foreseen low operation is not obvious from the data in Figure 7.

In its response dated August 2, 2013 to the Department's RAI, the applicant states:

"While the 2.17 lb/ton NOx limit currently in the permit was apparently established as a surrogate for a TPY NO_X limit, the 2.17 lb/ton limit is not an accurate surrogate. Compliance with the 2.17 lb/ton limit cannot be used to correctly calculate the tons per year of NO_X emissions because a limit of lb/ton of clinker only includes NO_X emissions when clinker is produced from the kiln. NO_X emissions can occur even when clinker is not being produced (i.e., any time fuel is fired in the kiln) regardless of whether clinker is produced".

The 12-month "2.17 lb/ton of clinker limit" was intended to, and in-fact does, accomplish the purpose of limiting annual emissions to a maximum of 2,376 tons NO_X/year. At continuous operation and at the permitted production limit, the 2.17 lb NO_X/ton equates precisely to 2,376 tons/year and also functions as an effective, practicable and enforceable limit that ensures PSD is not triggered for the original kiln construction. The 12-month average with monthly rolling is the longest period recognized by EPA in guidance issued to limit potential-to-emit (PTE). For example, in its guidance dated June 13, 1989, EPA states:

"EPA recognizes that in some rare situations, it is not reasonable to hold a source to a one month limit. In these cases, a limit spanning a longer time is appropriate if it is a rolling limit. However, the limit should not exceed an annual limit rolled on a monthly basis."

The Department does not consider this excerpt to be the single justification for the form of the limit established in the various MD-RER and DARM permits issued for the Kiln 5 project. However, it does demonstrate the harmony with EPA's PTE guidelines. The rolling 12-month lb NO_X/ton clinker limit coupled with the 24-hour production limit accomplishes the goals of limiting PTE. The units of this long-term limit (lb/ton clinker) are in the same units as the BACT standard for CO emissions, except that the latter requires compliance on a 30-day basis, rather than a 12-month basis. The units of "lb/ton clinker" are also recognized as the industry standard for criteria pollutants from Portland cement kilns (e.g., vendor guarantees, AP-42 emissions factors, and NSPS Subpart F).

The following table identifies the annual NOx emissions based on data submitted by Tarmac from the Annual Operating Reports showing annual levels below 2,376 tons/year.

Table 4. Annual NOx Emissions from Kiln No. 5, 2004 - 2012

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012
NOx, TPY	892.7	1682.3	1757	1494.7	1228.6	835.68	683.4	817.1	731

Although not required, the Department reviewed hourly NO_X emission data and ran a basic short-term dispersion model scenario assuming emissions of 1,000 lb/hour. The results demonstrated there would be no exceedance of the new 1-hour NO_2 National Ambient Air Quality Standard (NAAQS) when effects from the kiln stack emissions are combined with the measurements taken at the nearest NO_2 monitor. In

[2] Electronic mail from Dr. Max Lee, Koogler and Associates, to A.A. Linero, Florida DEP. August 14, 2013.

conducting this exercise, the Department conservatively assumed that most NO_X is NO_2 when it is primarily NO.

Conclusion. Based on actual short-term emissions, the 24-hour NO_X emission limit is not necessary to avoid PSD or exceedance of the ambient air quality standard. The original annualized NOx limit (lb/ton clinker) was a proper, federally enforceable restriction that has been effective in limiting PTE and avoiding PSD for the original kiln construction; however, a NOx emissions cap will serve a similar purpose. Therefore, the Department will revise:

- Specific Condition 9 in permit No. 0250020-017-AC (and the same condition as reflected in subsequent permits) to remove the 24-hour NO_X emission limit of 720 lb/hour;
- Specific Condition 14 in permit 0250020-017-AC (and the same condition as reflected in subsequent permits) by replacing the annualized 2.17 lb NOx/ton of clinker limit with a NOx emissions cap of 2,376 tons NO_X per consecutive 12 months, rolling total;
- Specific Condition 12 in permit 0250020-017-AC (and the same condition as reflected in subsequent permits) to indicate that annual stack tests are not required for CO, NOx and VOC because compliance for these long-term standards is based on data collected from each certified CEMS. Rather, the reference methods identified are used for the performance specification tests and other QA/QC procedures.

For informational purposes, the permit requires a recording of the annualized lb NOx/ton clinker on a monthly basis. See Specific Conditions A.2, A.3 and A.4 in Section 3 of the draft permit for the exact language.

3.2. Clarify Use of Whole Tires and Remove Whole Tire Feed Rate

Applicant Request. As stated in the application, the applicant requests:

"Based on the status of tire and TDF approval in (DARM issued permit) 0250020-031-AC, Tarmac requests that whole tires be added to 0250020-031-AC and that these limitations (in the MD-RER permit) be lifted to allow the unlimited use of whole or chipped tire-derived fuel. Further, we are requesting the Department clarify the conflicting conditions between permit 0250020-029-AC and 0250020-031-AC of stack testing requirements for tires such that the Department state that 029-AC conditions including stack testing is not applicable". (Parenthetical explanations added by the Department.)

As discussed in Section 2.2 above, DARM permit No. 0250020-031-AC identifies TDF as shredded used tires with or without steel belt material and tire fluff. TDF is one of the alternative solid fuels (ASF) authorized by that permit to be fed into the calciner by either a mechanical or pneumatic feed system and into the kiln by replacing the main kiln burner system, "… with a multi-fuel burner and related feed equipment specifically designed for co-firing ASF with coal and other authorized fuels." It also requires the permittee to submit details of the final main kiln burner design once it is complete (e.g., fuel types, design heat input rates and schematics). Only permit No. 0250020-029-AC regulates whole tires.

The application presents a chart *"from FDEP permitting (0530010-022-AC)"* that *"indicates expected air emissions reductions from tires"*. The reference is to the technical evaluation in support of a permit issued to Cemex to conduct a trial tire burn in a preheater kiln at the Brooksville North plant. Link to Technical Evaluation of Cemex Brooksville North Tire Burn Request.

Department Review. The Department concurs with the statement as it applies to the Cemex preheater kiln (and to kilns in general), but not to Kiln 5 for unlimited tire use. Tire introduction at the Cemex preheater kiln would add a fuel firing point where, in contrast to Kiln 5, none exists, thus reducing the amount of fuel burned at the very high temperature (thermal NO_X) zone near the main kiln burner. Further, it could create localized pockets of reducing conditions near the back side of the kiln that can help destroy some of the thermal NO_X. An effective reducing atmosphere already exists near the back side of Kiln 5. According to the applicant's August 2, 2013 response to the Department's RAI:

"As Tarmac stated in its alternative fuel permit application for permit 0250020-031-AC, and as DEP agreed in its technical evaluation of that application, the use of 100% whole tires should not result in an emissions increase (see Attachment 1 for pertinent excerpts from the Technical Evaluation.) Tarmac has been using tires as a supplemental fuel as previously authorized and has reported to the Department annually for the last two years that the use of tires as a fuel has not resulted in a significant emissions increase (see attached Reports for 2011 and 2012, Attachment 2). Based on the Department's prior analysis of 100% tire use and the recent PSD annual reports, there should be no concerns regarding any potential increases in PM emissions".

One of the excerpts (Department statements) mentioned in the paragraph above regarding the technical evaluation supporting the ASF permit and repeated in the attachment to the RAI response states:

"*Tire-derived fuel has a high heating value that is slightly higher than coal. The TDF will efficiently combust within the precalciner and the cement kiln due to the long residence times at high temperatures. Tire-derived fuel is a fairly common ASF used in cement kilns throughout the world including the United States. At the Colton Plant in California, the air permit mandated the firing of scrap tires as a NO_X control strategy. According to kiln manufacturer FLSmidth, NO_X emissions may be reduced by 30-50% when using tires as a fuel depending on the kiln design".*

The Department agrees that the excerpt is from the referenced technical evaluation. It has general applicability, but is not necessarily applicable to Kiln 5. For example, the Coltom Plant is a long dry kiln with no calciner. It is possible to introduce whole tires into the middle of such kilns and achieve significant NO_X reductions by doing so. No operators of precalciner kilns such as Kiln 5 are known to practice mid-kiln tire injection and the applicant does not plan to do that. Certainly the Department did not actually evaluate the case of 100% tire use in the mentioned evaluation as it might apply to Kiln 5.

The application that resulted in MD-RER permit 0250020-029-AC to burn 1.65 tons/hour of whole tires actually described the project as follows:

*"Titan America will utilize either manual feeding (as completed during the trial period) or an automatic system will be installed to feed **whole tires**. Titan America will replace up to 10% of coal/petcoke (by weight) fired in the kiln with TDF (in this context meaning whole and not shredded tires or fluff). This alternative fuel usage will result in a maximum feed rate of **3.0 tons/hour** based on a 24-hour block average or 26,300 tons/year. Based on the average weight of 25.5 pounds per tire, the estimated tire throughput is 235 tires per hour corresponding to the design maximum feed rate of 3.0 tons/year. TDF will not be used during start-up or shutdown periods for the kiln system".* (Emphasis and parenthetical note by the Department)

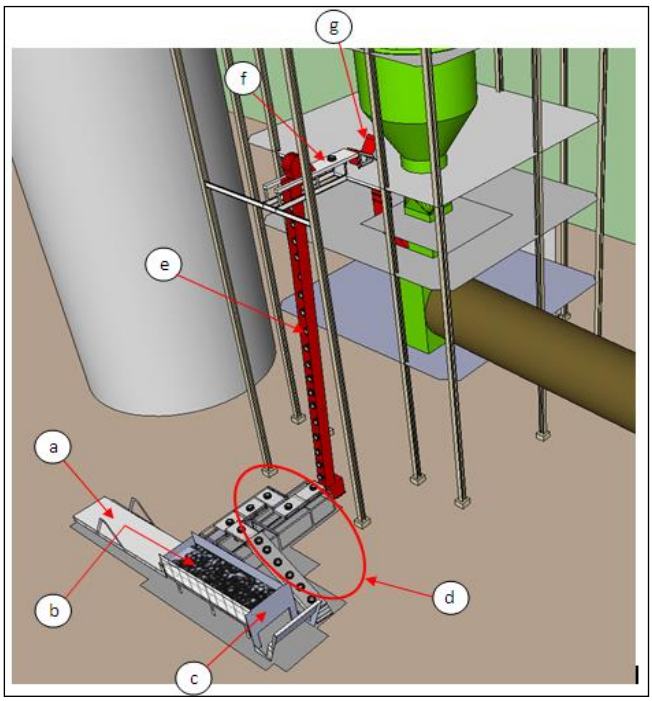


Figure 8 – Automatic Whole Tire Feeding System

Permit 0250020-029-AC Section B., Specific Condition 14 requires submittal of a trial burn summary report including test dates, feed rates, analytical results, emission monitoring data, production/process data, baghouse temperature, problems, and *"a conclusion as to the feasibility and practicality of whole tires as a supplemental fuel"*. The permit is still in effect by an extension of the expiration date.

Although no automated whole tire feed system

has been installed, refer to Figure 8 for a description of a possible feed system. A tipper (a) will tilt the enclosed trailer, allowing the tires to be gravity fed into a live bottom hopper (b). The live bottom hopper will feed a rotating disk separator located at the back of the hopper (c). The rotating disk separator will take one tire at a time and place it on the first of a series of roller conveyors (d). The roller conveyors align, reject oversized/undersized tires, and move the tires one at a time into the inlet of a hook elevator (e). The hook elevator will consist of a vertical moving chain with attached hooks. The hooks engage the tires through the center opening and move them upwards. The hook elevator picks the tires up at ground level and transfers them to the elevation (f) where an incline feeding scale is located (g). The tires are discharged one at a time from the hook elevator onto a horizontal rolling conveyor that transfers the tires onto the incline feeding scale. Tires are then fed into the preheater riser ducts of the kiln system.

Refer to the photograph in Figure 9 of the lower section of the FLSmidth Low NO_X In-Line Calciner (ILC) and the tertiary air duct installed on Kiln 5. The diagram in Figure 10 is from an FLSmidth (FLS) brochure helps explain the principles of the Low NO_X ILC. Link to FLSmidth Brochure (The Department added the references to temperatures, calcinations and oxidation).

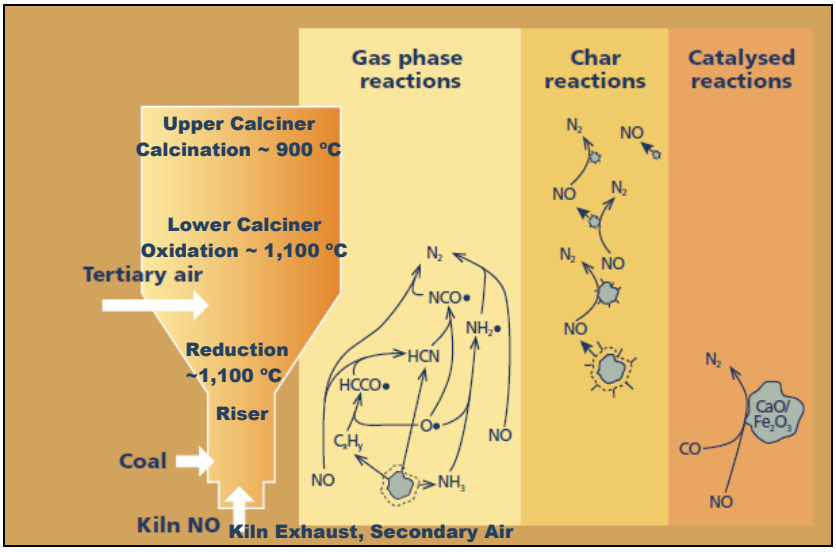


Figure 9 - Kiln 5 FLS Calciner **Figure 10 - Reaction Pathways in Oxygen-deficient Lower Calciner**

To assess the request, it is important to consider how NO_X is destroyed in the calciner. **All calciner fuel** for Kiln 5 presently injected in the riser between the kiln and calciner to create the required reducing atmosphere. The theory is that the greatest NO_X reduction will occur when the most aggressive reducing conditions and highest temperature persist ***just long enough*** to drive the gas phase NO destruction reactions. Then **all tertiary air** is added via the air duct from the kiln hood and clinker cooler to a single level near the bottom of the calciner.

The tertiary air supply duct is readily visible in the photograph above and the point where it enters the calciner is shown in the diagram. Another feature not fully appreciated is that raw meal is split to several sections of the calciner. Effective designs typically incorporate *meal splitting* for numerous reasons. One is to take advantage of the *catalytically* enhanced dissociation NO formed in the kiln.[3] Another reason is as a temperature control stratagem. The theory supporting the FLSmidth design is explained in a well-known paper.[4]

[3] Sprung, Siegbert. Technological Problems in Pyroprocessing Cement Clinker: Causes and Solutions. Beton Verlag. 1982.

[4] Thomsen, K., Schomburg, F. and Jensen, L.S. Inbetriebnahme und Betrieb des ILC-Low NOx-Calcinator bei Lone Star in St. Cruz, Kalifornien. ZKG International, Nr. 10/1998.

One important point appreciated from the diagram is that following gas-phase NO destruction, there is competition between reactions that form additional fuel NO from char combustion and those that destroy NO. Further staging of fuel (such as two fuels stages and two air stages) or separate combustion chambers does improve upon the overall NO destruction benefits of the single level fuel introduction and subjection of all kiln exhaust to the aggressive reducing zone created by introducing all fuel prior to introduction of tertiary air. Basically, the FLSmidth Low NO_X calciner design that was installed on Kiln 5 *is already optimized to destroy thermal NO_X from the kiln and minimize formation of fuel NO_X in the calciner*.

Figure 11 is a similar representation of reaction pathways from a Department presentation on NO_X control indicating the forks of NO versus molecular nitrogen (N_2) formation.

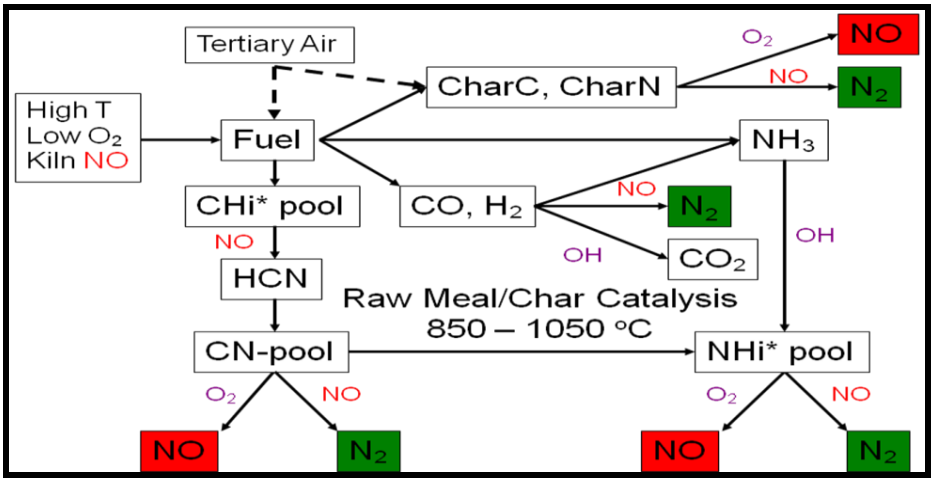


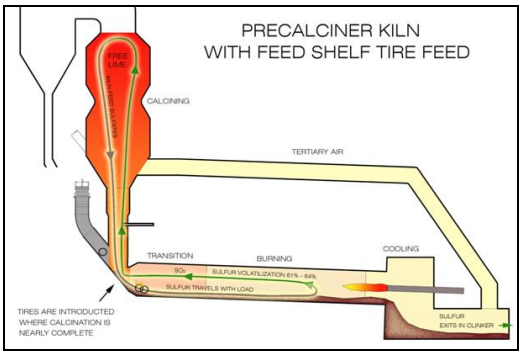
Figure 11 - NO Destruction, Suppression and Formation in Calciner.

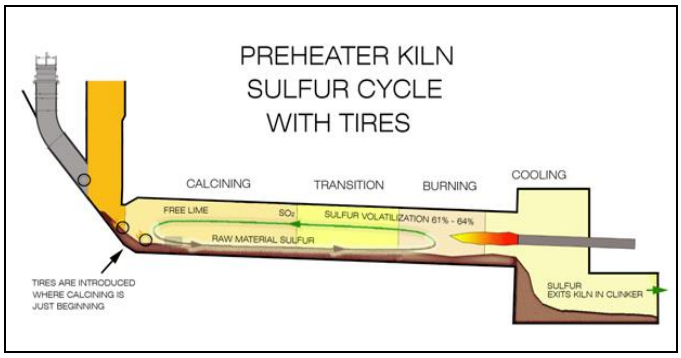
If all kiln gas is exposed first to calciner fuel prior to introduction of tertiary air (O_2) into the calciner, thermal NO destruction is maximized. Ultimately the necessary introduction of O_2 to complete combustion inevitably causes some further fuel NO formation. CO is adequately destroyed by the long residence time in the upper part of the FLS calciner and burnout loop.

When using this specific calciner, much of the CO measured at the stack exit is evolved from raw materials in the preheater and not from pulverized coal combustion in the kiln and riser. This is the reason why a low CO PSD/BACT limit was possible for Kiln 5 in addition to a relatively low NO_X limit.

Based on Figure 11, introducing **some whole** tires and **some pulverized coal** in the riser would preserve the strong reducing atmosphere and thermal NO destruction would still be favored. Typical ultimate analysis of tires (without reinforcement wiring) indicates that this fuel contains about 1/4 of the nitrogen contained in eastern bituminous steam coal. Link to TDF Characteristics Documents. This implies less fuel NO_X formation. The greater volatile content compared with coal suggests a larger hydrocarbon pool for further NO destruction. On the other hand, there will be less formation of ammonia radicals and less kiln thermal NO destruction. Fuel particle size effect on reaction kinetics must also be considered.

Much depends on whether whole tires combust within the riser and whether a portion falls into the kiln. If much of the tire mass reaches the kiln, it simulates the same operation as introducing tires into the kiln feed shelf of a precalciner. Refer to Figures 12 and 13 from AFS Technology. Link to AFS Article. If too much whole tires (or for that matter any fuel) reaches the back end of the kiln, sulfur formed by localized reduction can cause sulfur build up to reach an unmanageable level. Ultimately this can cause riser and tower plugs. This tendency is much more pronounced for preheater/calciner kilns (like Kiln 5) compared with preheater kilns where the calcination zone is actually inside the kiln.





Figures 12 – Shelf Feed - Precalciner Kiln Figure 13 – Whole Tire Shelf Feed in Preheater Kilns

As more ASF and TDF is introduced into the upper calciner, less fuel is available in the reducing zone to destroy thermal NO_X. Also the residence time for complete burnout is reduced if ASF or TDF (or even whole tires) are introduced high in the calciner. At 10% whole tire introduction through the riser, there may be sufficient measures available to plant personnel to manage the described challenges by raw material, process and chemistry adjustments.

Similar adjustments were made to meet the emission limits set in 2005 while increasing production from the new kiln. Figure 14 is a summary of daily production (tons/hour) NO_X and CO CEMS (lb/ton) emission data in terms of lb/ton for the first six months of 2005.

During the first quarter of 2005 (early in the Kiln 5 operating history), NO_X and CO emissions were managed to comply with the long term NO_X and CO limits of the 2001 permit issued by MD-RER (2.38 and 1.77 lb/ton clinker, respectively). During the second quarter of 2005 there was progressive improvement in NO_X and CO emission characteristics. By the end of June 2005, Tarmac demonstrated that it can operate the pyroprocessing line at the lower long-term emissions rates for both NO_X and CO (2.1 lb/ton and 1.33 lb/ton, respectively) that Tarmac actually requested (through an application by Golder Associates) to obtain the requested annual production increase without triggering PSD.

Although the applicant demonstrated CO emissions as low as 0.50 lb CO/ton while achieving 2.0 lb NO_X/ton, the Department recommended specification of a PSD/BACT CO limit of 2.0 lb/ton clinker instead of the 1.33 lb/ton clinker value that Tarmac requested. The rationale was that eventually Tarmac would use at least some raw materials (e.g. mill scale or power plant ash) with higher carbon and volatile content.

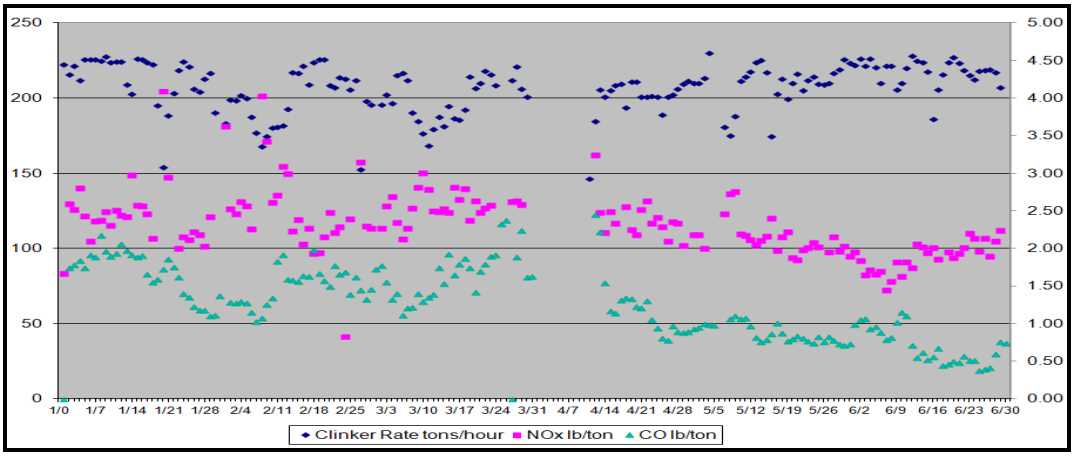


Figure 14 – Production and CO and NO_X Emissions from Kiln 5 (Jan. – June 2005)

Such materials (mill scale and fly ash), if fed at the top of the preheater, release CO and VOC before reaching the areas of high temperature treatment in the calciner and kiln. The higher-than requested CO emission limit also provided greater freedom to comply with the NO_X emission limit.

According to discussions with Tarmac representatives in 2005, the plant made changes to the pre-heater to allow material to flow smoother. They worked on the meal splitter(s) and made more C3S cement (alite) and less C2S (belite), thus requiring less intense burning. The operators also learned to handle the system more smoothly, which makes it run better. It achieves the lowest values in the state for plants relying on process control rather than add-on control equipment. Link to Titan America.

Conclusion. The Department will approve whole tire firing use up to **3 tons/hour** as requested by Tarmac in 2011. This does not revise the previously authorized use of TDF (such as shredded tires and tire fluff) introduced into the upper calciner in accordance with the previously approved permit that allows use of 15 tons/hour of ASF (including TDF). The Department will delete Section 3, Subsection B of MD-RER permit 0250020-029-AC, which contains conditions applicable to a trial burn firing whole tires beyond the previously permitted rate of 1.65 tons/hour.

The Department will adopt the same annual emissions reporting requirements into the present draft permit as already included in permit 0250020-031-AC, Section 2, Specific Condition 9. This will maintain the same baseline emissions assumptions as the ASF project and just include a different ASF (whole tires in the riser) as one of the actions to which the condition applies. The reports required for the ASF project can include the effects of the whole tire use as well.

An application for an air construction permit is required should the applicant decide to modify the existing or authorized whole tire injection system or increase the whole tire firing rate. Note that authorization under permit 0250020-029-AC to construct an automated whole tire feed system will expire on May 24, 2015.

3.3. Remove Limitations on Calcium Carbonate ($CaCO_3$) Residuals Sourcing and Use

The following write-up is based in part on the technical rationale given in the application.

Applicant Request. The applicant requests that the Department modify the MD-RER issued Title V operation permit 0250020-034-AV, Section B, Specific Condition 3.b. to allow calcium carbonate residuals from any supplier to be used as a substitute raw material for limestone. The applicant also requests that the 10% limitation given in Specific Condition 3.a. be removed "as the limitation is not needed to ensure compliance with the air rules.

According to Tarmac, these changes *"will allow Tarmac to re-use such materials to make a salable product, clinker, from a number of suppliers of limestone (actually calcium carbonate) residuals. Tarmac believes this re-use material can be re-used to offset a significant portion of Tarmac's current usage of virgin limestone".*

"Tarmac successfully conducted short term trials and provided material analysis to MD-RER to justify the long-term usage of these materials. Following these tests and analysis, concerns of MD-RER of the purity of limestone (actually $CaCO_3$ residuals) and its impact on air emissions has been thoroughly reviewed under the permitting of alternative fuels (DARM permit 0250020-031-AC).

"In addition to the analysis of the Miami-Dade County Water Treatment Plant (MDCWTP) material, EPA has reviewed the water treatment disposal options of these residuals and recommends its re-use in the production of cement. The American Water Works Association similarly supports research to use water treatment residuals (WTR) for cement and brick production."

"Like alternative fuels, other metals are captured in the pyroprocessing system. The chloride content must be similar to other raw materials. As with alternative raw material fuel materials, chloride is already monitored for cement quality and kiln system impacts (e.g., kiln plugging). Continuous

monitoring systems (CEMS) for NO_X, SO_2, THC and CO will ensure non-HAP emissions remain in compliance. Furthermore, these residuals compositions should not vary greatly from plant to plant in South Florida given the similar source of water (ground water from similar aquifer) and purification methods".

Department Review. The Department accepts the overall rationale provided by the applicant as sufficient for this specific set of circumstances (kiln, part of the country, type of residual, etc.) without necessarily agreeing with each individual point. For example, the Department did not consider or evaluate $CaCO_3$ residuals when it permitted alternative fuels. The Department did not evaluate a rationale provided by the applicant regarding free commerce. Basically, MD-RER approved use of materials from the County potable water treatment plants and would have approved others had similar information been provided.

Depending on the possible content of mercury, chloride, volatile matter, etc., the plant process chemistry constraints will inherently limit the amount of $CaCO_3$ residuals that can be used. Potential emission concerns will likely be resolved by internal quality control requirements and process chemistry constraints.

According to a release from FLSmidth, *"close interaction with Pennsuco will continue – helping to identify the limits for AF utilization and to find out where the bottlenecks are. Under discussion is a plan to install a chloride bypass unit by 2014, to improve the plant operation further".* Link to Titan FLSmidth Collaboration. Such a bypass will likely require an application for an air construction permit.

The Department has developed guidance for land application of drinking water treatment plant sludges including ferric, alum and lime sludges. Link to Department Land Application Guidance. Use of these materials to make cement would, on balance, be more favorable for the environment, energy and resource conservation than applying the residuals on land and mining more limestone.

Conclusion. The Department will remove the 10% restriction on calcium carbonate residuals and approve the use of the calcium carbonate residuals from *any* municipal potable water treatment plant, primarily on technical justifications by the applicant.

3.4. Revisions Related to EU 013, Finish Mill No. 4

Applicant Request. The applicant requests to replace the larger Finish Mill No. 4 Mikropul baghouse No. F-432 with the two smaller Mikropul baghouses, Nos. F-603 and F-604.

Department Review. No meaningful emission changes are expected and the replacement baghouses will be required to comply with the conditions presently applicable to the baghouse that will be replaced. These include applicable requirements in the cement NESHAP and a visible emission limit of 5% as shown in the attached draft permit.

Conclusion. The Department will revise the descriptions of the baghouses listed in the EU-013 description to reflect the requested change.

3.5. Establishment of Conditions Related to Clinker Conveyance and Storage Piles

Applicant Request. The applicant requests to construct a conveyer to allow the injection of stored clinker pile materials into the clinker cooler system. The application states:

"A new conveyor line will allow cementitious material to be input to the clinker system through an additional input line. The conveyor will not increase the current permitted amount of material to the kiln system. A primary and initial function of the conveyor will be to re-use older clinker material stored during past operations to substitute input of fresh clinker into the cooler system. Material will be added to a hopper, which will feed a conveyor belt.

"The conveyor belt will then feed into the existing clinker cooler system. A diagram of this process can be seen in Attachment 2. This conveying unit is determined to be subject to a unit-specific requirement

specified in 40 CFR 63, Subpart LLL. As such, it is being requested that this new conveyor line be added as an emission point to EU-027, the Cement Plant Clinker Handling & Storage System. Pursuant to 40 CFR 63.1345, conveying equipment is subject to a 10% opacity limit, with daily Method 22 observations to ensure compliance".

In its RAI response, the applicant added:

"There will not be any baghouse associated with this added conveyor line. All emissions from the associated conveyor line will be fugitive. The addition of the clinker material will occur into the clinker cooler. In summary, it will not have an effect on the actual material throughput, since it will be added post kiln processing and require subtraction of kiln-produced clinker. Any emissions from this process will strictly be either vented through the existing cooler control system as though the material is virgin clinker.

"Otherwise, the material will create the limited amount of fugitive emissions as stated in the application. The proposed fugitive PM emissions, as outlined above, were determined based on a maximum material transport and AP-42 emission factors".

Department Review. The newly requested activity point is related to one or more separate clinker piles that typically hold off-specification clinker. The clinker piles are not presently included EU-027. The new proposed clinker conveyor system will not be serviced by a baghouse in contrast to the other conveyors listed in EU 027. The applicant estimates that the material moisture content is greater than 1.5% and the material will be moved by enclosed conveyor belts.

The Cement NESHAP was updated on February 12, 2013 to regulate conveying system transfer points. According to section 63.1351:

(c) The compliance date for existing sources for all the requirements that became effective on February 12, 2013, except for the open clinker pile requirements will be September 9, 2015.

(e) The compliance date for existing sources with the requirements for open clinker storage piles in section 63.1343(c) is February 12, 2014.

The requirements applicable to open clinker storage piles are listed in section 63.1343 as follows:

(c) Open clinker storage pile. The owner or operator of an open clinker storage pile must prepare, and operate in accordance with, the fugitive dust emissions control measures, described in their operation and maintenance plan (see § 63.1347 of this subpart), that is appropriate for the site conditions as specified in paragraphs (c)(1) through (3) of this section. The operation and maintenance plan must also describe the measures that will be used to minimize fugitive dust emissions from piles of clinker, such as accidental spillage, that are not part of open clinker storage piles.

(1) The operation and maintenance plan must identify and describe the location of each current or future open clinker storage pile and the fugitive dust emissions control measures the owner or operator will use to minimize fugitive dust emissions from each open clinker storage pile.

(2) For open clinker storage piles, the operations and maintenance plan must specify that one or more of the following control measures will be used to minimize to the greatest extent practicable fugitive dust from open clinker storage piles: Locating the source inside a partial enclosure, installing and operating a water spray or fogging system, applying appropriate chemical dust suppression agents, use of a wind barrier, compaction, use of tarpaulin or other equally effective cover or use of a vegetative cover. You must select, for inclusion in the operations and maintenance plan, the fugitive dust control measure or measures listed in this paragraph that are most appropriate for site conditions. The plan must also explain how the measure or measures selected are applicable and appropriate for site conditions. In addition, the plan must be revised as needed to reflect any changing conditions at the source.

(3) Temporary piles of clinker that result from accidental spillage or clinker storage cleaning operations must be cleaned up within 3 days.

A visible emissions limitation of 10% opacity already applies to clinker, or finished product conveyance per the previous Cement NESHAP.

Conclusion. Because of certain unique requirements and lack of baghouses, the Department will establish EU-040, Open Clinker Storage Pile and Conveyor, rather than set up a separate emission point within EU 027. The applicable requirements are provided in the draft permit Section 3, Specific Conditions B.1 through B.10.

3.6. Revisions Related to Insignificant Activities

Applicant Request. The applicant requests that the present permitting action address certain insignificant emissions including: an on-site laboratory dust collector and railcar painting. According to the application:

"A request for painting has previously been submitted but, additional information was requested in the RAI dated February 6, 2012. As such, that additional information is provided".

Assessment of Request. The RAI dated February 6, 2012 related to an application for Title V permit 0250020-033-AV that was issued by MD-RER application. In the response to the RAI received for the present application the applicant acknowledged that a request for concurrent revision of the Title V permit is not presently requested.

Conclusion. The draft permit will identify that these activities are exempt from the requirement to obtain an air construction permit and the issue of insignificant emissions units will be addressed during the next revision or renewal of the Title V permit.

3.7. Revisions Related to Portable Transloading Operation in EU-034

Applicant Request. By email received on January 23, 2014, the applicant requested the addition of a portable transloading system with two baghouse dust collectors to the existing transloading operation (EU-034). The portable system would be subject to the same requirements as the existing equipment.

Assessment of Request. Emissions from the portable system will be adequately controlled.

Conclusion. The draft permit revises the existing transloading operation (EU-034) to include the portable system.

4. PRELIMINARY DETERMINATION

The Department makes a preliminary determination that the proposed changes applicable to the Tarmac facility will comply with all applicable state and federal air pollution regulations as conditioned by the draft permit. This determination is based on a technical review of the complete application, reasonable assurances provided by the applicant, operating history of the plant, the Department's own analysis and the conditions specified in the draft permit. Additional details may be provided by contacting the Department's Office of Permitting and Compliance, Division of Air Resource Management, at 850-717-9000 or Mail Station #5505, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400.