

PSD-FL-142

METRO-DADE-DEEM

(Department of Environmental Resources Management)
ENFORCEMENT SECTION

33 SOUTHWEST 2ND AVENUE
MIAMI, FL 33130-1540
(305) 372-6902

FAX COVER SHEET

DATE: 10/6/97 TIME: 2:30 AM/PM

TO: Al Linceo DEP PH#: _____

FAX: 922-6979
850 ~~850~~

FROM: Sharon Crabtree FAX: 305-372-6542
DEEM PH#: 305-372-6902

RE: _____

Number of pages including cover sheet: 12

MESSAGE: Al FYI. This is what Tarmac
Consent Agreement looks like. We are
mailing it 10/7/97 to Tarmac Reps for
review, & signature. Sharon Crabtree
P.S. I left off exhibit A - you have that - it
is their permit AC 13-169901.

AGREEMENT

DADE COUNTY DEPARTMENT OF ENVIRONMENTAL RESOURCES MANAGEMENT)
Complainant,)
VS.)
Tarmac Florida, Inc.)
Respondent)

THIS AGREEMENT, entered into by and between METROPOLITAN DADE COUNTY DEPARTMENT OF ENVIRONMENTAL RESOURCES MANAGEMENT (hereinafter referred to as DERM), and Tarmac Florida, Inc. (hereinafter referred to as Respondent) pursuant to Section 24-5(15)(c) Metropolitan Dade County Environmental Protection Ordinance shall serve to redress alleged violations of Section 24-55 of the Code of Metropolitan Dade County at the site located at 11000 NW 121 Way, Medley, Dade County, Florida (Folio #30-2031-001-0030).

The DERM finds and RESPONDENT admits the following:

FINDINGS OF FACT

1. The DERM is an agency of Metropolitan Dade County, a political subdivision of the State of Florida which is empowered to control and prohibit pollution and protect the environment within Dade County pursuant to Article VIII, Section 6 of the Florida Constitution, the Dade County Home Rule Charter and Section 403.182 of the Florida Statutes.

2. On July 8, 1980 the United States Environmental Protection Agency (EPA) issued Final Determination PSD-F1-050 for proposed conversions of the Pennsuco kilns 1,2 and 3 to coal. Condition # 8 of the Final Determination limits NOx emissions from kiln # 2 to 118 lb/hr at the maximum operating rate or 4.73 lb/ton of clinker produced at lesser operating rates. These limiting emission rates were proposed by Respondent.

3. The conversion to coal for kiln # 2 was deferred for several years. On August 21, 1989 Respondent submitted an application to the Florida Department of Environmental Regulation (FDER, now known as the Florida Department of Environmental Protection, DEP) to construct/operate an air pollution source. In this application Respondent requested, a maximum allowable NOx emission rate of 169.25 lbs/hr for kiln #2.

4. On February 25, 1991 DEP issued Construction Permit No. AC 13-169901 (exhibit A, attached) to convert kiln #2 to coal firing. Specific Condition # 5 limited NOx emissions to 113.8 lbs/hr. Specific Condition # 12 permitted up to a one year compliance testing period. As stipulated in Condition # 12, during this year-long testing and evaluation period, Respondent was to make reasonable efforts to limit air emissions and DEP would not initiate enforcement proceedings.

5. On April 24, 1994 Respondent initiated the bi-monthly compliance testing for a one year period ending April 1995. NOx emissions exceeded permittable levels at every testing event through to the present. However, through NOx emission testing data, Respondent has demonstrated the ability to limit NOx emissions to below 200 lbs/hr using the existing system.
6. On May 28, 1996 Respondent's consulting firm submitted a plan for testing NOx emission levels using a modified coal burner nozzle installed on kiln # 2. Testing was to commence by early June 1996 and test data was to be submitted to DEP by early August 1996.
7. On October 16, 1996 DEP issued a letter to Respondent stating that DEP had not received NOx emissions testing data as stated in the May 28, 1996 letter. DEP requested that Tarmac provide immediate assessment of the NOx emission using the modified burner nozzle. Resolution of the NOx emission violation was to be achieved by January 1, 1997.
8. Resolution of the elevated NOx emissions was not achieved and pursuant to the FDEP/DERM air permitting delegation agreement, on April 14, 1997, DEP referred the continuing NOx emissions violation at the subject site to DERM for follow-up enforcement action.
9. On June 17, 1997 DERM issued a Notice of Violation (NOV) and

Orders for Corrective Action and Settlement for exceedances of permitted NOx emission rates. Said NOV ordered Respondent to submit a written plan detailing proposed corrective actions to ensure that the allowable limits for emissions are not exceeded.

10. The Respondent hereby consents to the terms of this Agreement without either admitting or denying the allegations made by DERM in the Notice of Violation and Orders for Corrective Action and Settlement; and

11. In an effort to insure continued protection of the health and safety of the public and the environment of Dade County and to insure compliance with Chapter 24, Metropolitan Dade County Environmental Protection Ordinance and to avoid time-consuming and costly litigation, the parties hereto stipulate and agree to the following, and it is ordered:

12. Upon execution of this Consent Agreement Respondent shall meet an interim NOx emission limit of 195 lbs/hr for kiln # 2. This NOx emission limit shall remain in effect until February 28, 1998 which is the expiration date of permit #AC 13-169901 or until kiln #2 is retrofitted for indirect firing or converted to an alternative fuel according to the timeframes set forth in paragraphs # 15 or # 16. Respondent shall then be required to meet Best Available Control Technology (BACT) NOx emission limitations for kiln #2 as stipulated in permit #AC 13-169901.

13. On or before December 31, 1997, Respondent shall declare in writing to DERM its method for meeting the BACT NOx emission limitations for kiln #2 as stipulated in permit #AC 13-169901.
14. Respondent shall submit complete applications for required air construction permits and/or permit modifications or renewals to the FDEP or Dade County DERM, as appropriate by January 31, 1998. Additional information requested by the appropriate agencies shall be provided by Respondent within fourteen (14) days of the date Respondent receives the request.
15. If Respondent relinquishes its authorization to burn coal in kiln # 2, the retrofitting of kiln # 2 to use an alternative fuel shall be completed within 90 days of receiving the construction permit to modify, referenced in paragraph #14, above and then Respondent shall adhere to NOx emissions limitations as set forth in the permit.
16. Alternatively to paragraph #15, if Kiln # 2 is converted to indirect firing, construction shall be completed within 12 months after receiving the construction permit to modify referenced in paragraph #14, above and then Respondent shall meet the same BACT NOx emission limitations as set forth in construction permit No. AC 13-169901.

17. Alternatively to paragraphs # 15 and # 16, if kiln # 2 is converted to dry process technology, construction shall be completed within 36 months after the required permits have been issued, and then Respondent shall meet the NOx emissions limitation of 113.8 lbs/hr.

18. Respondent shall pay to FDEP the Title V permitting fee for kiln #2 NOx emissions based on the interim rate of 195 lbs/hr. This fee shall be effective upon execution of this Consent Agreement and shall remain in effect until Respondent is in compliance with kiln #2 permitted NOx emissions limitations.

SAFETY PRECAUTIONS

19. The Respondent shall maintain the subject site, during the pendency of this Agreement, in a manner which shall not pose a hazard or threat to the public at large or the environment and shall not cause a nuisance or sanitary nuisance as set forth in Chapter 24, Metropolitan Dade County Environmental Protection Ordinance.

VIOLATION OF REQUIREMENTS

20. This Agreement constitutes a lawful order of the Director of the Department of Environmental Resources Management and is enforceable in a civil or criminal court of competent jurisdiction pursuant to Chapter 24, Metropolitan Dade County Environmental Protection Ordinance. Violation of any requirement of the Agreement may result in enforcement action by DERM. Each violation of any of the terms and conditions of this Agreement by the Respondent shall constitute a separate offense.

SETTLEMENT COSTS

21. The Respondent hereby certifies that he has the financial ability to comply with the terms and conditions stipulated herein and to comply with the payments specified in this Agreement.
22. DERM has determined, that due to the costs incurred to bring the subject facility into compliance, a settlement of \$196,189.00 is appropriate. The Respondent shall within thirty (30) days of the effective date of this Agreement, submit to DERM a check in the amount of \$196,189.00, for full settlement payment. The Settlement shall be made payable to DERM and sent to the Department of Environmental Resources Management, c/o

Sharon Crabtree, Suite 1100, 33 SW 2nd Avenue, Miami, Florida,
33130.

23. In the event Respondent fails to submit, modify, implement, obtain, provide, operate, comply and or complete those items listed in paragraphs 12,13,14,15,16, and 17 herein, the Respondent shall pay DERM a civil penalty of one hundred dollars (\$100.00) per day for each day of non-compliance and the Respondent shall be subject to enforcement action in a civil or criminal court of competent jurisdiction for such failure pursuant to the provisions set forth in Chapter 24, Metropolitan Dade County Environmental Protection Ordinance. Said payment shall be made by Respondent to DERM within ten (10) days of receipt of written notification and shall be sent to the Department of Environmental Resources Management, c/o Sharon Crabtree, at 33 S.W. 2nd Avenue, Miami, Florida 33130.

GENERAL PROVISIONS

24. Respondent shall allow authorized representatives of DERM access to the property at reasonable times for purposes of determining compliance with this Consent Agreement and the rules and regulations set forth in Chapter 24, Metropolitan Dade County Environmental Protection Ordinance

25. The DERM expressly reserves the right to initiate appropriate legal action to prevent or prohibit the future violations of applicable statutes or the rules promulgated thereunder.
26. Entry into this Consent Agreement does not relieve Respondent of the responsibility to comply with applicable federal, state or local laws, regulations and Ordinances.
27. Where timetables or conditions cannot be met by Respondent due to circumstances beyond the Respondent's control, Respondent shall provide written documentation to DERM, which shall substantiate that the cause(s) for the delay or non-compliance was not reasonably in the control of the Respondent. A determination of the reasonableness shall be made by DERM for the purpose of imposition of penalties pursuant to paragraph 22 herein.
28. This Agreement shall neither be evidence of a prior violation of this Chapter nor shall it be deemed to impose any limitation upon any investigation or action by DERM in the enforcement of Chapter 24, Metropolitan Dade County Environmental Protection Ordinance.

29. In consideration of the complete and timely performance by the Respondent of the obligations contained in the Agreement, DERM waives its rights to seek judicial imposition of damages or criminal or civil penalties for the matters alleged in this Agreement.

30. This Agreement shall become effective upon the date of execution by the Director, Environmental Resources Management or his designee.

Date

John D. Carr, President
Tarmac Florida, Inc.

BEFORE ME, the undersigned authority, personally appeared _____ who after being duly sworn, deposes and says that he has read and agrees to the foregoing.

Sworn to and subscribed before me this _____ day of

_____, 1997 by _____
(name of affiant)

Personally Known _____ or Produced Identification _____

(Check one)

Type of Identification Produced: _____

Notary Public

Date

John W. Renfrow, P.E., Director
Environmental Resources Management

Witness

Witness

DERM
Complainant
VS.
Tarmac Florida, Inc.
Respondent

John R.

Memorandum

Florida Department of
Environmental Protection

7 25 00 20

TO: Donna Gordon, Chief, Code Enforcement
Dade County DERM

FROM: A. A. Linero, P.E. Administrator *A. A. Linero* 7/28

DATE: July 28, 1997

SUBJECT: Tarmac/Pennsuco Kiln No. 2

Per our teleconference of July 25, 1997 enclosed are the following references to nitrogen oxides emissions limits for Tarmac Kiln 2 from our permit files:

- EPA-issued Final Determination PSD-FL-050 dated July 8, 1980 for proposed conversions of Pennsuco Kilns 1, 2, and 3 to coal. Permit Condition 8 limits NOx from Kiln 2 to 118 lb/hr and 4.73 lb/ton clinker while burning coal. Per Table 4, this was the limit proposed by the applicant. Apparently the Kiln 2 conversion was deferred for some 10 years.
- Excerpt from application dated August 31, 1989 for Kiln 2 coal conversion project. Page 4 of the sealed application gives a maximum NOx emission rate of 169.25 lb/hr (6.77 lb/ton clinker). Value is also given on Page 2-6.
- Letter dated March 9, 1993 from KBN to DEP requesting exemption of Kilns 2 and 3 from Reasonable Available Control Technology (RACT) requirements for NOx. Table 2-1 attached to the letter acknowledges that the NOx limit is 113.8 lb/hr (4.55 lb/ton clinker). It includes the caveat that if emissions are between 113.8 to 169 lb/hr, Best Available Control Technology (BACT) may be re-evaluated by FDEP.

I was not the permitting engineer on any of these actions related to Tarmac and I was not involved with the Rinker consent order. At first glance, note that the Tarmac case appears to be at least a violation of a BACT limit in a PSD permit (PSD-FL-142). Construction projects offer the best chance for upgrading emissions controls and that opportunity arose for Tarmac during the coal conversion. Tarmac (or Pennsuco) has known (or should have known) for at least 17 years roughly what levels of NOx emissions represent BACT for NOx for Kiln 2. Tarmac did not approach DEP with a clear solution to its NOx problem even after they were advised in writing on October 16, 1996 that "the Department will have to take appropriate action to enforce the existing permit limits."

The Rinker case involves violation of a fairly recent RACT rule and Rinker apparently did not implement a major construction project affording a routine opportunity to upgrade its emissions control. That does not excuse a violation, but it is a difference. Presumably the modernization project at Rinker will afford that opportunity. In any case, Rinker approached the DEP with proposed solutions to its problem.

Our staff is available to assist, but by and large it appears that the facts to adequately support your action can be readily retrieved from your files. I can come by during one of my routine visits and review them with DERM. Please call me or John Reynolds if you have technical questions regarding Tarmac. If you wish to consult on Rinker or (possible) Tarmac consent orders, please contact Jim Pennington directly. We can be contacted at 850/488-1344.

AAL/aal

cc: Pat Wong, DERM
Sharon Crabtree, DERM
Clair Fancy, BAR
Jim Pennington, BAR
Tom Tittle, SED

Date: 4/15/97 7:22:21 AM
From: Thomas Tittle WPB
Subject: Re: Tarmac Kiln 2
To: See Below

> Tom. Can you provide any recent compliance-related reports
>you might have on them. I do think that Dade does compliance on
>these
>guys and maybe they have most relevant stuff in their own files?
>Thanks.

You are correct that Dade should have all recent compliance-related reports. If we can get a list of the pertinent tests they have, then we could check our files and see if we have any pertinent reports they are missing. If they need a complete test report of something we have, then we will need to get the bulk of the report(s) from ARCHIVE.

Only a few key pages of the test reports are kept in the Compliance folders (summary, pollutant test results, data tables, VE observations, etc...). We will be glad to provide as much as they need.

To: Alvaro Linero TAL
CC: Jim Pennington TAL
CC: Ewart Anderson MIAMI
CC: Thomas Tittle WPB
CC: Heather Hinst TAL
CC: Patricia Comer TAL
CC: Luna Ergas TAL
CC: John Reynolds TAL

Date: 4/14/97 10:16:21 AM
From: Alvaro Linero TAL
Subject: Tarmac Kiln 2
To: See Below

John. Donna Edwards of Dade County DERM Enforcement called. They will act on the enforcement matter. She would like a more complete file. Please help Heather who is trying to put it together.

They want copies of any test reports which support the action (i.e. besides KBN/Golder's summary table), extensions to the permit, and anything else that might be useful.

Tom. Can you provide any recent compliance-related reports you might have on them. I do think that Dade does compliance on these guys and maybe they have most relevant stuff in their own files?
Thanks.

To: John Reynolds TAL
CC: Jim Pennington TAL
CC: Ewart Anderson MIAMI
CC: Thomas Tittle WPB
CC: Heather Hinst TAL
CC: Patricia Comer TAL
CC: Luna Ergas TAL

Memorandum

Florida Department of Environmental Protection

TO: Donna Gordon, Chief, Code Enforcement
Dade County DERM

THRU: Clair Fancy, Chief
DARM/Bureau of Air Regulation

FROM: A. A. Linero, P.E. Administrator
DARM/New Source Review

DATE: March 20, 1997

SUBJECT: Tarmac/Pennsocco Kiln 2 Air Construction Permit Emission Limits

DRAFT

Kiln 2 is one of the original cement kilns at Tarmac/Pennsocco. It produces 25 tons per hour (TPH) of clinker. Kiln 2 was permitted to convert to coal-firing from natural gas in 1991. The permit No. is AC13-169901 and is a Florida Department of Environmental Protection (FDEP) air construction permit issued pursuant to Chapter 403, Florida Statutes and the associated Department rules. Certain conditions pursuant to the Department's Prevention of Significant Deterioration (PSD) rules are incorporated therein. Since its conversion, the kiln has not achieved the permitted limits for nitrogen oxides (NO_x) given in the permit. Attached for your review and action are the following items from the permitting files:

- Copy of air construction permit dated February 25, 1991 including Best Available Control Technology (BACT) Determination. Kiln No. 2 has not demonstrated compliance with Specific Condition 5 on page 6. It limits NO_x emissions to 4.55 pounds per ton clinker (lb/ton) and 113.8 pounds per hour (lb/hr). Specific Condition 12, page 6 provides for a **one year** test program. Based on the results of the program, **upward** adjustment of the NO_x limits to 6.77 lb/ton and 169.3 lb/hr may result.
- Petition for Formal Administrative Proceedings filed for Tarmac by Hopping Boyd Green & Sams on June 19, 1990. The relief requested was that limits be initially set at 169.3 lb/hr (6.77 lb/ton) with the possibility of adjustment downward. This petition was dismissed after a joint stipulation resulted in the above mentioned permit in consideration of Tarmac's request.
- Department letter of October 16, 1996 requesting an update from Tarmac and advising of possible enforcement.
- Letter dated January 21, 1997 from Golder Associates. According to attached Table A, Tarmac has conducted a **two and one-half** year program and has been unable to meet even its own requested NO_x limit. The ranges have been 177 to 450 lb/hr and 8.08 to 21.54 lb/ton.

Although Tarmac continues to conduct tests and plans to provide the results to the Department, we consider the period during which the Department shall not initiate enforcement to have ended. The effective date of the possible violations is January 23, 1997 when we received Golder's most recent letter with all of the test results.

Copies of past permitting documents should be in the files of the DERM Air Division. Please advise Tom Tittle of the Southeast District of your intended action within two weeks. If you have any questions, please call me or John Reynolds at (904)488-1344.

AAL/aal/l

cc: Pat Wong, DERM
Tom Tittle, SED
Pat Cemer, OGC
Luna Ergas, OGC
Jim Pennington, BAR

Golder Associates Inc.

6241 NW 23rd Street, Suite 500
Gainesville, FL 32653-1500
Telephone (352) 336-5600
Fax (352) 336-6603



January 21, 1997

Mr. A. A. Linero, Administrator
New Source Review Section
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RECEIVED

JAN 23 1997

BUREAU OF
AIR REGULATION

Re: Investigation of NO_x Emissions
Tarmac Florida, Kiln No. 2

Dear Mr. Linero:

The purpose of this letter is to respond to the Florida Department of Environmental Protection (the "Department") letter dated October 16, 1996, and to present a status report on the investigation of NO_x emissions from Kiln No. 2. As you are aware, Tarmac Florida, Inc., has been investigating the high NO_x emissions being experienced from Kiln 2, and potential methods to reduce the emissions. The thrust of our efforts has been toward discovering the reasons for the high emissions, and what can be done to reduce the emissions.

This letter presents a status report to the Department, which presents the results of our efforts to date. Some of the information presented in our May 28, 1996, status report is repeated herein, in order to be complete. In addition, Tarmac's continuing efforts to determine if NO_x reduction measures implemented by Tarmac can result in achieving the permitted NO_x limit, or to what extent they can reduce emissions, are described.

Kiln No. 3 Emissions and Basis for Original BACT

The Department has requested that Tarmac investigate why the NO_x emissions from Kiln No. 2 exceed the BACT limit stated in the permit, and why such emissions are much higher than Kiln No. 3, which was the basis for the BACT. Therefore, a review of the permitting history of the Kiln No. 2 coal conversion PSD permit is presented.

In the original PSD permit application for the Kiln No. 2 coal conversion, Tarmac proposed BACT levels of 400 lb/hr for SO₂ (16 lb/ton clinker) and 169.3 lb/hr for NO_x (6.77 lb/ton clinker) as starting points for the BACT evaluation. This starting point for NO_x was based on the permitted emission limit for Kiln No. 3, which experience had shown was achievable in Kiln No. 3, as well as a limited set of test data from Kiln No. 2 in 1980 when burning fuel oil and gas (see attached data).

It is important to recognize that the proposed BACT control technology was determined by the Department to be good combustion practices and the inherent SO₂ removal within the kiln system. Due to concerns over the nearby PSD Class I area (Everglades National Park), SO₂

9651002A/03

emissions were considered to be of much more importance at the time. Subsequently, EPA agreed that BACT for NO_x was good operating and maintenance procedures to minimize NO_x emissions.

Tarmac proposed and strongly argued that a comprehensive test program be conducted prior to setting any final emission limits for Kiln No. 2. This was due to the uncertainty in emissions from Kiln No. 2 versus Kiln No. 3 (due to different size of the kilns and different firing types). Tarmac alluded to a similar experience with Kiln No. 3 when it was converted to coal. An emission limit was agreed to without any test data, and the limit proved to be unattainable. Therefore, the Kiln No. 3 emission limits were revised. Tarmac did not want to make this same error again. Tarmac's commitment was to minimize SO₂ emissions to the extent possible, again due to the Class I area concerns. EPA approved the testing plan as a mechanism to set the BACT limit for SO₂ in January 1990. The BACT limit for NO_x was also to be set through the testing program.

The actual test data from Kiln No. 2 shows that the original commitment of minimizing SO₂ emissions to the extent practical is limited if NO_x emissions are to be reduced. The data reflect Tarmac's previous experience that reducing NO_x emissions results in an increase in SO₂ emissions. Prior to the most recent change to the coal burner on Kiln No. 2, actual SO₂ emissions were well below the allowable BACT limit. However, after installation of the new coal burner, which significantly reduced NO_x emissions, the SO₂ emissions increased markedly. As will be discussed in this report, the low NO_x emissions in effect cause the conversely high SO₂ emissions.

Kiln No. 2 NO_x Emissions

A complete summary of the SO₂ and NO_x emissions data and related process data obtained to date for Kiln No. 2 is presented in Table A attached. A discussion of these tests is provided below.

Burner Modifications

The series of tests spanning April 1994 through December 1995 were required by the original construction permit. These tests were conducted with the original coal burner installed under the construction permit. The nozzle diameter of the coal burner was 13 inches during these tests. Since these series of tests resulted in relatively high NO_x emissions, Tarmac decided to modify the coal burner. The rationale for this change is described below.

Kiln No. 2 is a direct fired kiln. This means that the primary combustion air to the kiln is provided through the coal burner. Air is swept through the coal mill, which provides for drying of the coal, as well as pneumatic conveying of the coal. The air and coal is then

discharged into the kiln through the burner. Additional secondary combustion air to the kiln is provided via air from the clinker cooler. Clinker cooler air is drawn into the kiln by means of the draft created by the kiln.

In the direct fired system, the control over the primary combustion air is limited since a certain minimum air flow through the coal mill must be maintained in order to dry and convey the coal. Flame characteristics (i.e., flame length and intensity) are critical to producing clinker of acceptable quality. However, one potential means of reducing the primary air requirements, and potentially reducing NO_x emissions, is to reduce the coal burner nozzle diameter. By reducing the nozzle diameter, it may be possible to maintain the critical flame characteristics and at the same time reduce the amount of primary air.

In order to investigate this potential, prior to the May 1996 testing the coal burner was modified to a 10 inch nozzle diameter. Although this modification resulted in NO_x emissions which were at the low end of the range of emissions experienced in the past for Kiln No. 2, emissions were still well above the permitted limit. In addition, this nozzle diameter was considered to be too small by plant personnel because it limited too severely the air flow through the coal mill, and high velocities at the nozzle tip were causing excessive wear on the burner tip.

As a result, the burner nozzle diameter was increased to 11 inches prior to the July 31, 1996 testing. Initial test results indicate that this nozzle configuration has significantly reduced NO_x emissions, that the burner is not adversely affected, and that satisfactory clinker can be produced using this burner. However, additional testing is needed to confirm these initial results. The December 1996 tests results were inconclusive due to kiln operating problems during the testing period.

Results of Testing

As shown in Table A, during the tests when the coal burner diameter was 13 inches (1994 and 1995 testing), the SO₂ emissions were generally very low, while the NO_x emissions were high compared to the permitted emission rates. According to plant kiln operators, the SO₂ and NO_x emissions are related to the oxygen level in the kiln. They state that as the oxygen level in the kiln increases, SO₂ emissions decrease while NO_x emissions increase. They stated that this trend has also been evident on Kiln No. 3.

The available test data for Kiln No. 2 was analyzed to determine if a correlation exists between NO_x, oxygen and SO₂ emissions. During the stack tests on Kiln No. 2, oxygen level at the stack is measured. However, this measurement is affected by infiltration of ambient air into the system and is not reflective of conditions in the kiln. Therefore, oxygen levels in the kiln itself are needed. Tarmac maintains a kiln oxygen monitor on Kiln No. 2,

and data from this monitor is archived. Due to this archiving, kiln oxygen data for only the 1996 tests were available. As a result, the stack oxygen data were analyzed to determine if any correlation exists between NO_x emissions and stack oxygen level. Kiln oxygen levels were also evaluated for the 1996 data.

Based on this evaluation, no significant relationship between stack or kiln oxygen level and NO_x or SO₂ emissions was found. However, there is a general trend towards lower NO_x emissions as oxygen level in the kiln is decreased.

The coal burner nozzle diameter was 10 inches during the May 1996 testing. As described previously, this burner diameter caused operating problems with the burner and the coal mill. Also, NO_x emissions averaged 253 lb/hr and 2.1 lb/MMBtu, which are lower than many previous tests, but remained above the permit "window" of 169.3 lb/hr, and above the RACT limit of 2.0 lb/MMBtu.

As a result, Tarmac modified the burner to an 11 inch nozzle diameter for the July/August 1996 testing. While resulting in satisfactory kiln and coal mill operation, the NO_x emissions from the July/August testing averaged 199.4 lb/hr and 1.56 lb/MMBtu. Although this emission level exceeds the permit "window" of 169.3 lb/hr, it is within the RACT limit of 2.0 lb/MMBtu.

Additional testing was conducted in December 1996 in an effort to duplicate the success of the July/August tests. Results from this test were much higher than the July/August testing, averaging 307 lb/hr and 2.90 lb/MMBtu. However, these higher emission rates are not considered to be representative of normal operation, because the kiln was experiencing some operational problems during the testing. During the testing, the kiln was experiencing several "hot spots" on the kiln shell.

Hot spots are areas of the kiln shell where the inner coating of brick and clinker has worn thin, causing the outer shell temperature to rise. When such conditions occur, the operator reduces fuel consumption and therefore clinker production, so as to not cause damage to the kiln. During this testing, the hot spots were in the area of the coal flame. As a result, the operator also increased the combustion air to the kiln, as a means of decreasing kiln temperatures. These operating changes are believed to be the cause of the higher NO_x emissions.

Because of the hot spots developing in the kiln, Tarmac is shutting down the kiln in January for repairs. The kiln will be brought back on-line in late February. Tarmac is planning an additional test for NO_x and SO₂ emissions in February or early March to confirm the emissions with the new burner pipe when the kiln is operating normally.

Conclusions

Based on the information gathered to date for Kiln No. 2, the reasons for the high NO_x emissions can be summarized as follows:

1. Kiln No. 2 operates at a kiln oxygen level normally in the range of 2 to 2.5%. By comparison, Kiln No. 3 normally operates at an oxygen level of approximately 1.0%.
2. Kiln No. 3 is an indirect fired kiln, meaning that the coal fuel and the primary combustion air are delivered to the kiln separately. This allows more control over the combustion air, allowing the combustion air to be varied to obtain optimum combustion conditions and flame characteristics. The air associated with the coal burner normally is not varied. In a wet process cement kiln, the flame characteristics (flame length and intensity) are critical to clinker production.

In contrast, Kiln No. 2 is a direct fired kiln, which means that the primary combustion air is delivered to the kiln through the coal feed system. In such a system, the amount of combustion air cannot be reduced or varied, because the air velocity through the burner is critical to the flame characteristics.

3. This difference in the two kilns is reflected in the gas flow rates from the kilns. Kiln No. 2, with a maximum clinker production rate of 25 TPH, has an exhaust gas flow rate of 50,000 to 60,000 dscfm. This equates to 2,000 to 2,400 dscfm per ton of clinker produced. Kiln No. 3 normally operates at 87.5 TPH clinker with exhaust gas flow of 140,000 to 160,000 dscfm. This equates to 1,600 to 1,830 dscfm per ton of clinker produced. Therefore, Kiln No. 2 requires approximately 25% more air to operate than Kiln No. 3. This in turn results in a higher oxygen level in the kiln, and hence higher NO_x emissions but lower SO₂ emissions compared to Kiln No. 3.


Continuing Investigation

Based on the above discussion, Tarmac is focusing on reducing the amount of combustion air to the kiln as the only feasible means of lowering NO_x emissions. To this end, Tarmac recently installed a modified coal burner on Kiln No. 2 during the recent outage in April 1996, and again modified the burner in July 1996. The previous coal burner had a 13 inch nozzle, while the new burner will have a 11 inch nozzle. The intention in reducing the nozzle diameter is to reduce the amount of primary air introduced through the coal burner, while maintaining the velocity through the burner obtained by the previous burner design, thus maintaining the previous flame characteristics. The additional emissions test will also be used to determine the effects of the changes upon the grind ability of the clinker product. As discussed above, proper clinker production is dependent upon the flame characteristics.

Tarmac is planning on conducting an additional stack test on Kiln No. 2 with the new burner in late February or early March. This test will further assess the effectiveness and potential in reducing NO_x emissions from Kiln No. 2. The Department will be notified prior to the testing as to the exact test dates. Upon completion of the testing, the test data will be analyzed and submitted to the Department. This analysis, along with analysis of the historic test data as described above, will be submitted to the Department within 45 days of completing the testing.

Please call if you have any questions concerning this status report.

Sincerely,



David A. Buff, P.E.
Principal Engineer
Florida P.E. #19011

SEAL

cc: Al Townsend
Scott Quass
Jim Alves

cc: G. Reynolds, BAR
P. Conner, OGC
T. Tittle, SED
E. Anderson, Dade Co.
B. Beale, EPA

