0530010-003-AC
PSD-FL-233

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KA 521-95-09

February 19, 1997

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BUREAU OF
AIR REGULATION

Mr. A. A. Linero
Florida Department of
Environmental Protection
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Addendum

Subject: Southdown, Inc.
Permit Application Modification
Kilns and Coolers No. 1 and No. 2
FDEP File No. 0530010-001-AC, PSD-FL-233

Dear Mr. Linero:

Enclosed are four (4) copies of a construction permit application addendum for the above referenced project, along with a disk containing air dispersion modeling output.

The enclosed addendum contains an updated Best Available Control Technology evaluation and an updated Air Quality Impact Analysis for FDEP review. The information is submitted in a format consistent with earlier discussions with FDEP staff. A disk containing the entire permit application in the ELSA format, to facilitate FDEP data entry, will be submitted soon under separate cover. An additional permit application processing fee, in the amount of $7500, is also enclosed in case it is required.

If you have any questions, please call me.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler, Ph.D., P.E.

JBK.par

c: Mr. Amarjit Singh Gill, Southdown

cc: EPA
NPS
SWD
HCEPD

ADDENDUM TO
PREVENTION OF SIGNIFICANT DETERIORATION
REVIEW

PREPARED FOR:

SOUTHDOWN, INC., BROOKSVILLE PLANT
HERNANDO COUNTY, FLORIDA

FEBRUARY 1997

PREPARED BY:

KOOGLER & ASSOCIATES
4014 N.W. 13TH STREET
GAINESVILLE, FLORIDA 32609
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1.0 UPDATED PROPOSED PROJECT

This report is submitted to FDEP as an addendum to Southdown's PSD permit application currently under FDEP review (File No. 0530010-001-AC and PSD-FL-233). As discussed with FDEP staff, the information presented herein is limited to updating information previously submitted to FDEP on the proposed project to avoid redundancy. It is anticipated that this approach will simplify both the submittal and review of the updated information for the proposed modification.

1.1 PROJECT DESCRIPTION

Southdown requests a modification to four permits, currently under FDEP review for Prevention of Significant Deterioration (PSD). The four permits are:

Emission Unit	Permit No.
Kiln No. 1	AC27-258571
Kiln No. 2	AC27-258572
Clinker Cooler No. 1	AC27-258569
Clinker Cooler No. 2	AC27-258570

The proposed modification consists of about a 4 percent increase in the kiln preheater feed rates from 145 to 150 tons per hour (tph), rolling 30 production-day average for each kiln. The design maximum feed rate, stated in the current permit as 165 tph, remains unchanged. The following changes, documented by Southdown in a letter to FDEP dated January 30, 1997, will ensure that this feed rate can be maintained:

1. Modify preheater exit gas cyclones to increase efficiency, which will reduce heat loss and lower the pressure drop.

2. Replace kiln ID fan with a higher efficiency in order to increase air flow without increasing the drive motor horsepower.

3. Add two modules to the existing Kiln No. 1 baghouse to allow a lower air-to-cloth ratio when a module is isolated for maintenance.

4. Improve the clinker cooler efficiency by upgrading fans and adding static gates.

5. Increase kiln preheater feed capacity to ensure 150 tph on a continuous basis, with a maximum design hourly rate of 165 tph.

6. Add drying drum to the No. 1 Raw Mill and increase the mill fan capacity to recuperate the waste heat from the preheater gas.

The above changes will increase the overall thermal efficiency of the process. Thus the maximum heat input will not exceed the existing limit of 300 MMBtu/hr. Each kiln and cooler utilizes a baghouse to control the emissions of particulate matter. There are no add-on controls for any of the other pollutants emitted from the cement kilns.

This request also includes an increase in the operating hours for Kiln No. 2 from 8200 to 8760 hours per year. As Kiln No. 1 is already permitted for 8760 hours of operation, almost all the operation and emissions limitations will now be identical for the two kilns and coolers. As the proposed modification will result in increased thermal efficiency, no increase in fuel use is expected.

The Department's draft emissions limitations for the proposed project have been extended to the proposed modification. The resulting proposed hourly emission rates are presented in Table 1-1. The emission rates have been prorated based on the increase in feed rate. In the case of sulfur dioxide, it is anticipated that there will be no change in the hourly emission rates due to the increase in absorption from the increase in feed rate.

The changes in annual emission rates, using FDEP's methodology, are presented in Table 1-2. FDEP used a very conservative approach for establishing actual emissions for the proposed project. Although Southdown does not agree with FDEP's method of calculating the actual emissions for this project, it will be accepted in order to expedite the application review. Using actual emissions, as determined by the Department, the proposed modification will result in a significant net emissions increase for PM/PM10, NOx, CO and VOCs.

1.2 RULE REVIEW

There is no change in the rule review for the proposed project as a result of this modification.

1.3 RULE APPLICABILITY

The proposed project at the existing Southdown facility is classified as a major modification to a major facility subject to both state and federal regulations as set forth in Chapter 62-212, FAC. The facility is located in an area classified as attainment for each of the regulated air pollutants. As the estimated net emissions increase from the proposed modification are significant, as defined in Rule 62-212, FAC, the proposed project will be subject to PSD review requirements in accordance with Rule 62-212.400, FAC, for PM/PM10, NOx, CO and VOCs.

The PSD review requirements for this modification include a determination of Best Available Control Technology, an air quality review, Good Engineering Practice stack height analysis and an evaluation of impacts on soils, vegetation and visibility.

TABLE 1-1

CURRENT AND PROPOSED HOURLY EMISSION RATES

SOUTHDOWN, INC.
HERNANDO COUNTY, FLORIDA

Pollutant		Allowable Emission Rates		
		Current (@ 145 tph)	Proposed (@ 150 tph)	
		lb/hr	lb/hr	lb/ton feed
PM/PM10:	Kiln 1	39.0	27.0	0.18
	Kiln 2	13.5	27.0	0.18
	Cooler 1	7.13	13.6	0.09
	Cooler 2	5.0	13.6	0.09
SO2:	Kiln 1	15.0	15.0	0.10
	Kiln 2	15.0	15.0	0.10
NOx:	Kiln 1	NA	285.0	1.90
	Kiln 2	250.0 (1)	285.0	1.90
CO:	Kiln 1	57.7	180.0	1.20
	Kiln 2	64.0	180.0	1.20
VOC:	Kiln 1	NA	13.6	0.09
	Kiln 2	7.4	13.6	0.09

NOTE:

(1) Based on a 30-day average.

TABLE 1-2

CHANGES IN ANNUAL EMISSION RATES

SOUTHDOWN, INC.
HERNANDO COUNTY, FLORIDA

	NET EMISSIONS INCREASE (TPY)				
	PM/PM10	SO2	NOx	CO	VOCs
Current, Actual	137.7	116.8	2045.7	341.0	68.8
Proposed, Allowable	355.8	131.4	2496.6	1576.8	119.2
Contemporaneous	0	0	0	99.9	0
Net Change	218.1	14.6	450.9	1335.7	50.4
Sig. Increase (2)	25/15	40	40	100	40
PSD Review	YES	NO	YES	YES	YES

(1) See Appendix for emission calculations.
(2) Presented in Table 212.400-2, FAC.

2.0 BEST AVAILABLE CONTROL TECHNOLOGY

Best Available Control Technology (BACT) is required to control air pollutants emitted from newly constructed major sources or from modification to the major emitting facilities if the modification results in a significant emissions increase. The emission rate increases of PM/PM10, NOx, CO and VOCs proposed by Southdown are significant; and, less than significant for SO2. A BACT analysis is, therefore, required for PM/PM10, NOx, CO and VOCs.

2.1 PREVIOUS BACT DETERMINATIONS

A review of the EPA BACT/LAER Clearinghouse identified a number of BACT determinations for portland cement plants. These BACT determinations addressed criteria pollutants emitted from portland cement manufacturing facilities. The emission limits for NOx and VOCs from cement kilns have been evaluated by regulatory agencies in several states. Recent BACT determinations in this category include those proposed by FDEP for Florida Rock Industries and Florida Crushed Stone. The most recent BACT evaluation for PM/PM10, NOx, CO and VOC is that performed by FDEP for Southdown's proposed project. The staff analysis indicated that NOx, CO and VOCs are interrelated to the extent that FDEP had to consider emissions levels of all three pollutants simultaneously. The resulting determinations in all three recent FDEP reviews identified proper combustion and operation practices, as BACT. No add on controls have been required for these pollutants.

In lieu of providing redundant information on the merits of FDEP's recent BACT determinations for the three similar sources, those projects are simply referenced herein. The emission levels requested by Southdown are in line with the FDEP's recent evaluation on the proposed project (PSD-FL-233) and the emissions limitations imposed on Florida Rock Industries (PSD-FL-228) and Florida Crushed Stone (PSD-FL-227). We are not aware of any changes in the last two months that would alter the technical and economic aspects of FDEP's most recent BACT determination. Pertinent information from FDEP files is presented in Appendix 3.

2.2 BACT CONCLUSION

Based upon the above analysis, the use of baghouses to control PM/PM10 emissions from the kilns and clinker coolers; and, the use of proper operation practices to control NOx, CO and VOC emissions from the kilns, represents BACT. Numerical emission limits which represent BACT, proposed for the kilns and clinker cooler, are presented in Table 1-1.

3.0 AIR QUALITY REVIEW

The air quality review submitted for the proposed project, currently under FDEP review, has been updated for determining the Class I and Class II area impacts from the proposed modification. The air quality modeling is required to provide assurance that the emissions from the proposed modification, together with the emissions of all other air pollutants in the project area, will not cause or contribute to a violation of any ambient air quality standard.

3.1 AIR QUALITY MODELING

The ambient air quality impacts resulting from the requested increase in emissions of PM/PM10, NOx, CO and VOCs were evaluated using air dispersion modeling with the EPA approved ISC-ST model, Version 96113 (ISC3).

The PM/PM10, NOx, CO and VOC emissions modeled to determine the ambient air impacts reflect the net increase in emissions from the proposed modification (see Table 3-1). The modeling utilized the same Class I and Class II area receptor grid used in the modeling submitted previously (dated 2/96). Five years of Tampa meteorological data were used in the modeling for the period 1987 to 1991.

3.2 MODELING RESULTS

The results of the ISC3 significant impact analyses (SIA) modeling, presented in Table 3-2, demonstrate that the predicted impacts of NOx, CO and VOC emissions increases associated with the proposed project are less than the corresponding significant impact levels and less than the de minimis impact levels, pursuant to Rule 62-212, FAC. Therefore, additional modeling for air quality impacts in the Class II area is not required.

The maximum predicted Class I area NOx impacts, however, were greater than the proposed EPA significant impact level. Consequently, additional modeling was conducted to determine compliance with the Class I area NOx PSD increment. An inventory of the Class I area NOx PSD increment consuming sources is presented in Table 3-3. The modeling results, summarized in Table 3-4, show that the maximum predicted Class I area NOx PSD increment consumption is below the allowable Class I area NOx PSD increment.

The maximum predicted PM10 impacts are above the corresponding significant impact level, pursuant to Rule 62-212, FAC, as indicated by the previous modeling submitted to FDEP (2/96). As extensive PM10 modeling had already been conducted for the proposed project, the maximum air quality impacts predicted by the previous modeling were simply updated by adding in the predicted increase in air impacts resulting from the proposed modification. This approach, as discussed with Mr. Cleve Holladay of FDEP (on 2/17/97), provides estimates of air impacts without redundant modeling. The results of the Class I and Class II area PSD increment analyses and the ambient air standards analysis are summarized in Tables 3-5, 3-6 and 3-7, respectively.

As expected, the proposed 4 percent change in the allowable PM/PM10 emissions does not significantly alter the results previously submitted to FDEP.

The results of the detailed modeling indicate that the proposed modification will not cause or contribute to any exceedance of Florida's ambient air quality standards.

TABLE 3-1

AIR QUALITY MODELING PARAMETERS

SOUTHDOWN, INC.
HERNANDO COUNTY, FLORIDA

Unit	Emission Rate (g/s)				Stack Parameters			
	PM/PM10	VOC	NOx	CO	Ht (m)	Dia (m)	Vel (mps)	Temp (°K)
K1 (1)	-4.91	-1.66	-34.71	- 7.27	45.7	3.96	10.37	413.6
K1 (2)	3.40	1.71	35.91	22.68	45.7	3.96	10.90	413.6
K2 (1)	-1.70	-0.93	-31.50	- 8.06	32.0	4.27	9.90	394.0
K2 (2)	3.40	1.71	35.91	22.68	32.0	4.27	10.40	394.0
C1 (1)	-0.90	NA	NA	NA	23.5	2.29	12.70	394.0
C1 (2)	1.71	NA	NA	NA	23.5	2.29	13.34	394.0
C2 (1)	-0.63	NA	NA	NA	27.4	2.96	7.60	394.0
C2 (2)	1.71	NA	NA	NA	27.4	2.96	7.98	394.0

NOTE:

(1) Current allowable emission rates; K and C reflect Kiln and Cooler.
(2) Proposed allowable emission rates.
(3) Building wake effects were addressed in the modeling using the EPA approved BPIP downwash program.

TABLE 3-2

SUMMARY OF SIGNIFICANT IMPACT ANALYSIS

SOUTHDOWN, INC.
HERNANDO COUNTY, FLORIDA

MET YEAR	MAX. PREDICTED AMBIENT AIR IMPACTS (ug/m3) (1)					
	PM10		NOx	CO		VOCs
	24-hr	Annual	Annual	1-hr	8-hr	1-hr (2)
CLASS I AREA IMPACTS						
1987	0.056	0.005	0.08	NA	NA	NA
1988	0.057	0.004	0.06	NA	NA	NA
1989	0.041	0.003	0.05	NA	NA	NA
1990	0.062	0.006	0.11	NA	NA	NA
1991	0.079	0.005	0.09	NA	NA	NA
EPA SIG.(3)	0.3	0.2	0.1	NA	NA	NA
NPS SIG.(4)	0.27	0.08	0.03	NA	NA	NA
CLASS II AREA IMPACTS						
1987	0.53	0.01	0.43	370	142	44
1988	0.74	0.02	0.45	376	124	45
1989	0.76	0.02	0.64	367	130	44
1990	0.63	0.02	0.53	368	123	44
1991	0.93	0.01	0.53	409	104	49
EPA SIG.(3)	5	1	1	2000	500	235 (5)

NOTES:
(1) The above impacts represent the highest-high impacts resulting from the emission changes proposed in Table 1-1. For PM10 only, the model inputs reflect the emissions increase from the modification only.
(2) Impact from kiln emissions as compared with ozone standard.
(3) Significant impact levels proposed by EPA.
(4) Significant impact levels suggested by National Park Service.
(5) Florida ambient air quality standard for ozone of 235 ug/m3.

Table 3-3
Class I Area NOx Source Inventory

		Modeling Designation	UTMS East km	UTMS North km	Relative UTMS - E km	Relative UTMS - North km	X m	X m	NOx g/s	Height m	Temperature K	Velocity m/s	Diamete m
AUBURNDALE COGEN.	1	1AUB	420.8	3103.3	64.6	-66.6	64600	-66600	21.17	48.80	411.0	14.30	5.50
ENRON-SILVER SPRINGS	2	2ENR	418.8	3240.9	62.6	71	62600	71000	1.33	13.72	641.0	36.51	0.49
FARMLAND SAP #5	3	3FAR	409.5	3080.1	53.3	-89.8	53300	-89800	1.25	45.72	355.0	11.58	2.44
FLORIDA ROCK NEWBERRY	4	4FLO	346.8	3285.4	-9.4	115.5	-9400	115500	33.8	76.22	369.3	14.15	2.87
FCS-Base	5	5FCS	360.0	3162.5	3.8	-7.4	3800	-7400	-45.23	97.54	385.4	6.67	4.88
FCS-Permited	6	6FCS	360.0	3162.5	3.8	-7.4	3800	-7400	81.98	97.54	392.6	8.25	6.48
FPC DEBARY	7	7FPC	467.5	3197.2	111.3	27.3	111300	27300	137.60	15.24	819.8	56.21	4.21
FPC INT CITY/7EA	8	8FPC	446.3	3126.0	90.1	-43.9	90100	-43900	84.20	15.24	819.8	56.21	4.21
FPC INT CITY/7FA	9	9FPC	446.3	3126.0	90.1	-43.9	90100	-43900	91.80	15.24	880.8	32.07	7.04
FPC POLK	10	10FP	414.4	3073.9	58.2	-96	58200	-96000	160.40	34.40	400.0	40.50	4.10
FPL MANATEE	11	11FP	367.3	3054.1	11.1	-115.8	11100	-115800	612.40	144.80	339.8	23.70	7.99
IMC-AGRICO New Wales SAP 1,2,3	12	12IM	396.7	3079.4	40.5	-90.5	40500	-90500	5.49	61.00	350.0	15.33	2.59
IMC - AGRICO SOUTH PIERCE SAP BASELINE	13	13IM	407.5	3071.9	51.3	-98	51300	-98000	-2.93	45.73	350.0	26.40	1.60
IMC - AGRICO SOUTH PIERCE SAP #10,11	14	14IM	407.5	3071.9	51.3	-98	51300	-98000	3.98	45.73	349.8	39.05	1.55
KISSIMMEE UTILITIES	15	15KI	447.7	3127.9	91.5	-42	91500	-42000	27.72	12.20	654.0	29.10	3.00
LAKELAND UTILITIES CT LARSON	16	16LA	409.2	3108.8	53	-61.1	53000	-61100	21.04	30.48	783.0	28.22	5.79
OGDEN MARTIN SYSTEMS OF LAKE COUNTY	17	17O	413.1	3179.3	56.9	9.4	56900	9400	20.79	38.10	422.0	23.36	1.83
ORLANDO UTILITIES STANTION 2 (24-HR)	18	18OR	483.5	3150.6	127.3	-19.3	127300	-19300	91.80	167.64	324.2	23.50	5.80
PASCO CO. RRF	19	19PA	347.1	3139.2	-9.1	-30.7	-9100	-30700	40.57	83.82	394.3	15.70	3.05
LAKE CO. COGENERATION	20	20LA	434.0	3198.8	77.8	28.9	77800	28900	11.64	30.48	384.3	17.13	3.35
PASCO CO. COGEN.	21	21PA	385.6	3139.0	29.4	-30.9	29400	-30900	11.64	30.48	384.3	17.13	3.35
PANDA KATHLEEN	22	22PA	398.7	3105.5	42.5	-64.4	42500	-64400	5.42	45.73	416.0	13.86	5.34
RIDGE COGEN.	23	23RI	416.7	3100.4	60.5	-69.5	60500	-69500	8.73	99.10	350.0	14.50	3.00
STAUFFER SHUTDOWN	24	24ST	325.6	3116.7	-30.6	-53.2	-30600	-53200	0.80	49.00	293.0	3.60	1.20
SEMINOLE ELECTRIC HARDEE 3 PROPOSED	25	25SE	405.0	3057.7	48.8	-112.2	48800	-112200	32.78	22.90	851.5	32.67	7.01
TPS - HARDEE	26	26TP	404.8	3057.4	48.6	-112.5	48600	-112500	241.83	22.90	389.0	23.90	4.88
TECO POLK AUX BOILER	27	27TE	402.5	3067.4	46.3	-102.5	46300	-102500	1.00	6.10	533.0	13.10	0.90
TECO POLK IGCC	28	28TE	402.5	3067.4	46.3	-102.5	46300	-102500	23.69	45.70	400.0	16.80	5.80
TROPICANA PRODUCTS	29	29TR	346.8	3040.9	-9.4	-129	-9400	-129000	3.96	24.40	555.4	7.55	2.13
TROPICANA GAS TURBINE WITH H/R	30	30TR	346.8	3040.9	-9.4	-129	-9400	-129000	9.20	24.40	404.3	16.55	3.66
KM&M - Southdown KILN 1 Base		KILN1N	356.2	3169.9	0	0			-34.71	45.70	413.6	10.37	3.96
KM&M - Southdown KILN 1 Proposed		KILN1P	356.2	3169.9	0	0			35.91	45.70	413.6	10.90	3.96
FM&M - Southdown KILN 2 Base		KILN2N	356.2	3169.9	0	0			-31.50	32.00	394.0	9.90	4.27
FM&M - Southdown KILN 2 Proposed		KILN2P	356.2	3169.9	0	0			35.91	32.00	394.0	10.40	4.27

TABLE 3-4

SUMMARY OF CLASS I AREA NOx MODELING ANALYSIS

SOUTHDOWN, INC.
HERNANDO COUNTY, FLORIDA

MET YEAR	MAX. PREDICTED NOx INCREMENT CONSUMPTION (ug/m3) (1) Annual
1987	0.82
1988	0.75
1989	0.83
1990	0.91
1991	0.80
CLASS I AREA PSD INCREMENT	2.5

NOTE:
(1) The above impacts represent the highest-high impacts resulting from the emission changes proposed in Table 1-1.

TABLE 3-5

SUMMARY OF CLASS I AREA PM10 PSD INCREMENT ANALYSIS

SOUTHDOWN, INC.
HERNANDO COUNTY, FLORIDA

MET YEAR	MAXIMUM PREDICTED CLASS I AREA 24-HR PM10 IMPACTS (ug/m3)		
	High-Second-High Total Inventory	Southdown Contribution (1)	Is Contribution Significant?
1987	7.94	0.116+0.079 = 0.195	NO
1988	6.77	0.040+0.079 = 0.119	NO
1989	7.06	0.014+0.079 = 0.093	NO
1990	8.24	0.021+0.079 = 0.100	NO
1991	8.11	0.000+0.079 = 0.079	NO
INCREMENT	8	-	
EPA SIG. LEVEL	-	0.3	
NPS SIG. LEVEL	-	0.27	

NOTE:

(1) The Southdown project's contribution (previously documented 2/96) has been updated by adding the maximum predicted Class I area impact resulting from the proposed modification (see Table 3-2), as discussed with FDEP.

TABLE 3-6

SUMMARY OF CLASS II AREA PM10 PSD INCREMENT ANALYSIS

SOUTHDOWN, INC.
HERNANDO COUNTY, FLORIDA

MET YEAR	MAXIMUM PREDICTED CLASS II AREA PM10 IMPACTS (ug/m3) 24-hr	Annual
1987	19.67+0.928 = 20.6	3.25+0.018 = 3.3
1988	20.70+0.928 = 21.6	3.61+0.018 = 3.6
1989	23.98+0.928 = 24.9	3.78+0.018 = 3.8
1990	17.03+0.928 = 18.0	3.55+0.018 = 3.6
1991	18.71+0.928 = 19.6	3.68+0.018 = 3.7
INCREMENT	30	17

NOTE:

(1) The Class II area increment consumption analysis (previously documented 2/96) has been updated by adding the maximum predicted Class II area impact resulting from the proposed modification (see Table 3-2), as discussed with FDEP.

TABLE 3-7

SUMMARY OF CLASS II AREA FAAQS ANALYSIS

SOUTHDOWN, INC.
HERNANDO COUNTY, FLORIDA

MET YEAR	MAXIMUM PREDICTED CLASS II AREA PM10 IMPACTS (ug/m3)	
	24-hr	Annual
1987	34.33+0.928 = 35.3	5.63+0.018 = 5.6
1988	34.91+0.928 = 35.8	6.14+0.018 = 6.2
1989	40.60+0.928 = 41.5	5.96+0.018 = 6.0
1990	29.15+0.928 = 30.1	6.12+0.018 = 6.1
1991	32.71+0.928 = 33.6	6.40+0.018 = 6.4
Maximum	41.5	6.4
Background	105	35
Impact+Background	146.5	41.4
FAAQS	150	50

NOTE:

(1) The FAAQS analysis (previously documented 2/96) has been updated by adding the maximum predicted Class II area impact resulting from the proposed modification (see Table 3-2), as discussed with FDEP.

4.0 GOOD ENGINEERING PRACTICE STACK HEIGHT

There is no change in the kilns and clinker coolers' stack heights associated with the proposed modification. As the respective stacks are less than 213 feet in height above-grade, the Good Engineering Practice (GEP) stack height criteria is satisfied.

5.0 IMPACTS ON SOILS, VEGETATION AND VISIBILITY

5.1 IMPACT ON SOILS AND VEGETATION

The updated air quality modeling demonstrates that the levels of PM10, NOx, CO and VOCs expected as a result of the proposed modification will be below the corresponding ambient air standards. Furthermore, the maximum predicted NOx, CO and VOC impacts from the proposed modification are at or below the EPA significance levels. As a result, it is reasonable to conclude that there will be no adverse effect to the soils or vegetation of the area.

5.2 GROWTH RELATED IMPACTS

The proposed modification will require no increase in traffic or personnel to operate the plant. Therefore, no additional growth impacts are expected as a result of the proposed modification.

5.3 VISIBILITY IMPACTS

The proposed increases in PM/PM10 and NOx emissions were evaluated for visibility impacts using the EPA approved VISCREEN model. The modeling results, summarized in Table 5-1, indicate that the proposed modification is not expected to have an adverse impact on visibility.

An analysis for determining the regional haze impacts was conducted using the guidance provided by the National Park Service. The results of the analysis, presented in Table 5-2, indicates that the proposed modification's contribution to the regional haze is expected to be insignificant.

5.4 CLASS I AREA IMPACTS

The Class I area Air Quality Related Values (AQRV) analysis previously submitted to FDEP for the proposed project can be extended to the proposed modification.

The updated air quality modeling demonstrates that the levels of PM10, NOx, CO and VOCs expected as result of the proposed modification will be below the corresponding ambient air standards. Furthermore, the maximum predicted NOx, CO and VOC impacts from the proposed modification are at or below the EPA significant impact levels. The updated modeling also indicated that the increase in Class I area PM10 impacts from a 4 percent change in allowable emissions is insignificant; and, therefore, the previously submitted AQRV analysis for PM10 is valid. As a result, it is reasonable to conclude that the proposed modification will not result in any adverse effect to the soils, vegetation, wildlife or visibility in the Class I area.

The proposed modification will consume up to 4 percent of the allowable Class I area NO2 PSD increment and 14 percent of the allowable Class I area PM10 PSD increment.

Table 5-1

Visual Effects Screening Analysis for
Source: FM&M - Southdown, Inc.
Class I Area: Chassahowitzka N.W.R.

*** Level-1 Screening ***

Input Emissions for KILNS 1 and 2

Particulates	10.20	G /S
NOx (as NO2)	71.82	G /S
Primary NO2	.00	G /S
Soot	.00	G /S
Primary SO4	.00	G /S

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	65.00 km
Source-Observer Distance:	100.00 km
Min. Source-Class I Distance:	15.00 km
Max. Source-Class I Distance:	26.00 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	4.	26.0	165.	2.00	.172	.05	.000
SKY	140.	4.	26.0	165.	2.00	.099	.05	-.003
TERRAIN	10.	4.	26.0	165.	2.00	.228	.05	.002
TERRAIN	140.	4.	26.0	165.	2.00	.075	.05	.002

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	60.	91.5	109.	2.00	1.196	.05	.001
SKY	140.	60.	91.5	109.	2.00	.443	.05	-.010
TERRAIN	10.	40.	82.4	129.	2.00	.321	.05	.005
TERRAIN	140.	40.	82.4	129.	2.00	.087	.05	.004

Table 5-2

Regional Haze Analysis For
Brooksville Cement – Southdown Inc.
CLASS I CHASSAHOWITZKA N.W.R.

(1) SO2 (µg/m^3)	(2) Background Visibility (km)	(3) Ambient b(ext)a	(4) Acid Mist Impact H2SO4 (µg/m^3)	(5) SO4 (µg/m^3)	(6) (NH4)SO2 (µg/m^3)	(7) Transport Time (hrs)	(8) Conversion
0.0000	65	0.0602	0.00000	0.0000	0.0000	1.0	0%
(9) AT 0% (NH4)SO2 CONVERSION (µg/m^3)	**(10) Relative Humidity FACTOR @ 83%**	**(11) PM-10 (µg/m^3)**	**(12) Source b(ext)s (NH4)SO2**	**(13) Source b(ext)s PM10**	**(14) Total Source b(ext)s**	**(15) Deciview**	**Is Deciview Greater than 1**
0.0000	4.2	1.1020	0.00000	0.00331	**0.00331**	0.53	NO

(1) Maximum 24-hour SO2 Impact at Class I Receptor (none).
(2) Measured Background Visibility Range as recomended by FWS
(3) Ambient b(ext)a = 3.912/Background Visibility
(4) Acid Mist Impact = 0.15/4 * SO2 Impact * 96/98 (none).
(5) SO4 = SO2 Impact * 1.5
(6) 100 % (NH4)SO2 Impact = 1.375 * (SO4 + Acid Mist)
(7) Transport Time (hours) = Maximum Distance / Average daily wind speed. Not Calculated
(8) Conversion = Transport Time * 0.03 (% / hour). Not calculated.
(9) (NH4)SO2 Conversion = % Conversion * (NH4)SO2)
(10) Relative Humidity Factor From Meteorology and Figure B-1 IWAQM
(11) Maximum 24-hour PM10 Impact at Class I Receptor. From table 3-5
(12) Source b(ext)s (NH4)SO4 = 0.003 * Relative Humidity Factor * (NH4)SO4
(13) Source b(ext)s PM10 = 0.003 * Relative Humidity Factor (1) * PM10
(14) Total Source b(ext)s = b(ext)s (NH4)SO4 + b(ext)s PM10
(15) Deciview = 10 * LN [1 + (Total b(ext)s / b(ext)a)]

6.0 CONCLUSION

It can be concluded from the information in this updated report that the proposed increase in the allowable emission rate of PM/PM10, NOx, CO and VOCs from the Southdown facility, as described in this report, will not cause or contribute to an exceedance of any air quality standard, PSD increment, or any other provision of Chapter 62, FAC.

APPENDIX I

EMISSION CALCULATIONS

PERMITTED EMISSION RATES

PM/PM10, No. 1 kiln	=	39.0 lb/hr, 170.8 tpy
PM/PM10, No. 2 kiln	=	13.5 lb/hr, 55.4 tpy
PM/PM10, No. 1 cooler	=	7.13 lb/hr, 28.14 tpy
PM/PM10, No. 2 cooler	=	5.0 lb/hr, 20.5 tpy
SO2, No. 1 kiln	=	15 lb/hr, 65.7 tpy
SO2, No. 2 kiln	=	15 lbs/hr, 61.5 tpy
NOx, No. 1 kiln	=	NO LIMIT
NOx, No. 2 kiln	=	250 lbs/hr, 1025 tpy
CO, No. 1 kiln	=	57.7 lbs/hr, 234.4 tpy
CO, No. 2 kiln	=	64.0 lbs/hr, 262.4 tpy
VOC, No. 1 kiln	=	NO LIMIT
VOC, No. 2 kiln	=	7.4 lbs/hr, 30.34 tpy

ACTUAL EMISSION RATES

Although Southdown does not agree with the FDEP methodology of calculating the actual emissions for the proposed project, the FDEP numbers are used in the following calculations to expedite the application review.

PM/PM10, No. 1 Kiln	=	17.8 lb/hr, 70.4 tpy (3.95 conversion factor used by FDEP)
PM/PM10, No. 2 Kiln	=	6.77 lb/hr, 25.9 tpy (3.83 conversion factor used by FDEP)
PM/PM10, No. 1 Cooler	=	6.17 lb/hr, 24.3 tpy
PM/PM10, No. 2 Cooler	=	4.44 lb/hr, 17.1 tpy

SO_2, No. 1 Kiln	=	15 lb/hr (allowable) x 3.95 FDEP factor
	=	59.3 tpy
SO_2, No. 2 Kiln	=	15 lb/hr (allowable) x 3.83 FDEP factor
	=	57.5 tpy
NOx, No. 1 Kiln	=	275.5 lb/hr (FDEP TEPD) x 3.95
	=	1088.2 tpy
NOx, No. 2 Kiln	=	250 lb/hr (30-day avg. allowable) x 3.83
	=	957.5 tpy
CO, No. 1 Kiln	=	31.6 lb/hr, 138 tpy
CO, No. 2 Kiln	=	53.0 lb/hr, 203 tpy
VOC, No. 1 Kiln	=	13.1 lb/hr (FDEP TEPD) x 3.95
	=	51.7 tpy
VOC, No. 2 Kiln	=	4.5 lb/hr, 17.1 tpy

PROPOSED EMISSION RATES

PM/PM10, Each Kiln	=	27.0 lb/hr (0.18 lb/ton dry feed) x 8760 hrs/yr x ton/2000 lbs
	=	118.3 tpy
PM/PM10, Each Cooler	=	13.6 lb/hr (0.09 lb/ton dry feed) x 8760 hrs/yr x ton/2000 lbs
	=	59.6 tpy
SO_2, Each Kiln	=	15 lb/hr (0.1 lb/ton dry feed) x 8760 hrs/yr x ton/2000 lbs
	=	65.7 tpy
NOx, Each Kiln	=	285 lb/hr (1.9 lb/ton dry feed) x 8760 hrs/yr x ton/2000 lbs
	=	1248.3 tpy
CO, Each Kiln	=	180 lb/hr (1.2 lb/ton dry feed) x 8760 hrs/yr x ton/2000 lbs
	=	788.4 tpy
VOC, Each Kiln	=	13.6 lb/hr (0.09 lb/ton dry feed) x 8760 hrs/yr x ton/2000 lbs
	=	59.6 tpy

NET EMISSIONS INCREASES

Net Emissions	=	Proposed - Actual + Contemporaneous
Net Increase, PM/PM10	=	(118.3 + 118.3 + 59.6 + 59.6) - (70.4 + 24.3 + 25.9 + 17.1)
	=	218.1 tpy
Net Increase, SO2	=	(65.7 + 65.7) - (59.3 + 57.5)
	=	14.6 tpy
Net Increase, NOx	=	(1248.3 + 1248.3) - (1088.2 + 957.5)
	=	450.9 tpy
Net Increase, CO	=	(788.4 + 788.4) - (138 + 203) + 99.9 (contemporaneous)
	=	1335.7 tpy
Net Increase, VOC	=	(59.6 + 59.6) - (51.7 + 17.1)
	=	50.4 tpy

APPENDIX II

MODELING OUTPUT ON DISK

THIS DISK CONTAINS PARTICULATE MATTER (PM10), CARBON MONOXIDE (CO), NITROGEN OXIDES (NOx), AND VOLATILE ORGANIC COMPOUNDS (VOC) MODELING FILES FOR THE SOUTHDOWN, INC. FACILITY IN BROOKSVILLE FLORIDA. THE FOLLOWING ARE OUTPUT FILES ARE IN SELF EXTRACTING ARCHIVE FORMAT.

THIS DISK CONTAINS ISCST3 MODELING OF SIA, AAQS, PSD CLASS 2 AND CHASSAHOWITZKA NWR PSD CLASS I AREA, AND BPIP FILES;

ASI ANALYSIS OF CHASSAHOWITZKA NWR PSD CLASS I AREA:

C1PM-ASI	EXE	50,810	02-19-97	FOR PM-10
C1NX-ASI	EXE	41,081	02-19-97	FOR NOx

ASI ANALYSIS OF FAAQS, AND PSD CLASS 2 AREA:

C2PM-ASI	EXE	183,979	02-19-97	FOR PM-10
C2NX-ASI	EXE	105,025	02-19-97	FOR NOx
C2CO-ASI	EXE	265,421	02-19-97	FOR CO
C2VOCASI	EXE	167,298	02-19-97	FOR VOC

INCREMENT ANALYSIS OF CHASSAHOWITZKA NWR PSD CLASS I AREA:

C1-NXINV	EXE	51,876	02-19-97	

AND:

BPIP-FIL	EXE	45,941	02-20-96	BUILDING DOWNWASH CALCULATIONS

TO UNARCHIVE THESE FILES COPY THEM TO A HARD DISK DRIVE AND TYPE THE FILE NAME. FOR EXAMPLE TO UNARCHIVE THE PM-10 ASI CLASS 2 ISCST3 OUTPUT FILES, TYPE "C2PM-ASI" AND PRESS ENTER. THE FILES WILL AUTOMATICALLY UNARCHIVE TO THE HARD DISK DRIVE. THESE ARCHIVED FILES CONTAIN THE MODELING AND ANALYSIS FILES ASCII DESCRIBED AS FOLLOWS;

THE FOLLOWING FILES CONTAIN ISCST3 MODELING OF SIGNIFICANT IMPACT ANALYSIS (SIA) FOR FAAQS AND PSD CLASS 2 AREAS FOR PM10, NOx, VOC AND CO. THERE ARE RECEPTORS AT 100 METER INTERVALS ALONG THE PROPERTY LINE, DISCRETE POLAR RECEPTORS FROM 2500 METERS TO 3000 METERS AND POLAR RECEPTORS @ 4000 5000 6000 8000 10000 15000 20000 METERS. POLAR RECEPTORS ARE CENTERED AT X=0 Y=500 THE APPROXIMATE GEOMETRIC CENTER OF THE FACILITY. NO SIGNIFICANCE IS FOUND FOR PM-10, CO OR VOC. THE SIA MODELING FOR CLASS 1 PSD NOx INDICATES THAT INCREMENT ANALYSIS IS REQUIRED.
THE FOLLOWING SIA FILES ARE PROVIDED:

C1PM-ASI	EXE	50,810	02-19-97	FOR PM-10:
C1SIAPM7	OUT	59,076	02-17-97	PM10 CLASS 1 AND FAAQS SIA FOR 1987
C1SIAPM8	OUT	59,076	02-17-97	PM10 CLASS 1 AND FAAQS SIA FOR 1988
C1SIAPM9	OUT	59,076	02-17-97	PM10 CLASS 1 AND FAAQS SIA FOR 1989
C1SIAPM0	OUT	59,076	02-17-97	PM10 CLASS 1 AND FAAQS SIA FOR 1990
C1SIAPM1	OUT	59,076	02-17-97	PM10 CLASS 1 AND FAAQS SIA FOR 1991

C1NX-ASI	EXE	41,081	02-19-97	FOR NOx:
C1SIANX7	OUT	37,981	02-11-97	NOx CLASS 1 AND FAAQS SIA FOR 1987
C1SIANX8	OUT	37,981	02-11-97	NOx CLASS 1 AND FAAQS SIA FOR 1988
C1SIANX9	OUT	37,981	02-11-97	NOx CLASS 1 AND FAAQS SIA FOR 1989
C1SIANX0	OUT	37,981	02-11-97	NOx CLASS 1 AND FAAQS SIA FOR 1990
C1SIANX1	OUT	37,981	02-11-97	NOx CLASS 1 AND FAAQS SIA FOR 1991

ASI ANALYSIS OF FAAQS, AND PSD CLASS 2 AREA:

C2PM-ASI	EXE	183,979	02-19-97	FOR PM-10:
C2SIAPM7	OUT	285,159	02-17-97	PM10 CLASS 2 AND FAAQS SIA FOR 1987
C2SIAPM8	OUT	285,159	02-17-97	PM10 CLASS 2 AND FAAQS SIA FOR 1988
C2SIAPM9	OUT	285,159	02-17-97	PM10 CLASS 2 AND FAAQS SIA FOR 1989

C2SIAPM0	OUT	285,159	02-17-97	PM10 CLASS 2 AND FAAQS SIA FOR 1990
C2SIAPM1	OUT	285,159	02-17-97	PM10 CLASS 2 AND FAAQS SIA FOR 1991
C2NX-ASI	EXE	105,025	02-19-97	FOR NOx:
C2SIANX7	OUT	172,284	02-11-97	NOx CLASS 2 AND FAAQS SIA FOR 1987
C2SIANX8	OUT	172,284	02-11-97	NOx CLASS 2 AND FAAQS SIA FOR 1988
C2SIANX9	OUT	172,284	02-11-97	NOx CLASS 2 AND FAAQS SIA FOR 1989
C2SIANX0	OUT	172,284	02-11-97	NOx CLASS 2 AND FAAQS SIA FOR 1990
C2SIANX1	OUT	172,284	02-11-97	NOx CLASS 2 AND FAAQS SIA FOR 1991
C2CO-ASI	EXE	265,421	02-19-97	FOR CO:
C2SIACO7	OUT	331,239	02-11-97	CO CLASS 2 AND FAAQS SIA FOR 1987
C2SIACO8	OUT	331,239	02-11-97	CO CLASS 2 AND FAAQS SIA FOR 1988
C2SIACO9	OUT	331,239	02-11-97	CO CLASS 2 AND FAAQS SIA FOR 1989
C2SIACO0	OUT	331,239	02-11-97	CO CLASS 2 AND FAAQS SIA FOR 1990
C2SIACO1	OUT	331,239	02-11-97	CO CLASS 2 AND FAAQS SIA FOR 1991
C2VOCASI	EXE	167,298	02-19-97	FOR VOC:
C2VIAVO7	OUT	225,818	02-18-97	VOC CLASS 2 AND FAAQS SIA FOR 1987
C2VIAVO8	OUT	225,818	02-18-97	VOC CLASS 2 AND FAAQS SIA FOR 1988
C2VIAVO9	OUT	225,818	02-18-97	VOC CLASS 2 AND FAAQS SIA FOR 1989
C2VIAVO0	OUT	225,818	02-18-97	VOC CLASS 2 AND FAAQS SIA FOR 1990
C2VIAVO1	OUT	225,818	02-18-97	VOC CLASS 2 AND FAAQS SIA FOR 1991

ALL CLASS 1 MODELING OF SIGNIFICANT IMPACT ANALYSIS (SIA) FOR CHASSAHOWITZKA NWR PSD CLASS 1 AREAS CONTAIN AN ADDITIONAL SEVEN RECEPTORS WERE ADDED BY INTERPOLATING BETWEEN SOME OF THE 13 RECEPTORS USED IN HISTORICAL RUNS. THIS WAS DONE TO PROVIDE A CLOSER PLACEMENT OF RECEPTORS NEARER TO THE SOURCE. THE CLASS 1 SIA FOR NOx INDICATES THAT INCREMENT ANALYSIS IS REQUIRED. THE FOLLOWING CLASS 1 PSD INCREMENT ANALYSIS FILES ARE PROVIDED;

C1-NXINV	EXE	51,876	02-19-97:	
C1NOX87	OUT	50,986	02-18-97	CLASS 1 PSD NOx MODELING FOR 1987
C1NOX88	OUT	50,986	02-18-97	CLASS 1 PSD NOx MODELING FOR 1988
C1NOX89	OUT	50,986	02-18-97	CLASS 1 PSD NOx MODELING FOR 1989
C1NOX90	OUT	50,986	02-18-97	CLASS 1 PSD NOx MODELING FOR 1990
C1NOX91	OUT	50,986	02-18-97	CLASS 1 PSD NOx MODELING FOR 1991

BUILDING INPUT PROFILE PROGRAM (BPIP) FILES ARE PROVIDED IN BPIP-FIL.EXE. THESE BUILDING DOWNWASH CALCULATIONS ARE USED IN ALL MODELING. THREE SETS OF DOWNWASH CALCULATIONS ARE MADE. THE FIRST FOR KILN1&2, CLCOOL1&2 SOURCES ANOTHER FOR B-11 THROUGH H-13 SOURCES AND A THIRD FOR L-07 THROUGH Q-17 SOURCES. BUILDING GEOMETRY IS CONSTANT FOR ALL THREE CALCULATIONS. THE FOLLOWING BPIP FILES ARE PROVIDED;

SWN-BPI	INP	2,238	01-11-96	INPUT FOR SOURCES KILN1&2, CLCOOL1&2
SDWN-BH1	INP	2,674	02-02-96	INPUT FOR SOURCES B-11 THROUGH H-13
SDWN-BH2	INP	2,674	02-02-96	INPUT FOR SOURCES L-07 THROUGH Q-17
SWN-BPI	OUT	5,836	01-11-96	OUTPUT FOR SOURCES KILN1&2 CLCOOL1&2
SDWN-BH1	OUT	12,619	02-02-96	OUTPUT FOR SOURCES B-11 THROUGH H-13
SDWN-BH2	OUT	12,619	02-02-96	OUTPUT FOR SOURCES L-07 THROUGH Q-17
SWN-BPI	SUM	118,465	01-11-96	SUMMARY FOR SOURCES KILN1&2, CLCOOL1&2
SDWN-BH1	SUM	303,743	02-02-96	SUMMARY FOR SOURCES B-11 THROUGH H-13
SDWN-BH2	SUM	306,720	02-02-96	SUMMARY FOR SOURCES L-07 THROUGH Q-17

IF THERE ARE ANY QUESTIONS OR IF I MAY PROVIDE ADDITIONAL FILES, OR ANALYSIS PLEASE CALL ME.

FEBRUARY 19, 1997

APPENDIX III

PREVIOUS BACT DETERMINATIONS

SOUTHDOWN, INC.
PORTLAND CEMENT FACILITY
PERMIT 0530010-001 AC (PSD-FL-233)
Hernando County

The applicant, Southdown Inc. (SI), owns a portland cement manufacturing facility in Brooksville. It consists of two kilns with a preheater design and two clinker coolers along with raw mill, finish mill, cement and clinker handling equipment, coal handling equipment, silos, and air pollution control equipment. A process description is included in the Technical Evaluation and Preliminary Determination.

Each kiln/cooler is permitted to process 165 tons per hour (TPH) of raw material fed to the preheater, 148 TPH to the kiln, and 90 TPH from the cooler on a 1-hr basis. Each is also permitted to process 145 TPH to the preheater, 130 TPH to the kiln, and 84 TPH from the cooler on a 30-day basis.

A single, large, fabric filter system (baghouse) is already in use to capture particulate matter from each kiln and cooler. Baghouses are also used to limit particulate emissions from other process emission points. All the emission units controlled by baghouses are listed in a Best Available Control Technology (BACT) determination performed for Cement Plant 2 in 1980. Kiln 2 has three (3) additional BACT determinations on file with the Department (1980, 1988 and 1993). No previous BACT determinations have been performed on Kiln 1.

Southdown requested to revise the allowable emissions limits for their kilns and coolers. Specifically, it was requested to increase emissions limits for particulate matter (PM/PM_{10}), carbon monoxide (CO), visible emissions (VE) and volatile organic compounds (VOC) from Kiln 2; decrease PM/PM_{10} (allowable emissions) and increase CO emission limits for Kiln 1; and increase the PM/PM_{10} limits for Coolers 1 and 2. The stated reason is to allow for fluctuations in emission rates during the normal operation.

The project and rule applicability are described in the separate Technical Evaluation and Preliminary Determination. A Best Available Control Technology (BACT) determination pursuant to Prevention of Significant Deterioration (PSD) is required for each pollutant exceeding the significant emission rates in Table 62-212.400-2, F.A.C., "Regulated Air Pollutants Significant Emissions Rates." The increase in emissions will subject Kilns 1 and 2 to PSD review for particulate matter and carbon monoxide and Coolers 1 and 2 to PSD review for particulate matter. The increase in the VOC emission limit for Kiln 2 will not trigger PSD. In this case, the determinations will be for particulate matter (PM/PM_{10}), and carbon monoxide (CO).

Following is the BACT determination proposed by the applicant. These are on the basis of feed to the kiln.

DRAFT

BACT DETERMINATION REQUESTED BY THE APPLICANT - KILN FEED BASIS:

POLLUTANT	EMISSION LIMIT
Particulate Matter (PM/PM_{10}) (kilns)	0.2 lb./ton of dry kiln feed
Particulate Matter (PM/PM_{10})(coolers)	0.1 lb/ton of dry kiln feed
Carbon Monoxide (kilns)	1.30 lb/ton dry kiln feed
Volatile Organic Compounds (Kiln 2)	0.1 lb/ton dry kiln feed
Visible Emissions (Kiln 2)	20 percent

The above limits are expressed in terms of pollutant emitted per ton of material reaching the kiln. Following a review of past permits, the exact process, requirements of the applicable NSPS for cement plants, and discussions with Southdown, the Department will limit only raw material fed to the kiln preheater. This is the most accurate and reliable measure of kiln operating rate in a preheater or precalciner kiln, particularly when there are no bypass streams and when little or no cement kiln dust is wasted. All limits will be expressed in terms of pounds of pollutant per ton of material fed to the kiln preheater ($kiln_{ph}$). Where appropriate, equivalent factors in terms of pounds of pollutant per ton of clinker produced will also be given for reference and comparison with industry or EPA reporting conventions. The above table is therefore adjusted as follows:

BACT DETERMINATION REQUESTED BY THE APPLICANT - PREHEATER BASIS:

POLLUTANT	EMISSION LIMIT
Particulate Matter (PM/PM_{10}) (kilns)	0.18 lb./ton of dry $kiln_{ph}$ feed
Particulate Matter (PM/PM_{10})(coolers)	0.09 lb/ton of dry $kiln_{ph}$ feed
Carbon Monoxide (kilns)	1.17 lb/ton dry $kiln_{ph}$ feed
Volatile Organic Compounds (Kiln 2)	0.09 lb/ton dry $kiln_{ph}$ feed
Visible Emissions (Kiln 2)	20 percent

DATE OF RECEIPT OF A BACT APPLICATION:

February 22, 1996

REVIEW GROUP MEMBERS:

Teresa Heron, and A. A. Linero of the New Source Review Section.

BACT DETERMINATION PROCEDURE:

In accordance with Chapter 62-212, F.A.C., this BACT determination is based on the maximum degree of reduction of each pollutant emitted which the Department of Environmental Protection (Department), on a case by case basis, taking into account energy, environmental and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques. In addition, the regulations state that, in making the BACT determination, the Department shall give consideration to:

(a) Any Environmental Protection Agency determination of BACT pursuant to Section 169, and any emission limitation contained in 40 CFR Part 60 - Standards of Performance for New Stationary Sources or 40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants.

(b) All scientific, engineering, and technical material and other information available to the Department.

(c) The emission limiting standards or BACT determination of any other state.

(d) The social and economic impact of the application of such technology.

The EPA currently stresses that BACT should be determined using the "top-down" approach. The first step in this approach is to determine, for the emission unit in question, the most stringent control available for a similar or identical emission unit or emission unit category. If it is shown that this level of control is technically or economically infeasible for the emission unit in question, then the next most stringent level of control is determined and similarly evaluated. This process continues until the BACT level under consideration cannot be eliminated by any substantial or unique technical, environmental, or economic objections.

The air pollutant emissions from this facility can be grouped into categories based upon the control equipment and techniques that are available to control emissions from these emission units. Using this approach, the emissions can be classified as follows:

- Particulate matter from kilns and coolers (PM/PM_{10}, and VE). Controlled generally by add-on particulate collection equipment such as baghouses or electrostatic precipitators.
- Products of combustion and incomplete combustion (e.g., SO_2, NO_x, CO, VOC). Control is largely achieved by good combustion practices and reactions with clinker and raw materials.

o Emissions from materials handling, conveyance, and storage (primarily PM). Controlled generally by fabric filters and reasonable precautions.

Grouping the pollutants in this manner facilitates the BACT analysis because it enables the equipment available to control the type or group of pollutants emitted and the corresponding energy, economic, and environmental impacts to be examined on a common basis. Although all of the pollutants addressed in the BACT analysis may be subject to a specific emission limiting standard as a result of PSD review, the control of "non-regulated" air pollutants is considered in imposing a more stringent BACT limit on a "regulated" pollutant (i.e., PM, SO_2, H_2SO_4, fluorides, etc.), if a reduction in "non-regulated" air pollutants can be directly attributed to the control device selected as BACT for the abatement of the "regulated" pollutants.

BACT ANALYSIS

PARTICULATE MATTER (PM/PM_{10})

Particulate Matter is generated by the various physical and chemical processes at a cement manufacturing plant. Sources of particulate matter at cement plants include (1) quarrying and crushing, (2) raw material storage, (3) grinding and blending, 4) clinker production, 5) finish grinding, and 6) packaging and loading. Additional sources of PM are raw material storage piles, conveyers, storage silos, and unloading facilities.

The largest emission source of PM within cement plants is the pyroprocessing system that includes the kiln and clinker cooler exhaust stacks (in this case, common kiln/cooler stack). Emissions from kilns are affected by several factors, including differences in convective patterns, material movement patterns, burner locations and insertion lengths, heat transfer mechanisms, and the type of clinker cooler that supplies secondary air to the kiln for combustion. Typically, dust from the pollution control equipment servicing the kiln and cooler is collected and recycled into the kiln and thus incorporated into the clinker. Southdown has stated that the great majority of the cement kiln dust (CKD) captured in the baghouse is returned to the pyroprocessing system as raw material.

Common control devices for stack gases include settling chambers, inertial separators, impingement separators, wet scrubbers, fabric filters, and electrostatic precipitators. Fabric filters (baghouses) and electrostatic precipitator (ESPs) are generally considered equivalent for particulate control. Both types of devices can achieve removal efficiencies of over 99 percent. ESPs and baghouses are used extensively as control devices at cement plants. ESPs are generally specified for kiln and clinker cooler exhaust gases because of their ability to operate effectively at varying temperatures. Baghouses are also used at various facilities for particulate control from kilns and coolers. Both types of control equipment provide for the recovery/recycling of collected dust back into the process stream. Baghouses are also used to control particulate emissions from most other material processing operations at cement plants.

Common controls to limit particulate emissions from fugitive sources (such as roadways, stockpiles, and material processing and conveying equipment) include wet suppression, sweeping, application of

surfactants, paving of roads and covering of stockpiles to reduce wind erosion. Wet suppression of fugitive particulate emissions is considered as BACT for most material handling operations and unpaved roads. Dust from stockpiles can be minimized by relatively high material moisture content with additional water spraying as necessary.
A review of the BACT Clearinghouse shows that baghouses and ESPs are widely used to control particulate matter from process emission units at cement plants. They are commonly accepted as BACT. This facility, particulate matter sources are controlled by baghouses.

Southdown has proposed to change the allowable emission rates for particulate matter (PM/PM_{10}) from Kilns 1 and. 2 and Clinker Coolers 1 and 2 to allow for the fluctuations in emission rates during normal operating conditions. The permitted PM/PM_{10} limits would be increased for Kiln 2 from 13.5 pounds per hour (lb/hr) to 26.0 lb/hr, while PM/PM_{10} emissions for Kiln 1 are proposed to be decreased from 39.0 lb/hr (allowable emissions) to 26.0 lb/hr. The proposed limit for the two clinker coolers would be increased from 7.13 lb/hr (kiln 1) and 5.0 lb/hr (kiln 2) to 13.0 lb/hr. The proposed kiln particulate emission limits are equivalent to 0.18 pounds per ton of dry feed to each kiln preheater (lb/ton $feed_{ph}$). This is a standard lower than the New Source Performance Standard NSPS limit of 0.3 pounds per ton of dry feed (kiln). For the coolers the proposed limits are equivalent to 0.09 lb/ton $feed_{ph}$ which is less than the applicable NSPS limit.

Southdown also requested to increase VE (which is largely linked to particulate emissions) from 10 percent for Kiln 2 to 20 percent.

PRODUCTS OF COMBUSTION AND INCOMPLETE COMBUSTION

Carbon Monoxide and Nitrogen Oxides

Carbon monoxide (CO) is a pollutant formed by the incomplete combustion (oxidation) of carbon containing compounds in the cement kiln fuel and during the transformation of cement raw materials to cement clinker. When insufficient oxygen is provided, more CO and less CO_2 are formed than under excess air conditions. Substantial quantities of CO and CO_2 are also generated through calcining of limestone and other calcareous material. This calcining process thermally decomposes $CaCO_3$ to CaO and CO_2. The calcining of limestone in the cement manufacturing process liberates large amounts of CO_2, which is available for dissociation into CO.

Flyash, a constituent of the raw feed mix, contains unburnt carbon which can vary in concentration depending on the source of the flyash. As the raw feeds travels down the preheater tower, most of the carbon present in the flyash is burned off. However, some of it is emitted as carbon monoxide. This contributes to fluctuations in carbon monoxide emissions.

Although this specific application does not necessitate a PSD review and BACT determination for nitrogen oxides (NO_x), past changes in production rates in Kiln 1 presumably caused concurrent increases in this pollutant. Unless specific measures were taken at the time to insure NO_x emissions increases were kept at less than significant levels, such a review and determination would have been required. The Department is using the opportunity to resolve this outstanding issue by setting a non-BACT emission limit which can be reasonably assumed to be lower than emissions prior to the changes which were not subjected to appropriate review. Southdown has agreed that this limit should be no greater than 275 lb/hr (1.9 lb NO_x/ton $feed_{ph}$).

Southdown is not proposing any changes for Kiln 2 NO_x emissions. Currently, the emission level of 250 lb NO_x/hr is being met (equivalent to 1.72 lb NO_x/ton $feed_{ph}$)

The generation of CO and NO_x is inversely related to that of NO_x and is linked to the oxygen level that is present in the kiln system. As the oxygen level increases, the formation of NO_x increases and the formation of CO decreases. Conversely, when the oxygen level decreases, the formation of NO_x decreases and the formation of CO increases. Southdown will meet CO and NO_x emission levels by controlling excess oxygen in the kiln to a level between one and one-half to three percent excess oxygen. A continuous CO process monitor will assist in the control of the CO content in the kiln.

Emissions of CO can potentially be reduced at portland cement plants through utilization of proper combustion practices to maximize the oxidation of CO to CO_2 and reducing the quantity of CO in the flue gas stream (flue gas control). The high temperatures and control of excess air and fuel, typically results in simultaneous optimization for CO and NO_x. The applicant proposes proper combustion practices as BACT to control emissions of CO from this plant. A review of the BACT Clearinghouse reveals that for cement plants, BACT for CO is proper combustion practices.

The applicant proposes a CO limit of 1.17 lb/ton of $feed_{ph}$ and good combustion practice as BACT for CO for each Kiln. This represents an emission increases for Kiln 1 from 57.7 lb/hr to 169.9 lb/hr and for Kiln 2 from 64.0 to 169.9 lb/hr respectively. This increase is proposed in order to allow for more representative on a year-round basis compared with what is achievable during an annual test. It also accounts for fluctuations due to normal process oscillations and varying characteristics of raw materials and fuels.

Volatile Organic Compounds

VOC is also a pollutant formed due to incomplete combustion of fuel and organic material in the feed material to the kiln system. Limestone contains very low levels of VOCs. An additional source of VOC is oil from mill scale which is sometimes used as a raw material for its iron.

Southdown will reduce the VOC emissions by controlling the temperatures in the kiln system. In the kiln, the feed material will reach about 2700 degrees Fahrenheit. The temperature of the gases in the kiln will reach between 3700 to 3800 degrees Fahrenheit. At these high temperatures, virtually all VOCs will be consumed or destroyed regardless of their source (limestone, mill scale, coal, fuel oil, etc.). Clinker production requires certain temperatures, residence time, and turbulence within the kiln. These factors are sufficient to ensure the destruction of almost all VOCs at cement plants.

Emissions of VOC can also be controlled by add-on control devices, by the mechanisms of adsorption, absorption, or incineration (afterburning). Incineration processes include flame incineration, thermal incineration, and catalytic incineration. No add-on controls for VOC have been demonstrated for cement plants.

A review of the BACT Clearinghouse reveals that for cement plants, BACT for VOCs is proper combustion practices. The applicant estimates low emissions of VOC such that the kilns will not be subject to BACT for this pollutant.

For VOC, the applicant has estimated 13.0 lb/hr (an increase of 8.0 lb/hr) for Kiln 2. The applicant is utilizing good combustion practices for both kilns to reduce VOCs emissions.

BACT DETERMINATION RATIONALE:

The existing BACT VE limit of 10 percent for Kiln 2 is more stringent than the NSPS for Portland Cement Plant, 40 CFR 60, Subpart F for Kiln 2. It is also consistent with various recent BACT determinations made throughout Florida. There is no good basis for considering the higher VE limit proposed by Southdown than the one already established. Although Kiln 1 has a VE limit of 20 percent, the kilns are operated similarly and will have identical PM limits. The efforts to maintain the lower Opacity limit at Kiln 2 will probably result in fairly low opacity from Kiln 1.

BACT for PM (0.2 lb/ton kiln feed) from Kilns 1 and 2 proposed by Southdown is more stringent than the NSPS for Portland Cement Plants, 40 CFR 60, Subpart F. The basis is the BACT determinations made by the Department for Florida Rock Industries and Florida Crushed Stone and the original BACT determination for Southdown (then FM&M). The Department accepts the applicant's proposed limit (as corrected to 0.18 lb/ton $kiln_{ph}$ feed) for both Kiln 1 and 2.

BACT for PM (0.1 lb/ton $kiln_{ph}$) feed from Coolers 1 and 2 proposed by Southdown is equal to that given in the NSPS for Portland Cement Plants. Southdown was unable to achieve lower limits set in the past as a result of permit conditions they agreed to comply with in order to avoid PSD/BACT. The basis is also the BACT determinations made by the Department for Florida Rock Industries and Florida Crushed Stone. The Department accepts the applicant's proposed limit (corrected to 0.09 lb/ton $kiln_{ph}$ feed) for both Cooler 1 and 2 with the understanding that it is being met at all times rather than just during annual emission tests.

During this review, the Department discovered that, miscellaneous PM sources (other than the kilns and coolers) controlled by baghouses were limited in the original permit (July 1, 1980) for Cement Plant 2 to "0" percent Opacity. These values have been changed in subsequent operating permit reviews, but the original enforceable permit was not changed. Since a 0 percent Opacity limitation is not generally feasible to achieve or demonstrate, the Department is rectifying the value in this construction permit. For each small baghouse associated with Cement Plant 2, the exhaust gases must not exhibit greater than 5 percent opacity. The Department has determined that 5 percent opacity is BACT and is attainable with a baghouse. This is consistent with recent BACT determinations.

BACT for CO was proposed by Southdown to be 1.17 lb/ton $kiln_{ph}$ feed (2.0 lb/ton clinker at a clinker production rate of 84 TPH) for both Kilns. This value will provide sufficient flexibility to minimize NO_x and SO_2 emissions. The value is with the Department's recent BACT determination to Florida Crushed Stone (FCS) with a CO limit of 2.0 lb/ton clinker. However the Department encourages Southdown to continue to be judicious in selecting sources of coal ash. Some of the local power companies are trying to recover the unburned carbon in the coal ash by reburning it, taking advantage of the heat content, and producing a more salable coal ash for customers such as the cement industry. If Southdown revises its specifications and accepts poor quality flyash, it can be counter-productive for this pollution prevention effort affecting both industries.

No BACT determination was required for VOC for either Kiln. The Department accepts the limit requested by Southdown which will result in annual emissions less than the PSD threshold. It will allow Southdown sufficient flexibility in control for all combustion products.

No BACT determination was requested or required for metals such as mercury, beryllium, lead arsenic, fluorides and sulfuric acid mist (PSD pollutants). Original emission estimates submitted for previous applications provided assurance that emissions of these pollutants are less than the PSD significant threshold values.

No new BACT determinations were requested for NO_x and SO_2. The actual BACT emission levels of 250 lb NO_x/hr and 15 lb SO_2/hr for Kiln 2 are being met. These are equal to 1.72 lb NO_x/ton $kiln_{ph}$ feed and 0.10 lb SO_2/ton $kiln_{ph}$ feed. For comparison with industry conventions, these values are equal to 2.98 lb NO_x/ton clinker and 0.18 lb SO_2/ton clinker at a production rate of 84 TPH. A new non-BACT emission limit of 275 lb NO_x/hr (equal to 1.9 lb/ton $kiln_{ph}$ feed or 3.27 lb/ton of clinker at a production rate of 84 TPH) is being set for Kiln 2. Kiln 1 also meets the same SO_2 limit as Kiln 2.

BACT DETERMINATION BY DEP:

Based on the information provided by the applicant and the information searches conducted by the Department, the BACT emission levels are established as follows:

POLLUTANT	EMISSION LIMIT
Particulate Matter (PM/PM_{10}) (kilns)	0.18 lb./ton $kiln_{ph}$ feed
Particulate Matter (PM/PM_{10})(coolers)	0.09 lb/ton $kiln_{ph}$ feed
Carbon Monoxide (kilns)	1.17 lb/ton $kiln_{ph}$ feed
Nitrogen Oxides (Kiln 1)	1.9 lb/ton $kiln_{ph}$ feed (30 day, non-BACT)
Volatile Organic Compounds (kilns)	0.09 lb/ton $kiln_{ph}$ feed (non-BACT)
Visible Emissions (Kiln 2)	10 percent (no change)
Minor points sources with baghouses	5 percent

COMPLIANCE

Compliance with the particulate emission limitations shall be in accordance with the EPA Reference Method 5 as contained in Appendix A, 40 CFR 60, and set forth in Subsection 60.64 of the NSPS for Portland Cement Plants, 40 CFR 60.

Compliance with opacity standards (minor sources controlled by baghouses) shall be determined by conducting observations in accordance with 40 CFR 60, Appendix A, Method 9.

Continuous opacity monitors (kilns and coolers) shall meet the requirements of the 40 CFR 60, NSPS Subpart F for Portland Cement Plants. Compliance with the opacity standard for the Kilns and Clinker Coolers No. 1 and No. 2 shall be demonstrated by CEMs.

Compliance with the CO limitations shall be demonstrated by 3 one-hour tests using EPA Method 10.

Pursuant to Rules 62-4.070(3), 62-212.400(6), and 62-297.520, F.A.C., the kiln/cooler exhaust stack system shall also be equipped with continuous monitors process monitors to record CO and/or O_2 to indicate proper maintenance, operation, and to optimize combustion for pollution control.

Compliance with the new Kiln 1 NO_x limitation shall be demonstrated annually by a 30 day test using a CEM which meets the requirements of 40 CFR 60, Appendix B and Appendix F.

Compliance with the VOC limitations shall be demonstrated (on a one time basis) by three one hour stack tests using Method 25 or 25A to confirm emission rate is less than the PSD significant emission rate.

DETAILS OF THE ANALYSIS MAY BE OBTAINED BY CONTACTING:

Teresa Heron, Review Engineer,
A. A. Linero, Administrator, New Source Review Section
Department of Environmental Protection
Bureau of Air Regulation
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Recommended By:

C. H. Fancy, P.E., Chief
Bureau of Air Regulation

Date:

Approved By:

Howard L. Rhodes, Director
Division of Air Resources Management

Date:

BEST AVAILABLE CONTROL TECHNOLOGY (BACT) DETERMINATION
PORTLAND CEMENT PLANT
Florida Crushed Stone
PSD-FL-227 and AC 27-274892
Hernando County
(revised 11/9/95)

The applicant, Florida Crushed Stone Company (FCS), plans to construct an 83 ton per hour (maximum TPH as clinker) dry process portland cement kiln with a preheater design at its existing cement plant approximately 3.5 miles northwest of Brooksville, Hernando County, Florida. The project includes a single kiln and clinker cooler along with raw mill, finish mill, cement and clinker handling equipment, coal handling equipment, silos, and air pollution control equipment. The facility will produce 727,080 tons per year (maximum TPY as clinker) and approximately between 760,000 and 800,000 TPY of portland cement. A process description is included in the Technical Evaluation and Preliminary Determination.

Following is the BACT determination proposed by the applicant:

<u>BACT Determination Requested by the Applicant:</u>

POLLUTANT	EMISSION LIMIT
Particulate Matter (kiln)	0.3 lbs/ton of dry kiln feed
Particulate Matter (cooler)	0.1 lbs/ton of dry kiln feed
Particulate Matter (material handling, conveying, storage)	0.01 gr/dscf by baghouses
Sulfur Dioxide (kiln)	0.55 lbs/ton clinker
Sulfuric Acid Mist (kiln)	0.014 lbs SO_3/ton clinker
Nitrogen Oxides (kiln)	4.3 lbs/ton clinker
Carbon Monoxide (kiln)	1.0 lbs/ton dry kiln feed
Volatile Organic Compounds (kiln)	0.07 lbs/ton clinker
Beryllium	6.6×10^{-7} lbs/ton clinker
Lead	7.5×10^{-5} lbs/ton clinker

A single, large, fabric filter system (baghouse) will be used to capture particulate matter from the kiln and the cooler. Baghouses will also be used to limit particulate emissions from other process emission points. Table 1 is a list of the emission units to be controlled by baghouses.

Portland cement plants are among the major facilities listed in Florida Administrative Code (F.A.C.) Chapter 62-212, Prevention of Significant Deterioration (PSD), Table 212.400-1, "Major Facilities Categories." A BACT determination is required for each pollutant exceeding the significant emission rates in Table 212.400-2, "Regulated Air Pollutants Significant Emissions Rates," which in this case are particulate matter (PM), sulfur dioxide (SO_2), carbon monoxide (CO), and nitrogen oxides (NO_X).

This facility is also subject to:

- 40 CFR 60, Subpart F - Standards of Performance for Portland Cement Plants.
- 40 CFR 51, Subpart P - Protection of Visibility.

Date of Receipt of a BACT Application:

March 13, 1995

Review Group Members:

Teresa Heron, Marty Costello, and A. A. Linero of the New Source Review Section.

BACT Determination Procedure

In accordance with Chapter 62-212, F.A.C., this BACT determination is based on the maximum degree of reduction of each pollutant emitted which the Department of Environmental Protection (Department), on a case by case basis, taking into account energy, environmental and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques. In addition, the regulations state that, in making the BACT determination, the Department shall give consideration to:

(a) Any Environmental Protection Agency determination of BACT pursuant to Section 169, and any emission limitation contained in 40 CFR Part 60 - Standards of Performance for New Stationary Sources or 40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants.

(b) All scientific, engineering, and technical material and other information available to the Department.

(c) The emission limiting standards or BACT determination of any other state.

(d) The social and economic impact of the application of such technology.

The EPA currently stresses that BACT should be determined using the "top-down" approach. The first step in this approach is to determine, for the emission unit in question, the most stringent control available for a similar or identical emission unit or emission unit category. If it is shown that this level of control is technically or economically infeasible for the emission unit in question, then the next most stringent level of control is determined and similarly evaluated. This process continues until the BACT level under consideration cannot be eliminated by any substantial or unique technical, environmental, or economic objections.

The air pollutant emissions from this facility can be grouped into categories based upon the control equipment and techniques that are available to control emissions from these emission units. Using this approach, the emissions can be classified as follows:

- o Combustion Products (e.g., SO_2, NO_x, PM). Controlled generally by good combustion of clean fuels, reactions with clinker and raw materials, removal in add-on control equipment.
- o Products of Incomplete Combustion (e.g., CO, VOC). Control is largely achieved by proper combustion techniques.
- o Emissions from materials handling, conveyance, and storage (primarily PM). Controlled generally by fabric filters and reasonable precautions.

Grouping the pollutants in this manner facilitates the BACT analysis because it enables the equipment available to control the type or group of pollutants emitted and the corresponding energy, economic, and environmental impacts to be examined on a common basis. Although all of the pollutants addressed in the BACT analysis may be subject to a specific emission limiting standard as a result of PSD review, the control of "non-regulated" air pollutants is considered in imposing a more stringent BACT limit on a "regulated" pollutant (i.e., PM, SO_2, H_2SO_4, fluorides, etc.), if a reduction in "non-regulated" air pollutants can be directly attributed to the control device selected as BACT for the abatement of the "regulated" pollutants.

COMBUSTION PRODUCTS

Nitrogen Oxides (NOx)

Emissions of NO_x from dry process cement plants with a preheater include the kiln and any fuel-fired support operation. Oxides of nitrogen (NOx) are generated during fuel combustion by oxidation of chemically bound nitrogen in the fuel (fuel NOx) and by thermal fixation of nitrogen in the combustion air (thermal NOx). As flame temperature increases, the amount of thermally generated NOx increases. Fuel type affects the quantity and type of NOx generated. Generally, natural gas is low in nitrogen. However it causes higher flame temperatures and generates more thermal NOx than oil or coal, which have higher fuel nitrogen content, but exhibit lower flame temperatures.

NO_x emissions represent a significant portion of the total emissions generated by this project, and must be minimized using BACT.

The emissions of NOx can potentially be reduced at Portland cement plants by two methods:

1. Minimizing the quantity of NOx generated during combustion (combustion modifications).

2. Reducing the quantity of NOx in the flue gas stream (flue gas controls).

A review of EPA BACT/LAER Clearinghouse (BACT Clearinghouse) information indicates that NO_x emissions at most facilities are minimized by process control and good combustion practices.

The applicant stated that NO_x emissions at this facility will be controlled through "proper combustion practices" such as burner design with primary combustion air control. Introduction of tires in the material feed end of the kiln will reduce the thermal load on the burner end and possibly result in lower NO_x emissions. In its original submittal, the applicant ruled out Selective Catalytic Reduction (SCR) and Selective Non-Catalytic Reduction (SNCR) as technically infeasible or cost prohibitive.

The applicant gave subsequent consideration to other possible control methods following a request by the Department for additional details justifying the selected method. The applicant rejected Low NO_x Burners, Low Nitrogen Fuel, Flue Gas Recirculation, Fuel Reburning, and Contemporaneous Reductions from the on-site power plant and cement kiln as options which are ineffective, undemonstrated, or beyond the control of the applicant.

The Department requested that the applicant provide an expanded BACT analysis using the procedures described in the EPA New source Review Workshop Manual to show, at a minimum, a technical, economic, and environmental analysis of any applicable control technology. The applicant's response was that the "top" technology was selected for all pollutants and that the technical, economic, and environmental analyses were not required.

The applicant has proposed a NOx emission rate of 359 lb/hr and 4.3 lb/ton clinker. It is compared below with previous determinations documented by the BACT Clearinghouse.

Previous BACT Determinations

BASIS	Least Stringent	Most Stringent	Proposed
	Year 1978	Year 1981	Year 1995
lb/ton clinker	11.13	0.85	4.3

It is important to note that the facility which was given the 0.85 lb/ton clinker NO_x limit has not been able to meet it since construction. A dry process plant with preheater/precalciner received a NO_x limit of 1.11 lb/ton clinker but was never built. Another dry process plant with preheater and calcining loop received a BACT determination of 2.09 lb NO_x/ton clinker. However, it appears that since that time a less stringent standard was applied. Two other dry process preheater/precalciner plants (including proposed Florida Rock Industries Plant) received a NO_x value of 2.5 lb/ton clinker **(later revised to 2.8 lb/ton).** A review of the NOx emission rate summary indicates that the applicant's proposal is not representative of the most stringent BACT determinations made to-date for plants utilizing dry processes.

The dry process with preheater/precalciner is considered to be the most energy-efficient process. Dry process preheater designs, such as the one to be employed by FCS, are also energy efficient. Therefore one would expect the lower fuel use to result in relatively low NO_x, all else being equal.

A survey of stack test data from various kilns around the country, operating for more than three years, suggests that a lower emission level than the one proposed for NOx is possible. Additionally, the Department became aware of a recent BACT determination in Nevada which was based on application of SNCR. These factors will also be considered in determining what emission rate can be achieved in accordance with a top-down BACT determination.

Sulfur dioxide

Sulfur dioxide (SO_2) may be generated both from sulfur compounds such as sulfates in the raw materials and from sulfur in the fuel. The sulfur content of both raw materials and fuels varies from plant to plant and with geographic location. Sulfur dioxide at this facility will be generated by the combustion of coal and tires in the kiln and generation of sulfur gases from the raw materials.

The exhaust gas from a cement kiln can contain varying amounts of SO_2. Under low oxygen conditions, sulfates in the raw materials can be converted to SO_2. At high temperature and excess air conditions, some of the sulfur introduced into the cement kiln with the raw materials, and most of the sulfur contained in the fuel, are converted to SO_2. Most of the SO_2 subsequently reacts with oxygen and alkali compounds (such as Na_2O and K_2O vaporized at sintering temperatures) to form alkali sulfates, which are found in cement clinker and in kiln dust. The amount of SO_2 released in the kiln flue gases will vary with the amount of excess alkali available for absorption. Additional SO_2 may be removed through contact with the incoming raw materials and, to some extent, in the particulate control equipment.

SO_2 control processes can be classified into five categories: fuel/material sulfur content limitations, absorption by a solution, adsorption on a solid bed, direct conversion to sulfur, or direct conversion to sulfuric acid.

FCS proposes to limit SO_2 emissions by taking advantage of the alkaline environment in the kiln, preheater, and raw mill to effect substantial removal of SO_2. Ultimately the sulfur is incorporated into the clinker lattice structure, thus minimizing the amount emitted to the atmosphere. Some additional SO_2 removal through contact with particulate matter may also take place in the kiln/cooler baghouse.

The SO_2 limit proposed by the applicant (0.55 lbs/ton clinker) is less stringent than some BACT determinations for other portland cement plants.

A review of the BACT determinations for cement plants as contained in the BACT Clearinghouse indicates SO_2 reduction levels from 70 to 96% (percent) from facilities utilizing the dry processes. The Department did not find instances of BACT involving measures beyond those proposed by FCS. Some plants use baghouses as proposed by FCS instead of Electrostatic Precipitators (ESPs) for particulate control. It is possible that the filter cake on the bags enhances SO_2 removal compared with an ESP. However the difference is marginal compared with the primary removal mechanism involving oxidation of SO_2 to SO_3, alkali reactions, and subsequent removal of sulfates as particulate matter and with the clinker.

A survey of stack test data from different facilities around the country operating for at least three years demonstrates lower rates possible for SO_2. This factor along with the energy efficiency of the plant, and the possible benefits of removal by the particulate control system will be considered by the Department in making a top-down BACT determination.

COMBUSTION PRODUCTS

Particulate Matter (PM, PM10) and Beryllium

Particulate Matter is generated by the various physical and chemical processes at a cement manufacturing plant. Sources of particulate matter at cement plants include (1) quarrying and crushing, (2) raw material storage, (3) grinding and blending, 4) clinker production, 5) finish grinding, and 6) packaging and loading. Additional sources of PM are raw material storage piles, conveyers, storage silos, and unloading facilities. The largest emission source of PM within cement plants is the pyroprocessing system that includes the kiln and clinker cooler exhaust stacks (in this case, common kiln/cooler stack). Emissions from kilns are affected by several factors, including differences in convective patterns, material movement patterns, burner locations and insertion lengths, heat transfer mechanisms, and the type of clinker cooler that supplies secondary air to the kiln for combustion. Typically, dust from the pollution control equipment servicing the kiln and cooler is collected and recycled into the kiln and thus incorporated into the clinker. FCS has not stated that all cement kiln dust (CKD) captured in the baghouse will be returned to the pyroprocessing system as raw material. It is expected that the majority of it will be recycled, while any excess will be stored in a silo for sale.

Common control devices for stack gases include settling chambers, inertial separators, impingement separators, wet scrubbers, fabric filters, and electrostatic precipitators. Fabric filters (baghouses) and electrostatic precipitator (ESPs) are generally considered equivalent for particulate control. Both types of devices can achieve removal efficiencies of over 99%. ESPs and baghouses are used extensively as control devices at cement plants. ESPs are generally specified for kiln and clinker cooler exhaust gases because of their ability to operate effectively at varying temperatures. Baghouses are also used at various facilities for particulate control from kilns and coolers. Both types of control equipment provide for the recovery/recycling of collected dust back into the process stream. Baghouses are also used to control particulate emissions from most other material processing operations at cement plants.

Common controls to limit particulate emissions from fugitive sources (such as roadways, stockpiles, and material processing and conveying equipment) include wet suppression, sweeping, application of surfactants, paving of roads and covering of stockpiles to reduce wind erosion. Wet suppression of fugitive particulate emissions is considered as BACT for most material handling operations and unpaved roads. Dust from stockpiles can be minimized by relatively high material moisture content with additional water spraying as necessary.

Small quantities of beryllium (Be) are generated by the combustion of coal and fuel oil blends. Beryllium will be generated as a particulate emission from the combustion of fuels, and will be controlled by the kiln/cooler baghouse. The applicant projects low emissions of Be such that it will not be subject to BACT.

A review of the BACT Clearinghouse shows that baghouses and ESPs are widely used to control particulate matter from process emission units at cement plants. They are commonly accepted as BACT.

The applicant has proposed the New Source Performance Standard NSPS limits of 0.3 pounds per ton of dry feed (kiln) and 0.1 pounds per ton of dry feed (cooler) as BACT for this facility. The NSPS values constitute the "floor" for BACT determinations. Consideration will also be given to any more stringent emission rates determined for kilns in Florida.

PRODUCTS OF INCOMPLETE COMBUSTION

Carbon Monoxide and Volatile Organic Compounds

Carbon monoxide (CO) is a pollutant formed by the incomplete combustion (oxidation) of carbon containing compounds in the cement kiln fuel and during the transformation of cement raw materials to cement clinker. When insufficient oxygen is provided, more CO and less CO_2 are formed than under excess air conditions. Substantial quantities of CO and CO_2 are also generated through calcining of limestone and other calcareous material. This calcining process thermally decomposes $CaCO_3$ to CaO and CO_2. The calcining of limestone in the cement manufacturing process liberates large amounts of CO_2, which is available for dissociation into CO.

VOC is also a pollutant formed by the incomplete combustion of fuel or hydrocarbons contained in the raw materials.

Emissions of CO can potentially be reduced at portland cement plants by two main methods: utilization of proper combustion practices to maximize the oxidation of CO to CO_2 and reducing the quantity of CO in the flu gas stream (flue gas control).

Emissions of VOC can be controlled by add-on control devices by the mechanisms of adsorption, absorption, or incineration (afterburning). Incineration processes include flame incineration, thermal incineration, and catalytic incineration. No add-on controls for CO or VOC have been demonstrated for cement plants.

The high temperatures and control of excess air and fuel, typically results in simultaneous optimization for control of products of incomplete combustion and NO_x. The applicant proposes proper combustion practices as BACT to control emissions of CO from this plant. The applicant estimates low emissions of VOC such that the new kiln will not be subject to BACT for this pollutant.

A review of the BACT Clearinghouse reveals that for CO and VOC, BACT from cement plants for these pollutants is proper combustion practices.

BACT Determination by DEP:

Based on the information provided by the applicant and the information searches conducted by the Department, lower emissions limits can be obtained employing the top-down BACT approach for SO_2 and NO_X.

The Department has determined that the NO_X and SO_2 levels proposed by the applicant are roughly equal to typical emission limits from plants already in operation throughout the country and do not reflect previous BACT determinations for portland cement plants.

The Department reviewed Document EPA-453/R-94-004, "Alternative Control Techniques - NO_X Emissions from Cement Manufacturing." Various methods beyond the one proposed by the applicant are detailed. As previously mentioned, the high energy efficiency of the dry preheater process also suggests a lower NO_X limit is achievable. Based on the referenced document, it appears that SNCR, Low NO_X burners and Indirect Firing are available (at least as technology transfer) to consider in achieving a lower NO_X emission limit.

The Department also reviewed a paper presented at the Air and Waste Management Association (AWMA) International Specialty Conference on Waste Combustion in Boilers and Industrial Furnaces. The paper, "Reduction of NO_X Emissions from Cement Kiln/Calciner through the Use of the NO_XOUT Process," which was written by representatives of Nalco and Ash Grove Cement, suggests that SNCR is a viable control method. A level as low as 1.0 lb/ton of clinker was reached based on demonstration tests conducted at the Ash Grove cement plant in Seattle, Washington.

Recently a proposed cement plant (Great Star Cement, Clark County, Nevada) was permitted with the urea-based SNCR/NO_XOUT process as BACT. The process relies on the reaction between ammonia and NO_X to yield molecular nitrogen. The delivery system consists of urea injectors in one of the preheater sections. The objective was to achieve 50% reduction of NO_X emissions. At that level there should be no ammonia slip while meeting the BACT limit of 3.1 lb/ton clinker.

The Department recently issued a (preliminary) BACT determination to Florida Rock Industries (FRI) with a NO_X limit of 2.5 lb/ton clinker **(subsequently revised to 2.8 lb/ton)**. FRI had proposed a BACT limit of 4.6 lbs/ton. The Department is requiring FRI to examine additional control options, such as SNCR to insure the limit is achieved.

Based on a recent Nalco estimate prepared for Great Star Cement, the capital costs for SNCR on a 3100 TPD kiln is $471,000 ($54,165 on an annualized basis). Operating costs to reduce NO_X emissions by 3.0 lb/ton clinker are $674,000. First year costs are projected to be $728,000 and $410/ton NO_X removed.

The Department examined the worst case scenario which assumes that FCS can only achieve its proposed BACT NO_X value of 4.3 lb/ton clinker while employing proper combustion practices. The Department reviewed the degree to which SNCR can be employed in order to achieve a further (roughly 40%) NO_X reduction to 2.5 lb/ton clinker.

For the FCS plant, the purchase and installation of an SNCR system similar to the one proposed for Great Star Cement (but with a lower removal objective) would be approximately $575,000 for an annualized capital investment of approximately $65,000 per year. Annual operating costs would be approximately $200,000. First year costs would be approximately $265,000 or approximately $425 per additional ton of NO_X removed.

The cost per ton of NO_X removed is well within BACT costs for industry in general. The added cost to clinker production is low (approximately $0.40 per ton of clinker) relative to other factors such as raw materials, product, and transportation cost fluctuations.

The Department is also aware of a cement plant owned by Mitsubishi in California, which makes use of a similar principal by injecting municipal wastewater sludge into a preheater section and relying (to some extent) on released ammonia to help lower NO_X emissions.

FCS previously ruled out SNCR as infeasible because the "optimum temperature range to drive the SNCR reactions between 1600-2000 degrees F is encountered in a typical kiln system only in the kiln itself." FCS contends that injection of ammonia/urea in the kiln will cause increases in NO_X.

Although SNCR has been demonstrated in the U.S. on a preheater/precalciner kiln and is being required at another one, the previously-mentioned EPA cement plant NO_X document refers to an

SNCR demonstration in Europe on a preheater type kiln. It is possible that the applicant considered the temperature of the materials entering the kiln rather than the gases leaving the kiln.

Subsequent to issuance of the Preliminary BACT Determination, the Department was unable to verify actual application of SNCR at any preheater type kiln including the one mentioned in Europe. The kiln manufacturer, Polysius, was not willing to provide a NO_x limit guarantee of less than 4 lb/ton nor willing to guarantee the performance of product quality from the kiln with an SNCR system attached.

The Department agrees that SNCR has not been demonstrated on a preheater type cement kiln. However the Department rejects the claim by Polysius that the kiln cannot meet a NO_x emission limit less than 4 lb/ton.

For SO_2 the Department reviewed information in the BACT Clearinghouse, performance test results, and various cement technology documents detailing the chemical reactions and technological problems of making cement. It is the conclusion of the Department that the key factors in SO_2 removal is maintaining proper ratios of sulfur and alkali in the kiln environment and intimate contact between raw materials and exhaust gases. This is considered by the Department to be BACT. It is clear that FCS can insure low SO_2 emissions is through its preheater dry process.

The Department believes that lower values than proposed by the applicant with no add-on gas treatment, are possible. This is substantiated by the letter of October 28, 1983 from Sholtes and Koogler, Environmental Consultants, regarding the original kiln at FCS (which is identical to the one proposed). Per page 13, "Polysius (cement plant designer) states that if only sulfur dioxide from the cement plant were considered, sulfur dioxide emissions as low as 20 pounds per hour could be expected from the cement plant." This is further proved by actual emissions tests from the original kiln which average about 10 lbs of SO_2 per hour or approximately 0.1 lbs/ton clinker.

The Department has also concluded that sulfuric acid mist emissions are not expected to be significant because free sulfite (SO_3) will preferentially react with clinker and kiln dust in the alkali environment of the kiln. Also, little water is available to complete the reaction to acid mist.

The BACT emission levels are established by the Department as follows:

Source	Pollutant Emission Limit
Kiln (PM)	0.20 lbs/ton kiln feed (dry basis) and 0.31 lbs/ton clinker - 1 hour average
Kiln (PM_{10})	0.26 lbs/ton clinker - 1 hour average
Kiln (VE)	Visible emissions not to exceed 10 percent opacity
Kiln (SO_2)	0.27 lbs/ton clinker 24 hr rolling average
	Coal, blend of fuel oil and on-spec used oil (1.5 sulfur by weight), tires (up to 15% of heat input), and natural gas are the <u>only</u> fuels allowed
Kiln (NOx)	2.8 lbs/ton clinker - 24 hr rolling average
Kiln (CO)	2.0 lbs/ton clinker - 1 hr average
Kiln (SO_3)	0.014 lbs/ton clinker (non-BACT)
Kiln (VOC)	0.10 lbs/ton clinker (non-BACT)
Kiln (Be)	9.9×10^{-7} lbs/ton clinker (non-BACT)
Kiln (Hg)	2.4×10^{-5} lbs/ton clinker (non-BACT)
Kiln (Pb)	5.2×10^{-4} lbs/ton clinker (non-BACT)
Cooler (PM)	0.10 lbs/ton kiln feed (dry basis) and 0.16 lbs/ton clinker
Cooler (PM10)	0.13 lbs/ton clinker
Cooler (VE)	Visible emissions not to exceed 10% opacity
Minor points with baghouses	Visible emissions not to exceed 5% opacity
Fugitive sources	Visible emissions not to exceed 10% opacity

Compliance with the particulate emission limitations shall be in accordance with the EPA Reference Method 5 as contained in Appendix A, 40 CFR 60, and set forth in Subsection 60.64 of the NSPS for Portland Cement Plants, 40 CFR 60.

Compliance with opacity standards shall be determined by conducting observations in accordance with 40 CFR 60, Appendix A, Method 9.

Compliance with the SO_2 and NO_x emission limitations shall be demonstrated using CEMS.

Compliance with the CO limitations shall be demonstrated by 3 one-hour tests using EPA Method 10.

Pursuant to F.A.C. 62-4.070(3), 62-212.400(5)(c) and 62-296.330, the kiln/cooler exhaust system shall be equipped with continuous monitors to record NO_x and SO_2 for the purposes of compliance; opacity at the stack to indicate proper maintenance and operation; and CO and/or O_2 to optimize combustion conditions for pollution control.

Compliance with the VOC limitations shall be demonstrated (on a one time basis) by three one hour stack tests using Method 25 or 25A to confirm emission rate is less than the PSD significant emission rate.

Compliance with the Pb, Hg, and Be limitations shall be demonstrated (on a one time basis) by three one-hour stack tests using EPA Method 29 to confirm emission rate is less than the PSD significant emission rate.

<u>BACT Determination Rationale:</u>

BACT for visible emissions was determined to be more stringent than the NSPS for Portland Cement Plant, 40 CFR 60, Subpart F. With respect to the kiln, BACT for PM was determined to be more stringent than the NSPS for Portland Cement Plant, 40 CFR 60, Subpart F. The basis is the BACT Determination set by EPA for Pennsuco Cement, Medley, Florida in 1980.

BACT for SO_2 emissions from the cement kiln was based on the lowest number (0.28 lbs/ton clinker) given in the BACT Clearinghouse database. A slightly lower value of 0.27 lbs/ton clinker will also insure that ambient SO_2 concentration increases will be less than applicable National Park Service Significant Impact Level. Although it appears that FCS can achieve even lower values, it would be prudent to allow sufficient flexibility such that emissions of all combustion products can be minimized simultaneously.

For each small baghouse in the material handling process the exhaust gases must not exhibit greater than 5 percent opacity. The Department has determined that 5 percent opacity is BACT, and is attainable with a baghouse.

BACT for NO_X emissions from the cement kiln was determined to be equal to 2.8 lbs/tons of clinker. **This rate is lower than that of any preheater type kiln and is based on the Department's assessment of the capability of such a kiln without SNCR, notwithstanding assertions to the contrary by the manufacturer's representative.**

BACT for CO was determined to be 2.0 lbs/ton clinker. This value is greater than the proposed by FCS or given in AP-42. It will provide additional flexibility to minimize NO_X and SO_2 emissions.

No BACT determination was required for VOC. The Department set a limit higher than requested by FCS which will result in annual emissions less than the BACT threshold, but allow FCS a little more flexibility in optimizing all control for all combustion products.

No BACT determination was required for Pb. The limit requested by FCS was adopted insures BACT will not be triggered.

No BACT was required for Be. The limit requested by FCS was not adopted because it would trigger BACT. The adopted value willresult in emissions less than the PSD significant threshold value.

No BACT was required for Hg. The estimate provided by FCS will result in emissions less than the applicable BACT threshold.

<u>Details of the Analysis May be Obtained by Contacting:</u>

Teresa Heron, Review Engineer,
A. A. Linero, Administrator, New Source Review Section
Department of Environmental Protection
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Recommended By:
[signature] P.E. for
C. H. Fancy, P.E., Chief
Bureau of Air Regulation

Date: 11/17/95

Approved By:
[signature]
Howard L. Rhodes, Director
Division of Air Resources Mgmt.

Date: 11/17/95

BEST AVAILABLE CONTROL TECHNOLOGY (BACT) DETERMINATION
PORTLAND CEMENT MANUFACTURING FACILITY
Florida Rock Industries
PSD-FL-228 and AC 01-267311
Alachua County

The applicant, Florida Rock Industries Inc. (FRI), plans to construct a 2,300 ton per day (maximum TPD as clinker) dry process portland cement plant with a preheater/precalciner design at its existing quarry approximately 2.5 miles northeast of Newberry, Alachua County, Florida. The project includes a single kiln and clinker cooler along with crushers, raw mill, finish mill, cement and clinker handling equipment, coal handling equipment, silos, and air pollution control equipment. The facility will, on average, operate at a lower rate and produce 712,500 tons per year (TPY) of clinker and yield 772,400 tons of portland cement per year. A process description is included in the Technical Evaluation and Preliminary Determination.

Table 1 is a list of the emission units from the proposed project.

BACT Determination Requested by the Applicant:

POLLUTANT	EMISSION LIMIT
Particulate Matter (kiln)	0.3 lbs/ton of dry kiln feed
Particulate Matter (cooler)	0.1 lbs/ton of dry kiln feed
Particulate Matter (material handling, conveying, storage)	0.01 gr/dscf by baghouses
Sulfur Dioxide (kiln)	0.54 lbs/ton clinker
Sulfuric Acid Mist (kiln)	Absorption by clinker. (future stack tests)
Nitrogen Oxides (kiln)	4.6 lbs/ton clinker
Carbon Monoxide (kiln)	3.6 lbs/ton clinker
Volatile Organic Compounds(kiln)	0.12 lbs/ton clinker
Beryllium	Particulate control equipment

Electrostatic Precipitators (ESPs) will be used to capture particulate matter from the kiln and the cooler. Fabric Filters (baghouses) and will be used to limit particulate emissions from all other process emission units.

Portland cement plants are among the major facilities listed in Florida Administrative Code (FAC) Chapter 62-212, Prevention of Significant Deterioration (PSD), Table 212.400-1, "Major Facilities Categories." A BACT determination is required for each pollutant exceeding the significant emission rates in Table 212.400-2, "Regulated Air Pollutants Significant Emissions Rates," which in this case are particulate matter (PM), sulfur dioxide (SO_2), carbon monoxide (CO), volatile organic compounds (VOC), nitrogen oxides (NO_x), and Beryllium (Be).

This facility is also subject to:

- **40 CFR 60, Subpart F - Standards of Performance for Portland Cement Plants.**
- **40 CFR 60, Subpart OOO - Standards of Performance for Non-Metallic Mineral Processing Plants.**
- **40 CFR 60, Subpart Y - Standards of Performance for Coal Preparation Plants.**
- **40 CFR 60, Subpart Kb - Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels).**

Date of Receipt of a BACT Application:

March 17, 1995

Review Group Members:

Teresa Heron and A. A. Linero of the New Source Review Section.

BACT Determination Procedure

In accordance with Chapter 62-212, F.A.C., this BACT determination is based on the maximum degree of reduction of each pollutant emitted which the Department of Environmental Protection (Department), on a case by case basis, taking into account energy, environmental and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques. In addition, the regulations state that, in making the BACT determination, the Department shall give consideration to:

(a) Any Environmental Protection Agency determination of BACT pursuant to Section 169, and any emission limitation contained in 40 CFR Part 60 - Standards of Performance for New Stationary Sources or 40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants.

(b) All scientific, engineering, and technical material and other information available to the Department.

(c) The emission limiting standards or BACT determination of any other state.

(d) The social and economic impact of the application of such technology.

The EPA currently stresses that BACT should be determined using the "top-down" approach. The first step in this approach is to determine, for the emission unit in question, the most stringent control available for a similar or identical emission unit or emission unit category. If it is shown that this level of control is technically or economically infeasible for the emission unit in question, then the next most stringent level of control is determined and similarly evaluated. This process continues until the BACT level under consideration cannot be eliminated by any substantial or unique technical, environmental, or economic objections.

The air pollutant emissions from this facility can be grouped into categories based upon the control equipment and techniques that are available to control emissions from these emission units. Using this approach, the emissions can be classified as follows:

- Combustion Products (e.g., SO_2, NO_x, PM). Controlled generally by good combustion of clean fuels, reactions with clinker and raw materials, removal in add-on control equipment.

- Products of Incomplete Combustion (e.g., CO, VOC). Control is largely achieved by proper combustion techniques.

- Emissions from materials handling, conveyance, and storage (primarily PM). Controlled generally by fabric filters and reasonable precautions.

Grouping the pollutants in this manner facilitates the BACT analysis because it enables the equipment available to control the type or group of pollutants emitted and the corresponding energy, economic, and environmental impacts to be examined on a common basis. Although all of the pollutants addressed in the BACT analysis may be subject to a specific emission limiting standard as a result of PSD review, the control of "non-regulated" air pollutants is considered in imposing a more stringent BACT limit on a "regulated" pollutant (i.e., PM, SO_2, H_2SO_4, fluorides, etc.), if a reduction in "non-regulated" air pollutants can be directly attributed to the control device selected as BACT for the abatement of the "regulated" pollutants.

COMBUSTION PRODUCTS

Nitrogen Oxides (NOx)

Emissions of NO_x from dry process cement plants with a preheater/precalciner include the kiln, the calcining loop, and any fuel- fired support operation. Oxides of nitrogen (NOx) are generated during fuel combustion by oxidation of chemically bound nitrogen in the fuel (fuel NOx) and by thermal fixation of nitrogen in the combustion air (thermal NOx). As flame temperature increases, the amount of thermally generated NOx increases. Fuel type affects the quantity and type of NOx generated. Generally, natural gas is low in nitrogen. However it causes higher flame temperatures and generates more thermal NOx than oil or coal, which have higher fuel nitrogen content, but exhibit lower flame temperatures.

NO_x emissions represent a significant portion of the total emissions generated by this project, and should be minimized using BACT.

The emissions of NOx can potentially be reduced at Portland cement plants by two methods:

1. Minimizing the quantity of NOx generated during combustion (combustion modifications).

2. Reducing the quantity of NOx in the flue gas stream (flue gas controls).

A review of the EPA's BACT/LAER Clearinghouse indicates that NO_x emissions at most facilities are minimized by process control and good combustion practices.

The applicant stated that NO_x emissions at this facility will be controlled through Process Control and Secondary Combustion of Fuel. The applicant gave subsequent consideration to other possible control methods following a request by the Department for additional details justifying the selected method. The applicant rejected Selective Catalytic Reduction (SCR), Selective Non-catalytic Reduction (SNCR), and Low NO_x burners (LNB) "as technologies involving adverse economic or questionable environmental and energy impacts."

The applicant has proposed a NOx emission rate of 440.82 lb/hr. Taking into consideration the clinker production rate of 95.83 tons/hr and heat input of 364 MMBtu/hr, the proposed emission rate equates to 4.60 lb/ton feed and 1.21 lb/MMBtu, respectively.

The proposed NOx emission rate is compared below with previous BACT determinations made irrespective of cement manufacturing process.

Previous BACT Determinations

BASIS	Least Stringent	Most Stringent	Proposed
	Year 1978	Year 1981	Year 1995
lb/ton clinker	11.13	0.85	4.6

It is important to note that the facility which was given the 0.85 lb/ton NO_x limit has not been able to meet it since construction. Another plant with a NO_x limit of 1.11 lb/ton, utilizing the same process as planned by FRI, was never built. A plant with a process similar to that of FRI received a BACT determination of 2.09 lb NO_x/ton but apparently recieved a less stringent requirement in subsequent operating permits. Another plant with the same process as FRI received a NO_x value of 2.5 lb/ton. A review of the NOx emission rate summary indicates that the applicant's proposal is not representative of the most stringent BACT determinations made to-date for plants utilizing the same process. Also, these BACT determinations were established for sources which were permitted several years ago, and do not necessarily represent present top-down BACT evaluation.

The dry process with preheater/precalciner proposed by the applicant is the most energy-efficient process. Therefore one would expect the lower fuel use to result in the lowest possible emissions, all else being equal. Additionally, the lower flame temperature realized when burning coal (compared with burning gas or oil) as well as documented reductions from tire burning, are further reasons to expect the lowest possible emission rate among kilns employing Process Control and Secondary Combustion of Fuel.

A survey of stack test data from various kilns around the country, operating for more than three years, suggest that a lower emission level than the one proposed for NOx is possible . Additionally, the Department became aware of a recent BACT determination in Nevada which was based on application of SNCR. These factors will also be considered in determining what emission rate can be achieved in accordance with a top-down BACT determination.

Sulfur dioxide

Sulfur dioxide (SO_2) may be generated both from sulfur compounds such as sulfates in the raw materials and from sulfur (including pyrites) in the fuel. The sulfur content of both raw materials and fuels varies from plant to plant and with geographic location. Sulfur dioxide at this facility will be generated by the combustion of coal and tires in the kiln and precalciner burners, and by the combustion of No. 2 fuel oil in the raw mill auxiliary heater. Sulfur reported as sulfite (SO_3) in the raw material is 0.08% (maximum as tested).

The exhaust gas from a cement kiln can contain varying amounts of SO_2. Under low oxygen conditions, sulfates in the raw materials can be converted to SO_2. At high temperature and excess air conditions, some of the sulfur introduced into the cement kiln with the raw materials (such as pyrites), and most of the sulfur contained in the fuel, are converted to SO_2. Most of the SO_2 subsequently reacts with oxygen and alkali compounds (such as Na_2O and K_2O vaporized at sintering temperatures) to form alkali sulfates, which are found in cement clinker and in kiln dust. The amount of SO_2 released in the kiln flue gases will vary with the amount of excess alkali available for absorption. Additional SO_2 may be removed through contact with the incoming raw materials and, to some extent, in the particulate control equipment.

Per the applicant, SO_2 control processes can be classified into five categories: fuel/material sulfur content limitations, absorption by a solution, adsorption on a solid bed, direct conversion to sulfur, or direct conversion to sulfuric acid.

FRI proposes to limit SO_2 emissions through Process Design and Material/Fuel Sulfur Limitations. This will be accomplished by taking advantage of the alkaline environment in the kiln, preheater/precalciner, and raw mill to effect substantial removal of SO_2. Ultimately the sulfur is incorporated into the clinker lattice structure, thus minimizing the amount emitted to the atmosphere. Some additional SO_2 removal through contact with particulate matter may also take place in the ESP.

The SO_2 limit proposed by the applicant (0.54 lbs/ton clinker) is less stringent than some BACT determinations for other portland cement plants.

A review of the BACT determinations for cement plants as contained in the BACT Clearinghouse indicates SO_2 reduction levels from 70 to 96% (percent) from facilities utilizing the dry processes. The Department did not find instances of BACT involving measures beyond those proposed by FRI. Some plants use baghouses for particulate control. It is possible that the filter cake on the bags enhances SO_2 removal compared with an ESP. However the difference is marginal compared with the primary removal mechanism involving oxidation of SO_2 to SO_3, alkali reactions, and subsequent removal of sulfates as particulate matter and clinker.

A survey of stack test data from different facilities around the country operating for at least three years demonstrates lower rates possible for SO_2. This factor along with the energy efficiency of the plant, and the possible benefits of removal by the particulate control system will be considered by the Department in making a top-down BACT determination.

COMBUSTION PRODUCTS

Particulate Matter (PM, PM10) and Beryllium

Particulate Matter is generated by the various physical and chemical processes at a cement manufacturing plant. Sources of particulate matter at cement plants include (1) quarrying and crushing, (2) raw material storage, (3) grinding and blending, 4) clinker production, 5) finish grinding, and 6) packaging and loading. Additional sources of PM are raw material storage piles, conveyers, storage silos, and unloading facilities. The largest emission source of PM within cement plants is the pyroprocessing system that includes the kiln and clinker cooler exhaust stacks. Emissions from kiln are affected by several factors, including differences in convective patterns, material movement patterns, burner locations and insertion lengths, heat transfer mechanisms, and the type of clinker cooler that supplies secondary air to the kiln for combustion. Typically, dust from the pollution control equipment servicing the kiln is collected and recycled into the kiln thereby, producing clinker from the dust. According to FRI's application, all cement kiln dust (CKD) captured in the ESP will be returned to the pyroprocessing system as raw material.

Common control devices for stack gases include settling chambers, inertial separators, impingement separators, wet scrubbers, fabric filters, and electrostatic precipitators. Fabric filters (baghouses) and electrostatic precipitator (ESPs) are generally considered equivalent for particulate control. Both types of devices can achieve removal efficiencies of over 99%. ESPs and baghouses are used extensively as control devices at cement plants. ESPs are generally specified for kiln and clinker cooler exhaust gases because of their ability to operate effectively at varying temperatures. Baghouses are also used at various facilities for particulate control from kilns and coolers. Both types of control equipment provide for the recovery/recycling of collected dust back into the process stream. Baghouses are also used to control particulate emissions from most other material processing operations at cement plants.

Common controls to limit particulate emissions from fugitive sources (such as roadways, stockpiles, and material processing and conveying equipment) include wet suppression, sweeping, application of surfactants, paving of roads and covering of stockpiles to reduce wind erosion. Wet suppression of fugitive particulate emissions is considered as BACT for most material handling operations and unpaved roads. Wind erosion of particles from stockpiles can be limited by the processing of wet materials (1.5% moisture or greater), and by covering of stockpiles where feasible.

Small quantities of beryllium are generated by the combustion of coal in the kiln and calciner burner, and by the combustion of No. 2 fuel oil in the raw mill auxiliary air heater. Beryllium will be generated as a particulate emission from the combustion of fuels, and will be controlled by the ESP on the kiln.

A review of the BACT Clearinghouse shows that baghouses and ESPs are widely used to control particulate matter from process emission units at cement plants. They are commonly accepted as BACT.

The applicant has proposed the New Source Performance Standard NSPS limits of 0.3 per ton of dry feed (kiln) and 0.1 pounds per ton of dry feed (cooler) as BACT for this facility. The NSPS values constitute the "floor" for BACT determinations. Consideration will also be given to any more stringent emission rates determined for kilns in Florida.

PRODUCTS OF INCOMPLETE COMBUSTION

Carbon Monoxide and Volatile Organic Compounds

Carbon monoxide is a pollutant formed by the incomplete combustion (oxidation) of carbon containing compounds in the cement kiln fuel and during the transformation of cement raw materials to cement clinker. When insufficient oxygen is provided, more CO and less CO_2 are formed than under excess air conditions. Substantial quantities of CO and CO_2 are also generated through calcining of limestone and other calcareous material. This calcining process thermally decomposes $CaCO_3$ to CaO and CO_2. The calcining of limestone in the cement manufacturing process liberates large amounts of CO_2, which is available for dissociation into CO.

VOC is also a pollutant formed by the incomplete combustion of fuel or hydrocarbons contained in the raw materials.

Emissions of CO can potentially be reduced at portland cement plants by two main methods: utilization of proper combustion practices to maximize the oxidation of CO to CO_2 and reducing the quantity of CO in the flu gas stream (flue gas control).

Emissions of VOC can be controlled by add-on control devices by the mechanisms of adsorption, absorption, or incineration (afterburning). Incineration processes include flame incineration, thermal incineration, and catalytic incineration. No add-on controls for CO or VOC have been demonstrated for cement plants. The high temperatures and control of excess air and fuel, typically results in simultaneous optimization for control of products of incomplete combustion and NO_X. The applicant proposes combustion control as BACT for VOC and CO from this plant.

A review of the BACT Clearinghouse reveals that for CO and VOC, as BACT from cement plants for these pollutants is as proposed by the applicant.

BACT Determination by DEP:

Based on the information provided by the applicant and the information searches conducted by the Department, lower emissions limits can be obtained employing the top-down BACT approach for SO_2 and NO_X.

The Department has determined that the NO_X and SO_2 levels proposed by the applicant are roughly equal to typical emission limits from plants already in operation throughout the country and do not reflect the most stringent BACT determinations for portland cement plants. The Department appreciates the concern by the applicant that compliance with such emissions limits may be more difficult in the future as a result of possible implementation of enhanced monitoring requirements pursuant to the Title V Operating Permit Program. However, there has not been any change in the methods for setting limits as a result of this pending program.

The Department reviewed Document EPA-453/R-94-004, "Alternative Control Techniques - NO_X Emissions from Cement Manufacturing." Various methods beyond the one proposed by the applicant are detailed. Some of the methods discussed therein are already planned for this project including tire burning and staged combustion. As previously mentioned, the high energy efficiency of the dry preheater/precalciner process also suggests a lower NO_X limit is achievable. Based on the referenced document, it appears that SNCR, Low NO_X burners and Indirect Firing are available (at least as technology transfer) to consider in achieving a lower NO_X emission limit.

The Department also reviewed a paper presented at the Air and Waste Management Association (AWMA) International Specialty Conference on Waste Combustion in Boilers and Industrial Furnaces. The paper, "Reduction of NO_X Emissions from Cement Kiln/Calciner through the

Use of the NO_xOUT Process," which was written by representatives of Nalco and Ash Grove Cement, suggests that SNCR is a viable control method. A level as low as 1.0 lb/ton of clinker was reached based on demonstration tests conducted at the Ash Grove cement plant in Seattle, Washington.

Recently a proposed cement plant (Great Star Cement, Clark County, Nevada) was permitted with the urea-based SNCR/NO_xOUT process as BACT. The process relies on the reaction between ammonia and NO_x to yield molecular nitrogen. The delivery system consists of urea injectors in one of the preheater sections. The objective was to achieve only 50% reduction in NO_x emissions. At that level there should be no ammonia slip while meeting the BACT limit of 3.1 lb/ton clinker.

The Department examined the worst case scenario which assumes that FRI can only achieve its proposed BACT NO_x value of 4.6 lb/ton clinker while employing process control and secondary combustion of fuel. The Department reviewed the degree to which SNCR can be employed in order to achieve a further NO_x reduction to 2.5 lb/ton clinker.

Based on a recent Nalco estimate prepared for Great Star Cement, the capital costs for servicing a 3100 TPD kiln is $471,000 ($54,165 on an annualized basis). Operating costs to reduce NO_x emissions by 3.0 lb/ton clinker are estimated at $674,000. First year costs are projected to be $728,000 and $410/ton NO_x removed. After adjusting only the operating costs for the smaller FRI kiln and lesser removal objective, annual operating costs would be roughly $400,000. Thus the first year costs would be approximately $450,000 for a marginal cost less than $400/ton NO_x removed and less than $0.50/ton of clinker.

The cost per ton of NO_x removed is well within BACT costs for industry in general. The added cost to clinker production is low relative to other factors such as raw material, product, transportation cost fluctuations.

The Department is also aware of a cement plant owned by Mitsubishi in California, which makes use of a similar principal by injecting municipal wastewater sludge into a preheater section and relying (to some extent) on released ammonia to help lower NO_x emissions.

In addition to the BACT Clearinghouse and performance test results, the Department also reviewed various cement technology documents detailing the chemical reactions and technological problems of making cement. It is the conclusion of the Department that the key factors in SO_2 removal is maintaining proper ratios of sulfur and alkali in the kiln environment and intimate contact between raw materials and exhaust gases. This is considered by the Department to be BACT. It is clear that FRI can, with good operating practices, insure the lowest possible SO_2 emissions through its preheater/precalciner dry process. The Department believes that lower SO_2 values than proposed by the applicant are possible without add-on gas treatment systems.

The Department has also concluded that sulfuric acid mist emissions are not expected to be significant because free sulfite (SO_3) will preferentially react with clinker and kiln dust in the alkali environment of the kiln. Also, little water is available to complete the reaction to acid mist.

The BACT emission levels are established by the Department as follows:

Source	Pollutant Emission Limit
Kiln (PM)	0.20 pounds particulate matter per ton of feed (dry basis) and 0.31 lbs/ton clinker
Kiln (PM_{10})	0.26 lbs/ton clinker
Kiln (VE)	Visible emissions not to exceed 10 percent opacity
Kiln (SO_2)	0.28 lbs/ton clinker (interim) 24 hr rolling average Coal (0.75% sulfur by weight), No. 2 fuel oil (0.05% sulfur by weight), and tires (up to 30% of heat input) are the only fuels allowed
Sulfuric Acid Mist	Absorption by clinker (future stack tests)
Kiln (NOx) Revised to 3.8	~~2.5~~ lbs/ton clinker - ~~24~~ hr rolling average
Kiln (CO)	3.6 lbs/ton clinker - 1 hr average
Kiln (VOC)	0.12 lbs/ton clinker - 1 hr average
Kiln (Be)	as controlled by PM BACT (ESP)
Cooler(PM)	0.10 pounds particulate matter per ton of kiln feed (dry basis) and 0.16 lbs/ton clinker

Cooler (PM10)	0.13 lbs/ton clinker
Cooler (VE)	Visible emissions not to exceed 10% opacity
Materials Handling Storage, Conveyance	Visible emissions not to exceed 10% opacity

Compliance with the particulate emission limitations shall be in accordance with the EPA Reference Method 5 as contained in Appendix A, 40 CFR 60, and set forth in Subsection 60.64 of the NSPS for Portland Cement Plants, 40 CFR 60.

Compliance with opacity standards shall be determined by conducting observations in accordance with 40 CFR 60, Appendix A, Method 9.

Compliance with the SO_2 and NO_x emission limitations shall be demonstrated using the CEMS.

Compliance with the CO limitations shall be demonstrated by 3 one-hour tests using EPA Method 10.

Compliance with the VOC limitations shall be demonstrated by 3 one-hour stack tests using Method 25 or Method 25A.

Pursuant to FAC 62-4.070(3), 62-212.400(5)(c) and 62-296.330, the kiln exhaust stack shall be equipped with continuous monitors to record NO_x and SO_2 for the purposes of compliance; opacity at both stacks to indicate proper maintenance and operation; and carbon monoxide and/or oxygen to optimize pollution control.

An additional purpose of the continuous monitors is to conduct a one-year program to optimize pollution removal and relate process variables to emissions. The Department will also consider a higher sulfur limit in the coal if it can be shown that the alkali/sulfur ratios are sufficiently balanced to minimize any additional SO_2 emissions.

BACT Determination Rationale:

BACT for visible emissions was determined to be more stringent than the NSPS for Portland Cement Plant, 40 CFR 60., Subpart F. With respect to the kiln, BACT for PM was determined to be more stringent than the NSPS for Portland Cement Plant, 40 CFR 60., Subpart F. The basis is the BACT Determination set by EPA for Pennsuco Cement, Medley, Florida in 1980.

BACT for SO_2 emissions from the cement kiln was based on the lowest number given in the BACT Clearinghouse. However the Department recognizes that because of the wide differences in fuels and raw materials nationwide it may be possible to meet a lower number or impossible to meet the value recommended by the Department. That is why the limit given is only an interim one. The final one will be determined after review of the process/pollutant optimization program described above.

For each small fabric filter in the material handling process the exhaust gases must not exhibit greater than 10 percent opacity. The Department has determined that 10 percent opacity is BACT, and is attainable with a baghouse.

BACT for NO_x emissions from the cement kiln was determined to be equal to 2.5 pounds per tons of clinker. This rate was obtained from the BACT clearinghouse report and was achieved by a dry preheater/precalciner process plant. Unless the company commits to installing SNCR, FRI will need to develop a contingency project plan to implement additional technology if the plant fails to meet the NO_x limit. The Department will need to review and approve that plan prior to initiation of construction.

Details of the Analysis May be Obtained by Contacting:

Teresa Heron, Review Engineer
A. A. Linero, Administrator, New Source Review Section
Department of Environmental Protection
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Recommended By:

C. H. Fancy, P.E., Chief
Bureau of Air Regulation

Date:

Approved:

Howard L. Rhodes, P.E., Director
Division of Air Resources Management

Date:

Best Available Control Technology (BACT) Determination
Southdown, Inc. dba Florida Mining & Materials
Hernando County

The applicant proposes an increase in the allowable nitrogen oxide (NOx) emission limitation to 250 lbs/hr (8200 hrs/yr), which results in a significant increase in emissions. The purpose for the increase is to adjust the cement kiln's allowable limit upward to compensate for potential peaks in NOx emissions that would be in violation with the current allowable limitation of 162.3 lbs/hr (8200 hrs/yr). Due to source obligation, the base limitation used for evaluation purposes was 158.4 lbs/hr (7896 hrs/yr). The facility is located in an area designated attainment for all of the criteria pollutants.

The applicant has indicated the maximum net change in pollutant emissions is as follows:

Pollutant	Max. Net Increase in Emissions (TPY)	PSD Significant Emission Rate (TPY)
NOx	399.6	40

Rule 17-2.500(2)(f)(3) of the Florida Administrative Code (F.A.C.) requires a BACT review of all regulated pollutants emitted in an amount equal to or greater than the significant rates listed in Table 500-2, F.A.C. Chapter 17-2.

<u>BACT Determination Requested by the Applicant</u>:

<u>No. 2 Cement Kiln</u>

NOx 250 lbs/hr, 30-day average

<u>Date of Receipt of a BACT Application</u>:

April 22, 1992

<u>Review Group Members</u>:

This determination was based on comments received from the applicant and the Permitting and Standards Section.

waste combustors, industrial and utility boilers, glass furnaces, and gas turbines, but not for portland cement kilns. Due to the optimum operational temperature requirements, the siting of a SCR or SNCR system in this existing cement kiln's configuration would be difficult and could lead to such problems as catalytic poisoning, additional NOx formation, inoperable conditions and adverse chemical reactions. As such, these add-on control systems are not considered technically proven and feasible at this time.

Another NOx reduction technique that was considered was the use of a low-NOx burner system. An evaluation was conducted for the potential availability of a low-NOx burner system for this type of source and it appears that this technology is not currently available.

Previous NOx BACT determinations have justified emissions limits of 240 - 1158 lbs/hr, of which the proposed limit of 250 lbs/hr is on the lower end. Another comparison is in "lbs NOx/ton clinker", and the range is 3.5 - 5.6, of which the No. 2 cement kiln will be at 3.2; also, on the lower side of the range for affected sources. Therefore, the NOx BACT limit recommended by the applicant is within the range of the previously issued BACT determinations; also, the control of excess combustion air and proper operation is currently being used to minimize NOx emissions.

A review of the proposed NOx increase in potential emissions have shown that there will not be an adverse affect to the environment.

In conclusion, the NOx emission rate requested by the applicant of 250 lbs/hr, 30-day average, is representative of BACT. For verification purposes, an annual test shall be conducted over a continuous 30-day period using EPA Reference Method 7-E in accordance with 40 CFR 60., Appendix A (July, 1991 version).

<u>BACT Determination Summary and Results</u>:

C. <u>No. 2 Cement Kiln</u>

For the No. 2 Cement Kiln, the Department has evaluated the pollutant NOx for BACT. The Department will establish the emission rate for NOx at the emission rate that was requested by the applicant. Therefore, the Department has determined that BACT should be as follows:

*NOx	250 lbs/hr, 30-day average; 1025.0 TPY (8200 hrs/yr) Process design and operation

BACT Determination Procedure

In accordance with Florida Administrative Code Chapter 17-2, Air Pollution, this BACT determination is based on the maximum degree of reduction of each pollutant emitted which the Department, on a case by case basis, taking into account energy, environmental and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques. In addition, the regulations state that in making the BACT determination the Department shall give consideration to:

(a) Any Environmental Protection Agency determination of Best Available Control Technology pursuant to Section 169, and any emission limitation contained in 40 CFR Part 60 (Standards of Performance for New Stationary Sources) or 40 CFR Part 61 (National Emission Standards for Hazardous Air Pollutants).

(b) All scientific, engineering, and technical material and other information available to the Department.

(c) The emission limiting standards or BACT determinations of any other state.

(d) The social and economic impact of the application of such technology.

The EPA currently stresses that BACT should be determined using the "top-down" approach. The first step in this approach is to determine for the emission source in question the most stringent control available for a similar or identical source or source category. If it is shown that this level of control is technically or economically infeasible for the source in question, then the next most stringent level of control is determined and similarly evaluated. This process continues until the BACT level under consideration cannot be eliminated by any substantial or unique technical, environmental, or economic objections.

BACT Analysis:

A. No. 2 Cement Kiln

NOx emissions potentially can be controlled by post-combustion reduction systems (i.e., selective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR). Such add-on systems have been proposed or recommended for such source categories as municipal

<u>Details of the Analysis May be Obtained by Contacting:</u>

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Recommended by:	Approved by:
C. H. Fancy, P.E., Chief Bureau of Air Regulation	Carol M. Browner, Secretary Dept. of Environmental Regulation
January 14, 1993 Date	Jan 26, 1993 Date