SHOLTES & KOOGLER, ENVIRONMENTAL CONSULTANTS
1213 N.W. 6th Street Gainesville, Florida 32601 (904) 377-5822

SKEC 124-85-01

August 19, 1985

Mr. C.H. Fancy
Deputy Chief, Bureau of Air Quality Management
Florida Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

Subject: Polk County - AP
IMC/New Wales Operation
No. 2 DAP Plant
AC53-23546/PSD-FL-034

Dear Mr. Fancy:

In response to your letter of August 7, 1985, I am providing the following information to assist the Department in the reevaluation of the Best Available Control Technology for nitrogen oxides emissions from a diammonium phosphate (DAP) fertilizer plant. In your August 7, 1985 letter you requested any NOx emission test data available for DAP plants and other similar sources (granular triplesuperphosphate [GTSP] plants and/or phosphate rock dryers) associated with the phosphate fertilizer industry. To the best of my knowledge nitrogen oxide emission data for sources in the phosphate fertilizer industry are very limited due to the fact that these data have not been required in the past as permit conditions. The only nitrogen oxides emission data for sources in the phosphate fertilizer industry that I am aware of are data on two phosphate rock dryers; one operated by Brewster Phosphates and the other by the Mobil Chemical Company. Test data from both of these facilities are in the files of the Department. The Brewster data were submitted in support of PSD Application PSD-FL-088 and the Mobil data were submitted in support of Construction Permit Application AC53-090634.

The Brewster data show a nitrogen oxides emission rate of 42.5 pounds of NO_2 per hour resulting from the combustion of 842 gallons per hour of No. 6 fuel oil with a 0.28 percent nitrogen content. This

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nitrogen oxides emission rate is equivalent to 50.5 pounds of nitrogen oxides per 1000 gallons of fuel.

The Mobil data show a nitrogen oxides emission rate of 28.6 pounds of nitrogen oxides per hour resulting from the combustion of 500 gallons per hour of No. 6 fuel oil. This is equivalent to a nitrogen oxides emission rate of 57.2 pounds per 1000 gallons of fuel.

Nitrogen oxides emission factors reported in AP-42 for the combustion of residual fuel oils range from 42 to 67 pounds per 1000 gallons fuel. The AP-42 nitrogen oxides emission factor rate for residual fuel oil with 0.28 percent nitrogen content fired into an industrial boiler is 53.4 pounds per 1000 gallons of fuel. Both the Brewster and Mobil nitrogen oxides emission rates are in the range of those reported in AP-42. Furthermore, these emission rates are approximately half of the NOx emission rates measured from the No. 2 DAP plant at IMC/New Wales; 104 pounds of nitrogen oxides per 1000 pounds of fuel. To the best of my knowledge, no other nitrogen oxide emission data exists for DAP plants, GTSP plants or rock dryers in the phosphate fertilizer industry.

The nitrogen content of the No. 6 fuel oil burned in the No. 2 DAP plant at IMC/New Wales when the nitrogen oxides reported in my July 3, 1985 letter were made was 0.2-0.3 percent. The maximum nitrogen content of No. 6 fuel oil burned by IMC/New Wales is 0.4 percent.

Regarding reasons for the unexpectedly high nitrogen oxides emission rates from the IMC/New Wales DAP plant, Willard Hanks mentioned the possible role that free ammonia in the dryer might play. On that matter I offer the following comments. The ammonia (NH_3) will decompose, or burn, at high temperatures to produce water vapor, elemental nitrogen and possibly nitrogen oxides. At temperatures below approximately 2700°F ammonia will more than likely decompose to elemental nitrogen and water vapor. At temperatures above the 2700°F range, it is likely ammmonia will decompose to produce nitrogen oxides and water vapor. The reactions discussed thus far are reactions that will occur in an oxygen rich environment.

The only place in a DAP dryer where temperatures of 2700°F are reached are in the burner flame. Temperatures of this magnitude elsewhere in the dryer will decompose the DAP product. It is likely that some free ammonia will be present in the burner flame however, the amount of free ammonia in this zone will certainly not be sufficient to increase the nitrogen oxides emission rate from 50 to 55

pounds of nitrogen oxides per 1000 gallons of fuel to 104 pounds per 1000 gallons of fuel. In all likelihood, the majority of free ammonia that is decomposed in the DAP dryer results in the formation of elemental nitrogen and water vapor; and not nitrogen oxides.

It should further be recalled, that the injection of ammonia into the combustion zone of boilers (in an oxygen starved environment) is a recognized means of reducing nitrogen oxides emissions. In this situation, the ammonia reacts with nitrogen oxides to produce elemental nitrogen and water vapor. It is doubtful that this reaction will occur in DAP dryer because of the high amount of excess air in these dryers.

In reviewing the data herein, it should be recognized by the Department that phosphate rock dryers, the only sources for which nitrogen oxides emission data are available, are not DAP dryers. Hence, parallels should not be drawn between nitrogen oxides emission rates from the rock dryers and expected nitrogen oxides emission rates from DAP dryers.

If additional data are required to continue your review of this matter, I will look into the possibility of conducting additional nitrogen oxides emission measurements on the No. 2 DAP plant at IMC/New Wales and possibly conducting emission measurements on the No. 1 DAP plant at that facility. Please contact me if we can be of further assistance to you.

Very truly yours,

SHOLTES & KOOGLER,
ENVIRONMENTAL CONSULTANTS

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

JBK:pdt
cc: Mr. Jerry Girardin

Mobil Chemical Company AC53-090634

NOx
Fuel - 500 gal/hr
NOx by test - 28.6 lb/hr

NOx = 57.2 lb/1000 gal

Brewster (PSD FL-088)

NOx
Fuel - 842 gal/hr @ 0.28% Nitrogen
NOx by test - 42.5 lb/hr

NOx = 42.5/0.842
= 50.5 lb/1000 gal

AP-42 NOx from Fuel Combustion

53.4 lb/1000 gal w/0.28%N fuel oil
55.0 lb/1000 gal Individual Boilers
42.0 lb/1000 gal Tangentially Fired Utility
105.0 lb/1000 gal Vertically Fired Utility
67.0 lb/1000 gal Other Utility

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

August 7, 1985

Dr. John B. Koogler
Sholtes & Koogler
1213 North West 6th Street
Gainesville, Florida 32601

Re: AC 53-23546/PSD-FL-034

Dear Dr. Koogler:

The Bureau of Air Quality Management acknowledges receipt of your letter dated July 3, 1985 that requests the best available control technology determination and allowable nitrogen oxides emission standard for International Minerals & Chemical Corporation's No.2 Diammonium Phosphate Fertilizer plant be modified.

If your request is approved, both the state and federal construction permits issued for this plant will be modified. By copy of this letter, we are requesting EPA to evaluate your request and modify federal permit PSD-FL-034 if the request is justified. The modification being requested by IMC will be reviewed by the BACT Coordinator, meteorologist, and a review engineer at BAQM and members of EPA's technical staff.

Additional information will be needed to evaluate this request. Please furnish copies of all emission test reports of IMC's DAP plants and, if available, other DAP plants and similar sources (dryer) that show the nitrogen oxides emissions and plant operation parameters, including the nitrogen content of the fuel used in the plant. As the review proceeds, there may be requests for additional information by the technical staff of the agencies involved. Any requests for information will be addressed to your attention unless we are told otherwise.

If you have any questions pertaining to this matter, please contact Willard Hanks at (304) 488-1344.

Sincerely,

C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality
Management

CHF/WH/p

cc: James T. Wilburn - (w/letter dated 7/3/85)
Bill Thomas
Jerry Girardin

SHOLTES & KOOGLER, ENVIRONMENTAL CONSULTANTS
1213 N.W. 6th Street Gainesville, Florida 32601 (904) 377-5822

7/10 Bill T.. Please assign to an engineer to write brief letter acknowledging receipt. Clair

SKEC 124-85-01

DER
JUL 8 1985
BAQM

July 3, 1985

Mr. Clair H. Fancy
Deputy Bureau Chief
Bureau of Air Quality Management
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

Subject: International Minerals & Chemical Corporation
New Wales Operations
Polk County, Florida
PSD-FL-034
DAP Plant NOx Emissions

Dear Mr. Fancy:

International Minerals & Chemical Corporation (IMC) owns and operates the New Wales Chemical Complex in Polk County, Florida; a phosphate fertilizer complex. IMC was permitted under Federal PSD Review (PSD-FL-34) to construct and operate the No. 2 Diammoniam Phosphate (DAP) Fertilizer plant at this chemical complex. The air pollution emission limits from the DAP plant were recently modified by the attached letter from EPA dated February 27, 1985.

The purpose of this letter is to request a modification to the nitrogen oxides (NOx) emission limits established by the initial PSD approval and modified by the EPA letter dated February 27, 1985.

When preparing the initial application for PSD review, a proposed NOx emission limit for the DAP dryer was proposed based on emission rates determined from emission factors for fossil fuel fired boilers published in the document, Compilation of Air Pollutant Emission Factors, EPA Publication AP-42, U.S. Environmental Protection Agency.

Fuel firing practices in a DAP dryer are considerably different from fuel firing practices in fossil fuel fired boilers. In boilers, the objective is to generate the maximum amount of heat and to transfer this heat to boiler feed water and steam circulating through

tubes surrounding the combustion chamber. Because of this, it is advantageous to introduce as little excess combustion air as possible since heat will be lost heating the excess air. In a DAP dryer, the objective is to transfer the heat of combustion to air which, in turn, is used to dry a granular DAP product in a rotary dryer.

In boilers fired with oil, it is common practice to introduce 15-20 percent excess air. In a DAP dryer in contrast, approximately 50 percent excess air is fired through the burner and immediately downstream of the burner nozzle additional quench air is added resulting in a total air flow that is equivalent to 300-500 percent excess air. The additional excess air in a DAP dryer is expected to quench the flame temperature and reduce the formation of NOx in the manner of a low-NOx burner; a burner designed specifically to minimize NOx emissions.

Because of the inherent operation of the burner in the DAP dryer, an NOx emission factor from the lower range of those published in AP-42 was selected when estimating NOx emissions during the preparation of the initial application for PSD review. The emission factor selected was 20 pounds of NOx per 1,000 gallons of fuel fired. At a DAP production rate of 140 tons per hour and fuel firing rate of two gallons per ton (280 gallons per hour of fuel in the DAP dryer) an NOx emission rate 5.6 pounds per hour or 23 tons per year (with a 0.95 annual operating factor) was calculated and proposed as an emission limiting standard for the DAP dryer.

In the modification to the approval granted under PSD-FL-034, dated February 27, 1985, EPA modified the NOx emission limiting standard to 0.21 pounds of NOx per million BTU input to the dryer or 8.6 pounds of NOx per hour, whichever is less. At design operating conditions, the 8.6 pounds per hour emission limit is equivalent to a NOx emission factor of 30.7 pounds of NOx per thousand gallons of fuel fired.

On May 29, 1985, an NOx emission test was run on the DAP dryer. At the time of the test, the plant was operating at a production rate of 124 tons of DAP per hour and No. 6 fuel oil was being fired to the dryer at the rate of 195 gallons per hour; 1.6 gallons per ton of product. The NOx emission rate (expressed as NO_2) averaged 20.2 pounds per hour. This is equivalent to a concentration of 36 ppm in a stack gas flow rate of 78,907 dry standard cubic feet per minute. This NOx emission rate corresponds to an emission factor of 104 pounds

of NOx per 1,000 gallons of fuel fired; an emission factor that is almost twice as high as the highest factor reported in AP-42 for oil fired boilers, and a rate of 0.71 pounds per million BTU heat input.

There is no apparent explanation for the high NOx emission rate from the New Wales DAP dryer. The dryer is operated as described in the application for PSD approval; that is with approximately 50 percent excess air fed through the burner and additional quench air added downstream of the burner resulting in a total air flow equivalent to 300-500 percent excess air. Nothing more can be modified in the operation of the dryer to effect the formation and emission rate of nitrogen oxides.

By this letter, we are requesting the reopening of the Best Available Control Technology (BACT) determination file for the subject source and a revision to the NOx emission limit. Based upon the test data provided herein, New Wales is requesting a NOx emission limit equivalent to NOx emission rate of 125 pounds of NOx per 1,000 gallons of fuel fired. Under the referenced emission test conditions, this limit would have resulted in an emission rate of 24.4 pounds per hour. At maximum plant operating rate (a 140 tons per hour production rate and a fuel firing rate of two gallons per ton of product) the maximum allowable NOx emission rate would be 35.0 pounds per hour.

In reviewing this request the following factors should be taken into consideration:

1. There is nothing that can be changed in the operation of the DAP dryer that will further reduce the formation and emissions of NOx. The dryer is operating under procedures that are common to the operation of all DAP dryers in the industry. There is no apparent explanation as to why the measured nitrogen oxide emission rate is so much greater than the expected nitrogen oxide emission rate resulting from the combustion of the same quantity of fuel in an oil fired boiler.

2. The requested increase in NOx emissions to 35.0 pounds per hour from 8.6 pounds per hour (See EPA letter dated February 27, 1985), will result in an increase of NOx emissions of 26.4 pounds per hour or 110 tons per year, assuming a 0.95 annual operating factor.

3. The impact of these additional nitrogen oxides are not expected to be significant. Based upon the air quality impact analysis submitted with the original application for PSD approval (see attached) the NOx from the DAP plant (23 tons per year) represented 18 percent of the NOx emitted from the expansion addressed by the PSD application. The total NOx emitted from the proposed new sources was less than four percent of the sulfur dioxide emission rate from the proposed sources.

   If the requested increase in the NOx emission limit for the DAP dryer is granted, the annual NOx emission rate will be 146 tons per year or 58 percent of the NOx emitted from the proposed new sources. The total NOx emissions from the new sources will then be approximately eight percent (rather than four percent) of the sulfur dioxide emissions from the sources.

   Since, according to the original air quality review, the annual impact of sulfur dioxide emissions was only five micrograms per cubic meter, the impact of the nitrogen oxides emissions will be approximately eight percent of this or less than 0.5 micrograms per cubic meter. Since the annual standard for nitrogen oxides is 100 micrograms per cubic meter, it is apparent that the requested increase in the NOx emission rate to 35 pounds per hour maximum will not result in a significant impact on ambient air quality.

Based upon the information provided herein, IMC requests that the Department review the BACT determination for NOx emissions from the No. 2 DAP plant dryer operated at the IMC/New Wales Chemical Complex and increase the allowable emissionlimit of NOx to 35.0 pounds per hour or 0.71 pounds per million BTU heat input. If there are any questions regarding this request or if additional information is required please do not hesitate to contact me.

Very truly yours,

SHOLTES & KOOGLER,
ENVIRONMENTAL CONSULTANTS

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

JBK:ssc
Attachments

cc: Mr. A. L. Girardin

Attachment 1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30365

FEB 2 7 1985

REF: 4AW-AM

RECEIVED BY
JOHN A. BRAFFORD

MAR - 4 1985

COPIES ROUTE TO JWB

Mr. Thomas L. Craig
Vice President and General Manager
International Minerals and Chemical Corp.
P. O. Box 1035
Mulberry, Florida 33860

RE: PSD-FL-034 - New Wales Chemical

Dear Mr. Craig:

We have received the determination from the Florida Department of Environmental Regulation, dated January 25, 1985, concerning your request of December 12, 1984, to modify emission limits within your May 23, 1980, PSD construction permit for the operation of your diammonium phosphate production train. We have reviewed this determination and find that the requested changes will affect neither the emission rates on a mass per unit of production basis, total emissions in tons per year, nor compliance with New Source Performance Standards. We hereby modify the portions of Specific Condition 9 of your May 23, 1980, PSD permit regarding emissions from the diammonium phosphate production train as follows:

Sulfur dioxide emissions from the dual train DAP reactor, granulator, and dryer shall not exceed 1.1 lbs/10^6 Btu input or 44 lbs/hr (whichever is less).

NO_x emission from the dual train DAP reactor, granulator, and dryer shall not exceed 0.21 lbs/10^6 Btu input or 8.6 lb/hr (whichever is less). { NOW WAS 35 #NO2/hr 125 #NO/10^6 }

Fluoride emissions from the dual train DAP reactor, granulator, and dryer shall not exceed 0.06 lbs/ton of equivalent P_2O_5 feed or 4.2 lbs/hr (whichever is less).

Particulate emissions from the dual train DAP reactor, granulator, and dryer shall not exceed 0.5 lb/ton of equivalent feed or 29.6 lbs/hr (whichever is less).

This permit modification is effective as of the date of this letter. As this revision does not affect emission rates, total emissions, air quality, or pollution control costs, a Federal Register notice will not be published for the change.

Attachment 2

SUPPLEMENTAL DATA FOR PSD REVIEW

NEW WALES CHEMICAL COMPANY
POLK COUNTY, FLORIDA

OCTOBER 1979

SHOLTES & KOOGLER
ENVIRONMENTAL CONSULTANTS
1213 NW 6TH STREET
GAINESVILLE, FLORIDA 32601

(904) 377-5822

SHOLTES & KOOGLER

LONG-TERM IMPACT ANALYSIS

The long-term impact is defined as the annual average impact of pollutants emitted from sources within the study area. The long-term impact analysis was conducted with the AQDM. The input data to the AQDM included emission data for sulfur dioxide and particulate matter resulting from all sources within 50 km of the New Wales Chemical Complex. This includes sources outside the area of significant impact of the proposed New Wales sources.

The meteorological data input to the AQDM was for the 1970-1974 period from Tampa, Florida. These data were in the STAR format with five stability classes.

Receptor spacing used in the AQDM was 1.0 km except that near the New Wales Chemical Complex, 0.5 km spacings were used.

Particulate Matter Impact Analysis

The AQDM was run once to determine baseling particulate matter levels and a second time to determine the impact of new and proposed sources. These model runs are Nos. 100 and 101, respectively. The impact of existing and new sources was determined by summing the impacts of the existing and new sources (Model Run 100 + Model Run 101).

The annual average particulate matter levels for all sources, baseline sources and new and proposed sources are summarized in Figures 5-10 through 5-12, respectively.

Sulfur Dioxide Impact Analysis

The AQDM runs described for the particulate matter impact analysis also included sulfur dioxide emission data. Additionally; however, the AQDM was run a second series of times with receptors shifted eastwardly to fully cover the major impact area of the proposed New Wales Sources. The AQDM runs with the easterly receptor grid are Model Runs 102 and 103.

The output of these model runs for sulfur dioxide are summarized in Figures 5-13 through 5-15 respectively.

Other Pollutant Impact Analysis

The other major pollutant emitted from the proposed sources for which a long-term ambient air standard exists is nitrogen oxides. The annual average ambient air quality standard for nitrogen oxides is 100 ug/m^3.

The impact of nitrogen oxides emissions from the proposed sources was estimated by proportioning the impact of sulfur dioxide emissions. This was done since sulfur dioxide and nitrogen oxides are emitted from the same sources; the proposed sulfuric acid plants and the proposed DAP plant. The sulfuric acid plant emits 86 percent of the sulfur dioxide emitted from the proposed sources and 82 percent of the nitrogen oxides.

The remainder of both pollutants is emitted from the proposed DAP plant. The nitrogen oxides emission rate is less than four percent of the sulfur dioxide emission rate. From Figure 5-15 it can be seen that the maximum annual average sulfur dioxide impact from the proposed sources is only 5 ug/m^3. The nitrogen oxides impact by proportion will be only four percent of the 5 ug/m^3 or less than one ug/m3. This impact is less than one percent of the ambient air quality standard and does not justify modeling specifically for nitrogen oxides.