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4014 NW THIRTEENTH STREET
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KA 261-91-01

February 27, 1992

Mr. C. H. Fancy
Florida Department of
Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Subject: Agrico Chemical Company
Polk County, Florida
Modification of No. 10 and No. 11
Sulfuric Acid Plants
FDER File No. AC53-199112 and PSD-FL-179

Dear Mr. Fancy:

Attached is the supplemental information on Agrico's impact on air quality related values for your review.

It is our understanding that all the information necessary to process the above permit has been submitted. We would appreciate your prompt review.

If you have any questions, please do not hesitate to contact me.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler

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

JBK:wa
Enc.

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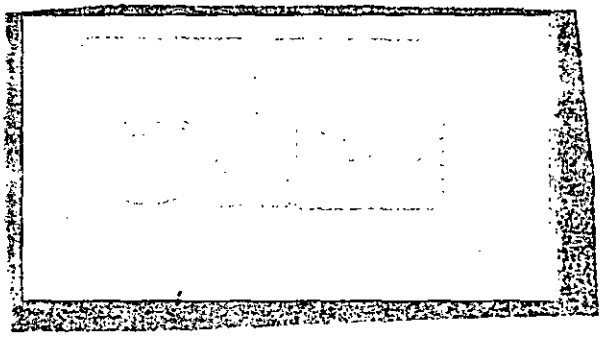
Division of Air
Resources Management

c: Mr. John Vimont, National Park Service
Mr. Tom Rogers, FDER
Mr. Cleve Holladay, FDER
Mr. Selwyn Presnell, Agrico



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TO: Mr. C. H. Fancy
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FIRST CLASS MAIL

IMPACT OF PROPOSED AGRICO CHEMICAL COMPANY PROJECT ON AIR QUALITY RELATED VALUES

The Agrico Chemical Company, a producer of phosphate fertilizer products in Polk County, Florida, is proposing to undertake a project to increase the recovery efficiency of two existing sulfuric acid plants. Associated with the installation of a heat recovery system and electric power generating turbines is a production rate increase of the two sulfuric acid plants from 2000 tons per day to 2700 tons per day of 100% sulfuric acid, each plant. This production rate increase will result in a nominal increase in sulfur dioxide emissions of 233 pounds per hour and a nominal increase of sulfuric acid mist emissions of nine pounds per hour.

In the permit application submitted to the Florida Department of Environmental Regulation for this project, the impact of these emission increases on air quality related values within an area of significant impact of the emissions was addressed. The analysis addressed herein extends the review of the impact of increased emissions on air quality related values to the Chassahowitzka Class I PSD area; an area in excess of 120 kilometers northwest of the Agrico facility.

Air quality modeling with the MESOPUFF 2.0 air quality model indicates that the Class I area impact of sulfur dioxide emission increases expected at the Agrico facility will, at a maximum, be in the range of 0.2 - 0.4 micrograms per cubic meter, 24-hour average, depending upon the technical options incorporated in the MESOPUFF model. The impact of 0.4 micrograms per cubic meter, maximum 24-hour average, results with no technical

options employed while the impact of 0.2 micrograms per cubic meter, maximum 24-hour average, is predicted when technical options accounting for dry deposition, chemical transformation and wet removal are employed. While not specifically modeled with the MESOPUFF model, maximum annual and 3-hour sulfur dioxide impacts resulting from the proposed project at Agrico were estimated to be 0.03 micrograms per cubic meter and 1.0 micrograms per cubic meter, respectively, in the Chassahowitzka area.

Impact on Vegetation

The response of vegetation to air pollutants is influenced by the concentration of the pollutant, the duration of the exposure and the frequency of the exposure. The pattern of exposure expected from a single facility is that of a few episodes of relatively high concentrations interdispersed with long periods of no exposure or extremely low concentrations. This is the pattern of exposure that would be expected from sulfur dioxide and acid mist emissions from the Agrico facility at Chassahowitzka; with the estimated highest sulfur dioxide impact as estimated in the preceding paragraph.

Vegetation responds to a dose of an air pollutant with a dose being defined as the product of the concentration of the pollutant and the duration of the exposure. The impact of the Agrico emissions on Chassahowitzka regional vegetation was assessed by comparing pollutant doses that have been projected with air quality modeling to threshold doses reported in the literature.

Sulfur dioxide damage to vegetation can be grouped into two general categories: acute and chronic. Acute damage is caused by short-term exposure to relatively high concentrations of sulfur dioxide. This damage is usually characterized by a yellowing of leaf tips with a sharp, well defined separation between the damaged and healthy areas of a leaf. In pine trees, injury usually first occurs at the base of the youngest needles (the newest tissue on the plant).

Damaged plants typically show decreased growth and yield. These effects vary widely between species but studies have shown a rough correlation between the loss and yield and the exposure dose. These studies showed approximately a 10 percent yield loss for each 10-fold increase in sulfur dioxide dose beyond 260 micrograms per cubic meter-hour. By comparison, the maximum expected 3-hour impact of increased emissions from the Agrico facility would result in a sulfur dioxide dose increase in the range of three micrograms per cubic meter-hour and the maximum expected 24-hour impact would result in a sulfur dioxide dose increase in the range of seven micrograms per cubic meter-hour.

Susceptibility to acute damage varies widely with plant species and also with the time of exposure. For example, alfalfa can tolerate 3250 micrograms per cubic meter for one hour (3250 micrograms per cubic meter-hour dose), but only 1850 micrograms per cubic meter for two hours (3700 micrograms per cubic meter-hour dose). Table 1 shows the sulfur dioxide concentration/time thresholds for several plant species common to Florida.

TABLE 1

CONCENTRATION - TIME EXPOSURES TO
SULFUR DIOXIDE RESULTING IN DAMAGE TO
SEVERAL SPECIES COMMON TO FLORIDA

Sensitive Plants

Popular	Radish	Cabbage
Lombardy Popular	Cucumber	Broccoli
Black Willow	Squash	Spinach
Elm	Bean	Wheat
American Elm	Pea	Begonia
Southern pines	Soybean	Zinnia
Red Oak	Cotton	Rubber plant
Black Oak	Eggplant	Bluegrass
Sumac	Celery	Ryegrass

Intermediate Plants

Basswood	Yellow Popular	Virginia creeper
Red Oxier Dogwood	Sweetgum	Rose
Maples	Locust	Hibiscus
Red Maple	Eastern Cottonwood	Gladiolus
Elm	Saltgrass	Honeysuckle
Pine	Cucumber	Wisteria
White Oak	Tobacco	Chrysanthemum
Pin Oak	Potato	

Tolerant Plants

Juniper	Pine	Gardenia
Ginkgo	Sumac	Citrus
Dogwood	Cantaloupe	Celery
Oak	Corn	
Live Oak	Lily	

TABLE 1 (CONTINUED)

Exposure Time, Hours	Concentration Needed to Produce Injury ($\mu g/m^3$)		
	Sensitive	Intermediate	Tolerant
0.5	2,620 - 10,480	9,170 - 31,440	>26,200
1.0	1,310 - 7,860	6,550 - 26,200	>20,960
2.0	655 - 5,240	3,930 - 19,650	>15,720
4.0	262 - 2,620	1,310 - 13,100	>10,480
8.0	131 - 1,310	524 - 6,550	> 5,240

The vegetation in the Chassahowitzka area is characterized by flatwoods, brackish-water, marine and halothytic terrestrial species. Predominant tree species are slash pine, laurel oak, sweet gum and palm. Other plants in the area include needlegrass rush, seashore saltgrass, marsh hay and red mangrove.

A study of the tolerance of native Florida species to sulfur dioxide (Woltz and Howe, 1981) demonstrated that cypress, slash pine, live oak and mangrove exposed to 1300 micrograms per cubic meter of sulfur dioxide for 8-hours were not visibly damaged. This is consistent with the results reported in Table 1. Another table (McLaughlin and Lee, 1974) demonstrated that approximately 20 percent of a broad range of plants ranging from sensitive to tolerant were visibly injured when exposed to a sulfur dioxide concentration of 920 micrograms per cubic meter for a 3-hour period.

Acute injury results from a plants inability to quickly convert absorbed sulfur dioxide into the sulfate ion; an essential nutrient to plants. Chronic injury, on the other hand, results from a build-up of sulfate in tissue to the point where it becomes toxic. This sulfate build-up occurs over a relatively long period of time. Symptoms include a reduction in chlorophyll production resulting in decreased photosynthesis and yellow or reddish areas on leaves in a mottled pattern. In pines, sulfate injury is typically shown first at tips of older needles (the oldest tissue in the needle).

Chronic injury can result from sulfur dioxide exposures that are much lower than is required for acute injury. Unfortunately, there is a lack of quantitative experimental data for long term effects of sulfur dioxide exposure. The lowest average concentration for which chronic injury has been shown is 80 micrograms per cubic meter. The Environmental Protection Agency has therefore established an ambient air quality standard of 80 micrograms per cubic meter, annual average. The Florida Department of Environmental Regulation adopted a more conservative standard of 60 micrograms per cubic meter, annual average. By comparison, the impact of the sulfur dioxide emission increase proposed by Agrico will result in an ambient impact in the Chassahowitzka area in the range of 0.03 micrograms per cubic meter, annual average.

The maximum expected concentrations of acid mist in the Chassahowitzka area resulting from the increased emissions from Agrico will be less than four percent of the expected sulfur dioxide impacts. Furthermore, it would be expected that by the time acid mist droplets have traveled the 120 kilometers from Agrico to the Chassahowitzka area, the droplets would have reacted with particles in the atmosphere to produce a sulfate salt.

Salt deposition concentrations in coastal areas are in the range of 25-300 pounds per acre per year and may be as high as 4000 pounds per acre per year on exposed shorelines. Sulfates can account for 5 - 6 percent of the total salt; resulting in a deposition rate in the range of 1-200 pounds per acre per year.

One study (Mulchi Armbruster, 1975) demonstrated leaf damage in reduced yields in corn and soybeans with a salt deposition of 169 - 339 pounds per acre per year. Another study (Curtis, 1975) reported that broad leaf plants absorbed greater amounts of salt than do pines, probably due to leaf shape. It has been found that deciduous trees begin to exhibit adverse effects to salt exposure concentrations in the range of 100 micrograms per cubic meter (DeVine, 1975). The same study reported no observed injury to plants with long-term exposures to salt spray of 40 micrograms per cubic meter.

The sulfate concentrations resulting from acid mist emissions from Agrico are well below concentrations which have been reported to produce vegetation damage.

Impact on Soils

The major soil classification in the Chassahowitzka area is Weeki Wachee-Durbin muck. This is an euic, hyderthermic typic sufihemist that is characterized by high levels of sulfur and organic matter. This soil is flooded daily with the advent of high tide and the pH ranges between 6.1 and 7.8. The upper level of this soil may contain as much as four percent sulfur (USDA, 1991).

Based upon the maximum expected sulfur dioxide and sulfate concentrations in the Chassahowitzka area resulting from the increased emissions from Agrico, it is not expected that there will be a significant increase in the sulfur content of the native soils.

Impacts on Wildlife

As the predicted sulfur dioxide levels are below those known to cause affects to vegetation, the increased sulfur dioxide and acid mist emissions increases from Agrico are not expected to have any impact on the wildlife in the Chassahowitzka area.

Visibility Impairment Analysis

Visibility impairment analysis could be performed to determine potential visibility effects of the proposed Agrico project in the Chassahowitzka area. A screening approach suggested by EPA (Workbook for Plume Visual Impact Screening and Analysis, 1988) and computerized in a model referred to as VISCREEN could be used for the analysis.

In reviewing the applicability of the VISCREEN model, it was found that the sulfur dioxide and acid mist emission increases from Agrico are not required as model inputs because the distance from Agrico to the Chassahowitzka area is less than 200 kilometers (Chapter 3 of the VISCREEN users manual). The Class I visibility impairment analysis required by FDER and federal rules are limited to Class I areas within 100 kilometers of a source.

In view of the limitations of the VISCREEN model and the state and federal PSD regulations, no visibility impact analysis was deemed necessary for this project for the following reasons:

1. The distance from Agrico to the Chassahowitzka area is greater than 100 kilometers but less than 200 kilometers,

2. The VISCREEN model is not sensitive to sulfur dioxide emission for source-receptor distances less than 200 kilometers, and

3. The maximum sulfur dioxide impact of the Agrico project in the Chassahowitzka area is expected to be in the 0.3 micrograms per cubic meter range, 24-hour average.

REFERENCES

Curtis, C.R., L.R. Krusbert, T.L. Lauver, and B.A. Francis. 1975. Chalk Point Cooling Tower Project: Field Research on Native Vegetation. Maryland Water Resources Research Center. Maryland Department of Natural Resources - Power Plant Siting Program. p.107.

McLaughlin, S.B. and N.T. Lee. 1974 Botanical Studies in the Vicinity of the Widows Creek Steam Plant. Review of Air Pollution Effects Studies, 1952-1972, and Results of 1973 Surveys. Internal Report I-EB-74-1. TVA.

United States Environmental Protection Agency, 1988. Workbook for Plume Visual Impact Screen and Analysis. EPA-450/4-88-015, September 1988.

Unites States Department of Agriculture, 1991. Surveys of Hernando and Citrus Counties, Florida. USDA Soil Conservation Service in cooperation with University of Florida, Institute of Food and Agricultural Sciences, Agricultural Experiment Stations and Soil Science Department.

Woltz, S.S. and T.K. Howe, 1981. Effects of Coal Burning Emissions on Florida Agriculture. In: The Impact of Increased Coal Use in Florida. Interdisciplinary Center for Aeronomy and (other) Atmospheric Sciences. University of Florida, Gainesville, Florida.

NOx BACT

Best Available Control Technology (BACT) Determination
International Minerals & Chemical Corporation
Polk County

The applicant has installed a dual train diammonium phosphate (DAP) plant with each train capable of producing 125 tons per hour. This (No. 2) DAP plant utilizes a dryer that was designed to be fired with either No. 6 fuel oil or natural gas.

The plant was permitted in 1980 under PSD construction permit PSD-FL-034 for a nitrogen oxides emission rate of 4.3 pounds per hour (0.21 pounds per million Btu heat input) for each of the two 70 tons per hour DAP trains. By letter dated February 27, 1985, EPA modified the nitrogen oxide emission limiting standard to allow a total plant nitrogen oxides emission rate of 8.6 pounds per hour or 0.21 pounds per million Btu heat input.

On May 29, 1985, nitrogen oxides emission measurements were made on the No. 2 DAP plant dryer to demonstrate compliance with the permitted emission limiting standard. The testing, which was performed while operating the dryer on No. 6 fuel oil, resulted in an average nitrogen oxides emission rate of 0.71 pounds per million Btu heat input. Subsequent nitrogen oxides emissions measurements on the No. 2 DAP plant showed nitrogen oxides emissions ranging from 0.80 to 0.88 pounds per million Btu heat input.

In accordance with this finding, the applicant completed a review of the plant operating practices and the dryer burner design, and concluded that there were no practical modifications that could be made to reduce nitrogen oxides emissions to the permitted emission rate of 0.21 pounds per million Btu heat input.

For permitting purposes, the applicant has proposed that the nitrogen oxides limit for the No. 2 DAP plant be set at 1.0 pound of nitrogen oxides (expressed as nitrogen dioxide) per million Btu heat input. At a maximum plant operation rate of 140 tons of DAP per hour and a design heat input rate of 0.3 million Btu per ton of DAP, the proposed limit of 1.0 pound of nitrogen oxides per million Btu heat input will result in a nitrogen oxides emission increase of 151.8 tons per year. The annual increase exceeds the 40 tons per year significant emission increase defined in 17-2.500(2)(e)2 FAC; thus requiring a PSD review and hence a BACT determination for the requested action.

BACT for NOx

Review Group Members:

This determination was based upon comments received from the applicant and the Stationary Source Control Section.

PERMITTEE:
International Minerals &
Chemical Corporation

Permit Number: AC 53-118671
Expiration Date: December 31, 1987

SPECIFIC CONDITIONS:

A, or other methods as approved by the department. Compliance tests shall be conducted prior to the expiration date of this construction permit or within 45 days after placing a plant in operation. P_2O_5 input, pH of the scrubber solution, and pressure drop across the scrubbers will be as normally operated and reported, along with the data and results, to the department. The department (SW District) shall be notified 15 days prior to any compliance test.

10. An application for permit to operate the No. 2 DAP plant shall be submitted to the department (SW District) within 45 days of the compliance tests. In the event the application for permit to operate does not include test data on both trains of the No. 2 DAP plant, the permittee shall request the District amend any permit to operate that may be issued for this plant within 45 days of placing the other train in operation.

11. Any permit to operate issued for the No. 2 DAP plant shall require annual tests for particulate matter and fluoride, and on renewal of the permit to operate (every 5 years), tests for sulfur dioxide and nitrogen oxides.

Issued this 21 day of April 1987

STATE OF FLORIDA DEPARTMENT OF
ENVIRONMENTAL REGULATION

Dale Twachtmann

Dale Twachtmann, Secretary

____ pages attached

$60.00 and 28.4 pounds/hour respectively. By comparison, the cost of using natural gas to dry 125 tons of product would compute to $56.34 and an emission rate of 4.7 pounds/hour when using the data submitted by the applicant. This calculation clearly shows that the applicant should be operating on natural gas both from the standpoint of reducing operating costs and emissions.

In addition to the data submitted, which served as the basis for the computations above, the applicant has submitted data which indicates that with proper operation the DAP dryer can be fired with No. 6 fuel oil at a lower throughput per ton of product resulting in a lower emission rate. During discussions with the bureau, the applicant has indicated that the dryer can be operated with a maximum emissions rate not to exceed 0.60 pounds per million Btu when operating at maximum production for one train (125 tons per hour). The data submitted indicates that the cost to operate at this level would be $44.57 with a corresponding emission rate of 12.7 pounds/hour. At this level of operation the incremental costs of switching to natural gas would be $1.47 per pound ($2,940.00/ton) of nitrogen oxides controlled which would indeed be unreasonable in comparison to the guideline of $1,000.00/ton of nitrogen oxides controlled for establishing NSPS. It should be noted that the cost of switching to natural gas only results in a change of operating costs, capital investment is not required to modify the facility to use natural gas as fuel. Based on this evaluation, the applicant's proposal of accepting a limitation of 0.60 pounds, per million Btu is justified.

Environmental Impacts Analysis

Dispersion modeling completed by the applicant indicates that the nitrogen oxides emissions at the originally permitted rate (0.21 pounds/million Btu) result in an ambient concentration level of 0.16 ug/m^3. The proposal to increase the emission rate to 1.0 pound per million Btu would increase the ambient concentration level by approximately 0.5 ug/m^3 for a total of 0.62 ug/m^3. This increase in the nitrogen oxides impact as originally proposed is insignificant in comparison to the maximum existing NO_2 level in urban Hillsborough County of 54 ug/m^3 and the Ambient Air Quality Standard (AAQS) of 100 ug/m^3. Based on the impacts analysis, the proposed emission rate and certainly the counter proposal of 0.6 pounds per million Btu, which would reduce the ambient impacts by a factor of 2, would not constitute a problem from an ambient concentration level standpoint.

Conclusion

In view of the fiscal condition of the phosphate fertilizer industry and the other information presented in the preceeding analysis, the bureau has determined that nitrogen oxides emission

limitation of 0.60 pounds/million Btu is justified in all respects as being BACT for this facility.

From an economic standpoint, the firing of No. 6 fuel oil at the 0.60 lb/MMBtu level does not justify switching to natural gas. In addition, the cost of having the applicant perform modifications to the burner/combustion chamber is not justified during a period when the market price of the applicant's product (DAP) is below the cost of production.

In terms of environmental impacts, it has been shown that the emissions limit, as proposed and as agreed to as being BACT, will be minimal.

It is important to note that the level of emissions determined to be BACT in this analysis is subject to change if deemed necessary in accordance with modifications that may be proposed in the future. At that time, the BACT determination would again be completed on a case-by-case basis taking into account the elements as presented herein.

Details of the Analysis May be Obtained by Contacting:

Barry Andrews, P.E., BACT Coordinator
Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Recommended by:

C. H. Fancy, P.E.
Deputy Bureau Chief, BAQM
4/16/87
Date

Approved by:

Dale Twachtmann, Secretary

21 April 87
Date

(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 Determined by DER:

Control Technology	Double Absorption/Fiber Mist Eliminators
Pollutant	Emission Limits
SO_2	4.0 lb/ton of 100% H_2SO_4 produced
Sulfuric Acid Mist	0.15 lb/ton of 100% H_2SO_4 produced
Visible Emissions	10% opacity
NOx	0.12 lb/ton

BACT Determination Rationale

DER's BACT determination is the same as that proposed by the applicant (except for the addition of a NOx limit for reasons discussed in the Technical Evaluation), determinations completed by other states, and Standards of Performance for Sulfuric Acid Plants, 40 CFR 60 Subpart H, (double absorption process). The process in itself is the control technology for SO_2 and acid mist. The emission limits reflect conversion efficiency of around 99.7% of SO_2 to H_2SO_4. High efficiency mist eliminators are considered BACT for sulfuric acid mist. A review of BACT/LAER Clearinghouse indicates that the double absorption technology, and the use of high efficiency mist eliminators is representative of BACT using the top-down approach.