

Mail to: RACT/BACT/LAER Clearinghouse
 ESD, OAQPS, MD-13
 RTP, N.C. 27711

RACT/BACT/LAER DETERMINATION INPUT SUMMARY

76
 Source Code
 JULY 27, 1992
 Date of this Report

Source Type/Size FERTILIZER PLANTS (AMMONIUM PHOSPHATE) 100.0 TPH DAP OR 120 TPH MAP

Company Name/Site Location FARMLAND HYDRO, L.P., CO. RD. 640, P.O. BOX 960, BARTOW, FL 33830

Determination is RACT ~~LAER~~ for a NEW ~~MODIFIED~~ source: Date of Permit Issuance: JULY 28, 1992

Permit No.: AC53-210886/PSD-FL-186 Date of Estimated Start-up: SEPTEMBER 1, 1993

Determination Made By (agency): FL DEPT ENVIRO REG WILLARD HANKS 904/488-1344

(Person Directly Knowledgeable About Permit) (Phone)

AIRS Facility Number: _____

E-5

Permit Parameters: (list all processes subject to this permit)	Maximum Design Capacity	Pollutant Reg.*	Emission limit(s)	Reg. require. assoc. w/limit **	Control Equipment or Process Modification Description	Efficiency %	Top-Down BACT Information		
							Number of control options examined	Rank of control option selected	Cost in \$/ton of option selected
DAP	100	F	0.06 LBS/T P ₂ O ₅	B	MULTI STAGE SCRUBBER	99.9			
MAP	120	F	0.06 LBS/T P ₂ O ₅	B	MULTI STAGE SCRUBBER	99.9			

Notes: COMPANY USES MULTI STAGE SCRUBBERS. SCRUBBER LIQUIDS ARE 10% P₂O₅ ACID, 28% B₂O₃ ACID, AND PROCESS WATER CONTAINING 0.45% F. SIGNIFICANT F EMISSION REDUCTION COULD HAVE BEEN ACHIEVED BY USING TREATED WATER IN FINAL STAGE SCRUBBER AT A COST OF \$77,110/TON F REMOVED.

*Use the following abbreviations wherever possible: PM = particulate matter, SO₂ = sulfur dioxide, NO_x = nitrogen oxides, CO = carbon monoxide, VOC = volatile organic compounds, VE = visible emission, TRS = total reduced sulfur, F = fluorine, Be = beryllium, H₂S = hydrogen sulfide, Hg = mercury, VC = vinyl chloride.

**Please use the following abbreviations: TDB = TOP-DOWN BACT, B = BACT, ONSR = OTHER NEW SOURCE REVIEW (Other BACT not required by PSD regulations), L = LAER, N = NSPS, II = NESIAP, A = NAAQS or PSD increment constraints, S = SIP, R = RACT, U = Unregulated.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

JUL 23 1992

4APT-AEB

Mr. Howard L. Rhodes, Interim Director
Air Resources Management Division
Florida Department of Environmental
Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

RECEIVED
JUN 25 1992
Division of Air
Resources Management

RE: Farmland Hydro, L.P., Bartow, Florida (PSD-FL-186)

Dear Mr. Rhodes:

This is to acknowledge receipt of an application for a Prevention of Significant Deterioration (PSD) permit for the above referenced facility by your letter dated March 27, 1992. Farmland Hydro proposes to increase both the granular monoammonium phosphate (MAP) and diammonium phosphate (DAP) production rates at the existing North plant from 70 to 120 TPH, and from 50 to 100 TPH, respectively. North plant process equipment will be modified to achieve the increased production rates. Granular triple super phosphate (GTSP) fertilizer will also no longer be produced at the North plant.

Additional information regarding the estimated overall wet scrubber system fluoride removal efficiency was received by fax on June 10, 1992, from Mr. Willard Hanks of your staff. Additional information clarifying the scrubber combinations selected for various process equipment, was received by fax on June 12, 1992, from Mr. Pradeep Raval of Koogler & Associates Environmental Services. Details of both dual mole and crossflow scrubber system operation, as well as a scrubbing water neutralization system cost analysis, were also included in the additional information. As discussed between Mr. Willard Hanks of your staff and Mr. Stan Kukier of my staff on June 10, and June 15, 1992, we have reviewed the package as submitted, including the additional information requested, and have no adverse comments.

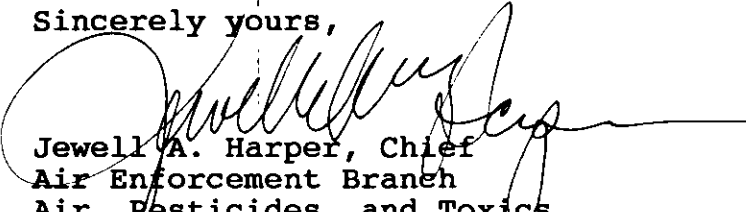
We agree that the wet scrubber system as proposed by Farmland Hydro is BACT for control of modified North plant fluoride emissions. Multi-stage combinations of cyclonic, venturi, dual mole, and counter current crossflow tail gas scrubbers will be used to minimize reactor, granulator, dryer, product cooler, and various solids handling equipment fluoride emissions. Phosphoric acid scrubbing solution of varying concentrations and mole ratios will also be used to reduce fluoride emissions. Water vapor condensing in the process ammonia vaporizer/heat exchanger unit assists in scrubbing fluoride

compounds from the reactor/granulator exhaust gas stream exiting the dual mole scrubber system.

The Farmland Hydro, L.P. chemical fertilizer facility will be subject to the requirements of 40 CFR § 60.222, Subpart V - Standards of Performance for the Phosphate Fertilizer Industry: Diammonium Phosphate Plants.

Thank you for the opportunity to review and comment on this package. If you have any questions or comments, please contact Mr. Stan Kukier of my staff at (404) 347-5014.

Sincerely yours,



Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides, and Toxics
Management Division

Farmland Hydro, L.P.

Green Bay Plant
County Road 640
Post Office Box 960
Bartow, Florida 33830
Tele.: 813 533-1141

Charles W. Jenkins
Environmental Coordinator

RECEIVED

JUL 20 1992

Bureau of
Air Regulation

July 17, 1992

Ms. Patty Adams
State of Florida Department
of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

Re: Affidavit of Publication for DER File No. AC53-210886

Dear Patty,

Please find enclosed the original Affidavit of Publication concerning the Notice of Intent to Issue a Construction Permit to Farmland Hydro, L.P.

Should there be any problem or questions please contact me at (813) 533-1141 ext. 384.

Very truly yours,



Charles Jenkins
Environmental Coordinator

CWJ:dr/cwj5892

Enclosure

cc: St. Hanks
C. Palladay
B. Thomas, SW Dist.
G. Harper, EPA
C. Shaver, NPS



A Delaware Limited Partnership



AFFIDAVIT OF PUBLICATION

THE LEDGER Lakeland, Polk County, Florida

Case No.

STATE OF FLORIDA)
COUNTY OF POLK)

Before the undersigned authority personally appeared Tharon Honeycutt, who on oath says that he is Controller of The Ledger, a daily newspaper published at Lakeland in Polk County, Florida; that the attached copy of advertisement, being a

Notice of Intent

in the matter of

Construction Permit


in the

Court, was published in said newspaper in the issues of

June 22;

1992


Affiant further says that said The Ledger is a newspaper published at Lakeland, in said Polk County, Florida, and that the said newspaper has heretofore been continuously published in said Polk County, Florida, daily, and has been entered as second class matter at the post office in Lakeland, in said Polk County, Florida, for a period of one year next preceding the first publication of the attached copy of advertisement; and affiant further says that he has neither paid nor promised any person, firm or corporation any discount, rebate, commission or refund for the purpose of securing this advertisement for publication in the said newspaper.

Signed 
Controller

Sworn to and subscribed before me this 22nd

day of June 1992
A.D. 19




Notary Public
Billie Morlan

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
NOTICE OF INTENT TO ISSUE PERMIT

The Department of Environmental Regulation gives notice of its intent to issue a construction permit (AC 53-210886/PSD-FL-186) to Farnland Hydro, L.P., P. O. Box 960, Bartow, Florida 33830. The permit will allow the applicant to modify and increase production of the North GISP/MAF/DAP Granulation Plant, located on County Road 640 West near Bartow, Polk County, Florida. The allowable emissions will be 22.6 lbs/hr (98.6 TPY) of particulate matter, 3.7 lbs/hr (16.4 TPY) fluorides, and 46.7 lbs/hr (204.7 TPY) ammonia. The proposed project is subject to Prevention of Significant Deterioration (PSD) regulations for fluorides. A determination of Best Available Control Technology (BACT) was required for fluorides. There are no PSD increments or ambient air quality standards for fluorides. These emissions will not cause a violation of any ambient air standard or Prevention of Significant Deterioration (PSD) increment. The Department is issuing this intent to issue for the reasons stated in the Technical Evaluation and Preliminary Determination.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57 Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within 14 days of publication of this notice. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, Florida Statutes.

The Petition shall contain the following information: (a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed; (b) A statement of how and where each petitioner received notice of the Department's action or proposed action; (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action; (d) A statement of the material facts disputed by petitioner, if any; (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action; (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and (g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this Notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-6.207, F.A.C.

The application is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at:
Department of Environmental Regulation
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Department of Environmental Regulation
Southwest District
4520 Oak Fair Blvd.
Tampa, Florida 33610-7347

Any person may send written comments on the proposed action to Mr. Preston Lewis at the Department's Tallahassee address. All comments received within 30 days of the publication of this notice will be considered in the Department's final determination.

Further, a public hearing can be requested by any person. Such requests must be submitted within 30 days of this notice.
M-538 — 6-22; 1992



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

4APT-AEB

JUL 15 1992

RECEIVED

JUL 20 1992

Mr. Clair H. Fancy, P.E., Chief
Bureau of Air Regulation
Florida Department of Environmental
Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Bureau of
Air Regulation

RE: Farmland Hydro, L.P., Bartow, Florida (PSD-FL-186)

Dear Mr. Fancy:

This is to acknowledge receipt of your preliminary determination and draft permit for the proposed modification to the above referenced facility by your letter dated June 16, 1992. Farmland Hydro proposes to increase both the granular monoammonium phosphate (MAP) and diammonium phosphate (DAP) production rates at the existing North plant from 70 to 120 TPH, and from 50 to 100 TPH, respectively. North plant process equipment will be modified to achieve the increased production rates. Granular triple super phosphate (GTSP) fertilizer will also no longer be produced at the North plant.

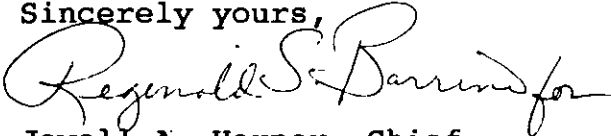
As discussed between Mr. Willard Hanks of your staff and Mr. Stan Kukier of my staff on July 8, 1992, we have reviewed the package as submitted and have no adverse comments.

We concur with your determination of BACT for control of modified North plant fluoride emissions. A wet scrubber system composed of multi-stage combinations of cyclonic, venturi, dual mole, and counter current crossflow tail gas scrubbers will be used to minimize reactor, granulator, dryer, product cooler, and various solids handling equipment fluoride emissions. Phosphoric acid scrubbing solution of varying concentrations and mole ratios will also be used to reduce fluoride emissions. Water vapor condensing in the process ammonia vaporizer/heat exchanger unit assists in scrubbing fluoride compounds from the reactor/granulator exhaust gas stream exiting the dual mole scrubber system.

The Farmland Hydro, L.P. chemical fertilizer facility will be subject to the requirements of 40 CFR Part 60, Subpart V - Standards of Performance for the Phosphate Fertilizer Industry: Diammonium Phosphate Plants.

Thank you for the opportunity to review and comment on this package.
If you have any questions or comments, please contact Mr. Stan Kukier
of my staff at (404) 347-5014.

Sincerely yours,

A handwritten signature in cursive script that reads "Reginald S. Barringer". The signature is written in dark ink and is positioned above the typed name.

Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides, and Toxics
Management Division

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY - REGION IV
 AIR, PESTICIDES & TOXICS MANAGEMENT DIVISION
 345 Courtland Street, N. E.
 Atlanta, Georgia 30365
 Fax Number: FTS 347 -5207 or 404/347-5207

FACSIMILE TRANSMISSION SHEET

DATE: 7/15/92 NUMBER OF PAGES (Including this sheet) 3
 (Preparer must number all pages)

TO: Clair H. Fancy PHONE: _____

ADDRESS: FOER FAX NUMBER: 904/922-6979

FROM: Stan Kukier PHONE: 404/347-5014

EPA - Region III

If the following pages are received poorly, please call _____
 at FTS 347 - _____ or 404/347- _____.

SPECIAL INSTRUCTIONS FOR RECEIVER: Formland Hydro, L.P. -
Preliminary Determination Letter

CC: J. Hanks
C. Holladay
B. Thomas, sub Dist.
C. Shaw, NPS
G. H. W. W. RBN
CHF/PL

05/22/92

12:30

U.S. - E.P.A. AIR DIV.

002



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

4APT-AEB

Mr. Howard L. Rhodes, Interim Director
Air Resources Management Division
Florida Department of Environmental
Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

RE: Farmland Hydro, L.P., Bartow, Florida (PSD-FL-186)

Dear Mr. Rhodes:

This is to acknowledge receipt of an application for a Prevention of Significant Deterioration (PSD) permit for the above referenced facility by your letter dated March 27, 1992. Farmland Hydro proposes to increase both the granular monoammonium phosphate (MAP) and diammonium phosphate (DAP) production rates at the existing North plant from 70 to 120 TPH, and from 50 to 100 TPH, respectively. North plant process equipment will be modified to achieve the increased production rates. Granular triple super phosphate (GTSP) fertilizer will also no longer be produced at the North plant.

Additional information regarding the estimated overall wet scrubber system fluoride removal efficiency was received by fax on June 10, 1992, from Mr. Willard Hanks of your staff. Additional information clarifying the scrubber combinations selected for various process equipment, was received by fax on June 12, 1992, from Mr. Pradeep Raval of Koogler & Associates Environmental Services. Details of both dual mole and crossflow scrubber system operation, as well as a scrubbing water neutralization system cost analysis, were also included in the additional information. As discussed between Mr. Willard Hanks of your staff and Mr. Stan Kukier of my staff on June 10, and June 15, 1992, we have reviewed the package as submitted, including the additional information requested, and have no adverse comments.

We agree that the wet scrubber system as proposed by Farmland Hydro is BACT for control of modified North plant fluoride emissions. Multi-stage combinations of cyclonic, venturi, dual mole, and counter current crossflow tail gas scrubbers will be used to minimize reactor, granulator, dryer, product cooler, and various solids handling equipment fluoride emissions. Phosphoric acid scrubbing solution of varying concentrations and mole ratios will also be used to reduce fluoride emissions. Water vapor condensing in the process ammonia vaporizer/heat exchanger unit assists in scrubbing fluoride

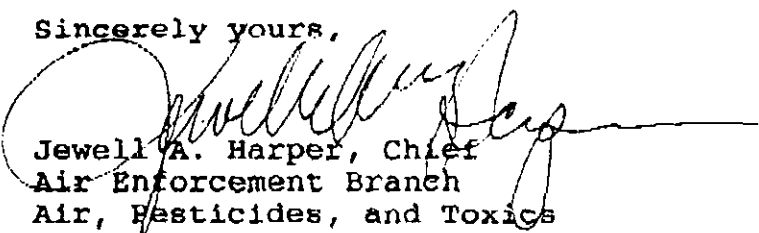
-2-

compounds from the reactor/granulator exhaust gas stream exiting the dual mole scrubber system.

The Farmland Hydro, L.P. chemical fertilizer facility will be subject to the requirements of 40 CFR § 60.222, Subpart V - Standards of Performance for the Phosphate Fertilizer Industry: Diammonium Phosphate Plants.

Thank you for the opportunity to review and comment on this package. If you have any questions or comments, please contact Mr. Stan Kukier of my staff at (404) 347-5014.

Sincerely yours,



Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides, and Toxics
Management Division



KOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES

4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 • FAX 377-7158

KA 123-92-01

June 17, 1992

RECEIVED
JUN 18 1992
Division of Air
Resources Management

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

Subject: Farmland Hydro, LP
MAP/DAP North Plant Permit Application

Dear Mr. Hanks:

Attached is information provided to Mr. Stan Kukier of EPA Region IV regarding the above project. This information will also serve to update your file on the project.

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

Very truly yours,

KOGLER & ASSOCIATES

Pradeep A. Raval

PAR:wa
Enc.

Willard's copy of submittal
to EPA.

file
Faxed to
Stan Kukier,
EPA.
PR
6/11/92

MEMORANDUM

TO: Mr. Willard Hanks
FDER, Tallahassee

FROM: Pradeep Raval *Raval*

DATE: April 20, 1992

SUBJECT: Additional Information on Farmland Hydro, L.P.
North Plant MAP/DAP Modification

This is in response to your request to identify the overall fluoride control in the proposed MAP/DAP North Plant project.

The fluorides in the feed to the North plant under DAP and MAP production mode will be 114.54 and 91.65 pounds fluoride/per ton of P_2O_5 , respectively.

Based on the proposed fluoride emission limit of 0.06 pound per ton of P_2O_5 , the overall process control efficiency can be estimated as follows:

MAP Mode:

$$\begin{aligned}\text{Fluoride Control Eff.} &= (91.65 - 0.06)/91.65 \times 100 \\ &= 99.9\%\end{aligned}$$

DAP Mode:

$$\begin{aligned}\text{Fluoride Control Eff.} &= (114.65 - 0.06)/114.65 \times 100 \\ &= 99.9\%\end{aligned}$$

It is anticipated that this response will satisfy the only remaining question you had on the proposed project.

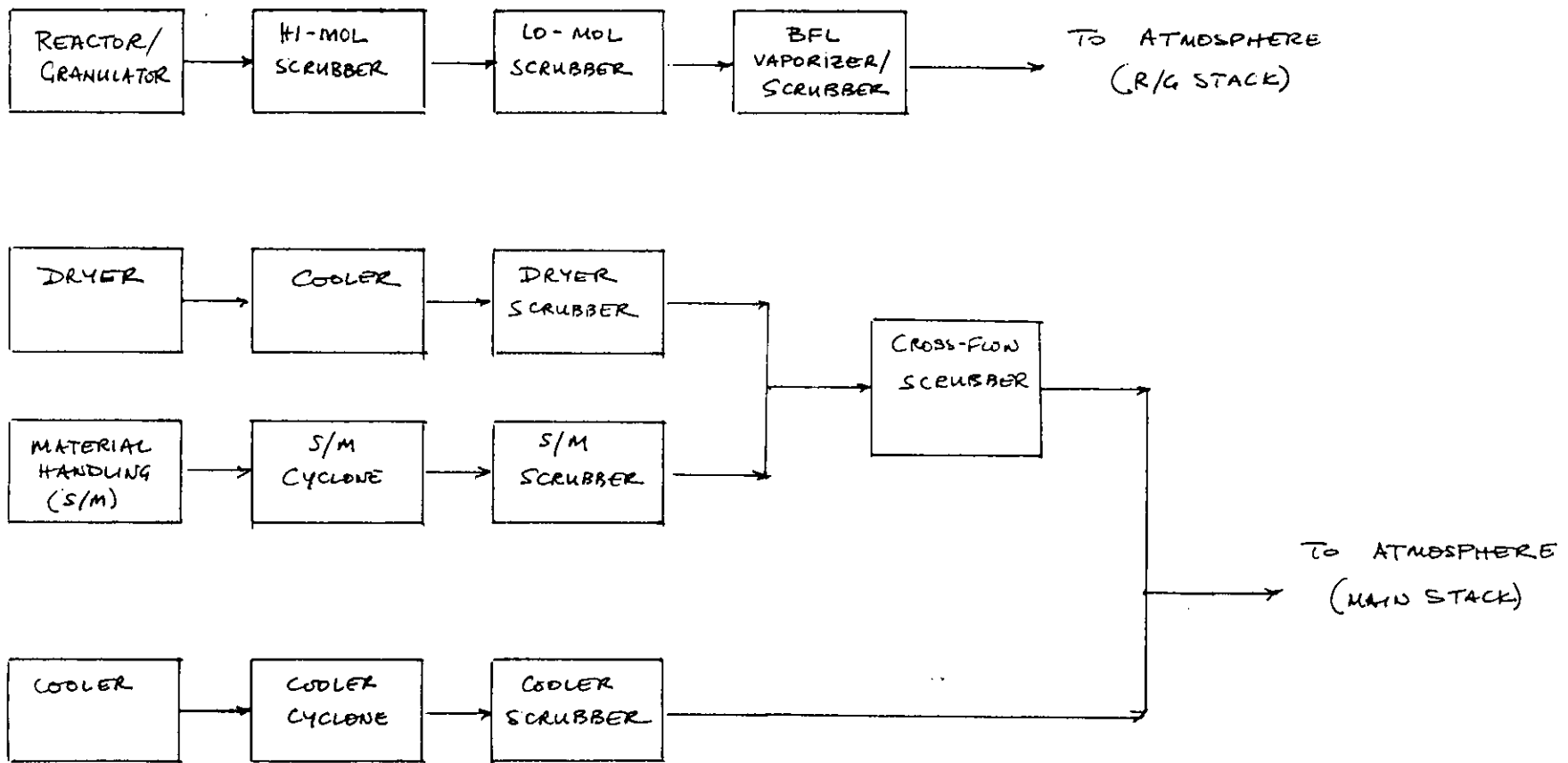
If you have any additional questions, please do not hesitate to give me a call.

PROCESS FLOW - CONTROLS (APC)

FARMLAND HYDRO, L.P.

MAP/DAP NORTH PLANT

(PROPOSED LAYOUT)



EMISSION LEVELS

FARMLAND HYDRO, L.P.
MAP/DAP NORTH PLANT
(PROPOSED LAYOUT)

DRYER SYSTEM					
	DAP		MAP		
	lb/hr	tpy	lb/hr	tpy	
PM	4.90	21.46	7.32	32.06	
NH ₃	1.80	7.88	2.67	11.69	
F	0.48	2.10	0.48	2.10	

S/M SYSTEM		
	lbs/hr	tpy
PM	6.60	28.91
NH ₃	1.50	6.57
F	0.20	0.88

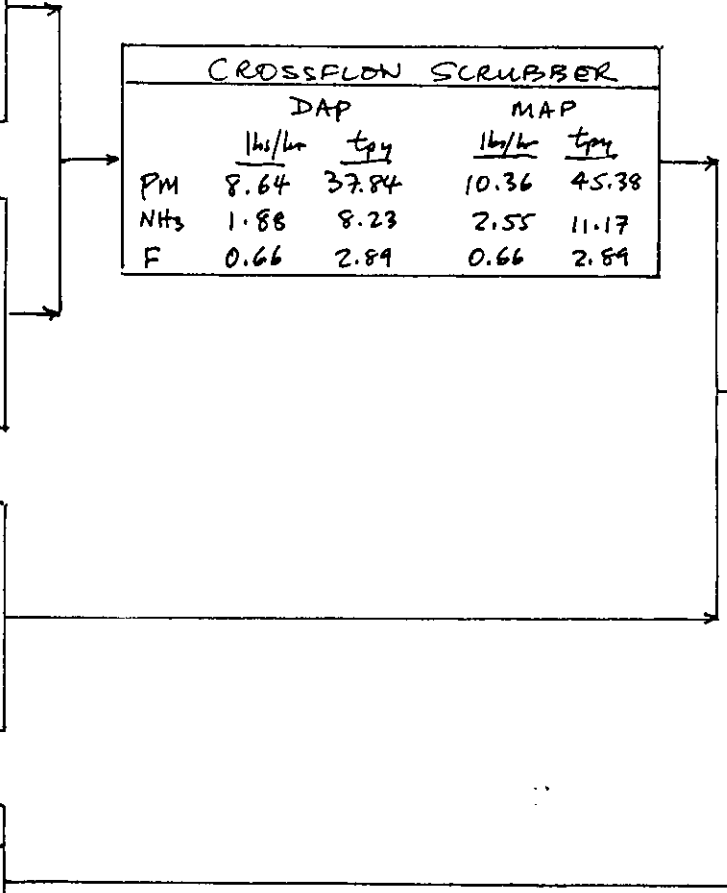
COOLER SYSTEM					
	DAP		MAP		
	lb/hr	tpy	lb/hr	tpy	
PM	1.98	8.67	5.52	24.18	
NH ₃	3.29	14.41	4.46	19.53	
F	0.94	4.12	1.21	5.30	

R/G SYSTEM (STACK)					
	DAP		MAP		
	lb/hr	tpy	lb/hr	tpy	
PM	5.52	24.18	6.62	29.00	
NH ₃	41.56	182.03	30.93	135.47	
F	1.16	5.08	1.87	8.19	

CROSSFLOW SCRUBBER					
	DAP		MAP		
	lb/hr	tpy	lb/hr	tpy	
PM	8.64	37.84	10.36	45.38	
NH ₃	1.88	8.23	2.55	11.17	
F	0.66	2.89	0.66	2.89	

MAIN STACK					
	DAP		MAP		
	lbs/hr	tpy	lbs/hr	tpy	
PM	10.62	46.52	15.88	69.55	
NH ₃	5.17	22.64	7.01	30.70	
F	1.60	7.01	1.87	8.19	

TOTAL EMISSIONS					
	DAP		MAP		
	lbs/hr	tpy	lbs/hr	tpy	
PM	16.14	70.69	22.50	98.55	
NH ₃	46.73	204.68	37.94	166.18	
F	2.76	12.09	3.74	16.38	



Concerning Fluoride Scrubbing

During the granulation of wet phosphoric acid into either DAP or MAP using the conventional TVA rotary granulator with preneutralizer process, the neutralization, granulation, crushing, screening, and transport of dry product does not liberate large quantities of fluoride. The gas streams from the granulation equipment contain mostly water vapor, gaseous ammonia and dust which later have to be scrubbed before discharge to the atmosphere. Low strength phosphoric acid (about 28% P_2O_5 by weight) is used to capture the ammonia and dust and return it to the granulation process. Fluoride, in various forms is, liberated from the acid into the air stream in the acid scrubbing stage. This fact causes a problem in determining fluoride scrubbing efficiency; that is, compared to the normal perception of efficiency defined as the removal of a percentage of a pollutant entering the scrubbing system. This fluoride liberation (release) is in proportion to the fluoride vapor pressure developed in the scrubbing liquor and the vapor pressure is influenced by two factors; temperature of the scrubbing liquor, and concentration of available fluoride. Fluoride control therefore, is achieved by reducing the fluoride vapor pressure in the scrubber system.

One way to reduce the vapor pressure of fluoride in the scrubber is to increase the ammonia to phosphoric acid mole ratio of the scrubbing acid or in other words to increase the pH of the scrubbing acid. The increased ammonia tends to hold the fluoride in combination with other elements in the acid therefore, not allowing it to be liberated into the air stream. A second method of reducing the fluoride vapor pressure is to lower the concentration of fluoride in the acid scrubbing liquor. 28% P_2O_5 phosphoric acid typically contains from 2.0 to 2.5% fluoride, therefore, lowering the strength to about 10% by diluting it with pond water with a fluoride content of about 0.45%, results in a final concentration of about 1.0% fluoride.

The Cooler, Dryer and Screens & Mills (S/M) scrubbers will all be modified to utilize low strength (about 10% P_2O_5) acid taking advantage of the second method of fluoride release control. These scrubbers collect mostly product dust which has a high mole ratio (1 for MAP and 2 for DAP). When this dust is captured in the weak acid, it tends to quickly increase the mole ratio of the weak scrubbing liquor and as some gaseous ammonia is released in the dryer, the weak scrubbing liquor will have mole ratios in the order of 1.0 to 1.5. This increased mole ratio raises the pH of the weak acid scrubbing liquor thus, taking advantage of the first fluoride vapor pressure reduction method as well. A 0.5 or better mole ratio is considered the optimum for reduction of fluoride release.

The dual mole scrubber system is designed to reduce fluoride emissions by increasing the mole ratio of the scrubbing liquor. Under normal operation the first stage would have a mole ratio of about 1.4 while the second stage would be about 0.5. The end result is that the Reactor/Granulator (R/G) and the above three scrubbers liberate less fluoride containing compounds into the air stream than conventional 28% P_2O_5 acid scrubbers.

The Dryer and S/M scrubbers are followed by a counter current cross-flow scrubber. This scrubber uses the complex pond water as a scrubbing medium. The fluoride concentration in the Farmland Hydro pond water runs a maximum of about 0.45% which is lower than most phosphate fertilizer manufacturers because we recover fluorine in our evaporators and sell it as a by-product. By comparison, it is not unusual to see fluoride values in other manufacturers' pond water of over 1.0%. Large amounts of pond water (about 1,200 gpm) are used in this scrubber and therefore the exiting air contains about as low a concentration of fluoride as can be achieved with pond water even though the actual scrubbing efficiency works out to be less than 4%. Expected emissions would be 0.014 lb/ton P_2O_5 for DAP and 0.011 for MAP from the cross-flow scrubber.

The cooler scrubber is shown without tail end scrubbing and this could be done with pond water as the scrubbing liquor for a capital cost of about \$500,000.00 amortized over 20 years of life plus about \$2,000.00 per year power cost and \$5,000.00 per year maintenance for a yearly cost of \$65,730.00. Assuming the same efficiency as the BFL vaporizer of 75.5%, this would result in a reduction from a maximum of 5.3 tons per year of fluoride to a maximum of 1.3 tpy. The cost of this reduction would be \$16,433.00 per ton.

It has been proposed that neutralization of the scrubbing water with lime (calcium oxide) would cause the fluoride in the water to form calcium-fluoride (CaF_2) which precipitates and produces a low fluoride tail gas scrubbing liquor. Test results show that neutralization to a pH of about 4 will result the lowest practical achievable fluoride concentration of about 300 to 500 ppm. If large amounts of water are used (in the order of 15 to 20 gallons per 1,000 cubic feet of air) we could obtain exhaust temperatures of about 120 °F and could achieve about 95% fluoride

scrubbing efficiency. This would result in a reduction of maximum fluoride emissions per year of 15.6 tons.

An appropriate system for the liming scrubbing water would require a separate granulation cooling pond of approximately 30 acres at a nominal 5 foot depth for a total of 45 million gallons. The scrubbing requirements would be about 3,000 gallons per minute (gpm). Pumping requirements are assumed to be 3,000 gpm at 50 feet of head requiring 58 horsepower at 65% pumping efficiency. At \$0.05 per kwh, we would consume about \$22,400 per year pumping cost. A lined 30 acre pond would cost about \$4,500,000 complete. The estimated cost of the liming station and associated piping and pumping is \$1,500,000 and the cost of operating, including power cost, about \$15,000 per year.

The practical problems that would be encountered with such a design are that the water will also pick up ammonia. Assuming that the ammonia scrubbing efficiency is only 50%, at a maximum of 205 lb/hr input, a scrubber return water loading of 102.5 lb/hr would be generated, for a return water concentration of about 68.3 ppm. Assuming at least 10% blow-down to keep the ammonia concentration near that of pond water or about 650 ppm, and using as much of this water in the granulation process as possible and performing a heat balance around the pond results in a net make-up of 282 gpm. As we would use our pond water as the make-up, then we would need to lime this water at 853 lbs. per hour. Total liming cost for the make-up water is about \$186,800 per year. One other problem would be encountered and that is the problem of disposal of the sludge generated by the liming process. There would be about 3,759 tons per year generated and if a disposal cost of \$50.00 per ton is assumed, this amounts to an annual cost of \$261,650. Looking at this whole system on an annual cost basis assuming a 20 year life with an annual rate of return of 10% gives:

\$6,000,000 @ 10% for 20 years	\$704,758
lime cost	189,150
power	22,300
operating	15,000
maintenance	10,000
sludge disposal	<u>261,650</u>
TOTAL	\$1,202,938

The total cost to reduce the pollutant loading by 15.6 tons of fluoride per year is:

$$1,202,938/15.6 = \$77,110 \text{ per ton}$$

In conclusion, lower total emissions of fluoride can not practically be achieved without excessive expenditures on the part of the applicant. It is my understanding that Mississippi Chemical tried this scrubbing method several years ago and found that operating problems involving calcium build-up or fall-out in the tail gas scrubber caused them to switch to straight pond water scrubbing.