UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V

DATE: MAR 12 1992

SUBJECT: A Proposal for Resolving the SO_2 State Implementation Plan Revision for Rhinelander, Wisconsin

FROM: Gary Gulezian, Chief
Air Toxics and Radiation Branch
Air and Radiation Division (AT-18J)

TO: Joseph A. Tikvart, Chief
Source Receptor Analysis Branch
Technical Support Division (MD-14)

Section 191(b) of the Clean Air Act Amendments of 1990 (CAAA) requires that all States with areas designated as nonattainment for SO_2 which lacked fully approved State Implementation Plans (SIPs) as of November 15, 1990, submit implementation plans by May 15, 1992, complying with the requirements of the CAAA. As a result, Wisconsin is required to submit a SIP for the nonattainment portion of Rhinelander, Wisconsin. However, the State submitted a SIP to Region V in 1989 which has not yet undergone rulemaking. Region V and the Wisconsin Department of Natural Resources (WDNR) have been wrestling with the technical aspects of this issue for over five years with little success. The fundamental problem involves setting emission limits for a source when a United States Environmental Protection Agency (USEPA) guideline model is known to be underpredicting concentrations in the area of interest. Region V will present in this letter a potential solution to this longstanding issue and we would like to have the concurrence of the Source Receptor Analysis Branch (SRAB) on the suitability of our approach before proceeding on this matter with the State and the affected company. Some historical background on this issue is included in the attachments.

The only source of SO_2 in Rhinelander is the Rhinelander Paper Company (RPC), a paper-making facility. Region V had in 1990 planned to approve the limits of 1.25 lbs of SO_2/mmBTU for the five stoker boilers at the plant and 3.5 lbs of SO_2/mmBTU for the cyclone boiler based on a rollback analysis. SRAB found technical deficiencies in Region V's rationale for approval and returned the SIP back to the Region. Specifically, SRAB did not approve the rollback analysis because not all of the sources at RPC were operating on the days of the exceedances and therefore could not be rolled back. The rollback analysis would be acceptable only if those sources that were not operating on the exceedance days were zeroed out.

Region V believes that there may now be an opportunity with WDNR and RPC to create an administrative order or revise Chapter NR 418.07: Rhinelander RACT sulfur limitations, Wisconsin Administrative Code, to allow for an acceptable rollback analysis. This would involve accounting for the sources that were not operating on the rollback days by mandating in the rule that, along with the cyclone boiler, no more than two stoker boilers can be operated at any

given time. Also, the assumption needs to be made that the surface condenser is a negligible contributor to the exceedance and need not be considered as part of the rollback. Given those two initial conditions, we believe that the rollback analysis performed by the Region, which is provided as an attachment, is now an acceptable and technically defensible means of setting emission limits for RPC, especially in light of an underpredicting guideline model. A copy of the current Wisconsin rule and how we propose to ask the State to revise it, is also included in the attachments.

In discussing this potential solution with WDNR, it was brought to our attention that approximately seven days a year the cyclone boiler is inoperable and RPC must employ all five stoker boilers to generate the necessary power. Region V believes because this scenario results in far less SO_2 emission to the atmosphere and, therefore, the employment of all five stoker boilers without the cyclone boiler would be an acceptable alternate operating scenario. Emissions from all five stoker boilers, all of which are similar in terms of amount of emissions, are limited to 5,104 lbs/day. This is much less than the emissions from two stoker boilers plus a cyclone boiler: 26,947 lbs/day. Additionally, the stack heights, exit velocities, and exit gas temperatures for the two different scenarios are essentially equivalent resulting in similar plume rises for the two scenarios.

Further strengthing the argument that the rollback-derived limits protect the ambient standards, are the results from a dispersion modeling analysis of the SO_2 emissions from RPC conducted by a consultant for WDNR. The modeling utilized the Industrial Source Complex Short Term air dispersion model in screening mode. While this model is known to be underpredicting the impacts of RPC, it seems reasonable to assume that the model is accurately representing the proportional contributions of process sources at the facility. The modeling showed that on the exceedance days the impacts from the stoker boilers were less than 10 percent of the impact from the cyclone boiler. This modeling along with the rollback analysis clearly shows that the cyclone boiler is the dominant process source at RPC. Therefore, the rollback-derived stoker boiler limits should also be acceptable for the infrequent no cyclone boiler/5 stoker boiler scenario.

Region V believes the approach discussed in this letter is a valid solution to this complicated problem and we appreciate your prompt review of our proposal. Rhinelander Paper Company is interested in meeting with USEPA-Region V in the near future to attempt to resolve this longstanding issue, so as to allow the SIP revision for Rhinelander to be approved and allow for the removal of the construction ban which is currently in place in Rhinelander. If you have any questions or need additional information on this subject, please contact me at 353-8559 or Patrick Dolwick at 886-6053.

Attachments

standard bcc's: official file copy w/attachment(s)
originator's file copy w/attachment(s)
originating organization reading file w/attachment(s)

other bcc's: J. Paisie (SO_2/PM Programs Branch) w/ attachments
R. Calby w/ attachments
P. Blakley w/ attachments
R. Patterson (WDNR) w/ attachments

ARD:ATRB:RDS:3/10/92 DISKETTE/FILE: dolwick(cumulonimbus)/rhinland.mmo

Attachment A

Background of the Rhinelander SO_2 Issue

Portions of Rhinelander, Wisconsin, were designated nonattainment by USEPA on October 9, 1985, (50 CFR 41139) as a result of monitored violations in 1981 and 1983. The Wisconsin Department of Natural Resources (WDNR) performed a modeling analysis using the USEPA guideline model, Industrial Source Complex (ISC) Dispersion Model in order to determine those emission limits from the culpable source (Rhinelander Paper Company) which would demonstrate attainment of the standards. As a result of this modeling, an administrative order was issued by WDNR to ensure attainment of the standards. This order which became effective on April 1, 1985, imposed a specific emission limit of 2.96 pounds (lbs) of SO_2/mmBTU for the five stoker boilers and 6.44 lbs of SO_2/mmBTU for the cyclone boiler.

Surprisingly, three more exceedances were monitored in Rhinelander in the latter half of 1985. A field investigation identified the facility's boiler stacks as the culpable sources. Stack testing of the facility's two boiler stacks showed the volumetric flow rates were lower than what were input into the original modeling. However, subsequent modeling with the correct flow rates also underpredicted what ambient air monitors observed.

As a result, USEPA and Wisconsin performed rollback analyses to determine allowable emission rates that would result in attainment of the standards. As a result of the rollback calculations, the State issued an administrative order on October 2, 1986, which limited the stoker boilers to 1.25 lbs of SO_2/mmBTU and the cyclone boiler to 3.5 lbs of SO_2/mmBTU. On April 28, 1989, Wisconsin submitted a SIP revision that relaxed the emission limitations on the stoker boilers to 1.6 lbs of SO2/mmBTU which according to dispersion modeling would still protect ambient air standards. USEPA has not accepted this relaxation as it was based on the same dispersion model which is known from the original demonstration to be underpredicting ambient SO_2 concentrations in this area. As a result, the SIP revision for Rhinelander remains unapproved.

This issue was discussed by the Miscellaneous Issues workgroup at the Regional Modelers Workshop of 1991. The workgroup recommendation for the Rhinelander issue was to require the source to obtain some on-site meteorological data with the expectation that new model simulations made with these input data would more accurately represent the monitored values. A state agency modeler within the workgroup noted, especially for point sources of SO_2, that the model input wind speeds and directions have a large effect on the resultant concentrations. Rhinelander Paper Company (RPC) has told the State that they are not willing to go to that expense to resolve this issue.

As a result of discussions between Region V, WDNR, the Office of Air Quality Planning and Standards (OAQPS), and representatives of RPC during August 1991, it was decided that the RPC facility would be remodeled using ISC in the screening mode and RPC operational data for the days of the 4 exceedances. If the concentrations predicted by ISC-screening mode exceeded the monitored violations, then the appropriate emission limits would be set by the conservative modeling. The modeling, however, predicted 24-hour concentrations still lower than that which was monitored in 1985 and 1986.

Attachment B

block avg. 2nd high: 383 $\mu g\ m^{-3}$ (9/17/55)
background: 20 $\mu g/m^3$

Pounds of SO_2 emitted on 9/17/85:

- cyclone: (B07)
  - BTU/lb = mixture of Island Creek, Sahara, + Perfect 8 as per DeBrock

$$= \frac{1}{2}\left(\left[(12096)(.63) + (12,436)(.37)\right] + \left[\frac{12,474 + 12,441}{2}\right]\right)$$

$$\text{BTU/lb}_{\text{coal}} = 12,340 \text{ BTU/lb}$$

  - $\frac{\text{lbs } SO_2}{\text{mm BTU}}$ = mixture of Island Creek, Sahara, + Perfect 8

$$= \frac{(4.56)(.63) + (3.98)(.37) + (3.33)(.5) + (3.50)(.5)}{2}$$

$$= 3.88 \text{ lbs } SO_2/\text{mmBTU}$$

  - $\frac{\text{lbs } SO_2}{\text{day}} = \frac{278 \text{ tons coal}}{\text{day}} \times \frac{2000 \text{ lbs}}{\text{ton}} \times \frac{12,340 \text{ BTU}}{\text{lb coal}} \times \frac{\text{mmBTU}}{10^6 \text{ BTU}} \times \frac{3.88 \text{ lbs } SO_2}{\text{mmBTU}}$

$$= 26,621 \text{ lbs } SO_2/\text{day}$$

- stokers (B04 + B05)
  - $\frac{\text{lbs } SO_2}{\text{day}} = \frac{60 \text{ tons coal}}{\text{day}} \times \frac{2000 \text{ lbs}}{\text{ton}} \times \frac{12,609 \text{ BTU}}{\text{lb coal}} \times \frac{\text{mmBTU}}{10^6 \text{ BTU}} \times 1.025 \frac{\text{lbs } SO_2}{\text{mmBTU}}$

$$= 1674 \text{ lbs } SO_2/\text{day}$$

(Vacuum Compressor)

- VC evaporator

SO_2 emission rate (from a 10/85 stack test) = 0.318 g/s

$$\frac{\text{lbs } SO_2}{\text{day}} = \frac{0.318 \text{ g } SO_2}{s}\left(\frac{1 \text{ lb } SO_2}{454 \text{ g } SO_2}\right)\left(\frac{3600 s}{1 \text{ hr}}\right)\left(\frac{24 \text{ hr}}{1 \text{ day}}\right) = \frac{\cancel{60.5}}{61} \text{ lbs } SO_2/\text{day}$$

- liquor dryer:

SO_2 emission rate (from a 10/85 stack test) = 0.123 g/s

$$\frac{\text{lbs } SO_2}{\text{day}} = \frac{0.123 \text{ g } SO_2}{s}\left(\frac{1 \text{ lb } SO_2}{454 \text{ g } SO_2}\right)\left(\frac{3600 s}{1 \text{ hr}}\right)\left(\frac{24 \text{ hr}}{1 \text{ day}}\right) = 23 \text{ lbs } SO_2/\text{day}$$

- yeast dryer:

SO_2 emission rate (from a 10/85 stack test) = 0.181 g/s

$$\frac{\text{lbs } SO_2}{\text{day}} = \frac{0.181 \text{ g } SO_2}{s}\left(\frac{1 \text{ lb } SO_2}{454 \text{ g } SO_2}\right)\left(\frac{3600 s}{1 \text{ hr}}\right)\left(\frac{24 \text{ hr}}{1 \text{ day}}\right) = 34 \text{ lbs } SO_2/\text{day}$$

Assumptions:

) The surface condenser was not operating on 9/17/85. From a 10/85 stack test, the SO_2 emission rate from the sfc. condenser was 0.0038 g/s. Its contribution to the exceedance is assumed to be negligible.

Total emissions: 26,621 + 1674 + 61 + 23 + 34 = 28,413 lbs SO_2/day

% of total emissions by process source:

cyclone (B07) = $\frac{26621}{28,413}$ = .937

stoker (B04) = $\frac{537}{28,413}$ = .029

stoker (B05) = $\frac{537}{28,413}$ = .029

VC evaporator = $\frac{61}{28,413}$ = .002

liquor dryer = $\frac{23}{28413}$ = .001

yeast dryer = $\frac{34}{}$ = .001

Calculate amount of exceedance due to each boiler

$383 - 20 = 363\ \mu g\,m^{-3}$

cyclone (BO7) =	$363 \times .937 =$	$340.13\ \mu g\,m^{-3}$
stoker (BO4) =	$363 \times .029 =$	$10.53\ \mu g\,m^{-3}$
stoker (BO5) =	$363 \times .029 =$	$10.53\ \mu g\,m^{-3}$
VCE =	$363 \times .002 =$	$0.73\ \mu g\,m^{-3}$
LD =	$363 \times .001 =$	$0.36\ \mu g\,m^{-3}$
YD =	$363 \times .001 =$	$0.36\ \mu g\,m^{-3}$

Rollup for stokers limited to 1.25 lbs SO_2/mmBTU vs. 1.025 lbs SO_2/mmBTU

$$10.53 \times \frac{1.25}{1.025} = 12.84\ \mu g/m^3 \quad (BO4 + BO5)$$

Cyclone can only be responsible for

$$365 - 20 - 12.84 - 12.84 - 0.73 - 0.36 - 0.36 = 317.87\ \mu g\,m^{-3}$$

$$\text{Cyclone limit} = \frac{317.87}{340.13} = \frac{X}{3.88} = \boxed{3.63\ \frac{\text{lbs } SO_2}{\text{mmBTU}}}$$

Emissions from 5 stoker boilers:

$$\text{emissions per boiler} = \frac{1674}{2} = 837\ \text{lbs } SO_2/\text{day}$$

$$837\ \text{lbs } SO_2/\text{day} \left(\frac{1.25\ \text{lbs } SO_2/\text{mmBTU}}{1.025\ \text{lbs } SO_2/\text{mmBTU}}\right) = 1,021\ \text{lbs } SO_2/\text{day}$$

$$\boxed{5 \text{ stokers} = 5,104\ \text{lbs } SO_2/\text{day}}$$

Emissions from cyclone + 2 stokers:

$$2(1,021) + 26,621 \left(\frac{3.63}{3.88}\right) = \boxed{26,948\ \text{lbs } SO_2/\text{day}}$$

Attachment C

NR 418.07 Rhinelander RACT sulfur limitations. (1) No person may cause, allow or permit sulfur dioxide to be emitted to the ambient air within the corporate boundary of the city of Rhinelander, Oneida county, from any direct stationary source on which construction or modification was last commenced prior to April 1, 1985 in amounts greater than those specified in this subsection.

(a) At any paper mill or yeast plant or any combination of these sources:

(a)1. switch 1.6 to 1.25

1. From any fossil fuel fired steam generating stoker boiler, a maximum of ~~1.60~~ pounds per million BTU heat input.

2. From any fossil fuel fired steam generating cyclone boiler, a maximum of 3.50 pounds per million BTU heat input.

3. From any surface condenser, 0.40 pounds per hour and 7.92 pounds in any 24 hours.

(a)4. switch 88.1 to 34

4. From any yeast dryer, 4.20 pounds per hour and ~~88.1~~ pounds in any 24 hours.

(a)5. switch 44.9 to 23

5. From any liquor dryer, 2.10 pounds per hour and ~~44.9~~ pounds in any 24 hours.

(c) At any yeast plant or yeast plant and paper mill:

(c)1. switch 600 to 61

1. From any vacuum compression evaporator, 28.8 pounds per hour and ~~600 pounds~~ in any 24 hours.

2. From any other source not covered by par. (a) or subd. 1., 0.0 pounds per hour.

(2) When a source is subject to sub. (1), the owner or operator shall achieve compliance with sub. (1) by April 1, 1985 and so certify to the department before June 1, 1985.

(3) The owner or operator of a source subject to sub. (1) shall prepare and maintain a compliance demonstration plan to assure continuous compliance with the emission limitations of sub. (1).

(a) The plan shall be in writing, updated as needed, and shall include but need not be limited to:

(b). No more than two fossil fuel fired steam generating stoker boilers may be operated at any ~~one~~ time when the cyclone boiler is operating

1. The name of the individual responsible for compliance demonstration activities at the source.

2. A description of the stacks, vents, raw materials, fuels and other items or parameters which will be tested, monitored, sampled, analyzed or measured to determine that the source is in compliance with sub. (1).

3. A description of the testing methods, monitoring techniques, sampling and analysis methods and measurements which will be used, including the types of equipment to be used and the frequency of testing, monitoring, sampling, analysis or measurement.

4. A description of the records which will be created and maintained, their retention time, and the periodic reports which will be submitted to the department to demonstrate that the emission limitations of sub. (1) are being met.

5. A procedure for detecting and reporting upsets, malfunctions and other events which may result in the violation of an emission limitation or which may affect the quantity or quality of compliance demonstration data.

6. Other relevant information reasonably needed to demonstrate continuous compliance with the emission limitations of sub. (1).

(b) The plan shall be filed with the department before May 1, 1985. Subsequent revisions to the plan shall be filed within 10 days of their completion.

(c) The department may order any owner or operator of a source subject to sub. (1) to submit the plan required by this subsection for review and approval. The department may amend the plan if deemed necessary to assure that continuous compliance is adequately demonstrated and to recognize changes in the economic or technological feasibility of different compliance demonstration methods.

(d) No owner or operator may fail to carry out the plan required under this subsection or as amended by the department under par. (c).

(e) Nothing in this subsection precludes the department from exercising its authority to require reporting or recordkeeping in addition to that required by this subsection or exempts the owner or operator of a source subject to sub. (1) from any other requirements relating to proof of compliance.

(4) No owner or operator of a source subject to sub. (1) may cause, allow or permit sulfur dioxide to be emitted from emission points lower than those which existed at the source on December 1, 1983, unless written permission has been granted by the department.

(5) The owner or operator of a mill subject to sub. (1) (a) shall notify the department in writing 30 days prior to resumption of pulp manufacturing.

History: Renum. from NR 154.12 (9) and am. Register, September, 1986, No. 369, eff. 10-1-86; am. (1) (a) (intro.), 1. and 2. and (5), r. (1) (b), (c) 1., 3. and 4., renum. (1) (c) 2. and 5. to be 1. and 2. and am 2., Register April, 1989, No. 400, eff. 5-1-89.

NR 418.08 Rothschild RACT sulfur limitations. (1) No person may cause, allow or permit sulfur dioxide to be emitted to the ambient air within the corporate boundary of the village of Rothschild, Marathon county, from any direct source on which construction or modification was last commenced prior to April 1, 1985 in amounts greater than those specified in this subsection.

(a) At any pulp, paper, or pulp and paper mill:

1. From any fossil fuel fired boiler, 0.52 pounds per million BTU heat input.

2. From any fossil fuel fired boiler which can also burn wood, 0.025 pounds per million BTU heat input.

3. From all pulp digesters, a total of 4,050 pounds in any 3 hours and 16,200 pounds in any 24 hours.

Attachment D

COMPUTATION SHEET

RMT INC

SHEET 9 OF 9

744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED By: DJF	PREPARED Date: 6/12/91	CHECKED By:	CHECKED Date:	PROJECT/PROPOSAL NO. 2361.21

Calculate Impacts for Cyclone @ 3.5 mm BTU/hr and stoker @ 1.25 mm BTU/hr

Case #	Cyclone Boiler @ 3.5	Stokers @ 1.25	Other Sources	Backgrd	Total	NAAQS
1	245.4	38.7 (3 stokers)	0.7	20.0	304.8	365
2	195.5	43.9	0.0	20.0	259.4	365
3	282.9	10.3	0.3	20.0	313.5	365
4	276.2	15.3	0.3	20.0	311.8	365

All predicted impacts are below the SO_2 24-hour NAAQS

TABLE 3-1

OPERATIONAL DATA DURING PERIODS OF EXCEEDANCES

Boilers at RPC (1985-1986 Scenario)
- Stoker Boilers 1, 2, 3, 4 vent to Stack S11 (BO1, BO2, BO3, BO4)
- Stoker Boiler 5 vents to Stack S10 (BO5)
- Cyclone Boiler 7 vented to Stack S10 (BO7)

Other Processes
- Surface Condenser (SC)
- Yeast Dryer (YD)
- Liquor Dryer (LD)
- VC Evaporator (VC)

	Period	Operating Sources	lbs SO_2/mmBTU	lbs SO_2/hr
Case 1	09/16/85(0800) - 09/17/85(0800)	BO4	1.02	45.99
		BO5	1.02	45.99
		BO7	4.04	1139.30
		VC	--	2.52
		YD	--	1.44
		LD	--	0.98
Case 2	09/18/85(2300) - 09/19/85(2300)	BO4	1.02	42.90
		BO5	1.02	42.90
		BO7	4.33	1199.00
		SC	--	0.03
		YD	--	1.44
Case 3	10/02/85(1500) - 10/03/85(1500)	BO2	1.02	57.30
		BO7	4.34	1257.10
		VC	--	2.52
		YD	--	1.44
		LD	--	0.98
Case 4	04/23/86(0600) - 04/24/86(0600)	B01	1.02	65.40
		BO4	1.02	65.40
		BO7	3.94	1114.00
		VC	--	2.52
		YD	--	1.44
		LD	--	0.98