ILLINOIS POLLUTION CONTROL BOARD
October 15, 1987

IN THE MATTER OF:	)	
	)	
PROPOSED AMENDMENTS TO PART 211 AND 215, AIR OXIDATION PROCESSES IN THE SYNTHETIC ORGANIC CHEMICAL MANUFACTURING INDUSTRY	)	R86-40

PROPOSED RULE. SECOND NOTICE

PROPOSED OPINION AND ORDER OF THE BOARD (by J.D. Dumelle):

This matter comes before the Board upon a September 23, 1986 proposal for the adoption of amendments to 35 Ill. Adm. Code 211 and 215 filed on behalf of the Illinois Environmental Protection Agency (Agency). The proposal was accepted and authorized for hearing by Board Order dated September 25, 1986. Hearings were held on February 24, 1987 in Springfield and March 10, 1987 in Chicago. The Agency filed an amended proposal on November 30, 1987 and a second amended proposal on June 1, 1987. The Department of Energy and Natural Resources (DENR) filed a negative declaration June 22, 1987 and the Board was informed of concurrence in that decision by the Economic and Technical Advisory Committee on June 26, 1987.

On July 16, 1987, the Board proposed regulatory amendments to 35 Ill. Adm. Code 211 and 215 for first notice. On August 16, 1987, the Board adopted an order (1) changing the section numbers proposed in the July 16 Order to correspond to the Subpart V designation and (2) noting that the definition proposed for "volatile organic material" is the subject of a concurrent Board proceeding, R86-37, and appears in the first notice order for purposes of notice only. The proposed amendments were published at 11 Ill. Reg. 13173 and 13293 on August 14, 1987. The statutory 45-day comment period ended on September 28, 1987. Non-substantive comments were received from the Secretary of State's Administrative Code Unit regarding form and format of the proposed rules. Those changes have been made at second notice. The only comment received during the 45-day comment period was from the Stepan Company. The Illinois Environmental Protection Agency (Agency) had previously filed comments on April 15, 1987.

VENT COVERAGE

Stepan's comments expressed its continued concern that the regulations as proposed improperly expand the coverage over that assumed in the Control Techniques Guidelines (CTG). In

particular, Stepan requested that the Board reconsider the comments submitted on June 18, 1987 regarding the definition of process vent stream. Stepan also argued that the definition is unclear and subject to a wide variation of interpretation by Agency personnel. Finally, Stepan argued that the definition should exclude storage tanks and material handling equipment.

The Board is not persuaded to alter the definition of process vent stream. The Board believes that the language of the definition is sufficiently clear for the Agency and the regulated community to determine what types of emission streams are covered. Further, the Board continues to believe that the scope, i.e. the inclusion of all streams, is reasonable.

REFERENCE METHOD 18

In response to Board request, Stepan commented that the Total Resource Effectiveness Index (TRE) in Appendix E of Part 215 does not take into account the costs associated with sampling. Stepan suggested that language be added to provide a flexible alternative for facilities. Stepan offered the following language:

> 2) D) A method using engineering techniques demonstrated by the applicant to be equivalent to Reference Methods and approved by the Agency.

The Board is not persuaded to amend Appendix E as suggested. First, the language proposed by Stepan is imprecise. The record is insufficient for the Board to adequately consider Stepan's proposed language. Second, although the Board does not believe that affected facilities should be required to use a test method which is not useful under certain circumstances, the Board does not believe that this record supports the inclusion of such an alternative as a general rule. The Board can only note that facilities unable or unwilling to use the test methods provided can petition the Board for relief.

VOM DEFINITION

The Board noted in its August 6, 1987 Order that the definition of volatile organic material is the subject of a concurrent Board proceeding, R86-37, and that the definition was included in the R86-40 proposal for purposes of providing notice. As R86-37 is devoted entirely to the amendment of that definition, the Board deems it appropriate to remove the definition from further consideration in this proceeding. The definition of volatile organic material is therefore, not included in the second notice order.

INCORPORATIONS BY REFERENCE

Within the text of the proposed amendments certain materials are incorporated by reference. Language was added to indicate that these materials are incorporated by reference in Section 215.105. In addition, materials not previously incorporated and appearing in Section 215.105 have been added to that section pursuant to Section 6.02(a) of the Illinois Administrative Procedure Act and 1 Ill. Adm. Code 220.760. These are not substantive changes, but are necessary for second notice review by the Joint Committee on Administrative Rules (JCAR).

The proposed text also utilizes certain abbreviations. Those abbreviations have been added to the list in Section 215.103.

DEFINITIONS

In the first notice order, several definitions were proposed to be added to Section 211.122. Most of the proposed definitions ("Flow", "Full Operating Flowrate", "Hourly Emissions", "Net Heating Value", and "Process Vent Stream") included the language "For the purposes of Part 215, Subpart V." So as not to unnecessarily burden the general definitions section, Section 211.122, the Board has created a definition section within Subpart V and has moved all the definitions thereto. The definitions are now located in proposed Section 215.521. This is not a substantive change.

Finally, the Board notes that it has made other non-substantive changes throughout the text of the proposed amendments. The equations in Appendix E have been rewritten for ease in typing and reproduction. Also, the tables in Appendix F have been reformatted.

ORDER

The following amendments to 35 Ill. Adm. Code 211 and 215 are directed to the Joint Committee on Administrative Rules for second notice review.

SUBPART A: GENERAL PROVISIONS

Section 215.103 Abbreviations and Conversion Factors

a) (Add the following to the list:)

g	gram
g/mole	grams per mole
kcal	kilocalorie
MJ	megajoules
scm	standard cubic meters

(Source: Amended at 11 Ill. Reg.
effective)

Section 215.105 Incorporations by Reference

The following materials are incorporated by reference:

a) American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103:

ASTM D1644-59 Method A

ASTM D1475-60

ASTM D1946-67 (reapproved 1977)

ASTM D2369-73

ASTM D2382-76

b) Federal Standard 141a, Method 4082.

c) National Fire Codes, National Fire Prevention Association, Battery March Park, Quincy, Massachusetts 02269 (1979).

d) United States Environmental Protection Agency, Washington, D.C., EPA-450/2-77-026, Appendix A.

e) Code of Federal Regulations:

40 CFR 60, Appendix A (1986)

f) This Part incorporates no later editions or amendments.

~~(Board note: The incorporation by reference listed above contain no later amendments or editions).~~

(Source: Amended at 11 Ill. Reg. ,
effective)

SUBPART V: AIR OXIDATION PROCESSES

Section 215.520 Applicability

This Subpart applies to plants using air oxidation processes which are located in any of the following counties: Will, McHenry, Cook, DuPage, Lake, Kane, Madison, St. Clair, Macoupin and Monroe.

(Source: Added at 11 Ill. Reg. ,
effective)

Section 215.521 Definitions

In addition to the definitions of 35 Ill. Adm. Code 211, the following definitions apply to this Subpart:

"Air Oxidation Process": any unit process including ammoxidation and oxychlorination which uses air or a combination of air and oxygen as an oxidant in combination with one or more organic reactants to produce one or more organic compounds.

"Cost Effectiveness": the annual expense for cost of control of a given process stream divided by the reduction in emissions of organic material of that stream.

"Flow (F)": Vent stream flowrate (scm/min) at a standard temperature of 20 C.

"Full Operating Flowrate": Maximum operating capacity of the facility.

"Hourly Emissions (E)": Hourly emissions reported in kg/hr measured at full operating flowrate.

"Net Heating Value (H)": Vent stream net heating value (MJ/scm), where the net enthalpy per mole of offgas is based on combustion at 25 C and 760 mm Hg, but the standard temperature for determining the volume corresponding to one mole is 20 C, as in the definition of "Flow."

"Process Vent Stream": An emission stream resulting from an air oxidation process.

"Total Resource Effectiveness Index (TRE)": Cost effectiveness in dollars per megagram of controlling any gaseous stream vented to the atmosphere from an air oxidation process divided by $1600/Mg, using the criteria and methods set forth in this Subpart and Appendices E and F.

(Source: Added at 11 Ill. Reg. , effective)

Section 215.525 Emission Limitations for Air Oxidation Processes

a) No person shall cause or allow the emission of volatile organic material (VOM) from any process vent stream unless the process vent stream is vented to a combustion device which is designed and operated either:

1) To reduce the volatile organic emissions vented to it with an efficiency of at least ninety eight percent (98%) by weight; or

2) To emit volatile organic material at a concentration less than twenty parts per million by volume, dry basis.

b) Air oxidation facilities for which an existing combustion device is employed to control process VOM emissions are not required to meet the 98 percent emissions limit until the combustion device is replaced for other reasons. The combustion device is considered to be replaced when:

1) All of the device is replaced; or

2) When the cost of the repair of the device or the cost of replacement of part of the device exceeds 50% of the cost of replacing the entire device with a device which complies.

c) The limitations of subsection (a) do not apply to any process vent stream or combination of process vent streams which has a Total Resource Effectiveness Index (TRE) greater than 1.0, as determined by the following methods:

1) If an air oxidation process has more than one process vent stream, TRE shall be based upon a combination of the process vent streams.

2) TRE of a process vent stream shall be determined according to the following equation:

$$TRE = E^{-1}[a + bF^{n} + cF + dFH + e(FH)^{n} + fF^{0.5}]$$

where:

n	=	0.88
TRE	=	Total resource effectiveness index.
F	=	Vent stream flowrate (scm/min), at a standard temperature of 20 C.
E	=	Hourly measured emissions in kg/hr.
H	=	Net heating value of the vent stream (MJ/scm), where the net enthalpy per mole of offgas is based on combustion at 25 C and 760 mm Hg,

but the standard temperature for determining the volume corresponding to one mole is 20 C, as in the definition of "Flow".

a,b,c,d, e and f = Coefficients obtained by use of Appendix F.

3) For nonchlorinated process vent streams, if the net heating value, H, is greater than 3.6 MJ/scm, F shall be replaced by F' for purposes of calculating TRE. F' is computed as follows:

F' = FH / 3.6

where F and H are as defined in subsection (c)(2).

4) The actual numerical values used in the equation described in subsection (c)(2) shall be determined as follows:

A) All reference methods and procedures for determining the flow, (F), hourly emissions, (E), and net heating, (H), value shall be in accordance with Appendix E.

B) All coefficients described in subsection (c)(2) shall be in accordance with Appendix F.

(Source: Added at 11 Ill. Reg. , effective)

Section 215.526 Testing and Monitoring

a) Upon request by the Agency, the owner or operator of an air oxidation process shall demonstrate compliance with this Subpart by use of the methods specified in Appendix E.

b) A person planning to conduct a volatile organic material emissions test to demonstrate compliance with this Subpart shall notify the Agency of that intent not less than 30 days before the planned initiation of the tests so that the Agency may observe the test.

(Source: Added at 11 Ill. Reg. , effective)

Section 215.527 Compliance Date

Each owner or operator of an emission source subject to this Subpart shall comply with the standards and limitations of this Subpart by December 31, 1987.

(Source: Added at 11 Ill. Reg. , effective)

Appendix E Reference Methods and Procedures

Introduction

This Appendix presents the reference methods and procedures required for implementing Reasonably Available Control Technology (RACT). Methods and procedures are identified for two types of RACT implementation:

a) Determination of VOC destruction efficiency for evaluating compliance with the 98 weight percent VOC reduction or 20 ppmv emission limit specified in the recommended RACT; and

b) Determination of offgas flowrate, hourly emissions and stream net heating value for calculating TRE.

All reference methods identified in this Appendix refer to the reference methods specified at 40 CFR 60, Appendix A, incorporated by reference in Section 215.105

VOC DESTRUCTION EFFICIENCY DETERMINATION

The following reference methods and procedures are required for determining compliance with the percent destruction efficiency specified in the recommended RACT.

a) Reference Method 1 or 1A, as appropriate, for selection of the sampling site. The control device inlet sampling site for determination of vent stream molar composition or total organic compound destruction efficiency shall be prior to the inlet of any control device and after all recovery devices.

b) Reference Methods 2, 2A, 2C or 2D as appropriate, for determination of the volumetric flowrate.

c) Reference Method 3 to measure oxygen concentration of the air dilution correction. The emission sample shall be corrected to 3 percent oxygen.

d) Reference Method 18 to determine the concentration of total organic compounds (minus methane and ethane) in the control device outlet and total organic compound reduction efficiency of the control device.

TRE DETERMINATION

The following reference methods and procedures are required for determining the offgas flowrate, hourly emissions and the net heating value of the gas combusted to calculate the vent stream TRE.

a) Reference Method 1 or 1A, as appropriate, for selection of the sampling site. The sampling site for the vent stream flowrate and molar composition determination prescribed in (b) and (c) shall be prior to the inlet of any combustion device, prior to any post-reactor dilution of the stream with air and prior to any post-reactor introduction of halogenated compounds into the vent stream. Subject to the preceding restrictions on the sampling site, it shall be after the final recovery device. If any gas stream other than the air oxidation vent stream is normally conducted through the recovery system of the affected facility, such stream shall be rerouted or turned off while the vent stream is sampled, but shall be routed normally prior to the measuring of the initial value of the monitored parameters for determining compliance with the recommended RACT. If the air oxidation vent stream is normally routed through any equipment which is not a part of the air oxidation process as defined in 35 Ill. Adm. Code 211.122, such equipment shall be bypassed by the vent stream while the vent stream is sampled, but shall not be bypassed during the measurement of the initial value of the monitored parameters for determining compliance with Subpart V.

b) The molar composition of the vent stream shall be determined using the following methods:

   1) Reference Method 18 to measure the concentration of all organics, including those containing halogens, unless a significant portion of the compounds of interest are polymeric (high molecular weight), can polymerize before analysis or have low vapor pressures, in which case Reference Method 25(a) shall be used.

   2) ASTM D1946-67 (reapproved 1977), incorporated by reference in Section 215.105, to measure the concentration of carbon monoxide and hydrogen.

   3) Reference Method 4 to measure the content of water vapor, if necessary.

c) The volumetric flowrate shall be determined using Reference Method 2, 2A, 2C or 2D, as appropriate.

d) The net heating value of the vent stream shall be calculated using the following equation:

$$H = K \sum_{i=1}^{n} CiHi$$

Where:

H = Net heating value of the sample, MJ/scm, where the net enthalpy per mole of offgas is based on combustion at 25 C and 760 mm Hg, but the standard temperature for determining the volume corresponding to one mole is 20 C, as in the definition of F (vent stream flowrate) below.

K = Constant, 1.740×10^{-7} (1/ppm) (mole/scm)(MJ/kcal) where standard temperature for mole/scm is 20 C.

Ci = Concentration of sample component i, reported on a wet basis, in ppm, as measured by Reference Method 18 or ASTM D1946-67 (reapproved 1977), incorporated by reference in Section 215.105.

Hi = Net heat of combustion of sample component i, kcal/mole based on combustion at 25 C and 760 mm Hg. If published values are not available or cannot be calculated, the heats of combustion of vent stream components are required to be determined using ASTM D2382-76, incorporated by reference in Section 215.105.

e) The emission rate of total organic compounds in the process vent stream shall be calculated using the following equation:

$$E = K'F \sum_{i=1}^{n} CiMi$$

Where:

E = Emission rate of total organic compounds (minus methane and ethane) in the sample in kg/hr.

K' = Constant, 2.494×10^{-6} (1/ppm) (mole/scm) (kg/g) (min/hr), where standard temperature for (mole/scm) is 20 C.

Mi = Molecular weight of sample component i (g/mole).

F = Vent stream flowrate (scm/min), at a standard temperature of 20 C.

f) The total vent stream concentration (by volume) of compounds containing halogens (ppmv, by compound) shall be summed from the individual concentrations of compounds containing halogens which were measured by Reference Method 18.

(Source: Added at 11 Ill. Reg. , effective)

APPENDIX F: COEFFICIENTS FOR THE TOTAL RESOURCE EFFECTIVENESS INDEX (TRE) EQUATION

This Appendix contains values for the total resource effectiveness index (TRE) equation in Subpart V.

If a flow rate falls exactly on the boundary between the indicated ranges, the operator shall use the row in which the flow rate is maximum.

COEFFICIENTS FOR TRE EQUATION FOR CHLORINATED PROCESS VENT STREAMS WITH NET HEATING VALUE LESS THAN OR EQUAL TO 3.5 MJ/scm

FLOW RATE (scm/min)							
Min.	Max.	a	b	c	d	e	f
0.0	13.5	48.73	0.	0.404	-0.1632	0.	0.
13.5	700.	42.35	0.624	0.404	-0.1632	0.	0.0245
700.	1400.	84.38	0.678	0.404	-0.1632	0.	0.0346
1400.	2100.	126.41	0.712	0.404	-0.1632	0.	0.0424
2100.	2800.	168.44	0.747	0.404	-0.1632	0.	0.0490
2800.	3500.	210.47	0.758	0.404	-0.1632	0.	0.0548

COEFFICIENTS FOR TRE EQUATION
FOR CHLORINATED PROCESS VENT STREAMS WITH
NET HEATING VALUE GREATER THAN 3.5 MJ/scm

FLOW RATE (scm/min)							
Min.	Max.	a	b	c	d	e	f
0.	13.5	47.76	0.	-0.292	0.	0.	0.
13.5	700.	41.58	0.605	-0.292	0.	0.	0.0245
700.	1400.	82.84	0.658	-0.292	0.	0.	0.0346
1400.	2100.	123.10	0.691	-0.292	0.	0.	0.0424
2100.	2800.	165.36	0.715	-0.292	0.	0.	0.0490
2800.	3500.	206.62	0.734	-0.292	0.	0.	0.0548

COEFFICIENTS FOR TRE EQUATION
FOR NONCHLORINATED PROCESS VENT STREAMS WITH
NET HEATING VALUE LESS THAN OR EQUAL TO 0.48 MJ/scm

FLOW RATE (scm/min)							
Min.	Max.	a	b	c	d	e	f
0.	13.5	19.05	0.	0.113	-0.214	0.	0.
13.5	1350.	16.61	0.239	0.113	-0.214	0.	0.0245
1350.	2700.	32.91	0.260	0.113	-0.214	0.	0.0346
2700.	4050.	49.21	0.273	0.113	-0.214	0.	0.0424

COEFFICIENTS FOR TRE EQUATION
FOR NONCHLORINATED PROCESS VENT STREAMS WITH
NET HEATING VALUE GREATER THAN 0.48 AND LESS THAN OR EQUAL TO 1.9 MJ/scm

FLOW RATE (scm/min)							
Min.	Max.	a	b	c	d	e	f
0.	13.5	19.74	0.	0.400	-0.202	0.	0.
13.5	1350.	18.30	0.138	0.400	-0.202	0.	0.0245
1350.	2700.	36.28	0.150	0.400	-0.202	0.	0.0346
2700.	4050.	54.26	0.158	0.400	-0.202	0.	0.0424

COEFFICIENTS FOR TRE EQUATION
FOR NONCHLORINATED PROCESS VENT STREAMS WITH
NET HEATING VALUE GREATER THAN 1.9 AND LESS THAN OR EQUAL TO 3.6 MJ/scm

FLOW RATE (scm/min)							
Min.	Max.	a	b	c	d	e	f
0.	13.5	15.24	0.	0.033	0.	0.	0.
13.5	1190.	13.63	0.157	0.033	0.	0.	0.0245
1190.	2380.	26.95	0.171	0.033	0.	0.	0.0346
2380.	3570.	40.27	0.179	0.033	0.	0.	0.0424

COEFFICIENTS FOR TRE EQUATION
FOR NONCHLORINATED PROCESS VENT STREAMS WITH
NET HEATING VALUE GREATER THAN 3.6 MJ/scm

FLOW RATE (scm/min)							
Min.	Max.	a	b	c	d	e	f
0.	13.5	15.24	0.	0.	0.0090	0.	0.
13.5	1190.	13.63	0.	0.	0.0090	0.0503	0.0245
1190.	2380.	26.95	0.	0.	0.0090	0.0546	0.0346
2380.	3570.	40.27	0.	0.	0.0090	0.0573	0.0424

(Source: Added at 11 Ill. Reg. , effective)

IT IS SO ORDERED.

I, Dorothy M. Gunn, Clerk of the Illinois Pollution Control Board, hereby certify that the above Proposed Opinion and Order was adopted on the 15th day of October, 1987 by a vote of 6-0.

Dorothy M. Gunn

Dorothy M. Gunn, Clerk
Illinois Pollution Control Board