ILLINOIS POLLUTION CONTROL BOARD
August 6, 1987

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

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

On July 16, 1987, the Board adopted an Order proposing amendments to 35 Ill. Adm. Code 211 and 215 for First Notice. The proposed amendments were based on an Illinois Environmental Protection Agency (Agency) proposal for the adoption of Subpart V: Air Oxidation Processes, which consisted of proposed Sections 215.490, 215.495, 215.496 and 215.497. The Board's July 16, 1987, Order adopted the proposal as such. It has since come to the Board's attention that the assigned section numbers do not correspond with the Subpart V designation. To maintain alphabetical and numerical order in the Board's Air Pollution regulations, the section numbers assigned to Section V should begin with Section 215.520 and proceed therefrom. Therefore, the Board takes its action today to reassign correct section numbers to Subpart V. Proposed Sections 215.490, 215.495, 215.496 and 215.497 shall now be numbered Sections 215.520, 215.525, 215.526 and 215.527, respectively.

Also, the July 16, 1987, Order proposed an amendment of the definition of "volatile organic material." The Board notes that a concurrent proceeding, R86-37, is devoted entirely to the definition of "volatile organic material." The Agency has indicated that in proceedings addressing similar issues, it has amended definitions of "volatile organic material" not for purposes of obtaining several definitions of that term but for purposes of serving notice on all interested parties that that definition is subject to change in R86-37. As notice is the primary goal and as the Board has discovered that the definition proposed on July 16, 1987, in R86-40 differs slightly from the present proposed definition in R86-37, the Board believes it consistent with the Agency's intent to modify the definition proposed in this proceeding to read the same as in R86-37.

For purposes of clarity and convenience, the Board will set out the entire proposal as amended in the Order below.

ORDER

The Board hereby amends the proposed order of July 16, 1987, in R86-40, to read in its entirety asd follows:

TITLE 35: ENVIRONMENTAL PROTECTION
SUBTITLE B: AIR POLLUTION
CHAPTER I: POLLUTION CONTROL BOARD
SUBCHAPTER c: EMISSION STANDARDS AND LIMITATIONS FOR STATIONARY SOURCES

PART 211
DEFINITIONS AND GENERAL PROVISIONS

Section 211.122 Definitions

"Air Oxidation Process": any unit process including ammoxidation, oxychlorination that 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": For the purposes of Part 215, Subpart V, vent stream flowrate (scm/min), at a standard temperature of 20°C.

"Full Operating Flowrate": For the purposes of Part 3215, Subpart V, maximum operating capacity of the facility.

"Hourly Emissions": For the purposes of Part 215, Subpart V, hourly emissions reported in kg/hr measured at full operating flowrate.

"Net Heating Value (H_T)": For the purposes of Part 215, Subpart V, vent stream net heating value (MJ/scm), where the net enthalpy of 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" in this Section.

"Process Vent Stream": For the purposes of Part 215, Subpart V, 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 Part 215, Subpart V of these regulations and Appendices thereto.

~~"Volatile Organic Material": Any organic material which has a vapor pressure of 17.24 kPa (2.5 psia) or greater at 294.3°K (70°F). For purposes of 35 Ill. Adm. Code 215.442 through 215.444, volatile organic material means any organic material which has a vapor pressure of 10.34 kPa (1.5 psia) at 294.3°K (70°F). For purposes of 35 Ill. Adm. Code 215.181 through 215.184, 215.445 through 215.451, 215.204 through 215.209, 215.401 through 215.404, 215.461 through 215.464 and 215.601 through 215.603 volatile organic material means any organic material which has a vapor pressure greater than 0.013 kPa (.0019 psia) at 294.3°K (70°F).~~

a) Any organic materials which participates in atmospheric photochemical reactions or is measured by the applicable reference methods specified under Part 230, Appendix A, unless specifically exempted from this definition.

b) For purposed of this definition, the following are not volatile organic materials:

Methane
Ethane
1,1,1 trichloroethane
Methylene chloride
Trichlorofluoromethane
Dichlorodifluoromethane
Chlorodifluoromethane
Trifluoromethane
Trichlorotrifluoroethane
Dichlorotetrafluoroethane
Chloropentafluoroethane

(Source: Amended at ___ Ill. Reg. _____, effective _____)

TITLE 35: ENVIRONMENTAL PROTECTION
SUBTITLE B: AIR POLLUTION
CHAPTER I: POLLUTION CONTROL BOARD
SUBCHAPTER c: EMISSION STANDARDS AND LIMITATIONS FOR STATIONARY SOURCES

PART 215
ORGANIC MATERIAL EMISSION STANDARDS AND LIMITATIONS

Section 215.104 Definitions

The definitions of 35 Ill. Adm. Code 201 and 211 apply to this Part, as well as the definition contained in this Section. Where the definition contained in this Section is more specific than that found in Part 201 or 211, it shall take precedence in application of this Part.

~~"Volatile Organic Material": Any organic material which has a vapor pressure of 17.24 kPa (2.5 psia) or greater at 294.3°K (70°F). For purposes of this definition, the following are not volatile organic materials:~~

~~Methane~~
~~Ethane~~
~~1,1,1-trichloroethane~~
~~Methylene chloride~~
~~Trichlorofluoromethane~~
~~Dichlorodifluoromethane~~
~~Chlorodifluoromethane~~
~~Trifluoromethane~~
~~Trichlorotrifluoroethane~~
~~Chloropentafluoroethane~~

~~For purposes of the following Sections, volatile organic materials are any organic materials having the corresponding vapor pressures at 294.3°K (70°F):~~

~~Sections~~	~~Vapor Pressure~~
~~215.181 - 215.1840~~	~~013 kPa (.0019 psia)~~
~~215.104 - 215.209~~	~~0.013 kPa (.0019 psia)~~
~~215.340 - 215.345~~	~~0.013 kPa (.0019 psia)~~
~~215.401 - 215.408~~	~~0.013 kPa (.0019 psia)~~
~~215.420 - 215.428~~	~~0.013 kPa (.0019 psia)~~
~~215.441 - 215.444~~	~~10.34 kPa (1.5 psia)~~
~~215.445 - 215.451~~	~~0.013 kPa (.0019 psia)~~
~~215.461 - 215.464~~	~~0.013 kPa (.0019 psia)~~
~~215.510 - 215.513~~	~~0.013 kPa (.0019 psia)~~
~~215.601 - 215.613~~	~~0.013 kPa (.0019 psia)~~

(Source: Amended at ___ Ill. Reg. _____, effective _____)

Section 215.520 Applicability

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

(Source: Added in R86-40 at 11 Ill. Reg. ___, effective _____)

Section 215.525 Emission Limitations of Air Oxidation Processes

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

1) To reduce the volatile organic emissions vented to it with an efficiency of at least ninety-eight (98) percent 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 all of the device is replaced or 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 compliant device.

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

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

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

$$TRE = \frac{1}{E}\left[a + b\,(FLOW)^{0.88} + c(FLOW + d(FLOW)\,(H_T) + e(FLOW)^{0.88})\,(H_T^{0.88}) + f(FLOW)^{0.5}\right]$$

where:

TRE = Total resource effectiveness index value.

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

E = Hourly measured emissions in Kg/hr.

H_T = 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.

a,b,c,d, e and f = coefficients. The coefficients shall be obtained by use of Appendix F to this Subpart.

(Board Note: For nonchlorinated process vent streams, if 3.6 is less than net heating value, designated a H_T, FLOW shall be replaced by "FLOW x H_T/3.6" for purposes of calculating TRE.)

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

A) All reference methods and procedures for determining the flow, hourly emissions and net heating value, shall be in accordance with Appendix E to this Subpart,

B) All coefficients described in Subsection (2) shall be in accordance with Appendix F to this Subpart.

(Source: Added in R86-40 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 or any portion thereof by use of the methods specified in Appendix E to this Subpart.

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. In addition, the test procedure shall follow all stack test procedure specifications filed in accordance with the Administrative Procedure Act.

(Source: Added in R86-40 at 11 Ill. Reg. ___, effective _____)

Section 215.527 Compliance Date

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

(Source: Added in R86-40 at 11 Ill. Reg. ___, effective _____)

APPENDIX E: REFERENCE METHODS AND PROCEDURES

INTRODUCTION

This appendix presents the reference methods and procedures required for implementing RACT. Methods and procedures are identified for two types of RACT implementation: (1) 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 (2) determination of offgas flowrate, hourly emissions, and stream net heating value for calculating a TRE index. All reference methods identified in this appendix refer to the reference methods specified at 40 CFR Part 60 - Appendix A.

a. 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.

1) 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.

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

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

4) 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.

b. TRE INDEX 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 index value.

1) 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)(2) and (3) 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 parameter(s) 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 facility as defined in Chapter 4, 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 parameter(s) for determining compliance with Subpart V.

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

A) 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.

B) ASTM D1946-67 (reapproved 1977) to measure the concentration of carbon monoxide and hydrogen.

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

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

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

$$H_T = K_1 \sum_{i=1}^{n} C_i H_i$$

H_T = 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 Q_s (offgas flowrate).

K_1 = Constant, 1.740×10^{-7} $\frac{1}{\text{ppm}}$ $\frac{\text{g mole}}{\text{scm}}$ $\frac{\text{MJ}}{\text{kcal}}$,

where standard temperature for g-mole/scm is 20°C.

C_i = Concentration of sample component i, ppm, as measured by Reference Method 18 and ASTM D1946-67 (reapproved 1977), reported on a wet basis.

H_i = Net heat of combustion of sample component i, kcal/g-mole based on combustion at 25°C and 760 mm Hg. The heats of combustion of vent stream components would be required to be determined using ASTM D2382-76 if published values are not available or cannot be calculated.

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

$$E_{TOC} = K_2 \left(\sum_{i=1}^{n} C_i M_i \right) Q_s$$

E_{toc} = TOC emission rate of total organic compounds (minus methane and ethane) in the sample, kg/hr.

K_2 = Constant, 2.494×10^{-6} (1/ppm) (g-mole/scm) (kg/g) (min/hr), where standard temperature for (g-mole/scm) is 20°C.

M_i = Molecular weight of sample component i, g/g-mole.

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

6) 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 in R86-40 at 11 Ill. Reg. ___, effective _____)

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

A1. FOR CHLORINATED PROCESS VENT STREAMS, IF 0 < NET HEATING VALUE (MJ/scm) < 3.5:

W = Stream Flowrate (scm/min)	a	b	c	d	e	f
$W \leq 13.5$	48.73	0.	0.404	-0.1632	0	0.
$13.5 \leq W \leq 700$	42.35	0.624	0.404	-0.1632	0	0.0245
$700 \leq W \leq 1400$	84.38	0.678	0.404	-0.1632	0	0.0346
$1400 \leq W \leq 2100$	126.41	0.712	0.404	-0.1632	0	0.0424
$2100 \leq W \leq 2800$	168.44	0.747	0.404	-0.1632	0	0.0490
$2800 \leq W \leq 3500$	210.47	0.758	0.404	-0.1632	0	0.0548

A2. FOR CHLORINATED PROCESS VENT STREAMS, IF 3.5 < NET HEATING VALUE (MJ/scm):

W = Vent Stream Flowrate (scm/min)

	a	b	c	d	e	f
$W \leq 13.5$	47.67	0.	-0.292	0	0	0.
$13.5 \leq W \leq 700$	41.48	0.605	-0.292	0	0	0.0245
$700 \leq W \leq 1400$	82.84	0.658	-0.292	0	0	0.0346
$1400 \leq W \leq 2100$	123.10	0.691	-0.292	0	0	0.0424
$2100 \leq W \leq 2800$	165.36	0.715	-0.292	0	0	0.0490
$2800 \leq W \leq 3500$	206.62	0.734	-0.292	0	0	0.0548

B. FOR NONCHLORINATED PROCESS VENT STREAMS, IF 0 < NET HEATING VALUE (MJ/scm) < 0.48:

W = Vent Stream Flowrate (scm/min)

	a	b	c	d	e	f
$W \leq 13.5$	19.05	0.	0.113	-0.214	0	0.
$13.5 \leq W \leq 1350$	16.61	0.239	0.113	-0.214	0	0.0245
$1350 \leq W \leq 2700$	32.91	0.260	0.113	-0.214	0	0.0346
$2700 \leq W \leq 4050$	49.21	0.273	0.113	-0.214	0	0.0424

C. FOR NONCHLORINATED PROCESS VENT STREAMS, IF 0.48 < NET HEATING VALUE (MJ/scm) < 1.9:

W = Vent Stream Flowrate (scm/min)

	a	b	c	d	e	f
$W \leq 13.5$	19.74	0	0.400	-0.202	0	0.
$13.5 \leq W \leq 1350$	18.30	0.138	0.400	-0.202	0	0.0245
$1350 \leq W \leq 2700$	36.28	0.150	0.400	-0.202	0	0.0346
$2700 \leq W \leq 4050$	54.26	0.158	0.400	-0.202	0	0.0424

D. FOR NONCHLORINATED PROCESS VENT STREAMS, IF 1.9 < NET HEATING VALUE (MJ/scm) < 3.6:

W = Vent Stream Flowrate (scm/min)

	a	b	c	d	e	f
$W \leq 13.5$	15.24	0.	0.033	0	0	0.
$13.5 \leq W \leq 1190$	13.63	0.157	0.033	0	0	0.0245
$1190 \leq W \leq 2380$	26.95	0.171	0.033	0	0	0.0346
$2380 \leq W \leq 3570$	40.27	0.179	0.033	0	0	0.0424

E. FOR NONCHLORINATED PROCESS VENT STREAMS, IF 3.6 < NET HEATING VALUE (MJ/scm):

W = Dilution Flowrate (scm/min)

	a	b	c	d	e	f
$W \leq 13.5$	15.24	0	0	0.0090	0.	0.
$13.5 \leq W \leq 1190$	13.63	0	0	0.0090	0.0503	0.0245
$1190 \leq W \leq 2380$	26.95	0	0	0.0090	0.0546	0.0346
$2380 \leq W \leq 3570$	40.27	0	0	0.0090	0.0573	0.0424

(Source: Added in R86-40 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 Order was adopted on the 6th day of August, 1987 by a vote of 6-0.

Dorothy M. Gunn

Dorothy M. Gunn, Clerk
Illinois Pollution Control Board