ILLINOIS POLLUTION CONTROL BOARD
November 25, 1987

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

ADOPTED RULE. FINAL ORDER

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 on June 22, 1987 and the Board was informed of concurrence in that decision by the Economic and Technical Advisory Committee on June 26, 1987.

The overriding basis of this proceeding is to correct deficiencies in the Illinois State Implementation Plan (SIP) which have been identified by the United States Environmental Protection Agency (USEPA). Section 172 of the Clean Air Act requires the state to impose the use of Reasonably Available Control Technology (RACT) on existing sources in non-attainment areas. On May 19, 1978, the USEPA gave notice at 43 Fed. Reg. 21673 that the SIP must include, at least for major urban areas, enforceable regulations reflecting the application of RACT to those stationary sources for which USEPA has published control techniques guidelines (CTGs) since 1978. A final CTG for control of emissions from air oxidation processes in the synthetic organic chemical manufacturing industry was published in December of 1984. (See Ex. 5).

Air oxidation processes are those which introduce one or more oxygen atoms into a compound while removing hydrogen or carbon atoms. The reaction includes one or more chemicals with oxygen supplied as air or a combination of air with ammonia or halogens as reactants. Processes which use pure oxygen are not included in this category. The processes used to produce air oxidation chemicals vent large quantities of inert material (predominantly nitrogen) containing volatile organic material (VOM) to the atmosphere.

The heart of the Agency's proposal is contained in Sections 215.520 and 215.525. The former section sets forth the area of geographic applicability of the rules. The latter section sets forth the applicable emission limitations which, in general, require process vent streams to be vented to a combustion device that is designed and operated either to reduce the VOM emissions by at least 98% or to emit less than 20 parts per million VOM. These limitations only apply, however, if the vent streams have a Total Resource Effectiveness (TRE) of less than 1.0 and the vent streams are not controlled by an existing combustion device.

Section 215.525 is patterned after the CTG, including the rather unusual mechanism of basing applicability upon the TRE. The Agency stated that such an approach

> is necessary, at least in part, because of the large variation in reaction types used to produce oxidation chemicals, a characteristic of this category. Thirty-six chemicals fall within this category -- these are produced nationally by fifty-nine companies (in non-attainment areas), in differing amounts, and using different techniques of production ... The TRE index is established through the use of a specific formula as set forth in Section 215.495(b) of the proposed regulations [and] corresponds to a cost effectiveness of $1,600 per megagram of VOC destroyed. (June 1, 1987 Statement of Reasons at 15-16).

ISSUES

The only issues which have arisen in this proceeding regard the geographic applicability of the rule, the types of vents covered, whether methods for determining VOM content other than Reference Method 18 can be used, and the scope of the grandfather clause. The Board adopted a First Notice Opinion and Order on July 16, 1987.

1. Geographic Coverage

The question of geographic coverage in this proceeding was virtually the same question raised in R86-39 which was proposed for first notice oN the same day. Upon motion of Stepan Chemical Company at the March 10, 1987 hearing, the testimony of Mr. Erwin Kauper, a certified consulting meteorologist, which was presented at the April 24, 1987, hearing in R86-18 was incorporated into this record in an apparent attempt to demonstrate that Will County emissions do not contribute to ozone violations. That testimony appears at 1034-1106 of the April 24 hearing.

The Board examined this issue in the First Notice Opinion at pages 2-5. That discussion need not be repeated here. The Board added the same exhibits referred to as Exhibits 10 and 11 in R86-39 into this proceeding as Exhibits 15 and 16. As in R86-39, the Board concluded that these rules would be applicable to the ten counties proposed by the Agency.

2. Vent Coverage

Dan Muno of Stepan argued that the Agency's proposal improperly extends the universe of vents covered under the Agency's proposal beyond those vents covered by the CTG in that the proposal covers all process vents while the CTG covers only the main reactor vent and not the distillation vents or any other vents associated with the process. (R. 70-71). The Agency disagreed, contending that "the CTG exempts only 'process vents that result from the product purification of a reactor bottom stream.'" (Agency Comments, April 15, 1987, at 2). Further, the Agency believed that it is appropriate to include reactor bottom streams in this rulemaking, since the technology to control them is reasonably available, the method for controlling these streams is included in the CTG, and the method is sound. (Agency Comments at 4).

As proposed by the Agency, the rules require controls on streams only if the cost of control is $1,600/Mg or less. The Agency contended that the TRE is applicable to all streams which may be covered by the proposal, and the record fails to contain any evidence to the contrary. The Board found reason for the failure of the CTG to be made applicable to these streams other than the fact that these streams were to be covered under another CTG which has not been published. That fact does not lead to the conclusion that it would be inappropriate to cover those streams here. The reason may simply be that USEPA has preconceived functional groupings to be covered by various CTGs, that reactor bottom streams could fall within two or more of those functional groupings, and that USEPA simply decided they fit better within another category. That does not mean that future controls will be any more or less stringent than if they had been covered under this CTG, or that coverage under these rules is inappropriate.

Given the absence of any showing to the contrary and the apparent applicability of the TRE to all streams, the Board concluded that the Agency had reasonably included all streams in its proposal. The Board, therefore, proposed the Agency's language for first notice.

3. Reference Method 18

In the rules as proposed by the Agency, Appendix A, Section A.3(b)(2)(i) [redesignated in the first notice proposal as Appendix E, Section (b)(2)(A)] requires the use of Reference

Method 18 to measure the concentration of all organics, including those containing halogens. Dan Muno testified, however, that "there should be provision for alternative test methods because Method 18 will not determine compounds that (1) are polymeric (high molecular weight), (2) can polymerize before analysis or (3) have very low vapor pressures at stack or instrument conditions." (R. 71-72). The Agency's response was simply that "Method 18, specified in the proposed rule is a good method of wide applicability. However, if any company would like to propose another test method to use for any particular chemical, the Agency would be happy to look at any such proposals to determine whether it (sic) would be acceptable." (P.C. No. 1 at 5).

As proposed by the Agency, affected facilities would be required to use a test method which admittedly is not useful under certain conditions. The Board did not believe that should be required, and revised the rule to require that Method 18 be used unless one or more or the circumstances noted by Mr. Muno is present in which case Reference Method 25(a) must be used. The Board believed that Method 25(a) would be appropriate in such circumstances.

4. Grandfather Clause

Under Section 215.525(b) a facility otherwise required to meet the limitations of Section 215.525(a) need not meet those limitations if it has an existing combustion device until that device is "replaced for other reasons."

The Agency stated its position as follows:

> The Agency believes that what constitutes "replacement of the combustion device" will probably need to be determined on a case by case basis. Certainly, the Agency believes that if replacement of the catalyst is only a small fraction of the cost of replacing the incinerator, then IEPA's interpretation of the proposed rule would not require a company to comply with the emissions limitation of the rule at that point. Similarly, it is IEPA's interpretation of the proposed rule that if the cost of replacing the catalyst is, for example, over half of the cost of a new incinerator, the company would be required to upgrade its incinerator and come into compliance when it replaced a catalyst.
>
> (P.C. No. 1 at 5).

Stepan, however, requested that language be added to the rule to clarify that catalyst replacement would not constitute replacement of the device "for other reasons." Stepan's view appeared to be in general accord with the intent of the grandfather clause and the Agency's proposed language. The intent of the provision appears to be to allow facilities which have made a relatively recent investment in a combustion control device to avoid having to replace that device during its useful life. The Board does not believe, in general, that the replacement of a catalyst should be equated with the replacement of the device: replacement of a catalyst is more in the realm of operation and maintenance. On the other hand, it makes little sense to allow a device to continue to be grandfathered if a new compliant device would cost little more than the replacement of the catalyst in a non-compliant device.

The Agency did not believe that "replacement" needed to be further defined. However, the Agency suggested the following additional language as acceptable if the Board were to determine clarification to be necessary:

> The combustion device is considered to be replaced when all of the device is replaced, or when the cost of replacement of part of the device equals 50% or more of the cost of replacing the entire device.
>
> (Agency Response at 4).

The Board believed that clarification was appropriate. The concept of replacement for the other reasons is vague, and to the extent it can be clarified, it should be. The Board, therefore, added language generally in line with the Agency's suggestion except that it added the concept that significant repairs can be considered as replacement and further clarified that the 50% provision is based upon the relationship of the cost of replacement and the cost of a compliant device rather than the cost of replacement and the cost of a grandfathered device as Stepan appears to assume.

FIRST NOTICE HISTORY

On July 16, 1987, the Board proposed these 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 appeared 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.

1. 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 was not persuaded to alter the definition of process vent stream. The Board believed 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 continued to believe that the scope, i.e. the inclusion of all streams, is reasonable.

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

3. VOM Definition

The Board noted in its August 6, 1987 Order that the definition of volatile organic material was 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 was devoted entirely to the amendment of that definition, the Board deemed it appropriate to remove the definition from further consideration in this proceeding. The definition of volatile organic material was, therefore, not included in the second notice order.

4. Incorporations By Reference

Within the text of the proposed amendments certain materials were 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 utilized certain abbreviations. Those abbreviations have been added to the list in Section 215.103.

5. 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 created a definition section within Subpart V and moved all the definitions thereto. The definitions are now located in proposed Section 215.521.

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

SECOND NOTICE CHANGES

On October 15, 1987, the Board adopted an opinion and order sending the proposed amendments to Second Notice for review by the Joint Committee on Administrative Rules (JCAR). The Second Notice period commenced on October 22, 1987. The JCAR staff suggested several non-substantive changes, all of which have been

incorporated at final notice. At its November 29, 1987 meeting, JCAR formally objected to the amendments to Part 215 insofar as the regulatory flexibility analysis is concerned. The JCAR objection was based on its belief that "not applicable" was an inappropriate response to the regulatory flexibility analysis question.

The Board, by Resolution also adopted today, has declined to modify the rulemaking so as to comply with the JCAR objection. Although "not applicable" may not be an appropriate response, the Board believes that the response will have no adverse effect and, further, that final action must be taken to comply with deadlines imposed by the Clean Air Act (42 U.S.C. 7401 et seq.). Notice of the refusal to modify will be submitted to JCAR and to the Secretary of State for publication in the Illinois Register.

All of the non-substantive changes recommended by JCAR have been adopted at Final Notice. Specific changes are as follows:

Section 215.105: The amendments to this Section proposed at Second Notice have been deleted because, according to JCAR, amendment at Section Notice to a section not proposed at First Notice is not consistent with the Illinois Administrative Procedures Act. JCAR suggested making the revisions to Section 215.105 as part of the Board's proceeding docketed R86-10: Organic Material Emission Standards and Limitations for Pharmaceutical Manufacturing Plants. The Board will make the necessary changes in the R86-10 proceeding.

Section 215.525: In subsection (b), the language "which shall include but not be limited to, normal maintenance, malfunction, accident, and obsolescence" was added after "other reasons."

Section 215.526: In subsection (a), the language "during the permitting process" was added after "upon request by the Agency." Also, a sentence was added to subsection (a) clarifying that this section does not limit USEPA's authority.

Appendix E: The language "the recommended RACT", was replaced with "Sections 215.520 through 215.527." Also, where reference methods are specified, the language "as appropriate" was deleted.

ORDER

The Clerk of the Pollution Control Board is hereby directed to submit the following adopted amendments to 35 Ill. Adm. Code 215 to the Secretary of state for Final Notice:

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

STATIONARY SOURCES

PART 215
ORGANIC MATERIAL EMISSION STANDARDS AND LIMITATIONS

SUBPART A: GENERAL PROVISIONS

Section
215.100 Introduction
215.101 Clean-up and Disposal Operations
215.102 Testing Methods
215.103 Abbreviations and Conversion Factors
215.104 Definitions
215.105 Incorporations by Reference
215.106 Afterburners
215.107 Determination of Applicability

Section 215.103 Abbreviations and Conversion Factors

a) The following abbreviations are used in this Part:

bbl	barrels (42 gal)
C	degrees Celsius or centigrade
cu in	cubic inches
F	degrees Fahrenheit
ft	foot
g	gram
g/mole	grams per mole
gal	gallon
hr	hour
in	inch
K	degrees Kelvin
kcal	kilocalorie
kg	kilogram
kg/hr	kilograms per hour
kPa	kilopascals; one thousand newtons per square meter
l	liter
lb	pound
lbs/hr	pounds per hour
lbs/gal	pounds per gallon
m	meter
Mg	Megagram, metric ton or tonne
min	minute
MJ	megajoules
mm Hg	millimeters of mercury
ml	milliliter
ppm	parts per million
ppmv	parts per million by volume
psi	pounds per square inch
psia	pounds per square inch absolute

psig	pounds per square inch gauge
scm	standard cubic meters
T	English ton

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

SUBPART V: AIR OXIDATION PROCESSES

Section	
215.520	Applicability
215.521	Definitions
215.525	Emission Limitations for Air Oxidation Processes
215.526	Testing and Monitoring
215.527	Compliance Date
Appendix E	Reference Methods and Procedures
Appendix F	Coefficients for the Total Resource Effectiveness

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 ___ 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 ___ 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, which shall be considered to include, but not be limited to, normal maintenance, malfunction, accident, and obsolescence. 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 ___ Ill. Reg. _____, effective _____)

Section 215.526 Testing and Monitoring

a) Upon request by the Agency during the permitting process under Section 39 of the Act, the owner or operator of an air oxidation process shall demonstrate compliance with this Subpart by use of the methods specified in Appendix E. This Section does not limit the USEPA's authority, under the Clear Air Act, to require demonstrations of compliance.

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 ___ 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 ___ 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 ACT implementation:

a) Determination of VOC destruction efficiency for evaluating compliance with the 98 weight percent VOC reduction or 20 ppmv emission limit specified in Sections 215.520 through 215.527; 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 Sections 215.520 through 215.527.

a) Reference Method 1 or 1A 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 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 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 ___ 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 ___ Ill. Reg. _____, effective _____)

IT IS SO ORDERED.

I, Dorothy M. Gunn, Clerk of the Illinois Pollution Control Board, hereby certify that the above Opinion and Order was adopted on the 25th day of November, 1987 by a vote of 6-0.

Dorothy M Gunn

Dorothy M. Gunn, Clerk
Illinois Pollution Control Board