

ILLINOIS POLLUTION CONTROL BOARD
July 16, 1987

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

PROPOSED RULE. FIRST 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 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 Reasonable 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 215.490 and 215.495. 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 215.495 is patterned after the CTG, including the rather unusual mechanism of basing applicability upon the TRE. The Agency states 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).

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.

GEOGRAPHIC COVERAGE

The question of geographic coverage in this proceeding is virtually the same question raised in R86-39 which is today also being proposed for first notice. 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 R86-39 Proposed Opinion at pages 2-5, at which it stated as follows:

Mr. Forbes of the Agency, however, testified that Will County should be included since it is part of the SIP area, that emissions from the County impact the ozone air quality of the region, and that the emissions reductions from application of RACT to sources in Will County have been included in previous analyses and are necessary to demonstrate attainment of the National Ambient Air Quality Standards (NAAQS). (R. 15-16).

The Board has considered the geographic applicability of the RACT rules in several recent opinions: R82-14, April 19, 1987 at 4-5; R82-14, April 30, 1987 at 21-22; R85-21(A), May 28, 1987 at 21-22; and R86-12, May 28, 1987 at 4. In each of these, the Board indicated that it would follow the Agency's proposal that the RACT regulations be applied to Cook, DuPage, Kane, Lake, Macoupin, Madison, McHenry, Monroe, St. Clair and Will counties. All except McHenry and Will are presently designated as non-attainment for ozone.

The fullest and most developed analysis of this issue appears in the April 30, 1987 Opinion in R82-14 at pp. 21-22:

Several years ago, when these proceedings were completed and RACT III was proposed, much of the state was designated as non-attainment. When RACT I was initiated, 25 counties in Illinois were non-attainment for ozone. The rationale for statewide applicability was based on the pervasive statewide ozone problem, the atmospheric transport of ozone and ozone precursors from sources in attainment areas to non-attainment areas, and the need to provide for growth in the SIP (R. 40-63). At present, many areas of the state have achieved attainment for ozone and the major non-attainment areas, with one exception, are concentrated in the Chicago and East St. Louis major urbanized areas (R. 3204-5). Macoupin County is not located in a major

urbanized area but continues to experience violations of the NAAQS for ozone.

Recent regulatory proposals have focused on implementing RACT in the nine counties that comprise the Chicago and East St. Louis major urbanized regions and Macoupin County. Eight of these counties are currently designated non-attainment for ozone. Will and McHenry counties are currently designated attainment for ozone but are part of the Chicago urbanized area. The SIP must, in addition to imposing RACT on major stationary sources in non-attainment areas, provide for ultimate attainment of the ozone NAAQS. To that end, sources in Will and McHenry still need to be RACT controlled in order to ensure adequate emission reductions because of the transport of ozone and ozone precursors from these geographically contiguous counties.

During the course of the various ... regulatory proposals for the heatset web offset category, no participant has raised the issue of changing the geographic applicability in light of the current SIP strategy. Consequently, the Board will limit the geographic applicability of RACT controls to the ten counties designated either non-attainment for ozone or that are a part of the Chicago urbanized area.

As noted above, the geographic coverage has been questioned in this proceeding. The only evidence presented in opposition to the Agency's proposal is contained in the Kauper material which has been incorporated by reference. Mr. Kauper concludes:

1. That the EKMA model used to demonstrate approvability of SIP submissions is flawed;
2. That urban traffic sources rather than point sources are responsible for ozone exceedances; and

3. That proper trajectory analysis generally rules out the significance of point sources in Will, Kane, McHenry and DuPage counties as contributors to ozone exceedances.

(R. 86-19, April 24, 1987, R. 1045-1048 and 1059).

While the Board finds Mr. Kauper's analysis to be interesting, the Board is not persuaded of the validity of his conclusions. Mr. Kauper bases his conclusions on the trajectory analysis. A trajectory is constructed by identifying a specific air parcel (i.e. one containing an ozone concentration in excess of the NAAQS for ozone) and tracing the locations of the air parcel backward in time using hourly wind data. Trajectory analysis attempts to determine the source of the emissions that ultimately led to the exceedances. Twenty-nine (29) separate trajectories were presented by Mr. Kauper showing the paths taken by the air parcels that led to ozone violations in Illinois and Wisconsin on 22 days during the 1985 and 1986 ozone seasons. These trajectories do tend to pass through the Chicago metropolitan area. They do not, however, tend to pass through the Chicago urban area during times when heavy traffic would be expected.

Assuming the urban area to be defined on the trajectory maps by the area bounded by Evanston, Des Plaines, ORD (O'Hare), Cicero, Midway, SW Pump, Calumet City and the lake, and assuming that heavy traffic would not be expected prior to 5:30 a.m. CST, only 8 of the 29 trajectories are indicated to have passed through the urban area at relevant times. On the other hand, at least 15 of the air parcels were over Lake Michigan during the time period after 5:30 a.m. On this simplistic basis it appears more reasonable to assume that the problem stems from Lake Michigan emissions rather than urban traffic. That, of course, is not the case, however, and it appears most reasonable to hypothesize that the ozone precursors in most of the cited cases were injected into the atmosphere at some point prior to the last

plotted point of most of the trajectories. Thus, the data presented is of limited value in determining the sources of the ozone exceedances studied, and is of even more limited value with respect to the stated generalized conclusions. Furthermore, Mr. Kauper indicated that short of extending a complete analysis farther back in time, the best guess as to the trajectories prior to the last plotted points would be based upon a presumed movement similar to that indicated by the last few plotted points. (id. at 1074). If that is done, at least 20 of the 29 trajectories would be expected to pass near, or through, Will County. It is difficult to understand, then, how the Board could be expected to conclude that Will County sources are not contributing to these ozone violations. Other factors serve to further undercut Mr. Kauper's conclusions. Mr. Kauper admitted that he was not familiar with the location of stationary sources in the Chicago area and that he simply assumed, based upon his knowledge of other cities, that the Chicago urban area would be dominated by mobile sources. (id. at 1083). Mr. Kauper further admitted that there is some uncertainty involved in plotting air parcel trajectories, particularly over the lake where there are no wind velocity measurements. (id. at 1075-1079). One such uncertainty is the presumption that wind speed increases by 50% when the air parcel moves offshore due to the reduction in surface friction. (id. at 1079-1080). Studies over oceans have shown a 35% factor. (id. at 1080). Over the distances involved, this difference could be significant, since the uncertainties could be additive.

The Board simply cannot conclude that Mr. Kauper's data supports his conclusion regarding ozone exceedances being caused by Chicago urban mobile sources. While the Board is inclined to agree that the EKMA model may have shortcomings as a predictor of ozone exceedances near Lake Michigan and that a substantial majority of the studied exceedances are impacted by lake effect winds, insufficient information has been provided to demonstrate that Will County does

not contribute to those exceedances even assuming the accuracy of the plotted trajectories.

The state is required to have an approved SIP for ozone, and it is already late in that effort. On the one hand, the Agency's proposal appears to be federally approvable; on the other hand, there are serious questions as to whether an attainment demonstration could be made if Will County were not to be subject to the proposed rules. As set forth by Steve Rothblatt, Chief, Air and Radiation branch of USEPA, in order to exclude Will County from the proposal, "USEPA would have to be convinced that emissions from [Will County] do not contribute to the emissions which lead to the violations of the ozone standard found in and downwind of the Chicago area. In addition, it would be necessary for the state to prepare, adopt and submit a SIP revision which includes a new EKMA analysis [which] would have to reflect new values for various parameters which would be affected by the reduction in analysis area. (Attachment to Agency comments, Rothblatt letter at 2). Furthermore, if Will County is excluded from coverage, a "completely revised set of input data would be required" and the delay which would be required for such an analysis and review by USEPA may well subject Illinois' program "to various additional requirements currently under development by USEPA." (id.) That is, by the time such a reanalysis's could be completed, USEPA may well have revised its procedures for approval, thus requiring additional support.

Finally, ozone levels recorded during the 1987 ozone season appear to demonstrate the prudence of including some attainment counties under the coverage of these rules. Dr. Rao of the Board's Scientific/Technical Staff has introduced two exhibits at a June 30, 1987 hearing in R86-37 containing preliminary details of the 1987 exceedances of the NAAQS for ozone based upon monitored data. The Board, on its own motion, hereby makes those same documents exhibits in this proceeding.

The first document (Exhibit 10), entitled "1987 Illinois Ozone Excursions Above the NAAQS Level of 120 ppb," consists of a table showing the date and location (city and county) of monitoring sites along with measured values of the ozone concentration. This table was compiled by the Scientific/Technical Section (STS), using the information provided by Bob Swinford and Will Flowers from the Illinois Environmental Protection Agency (Agency). Dr. Rao from the STS has spoken with the Agency personnel on a number of occasions to update the table which includes data up to July 15, 1987.

Bod Swinford provided the second document (Exhibit 11), which is a summary report generated by the Agency using data from the ozone monitoring sites in Illinois. This report, updated June 22, 1987, is similar to the earlier described table, but in addition also shows 1) the number of excursions that have taken place at each location; 2) the date and location of sites with measured ozone concentrations between 120 and 125 ppb which have been labeled unhealthy pollution standard index (PSI) days; and 3) dates and regions where ozone advisories were issued along with the monitor which triggered the event.

It is interesting to note that several of the 1987 exceedances occur in counties that are presently classified as attainment for ozone (Will, McHenry, and Peoria). Obviously, this may have a bearing on whether the Board should be applying RACT controls in counties presently designated as attainment. The Board requests comment on the significance of these exhibits.

Given the Board's findings concerning the sufficiency of the Kauper testimony, the Board concludes that there is no reasonable likelihood of demonstrating attainment based upon reanalysis of the ozone SIP without including Will County. Since the failure to demonstrate attainment would result in disapproval of the SIP and the state is required to have an approved SIP, the Board proposes that these rules be applicable to the ten counties proposed.

The Board has added the same exhibits referred to above as Exhibits 10 and 11 into this proceeding as Exhibits 15 and 16. As in R86-39, the Board concludes that it will propose that these rules be applicable to the ten counties proposed by the Agency.

VENT COVERAGE

Dan Munro of Stepan argues 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 disagrees, 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 believes 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 has 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 can discern no 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 concludes that the Agency has reasonably included all streams in its proposal. The Board will, therefore, propose the Agency's language for first notice.

REFERENCE METHOD 18

In the rules as proposed by the Agency, Appendix A, Section A.3(b)(2)(i) [redesignated in this 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 is 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).

Mr. Muno has properly set forth the limitations of Reference Method 18 and the Agency's willingness to look at other methods does not remedy the problem of the present proposal. 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 does not believe that should be required, and has rewritten the rule to require that Method 18 be used unless one or more of the circumstances noted by Mr. Muno is present in which case Reference Method 25(a) must be used. The Board believes that Method 25(a) would be appropriate in such circumstances, but requests comment on its propriety.

GRANDFATHER CLAUSE

Under Section 215.495(b) a facility otherwise required to meet the limitations of Section 215.495(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, requests 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 appears 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 does not believe that "replacement" needs to be further defined. However, the Agency has 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 believes that clarification is appropriate. The concept of replacement for the other reasons is vague, and to the extent it can be clarified, it should be. The Board has, therefore, added language generally in line with the Agency's suggestion except that it has added the concept that significant repairs can be considered as replacement and further clarifies 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.

With the exception of the noted changes and a few minor non-substantive changes, the Board will propose for first notice the rules as proposed by the Agency.

ORDER

The Board hereby proposed the following rules for first notice publication in the Illinois Register.

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 amoxidation or 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 215, 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 (0.0019 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 (40 CFR 60, 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

TITLE 35: ENVIRONMENTAL PROTECTION
SUBTITLE B: AIR POLLUTION
CHAPTER I: POLLUTION CONTROL BOARD

PART 215
ORGANIC MATERIAL EMISSION STANDARDS AND LIMITATIONS

SUBPART V: AIR OXIDATION PROCESSES

Section 215.490 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.

Section 215.495 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:

$$\text{TRE} = \left[a + b (\text{FLOW})^{0.88} + c(\text{FLOW} + d(\text{FLOW})(H_t)) + e(\text{FLOW})^{0.88} (H^{0.8}) + f(\text{FLOW})^{0.5} \right]$$

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.

Section 215.496

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.

Section 215.497 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.

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).

K₁ = Constant, 1,740 x 10⁻⁷ $\frac{1 \text{ g mole}}{\text{ppm scm}} \frac{\text{MJ}}{\text{kcal}}$,

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:

$$E_{\text{toc}} = K_2 \sum_{i=1}^n (S C_i M_i) Q_s$$

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

K₂ = Constant, 2.494 x 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.

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

a) 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
<u>W < 13.5</u>	<u>48.73</u>	<u>0</u>	<u>0.404</u>	<u>-0.1632</u>	<u>0</u>	<u>0</u>
<u>13.5 < W < 700</u>	<u>42.35</u>	<u>0.624</u>	<u>0.404</u>	<u>-0.1632</u>	<u>0</u>	<u>0.0245</u>
<u>700 < W < 1400</u>	<u>84.38</u>	<u>0.678</u>	<u>0.404</u>	<u>-0.1632</u>	<u>0</u>	<u>0.0346</u>
<u>1400 < W < 2100</u>	<u>126.41</u>	<u>0.712</u>	<u>0.404</u>	<u>-0.1632</u>	<u>0</u>	<u>0.0424</u>
<u>2100 < W < 2800</u>	<u>168.44</u>	<u>0.747</u>	<u>0.404</u>	<u>-0.1632</u>	<u>0</u>	<u>0.0490</u>
<u>2800 < W < 3500</u>	<u>210.47</u>	<u>0.758</u>	<u>0.404</u>	<u>-0.1632</u>	<u>0</u>	<u>0.0548</u>

b) 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
<u>W < 13.5</u>	<u>47.67</u>	<u>0</u>	<u>-0.292</u>	<u>0</u>	<u>0</u>	<u>0</u>
<u>13.5 < W < 700</u>	<u>41.48</u>	<u>0.605</u>	<u>-0.292</u>	<u>0</u>	<u>0</u>	<u>0.0245</u>
<u>700 < W < 1400</u>	<u>82.84</u>	<u>0.658</u>	<u>-0.292</u>	<u>0</u>	<u>0</u>	<u>0.0346</u>
<u>1400 < W < 2100</u>	<u>123.10</u>	<u>0.691</u>	<u>-0.292</u>	<u>0</u>	<u>0</u>	<u>0.0424</u>
<u>2100 < W < 2800</u>	<u>165.36</u>	<u>0.715</u>	<u>-0.292</u>	<u>0</u>	<u>0</u>	<u>0.0490</u>
<u>2800 < W < 3500</u>	<u>206.62</u>	<u>0.734</u>	<u>-0.292</u>	<u>0</u>	<u>0</u>	<u>0.0548</u>

c) 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
<u>W < 13.5</u>	<u>19.05</u>	<u>0</u>	<u>0.113</u>	<u>-0.214</u>	<u>0</u>	<u>0</u>
<u>13.5 < W < 1350</u>	<u>16.61</u>	<u>0.239</u>	<u>0.113</u>	<u>-0.214</u>	<u>0</u>	<u>0.0245</u>
<u>1350 < W < 2700</u>	<u>32.91</u>	<u>0.260</u>	<u>0.113</u>	<u>-0.214</u>	<u>0</u>	<u>0.0346</u>
<u>2700 < W < 4050</u>	<u>49.21</u>	<u>0.273</u>	<u>0.113</u>	<u>-0.214</u>	<u>0</u>	<u>0.0424</u>

d) 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
<u>W < 13.5</u>	<u>19.74</u>	<u>0</u>	<u>0.400</u>	<u>-0.202</u>	<u>0</u>	<u>0</u>
<u>13.5 < W < 1350</u>	<u>18.30</u>	<u>0.138</u>	<u>0.400</u>	<u>-0.202</u>	<u>0</u>	<u>0.0245</u>
<u>1350 < W < 2700</u>	<u>36.28</u>	<u>0.150</u>	<u>0.400</u>	<u>-0.202</u>	<u>0</u>	<u>0.0346</u>
<u>2700 < W < 4050</u>	<u>54.26</u>	<u>0.158</u>	<u>0.400</u>	<u>-0.202</u>	<u>0</u>	<u>0.0424</u>

e) 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
<u>W < 13.5</u>	<u>15.24</u>	<u>0</u>	<u>0.033</u>	<u>0</u>	<u>0</u>	<u>0</u>
<u>13.5 < W < 1190</u>	<u>13.63</u>	<u>0.157</u>	<u>0.033</u>	<u>0</u>	<u>0</u>	<u>0.0245</u>
<u>1190 < W < 2380</u>	<u>26.95</u>	<u>0.171</u>	<u>0.033</u>	<u>0</u>	<u>0</u>	<u>0.0346</u>
<u>2380 < W * 3570</u>	<u>40.27</u>	<u>0.179</u>	<u>0.033</u>	<u>0</u>	<u>0</u>	<u>0.0424</u>

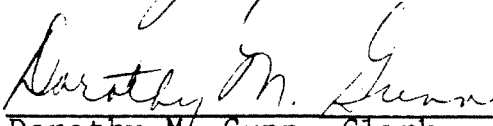
f) FOR NONCHLORINATED PROCESS VENT STREAMS, IF 3.6 < NET HEATING VALUE (MJ/scm):

w = Dilution Flowrate (scm/min)

	a	b	c	d	e	f
<u>W < 13.5</u>	<u>15.24</u>	<u>0</u>	<u>0</u>	<u>0.0090</u>	<u>0</u>	<u>0</u>
<u>13.5 < W < 1190</u>	<u>13.63</u>	<u>0</u>	<u>0</u>	<u>0.0090</u>	<u>0.0503</u>	<u>0.0245</u>
<u>1190 < W < 2380</u>	<u>26.95</u>	<u>0</u>	<u>0</u>	<u>0.0090</u>	<u>0.0546</u>	<u>0.0346</u>
<u>2380 < W < 3570</u>	<u>40.27</u>	<u>0</u>	<u>0</u>	<u>0.0090</u>	<u>0.0573</u>	<u>0.0424</u>

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 16th day of July, 1987 by a vote of 6-0.


 Dorothy M. Gunn, Clerk
 Illinois Pollution Control Board

**1987 Illinois Ozone Excursions
Above the NAAQS Level of 120 ppb**

Date	Monitoring Site (County)	Concentration (ppb)
4/18/87	Lisle, IL (Cook)	139
6/13/87	Chicago - Edgewater (Cook)	156
6/13/87	Chicago - South Water Filtration Plant (Cook)	135
6/13/87	Chicago - Taft High School (Cook)	138
6/13/87	Deerfield, IL (Lake)	130
6/13/87	Waukegan, IL (Lake)	126
6/14/87	Chicago - Edgewater (Cook)	140
6/14/87	Chicago - South-East Police Station (Cook)	144
6/14/87	Chicago - South Water Filtration Plant (Cook)	135
6/14/87	Evanston, IL (Cook)	141
6/14/87	Waukegan, IL (Lake)	140
6/16/87	Waterloo, IL (Monroe)	140
6/17/87	Cary, IL (McHenry)	129
6/17/87	DesPlaines, IL (Cook)	127
6/17/87	Evanston, IL (Cook)	132
6/18/87	Calumet City, IL (Cook)	139
6/18/87	Chicago - Edgewater (Cook)	162
6/18/87	Chicago - South-East Police Station (Cook)	165
6/18/87	Chicago - Taft High School (Cook)	148
6/18/87	Cicero, IL (Cook)	146
6/18/87	Deerfield, IL (Lake)	150
6/18/87	DesPlaines, IL (Cook)	129
6/18/87	Evanston, IL (Cook)	149
6/18/87	Libertyville, IL (Lake)	164
6/18/87	Waukegan, IL (Lake)	178
6/19/87	Evanston, IL (Cook)	133
6/19/87	Libertyville, IL (Cook)	144
6/19/87	Waukegan, IL (Lake)	141
6/20/87	Chicago - Taft High School (Cook)	129
6/23/87	Lemont, IL (Cook)	129
6/23/87	South Lockport (Will)	133
6/24/87	Chicago - Taft High School (Cook)	125
6/24/87	Deerfield, IL (Lake)	177
6/24/87	Evanston, IL (Cook)	127
6/24/87	Libertyville, IL (Lake)	173
6/24/87	Waukegan, IL (Lake)	162
6/24/87	Peoria Heights, IL (Peoria)	126

*Ex. 15
R86-40
JFC*

AAMS EXCURSION OF OZONE & AQS REPORT

1987 OZONE EXCURSIONS (DAYS > 125PPB)

DATE	LOCATION	CONCENTRATION	COMMENTS
Apr 18, 1987	Lisle	139 ppb	*1st Excursion
Jun 13, 1987	Chicago - Edgewater	156 ppb	*1st Excursion
Jun 13, 1987	Chicago - SWFP	135 ppb	*1st Excursion
Jun 13, 1987	Chicago - Taft HS	138 ppb	*1st Excursion
Jun 13, 1987	Deerfield	130 ppb	*1st Excursion
Jun 13, 1987	Waukegan	126 ppb	*1st Excursion
Jun 14, 1987	Chicago - Edgewater	140 ppb	**2nd Excursion
Jun 14, 1987	Chicago - SE Police	144 ppb	*1st Excursion
Jun 14, 1987	Chicago - SWFP	135 ppb	**2nd Excursion
Jun 14, 1987	Evanston	141 ppb	*1st Excursion
Jun 14, 1987	Waukegan	140 ppb	**2nd Excursion
Jun 16, 1987	Waterloo	148 ppb	*1st Excursion
Jun 17, 1987	Cary	129 ppb	*1st Excursion
Jun 17, 1987	Des Plaines	127 ppb	*1st Excursion
Jun 17, 1987	Evanston	132 ppb	**2nd Excursion
Jun 18, 1987	Calumet City	139 ppb	*1st Excursion
Jun 18, 1987	Chicago - Edgewater	162 ppb	***3rd Excursion
Jun 18, 1987	Chicago - SE Police	165 ppb	**2nd Excursion
Jun 18, 1987	Chicago - Taft HS	148 ppb	**2nd Excursion
Jun 18, 1987	Cicero	146 ppb	*1st Excursion
Jun 18, 1987	Deerfield	150 ppb	**2nd Excursion
Jun 18, 1987	Des Plaines	129 ppb	**2nd Excursion
Jun 18, 1987	Evanston	149 ppb	***3rd Excursion
Jun 18, 1987	Libertyville	164 ppb	*1st Excursion
Jun 18, 1987	Waukegan	178 ppb	***3rd Excursion
Jun 19, 1987	Evanston	133 ppb	***4th Excursion
Jun 19, 1987	Libertyville	144 ppb	**2nd Excursion
Jun 19, 1987	Waukegan	141 ppb	***4th Excursion
Jun 20, 1987	Chicago - Taft HS	129 ppb	**3rd Excursion

UNHEALTHFUL PSI DAYS WITHOUT OZONE EXCURSION (120 < value < 125)

May 19, 1987	Edwardsville	121 ppb
Jun 15, 1987	Champaign	123 ppb
Jun 15, 1987	Peoria	122 ppb
Jun 15, 1987	Chicago - SW Pump	121 ppb
Jun 19, 1987	Cary	124 ppb

OZONE ADVISORIES ISSUED

Jun 13, 1987	Chicago - Northside	3pm CDT	Chicago - Taft 136 ppb
Jun 13, 1987	Chicago - Southside	3pm CDT	Chicago - SWFP 126 ppb
Jun 13, 1987	Lake County	3pm CDT	Deerfield 130 ppb
Jun 17, 1987	Chicago-West & South	2pm CDT	Cary 129 ppb
Jun 17, 1987	Chicago - Northside	5pm CDT	Evanston 126 ppb

UPDATED 6/22/87

FOR FURTHER INFORMATION CONTACT BOB SWINFORD

EX-16
R86-40
JFC