Consolidated Comments of

Legal & Safety Employer Research, Inc. (LASER), Sierra Club Michigan Chapter & Concerned Citizens of St. Clair County

Regarding Draft Air Quality Permit for Marysville Ethanol, LLC Production Plant

Presented to

Michigan Department of Environmental Quality
Air Quality Division
&
U.S. Environmental Protection Agency, Region V,
Air & Radiation Division, Permits & Grants Section
& Air Enforcement Section

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1 Introduction

Legal & Safety Employer Research, Inc. (LASER), Sierra Club Michigan Chapter and Concerned Citizens of St. Clair County (CCSCC) have produced these comments as an independent review of the air permit application and draft permit for the proposed Marysville Ethanol LLC facility at Marysville, MI.

We submit these comments for filing with the Michigan Department of Environmental Quality - Air Quality Division and the U.S. Environmental Protection Agency, Region 5, Air & Radiation Division.

2 The Proposed Issuance of the Air Discharge Permit for Marysville Ethanol is a Major State Decision Which Requires a Process of Comprehensive Environmental Review of Pollution, Impairment and Destruction of Michigan's Natural Resources, Consideration of Reasonable Alternatives to the Proposed Action and a MDEQ Final Finding and Determination as to these Matters in Order to Comply with the Michigan Constitution and the Natural Resources and Environmental Protection Act

Michigan Law requires that major state decisions on matters such as the granting of an air discharge permit to install for the proposed Marysville Ethanol facility properly consider the consequences of such decisions for pollution, impairment and destruction of Michigan's natural resources, the public's trust placed on these natural resources and the consideration of feasible and prudent alternatives that would limit such pollution, impairment and destruction.

The Michigan Constitution of 1963 provides:

> "The conservation and development of the natural resources of the state are hereby declared to be of paramount public concern in the interest of the health, safety and general welfare of the people. The legislature shall provide for the protection of the air, water and other natural resources of the state from pollution, impairment and destruction." (Michigan Constitution, 1963; Article IV, Section 52)

The Michigan Natural Resources and Environmental Protection Act (NREPA) provides:

> "In administrative, licensing, or other proceedings, and in any judicial review of such a proceeding, the alleged pollution, impairment, or destruction of the air, water, or other natural resources, or the public trust in these resources, shall be determined, and conduct shall not be authorized or approved that has or is likely to have such an effect if there is a feasible and prudent alternative consistent with the reasonable requirements of the public health, safety, and welfare." (MCL 324.1705(2)) (emphasis added)

NREPA provides that any citizen may commence an action to gain declaratory and equitable relief to protect the natural resources of this state and the public trust therein:

> "(1) The attorney general or any person may maintain an action in the circuit court having jurisdiction where the alleged violation occurred or is likely to occur for declaratory and equitable relief against any person for the protection of the air, water, and other natural resources and the public trust in these resources from pollution, impairment, or destruction.
>
> (2) In granting relief provided by subsection (1), if there is a standard for pollution or for an antipollution device or procedure, fixed by rule or otherwise, by the state or an instrumentality, agency, or political subdivision of the state, the court may:
>
> > (a) Determine the validity, applicability, and reasonableness of the standard.
> >
> > (b) If a court finds a standard to be deficient, direct the adoption of a standard approved and specified by the court." (MCL 324.1701)

Finally, decisions affecting Michigan's natural resources and the public trust therein that take place in a permit process and which represent agency decisions must be subject to prior public notice and public comment under multiple NREPA provisions and under the Michigan Administrative Procedures Act.

2.1 The Michigan Department of Environmental Quality (MDEQ) Does Not Have an Open Process of Comprehensive Environmental Review in Place as a Systematic Decisionmaking Process and MDEQ Has Not Provided an Ad Hoc Equivalent of Such a Process for the Marysville Ethanol Facility Decision that Meets the Statutory Requirements for Environmental Review

Michigan formerly had a process for environmental and natural resources impact review that featured mandatory consideration of major state actions before the Michigan Environmental Review Board (MERB). That process was abolished by Executive Order in the last days of the Blanchard Administration with the intent on replacing it with an alternative and substitute process. However, a replacement process was never implemented and major state decisions since the abolition of MERB have not received comprehensive environmental review commensurate with the MEPA provisions of NREPA which were previously in effect as a stand alone statute prior to the 1994 codification of natural resource and environmental protection laws by the Legislature.

As such, there is no regular and organized system of comprehensive environmental and natural resources impact review that reaches the non-discretionary requirements of MCL 324.1705(2) for consideration of pollution, impairment and destruction of Michigan natural resources and consideration of alternatives. This chronic non-compliance with Michigan statutory requirements must end.

It is conceivable that an ad hoc system of review could be afforded to decisionmaking on such matters as the Marysville Ethanol facility. However, there has been no such ad hoc process set up to reach and satisfy the non-discretionary requirements of MCL 324.1705(2) for purposes of this subject facility.

In fact, the present air permit process has discouraged comprehensive review with statements in "Public Participation Documents" such as:

> "The Air Quality Division does not have the authority to regulate noise, local zoning, property values, off-site truck traffic, or lighting."

While it may be true that the AQD does not have such authorities for direct regulation of the matters listed, MDEQ nevertheless has authority to consider and evaluate comprehensive environmental and natural resources impacts from the proposed facility under MCL 324.1705(2). In partial recognition of this authority, Michigan air use rules provide that air permit to install applications provide:

> "Information, in a form prescribed by the department, that is necessary for the preparation of an environmental impact statement if, in the judgment of the department, the equipment for which a permit is sought may have a significant effect on the environment." (MAC R 336.1203(1)(g))

However, in the present case, MDEQ-AQD has committed error by failing to require the submittal of any such information as provided by its rules and has further failed to conduct a comprehensive environmental impact statement and environmental review on the proposed Marysville Ethanol facility.

2.2 The Decision to Issue an Air Permit to Marysville Ethanol is a Major Action Having Significant Consequences for Management of Natural Resources and Protection of the Environment; Such Consequences Have Not Been Subjected to an Open Public Process of Comprehensive Review and MDEQ Does Not Plan to Make Final Determinations Involving Such Consequences

Although the present proceeding involves consideration of air pollution impacts of the facility, the review process so far has failed to properly characterize airborne emissions from the plant and to provide for appropriate permitting and technology-based controls as outlined in sections of this comment below.

Moreover, the existing air pollution permitting process has failed to consider environmental impacts from the large amounts of greenhouse gases – on the order of

500-600 thousand tons per year of carbon dioxide from fermentation processes at the proposed Marysville Ethanol facility.

Finally, about half of the Great Lakes Watershed water used by the plant will be lost to evaporation, representing an out-of-Great-Lakes basin transfer. This latter fact poses significant questions of Great Lakes water management public policy which have not been addressed or answered by MDEQ.

Other social and community impacts are posed by the subject facility, including the potential effects of the facility operations on grain markets, animal agriculture utilization in St. Clair County and cooling tower icing on adjacent property owners and on area roads.

The comprehensive environmental, natural resources and community effects of the proposed facility have not been adequately considered (or considered at all) by MDEQ on the proposed major state decision to grant the Marysville Ethanol air permit.

In summary, MDEQ has failed to carry out its mandatory and non-discretionary duties for environmental and natural resources impact review, consideration of alternatives and protection of the public trust in Michigan’s natural resources in making the decision to issue the Marysville Ethanol air permit to install. This failure gives rise to a cause of action by any person to have adjudications of these issues by the applicable circuit court of jurisdiction.

3 The Proposed Facility is Located in an Area Where It Will Exacerbate Pre-existing Air Pollution Health Hazards in St. Clair County Resulting from Present Violations of National Ambient Air Quality Standards for PM 2.5 and Ozone Air Pollution and/or Nonattainment Designation Status for These Pollutants

The Applicant and MDEQ have not recognized in the application submittal, the MDEQ Fact Sheet and the air quality modeling analysis that the subject facility is being constructed in an area where pre-existing pollutant concentrations for ozone and PM 2.5 are presumed to exceed National Ambient Air Quality Standards for these pollutants. In fact, St. Clair County has been designated as a primary non-attainment area for both ozone and PM 2.5. Neither the Applicant, nor MDEQ, have recognized that construction and operation of the subject facility will exacerbate this existing public health-related air pollution problem.

For PM 2.5 in particular, PM 2.5 ambient air pollution in St. Clair County is a public health problem. MDEQ PM 2.5 reporting for Federal Reference Method (FRM) monitoring for PM 2.5 in Port Huron shows a 2003-2005 average of the 98th percentile 24 hour average of 39.0 micrograms per cubic meter, which is over the level of the newly revised PM 2.5 National Ambient Air Quality Standard of 35.0 micrograms per cubic meter (24 hour average). In the period 1999-2005, the highest 24 hour 98th percentile concentration was monitored in year 2005 at 47.6 micrograms per cubic meter.

The Port Huron PM 2.5 FRM is in a location which is considered to be broadly reflective of regional transport background air quality in St. Clair County, including for the Marysville area.

In addition to the 24 hour average PM 2.5 ambient air pollution in St. Clair County, the 2003-2005 average of annual means was 13.8 micrograms per cubic meter in St. Clair County, which exceeds advisory group recommendations for proposals for final amendment to the federal annual primary health standard. Such annual average PM 2.5 exposure is considered by air pollution health experts to be at a level of air pollution associated with both morbidity and mortality from both respiratory and cardiac diseases.

Furthermore, St. Clair County is designated as non-attainment for PM2.5 because it contributes to the very high PM2.5 levels in the Detroit-area.

Emissions from the subject facility would increase PM 2.5 exposures in the area of the facility and beyond over and above the pre-existing health-damaging PM 2.5 air pollution exposures in St. Clair County and the rest of the multi-county PM 2.5 nonattainment area..

There is presently no plan in place to control the PM 2.5 ambient air pollution problem in St. Clair County and throughout the rest of the multi-county nonattainment area. The area has both local sources of PM 2.5 and receives regional and long range transport of PM 2.5 from other locations. If the subject facility were regulated as a major source, which it is, it would be called upon to come up with emission offsets from the area that would reduce area pollution by an amount greater than the new pollution being introduced and the facility would have to demonstrate lowest achievable emission rate control technology. As presently vetted, the proposed facility hasn't accomplished either of these tasks.

Because MDEQ is choosing to regulate the subject facility as a minor source, the facility will have no emission offsets and because there is no presently approve PM 2.5 plan to reach attainment there is no accommodation at all presently from an air quality planning aspect for countervailing PM 2.5 emission reductions from control of precursors and control of local PM 2.5 sources. As a result, air permitting, construction and operation of the subject facility is an unmitigated exacerbation of existing adverse PM 2.5 air quality problems. Neither the Federal Clean Air Act, nor the Michigan Environmental Protection and Natural Resources Act (and its MEPA provisions) contemplate this type of exacerbation of an existing problem in an unmitigated manner. Both of these statutes are remedial measures designed to address and control demonstrable air pollution and environmental problems rather than authorization of actions that would exacerbate such problems.

From a federal perspective, proposed issuance of the draft permit prior to the formal plan to achieve PM 2.5 attainment is nevertheless part of the *de facto* Michigan State Implementation Plan carried out in a manner that fails to provide reasonable further progress in violation of 42 U.S.C. §7502(c)(2). From the standpoint of NREPA, issuance of a permit that exacerbates a pre-existing PM 2.5 air quality problem in St. Clair County in complete non-acknowledgment of the pre-existing PM 2.5 problem is an act to authorize pollution, impairment and destruction of Michigan air resources and jeopardize public health, while failing to exercise the required due diligence of analysis of such a decision on pre-existing PM 2.5 air pollution problems.

4 Applicant is Subject to a 100 Ton Major Stationary Source New Source Review Threshold

The Applicant has proposed a process which has traditionally been regulated as a "chemical process unit" for purposes of major stationary source new source review air permitting. EPA has published a final rule attempting to revise EPA new source review procedure to remove ethanol production facilities from being considered as "chemical process units."

Notwithstanding the content of the recent EPA Federal Register notice of final rule, such a decision does not affect Michigan air permitting unless and until such a change has been vetted in the Michigan Administrative Procedure Act rulemaking process after sufficient public notice and opportunity for public comment. On December 4, 2006, Michigan enacted in its prevention of significant deterioration rules which specified that a 100 ton major source designation was included for "chemical process plants" at a time before EPA made its rule change when this industrial category was widely understood as including ethanol manufacturing plants. In addition, adopting EPA's rule re-defining "chemical process plants" to exclude ethanol manufacturing plants would be a change in the Michigan State Implementation Plan under the Clean Air Act which must be properly noticed for adoption as a revised federal requirement for Michigan-specific air permitting. In addition, such a change can be considered as impermissible SIP backsliding which may be prohibited under Clean Air Act Sections 110(i) and 193 as any such emissions may affect a non-attainment area or air quality maintenance plans for an existing attainment area (see discussion in the prior section of the pre-existing PM 2.5 and ozone air quality standards violations). This particular point is directly on point to the construction of the Marysville Ethanol facility in such a PM 2.5 and ozone nonattainment area.

Even if EPA's final rule disallowing consideration of ethanol plants as chemical process units were construed to have immediate effect, such an action would not have retroactive application to the subject facility which both applied for a permit and had publication of a draft permit before EPA's final rule was published in the Federal Register. Application of the federal rule relaxing the major stationary source thresholds for ethanol plants is barred in Michigan air permit proceedings as an arbitrary action that doesn't conform to MDEQ-AQD's duties for the public trust protection in the air resources of this state to prevent pollution, impairment and destruction of such public trust air resources and Michigan constitutional provisions holding as paramount the protection of public health and natural resources of this state.

EPA's final rule does not alter the triggering status of fossil fuel steam generation units (or combinations thereof) that are 250 MMbtu/hour heat input or greater from mandatory designation as major stationary sources. The 100 ton major stationary source status of such steam generation units is provided by statute[1] and by EPA rule.[2] Similarly, ethanol plants are "fuel conversion plants" under the same statutory provisions and regulations that convert biomass-fuel[3] to alcohol fuels and trigger 100 ton major stationary source status in the same manner as the 250 MMbtu/hour heat input fossil fueled boiler units applicability criterion.

Applicant's facility will still have a major stationary source new source review threshold of 100 tons even after publication of EPA's final notice because the Applicant plans operations of two natural gas fired thermal oxidizers with heat recovery steam generators (such a combination is still considered to be such "boilers" fired by natural gas as a fossil fuel with a combined heat input capacity of 250 MMbtu/hour and Applicant's facility will be a biomass energy fuel conversion facility. In fact, the Applicant's two boiler facilities will have total heat input exceeding 250 MMbtu/hour because the thermal oxidizer units are also receiving process gas as fuel and heat input from the dryer burners.

Setting aside the question of whether the facility is or is not a "chemical process unit" because of the new final federal rule, ethanol plants of the size proposed by the Applicant have necessarily been defined as having the primary pollutant-generating activity at the site as being the generation of steam from the combustion of fossil fuels. The associated upstream and downstream process activities with operations of the fossil-fueled steam generation systems on site cannot practically be isolated or distinguished as separate stationary sources from the steam generation function on site as these terms are defined by the Clean Air Act. There is no functional or economic purpose for an ethanol production site fossil fuel-fired steam generation unit without its need to generate steam for beneficial use elsewhere on site. All of the other emission units on site are integral to the pollutant generating aspects of this particular implementation of a fossil fuel fired

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[1] 42 U.S.C. §7479(1)

[2] 40 C.F.R. §52.21(b)(1)(i)(a)

[3] Corn is a bio-mass fuel used for heat input through combustion. Corn biomass fuel contains 8000 to 8500 BTUs per pound on a dry basis. See: http://energy.cas.psu.edu/energycontent.html

steam generating unit and all emission units associated with it under the Clean Air Act's rubric of a major stationary emission source.

Under the prevention of significant deterioration regulation and apart from "chemical process unit" applicability, the following primary pollutant-emitting source activities trigger the major stationary source threshold of 100 tons for Marysville Ethanol, as well as source-wide accountability for fugitive emissions in contributing to such a total:

> "....fossil fuel boilers (or combinations thereof) totaling more than 250 million British thermal units per hour heat input..."
>
> "....fuel conversion plants...." (40 C.F.R. §52.21(b)(1)(i)(a); 40 C.F.R. §52.21(b)(1)(iii)(u) and 40 C.F.R. §52.21(b)(1)(iii)(q))

Applicant's facility will convert biomass fuel as corn to another fuel form as ethanol, hence the designation of the subject facility as a "fuel conversion plant."

Any source having a major stationary source threshold of 100 tons will also have a simultaneous requirement to count all emission units at the site, including fugitive emission units, in source emission totals, in determining whether or not the source emissions is 100 tons or greater.

Applicant's proposed facility will be a stationary source as defined in the regulations:

> "*Stationary source* means **any** building, structure, facility, or installation which emits or may emit a regulated NSR pollutant." 40 C.F.R. §52.21(b)(5) (emphasis added)
>
> (6) *Building, structure, facility, or installation* means **all of the pollutant emitting activities which belong to the same industrial grouping**, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control) except the activities of any vessel. Pollutant-emitting activities shall be considered as part of the same industrial grouping if they belong to the same ''Major Group'' (i.e., which have the same first two digit code) as described in the *Standard Industrial Classification Manual, 1972,* as amended by the 1977 Supplement (U. S. Government Printing Office stock numbers 4101–0066 and 003–005–00176–0, respectively)" 40 C.F.R. §52.21(b)(5)

Applicant's fossil-fueled boilers (the thermal oxidizer-heat recovery steam generator combination units) and fuel conversion capabilities are necessarily in the same "industrial grouping" as the other portions of the single stationary source at the site because the production of ethanol is inextricably intertwined with the need to produce steam at the site, to incinerate waste process gases and to convert biomass to ethanol fuels, and because all process equipment is under common control and because all such processes are adjacent to each other on the same site.

The provisions of the Act and applicable regulations cited above also similarly ensure that fugitive emissions from such a major source will be counted towards the 100 ton threshold.

Also, as described at length below, the Marysville plant would be a “major source” for the reason that it will emit over >10 tpy of single HAP, and 25tpy of aggregated HAPs.

For all these reasons, the DEQ decision to treat this plant as a minor source is arbitrary.

5 The Draft Permit Must Not Issue Since Applicant’s Facility is a Major Stationary Source of One or More New Source Review Regulated Pollutants and a Hazardous Air Pollutant Under the Clean Air Act

The comments in subsequent sections identify a number of serious problems showing Applicant’s and MDEQ-AQD’s underestimation of the potential to emit from specific emission units at the proposed facility and from the entire emission source as a whole, and failures to properly limit the potential to emit through physical process limits and post operation commencement requirements for sufficient monitoring, testing, recordkeeping and reporting.

Given that the potential to emit for one of more New Source Review Regulated pollutants or more criteria pollutants exceeds 100 tons per year from the entire source, Applicant’s permit as proposed must not be approved since the facility would not have received the required and appropriate reviews and permits. As a major stationary source, the Applicant’s facility must apply for and receive the required Prevention of Significant Deterioration review, including a determination of Best Available Control Technology for all criteria pollutants emitted in significant amounts and an air quality impact analysis. In addition, the Applicant must also receive a non-attainment new source review permit with requirements for lowest achievable emission rate control technology, emission offsets and other required applicant demonstrations and duties.

The margins between the Applicant’s erroneously claimed potential-to-emit emissions and the 100 ton threshold for the subject facility are small. In subsequent subsections of this comment, we identify a number of emission unit/process areas subject to the following problems:

> The potential to emit is underestimated.
>
> Emission units are not listed or characterized.

> There are no emission limitations to enforce on individual emission units needed to ensure that the whole source total potential to emit does not exceed major stationary source thresholds.
>
> There are no short term emission limitations and/or limitations on the potential to emit that can ensure that air quality modeling predictions will actually be valid.
>
> There are either insufficient or no federally enforceable physical limitations on the potential to emit.
>
> Testing and monitoring methodologies are either not specified, are insufficient or are not capable of assuring compliance with prior characterizations of the potential to emit.
>
> There are no compliance assurance measures at some of the emission units.
>
> The facility will be unable to comply with its permit as published in draft version.

When the margins from the amount of some of the clear underestimations can be quantified and summed, it is clear that the subject facility will have NSR regulated pollutant emissions exceeding the 100 ton major stationary source threshold. Other units have emission projections but the terms of the draft permit do not provide sufficient monitoring measures to assure compliance with the emission limitations on an continual basis. Under these circumstances, the permit should not be issued because of failure to assure compliance in conforming to major stationary source permitting requirements.

Notwithstanding the major stationary threshold issue, the individual process unit emission characterizations constitute error in cases where we identify underestimation of expected emissions.

6 Because the Facility is a Major Stationary Source for One or More Pollutants Subject to Regulation under the Clean Air Act, the Present Federally Approved Michigan Approved State Implementation Plant, the Present Rule 220, and 40 CFR Part 51, Appendix S Control Requirements for Air Permitting on Marysville Ethanol

At a minimum, the subject facility is a major stationary source for particulate matter which is regulated under the Act. Attachment #7 is EPA’s most recent memorandum addressing new source review permitting for PM 2.5 sources. This memorandum, which is not binding law, indicates existing State Implementation Plan particulate control requirements and 40 CFR Part 51, Appendix S control requirements apply.

6.1 Michigan's Existing PM Control State Implementation Plan Requires Lowest Achievable Emission Rates, Emission Offsets and Reasonable Further Progress when Siting New Sources in Particulate Non-Attainment Areas

Attachment #12 is Michigan's existing Federally approved State Implementation Plan for particulate matter. Since the subject facility has a potential to emit of greater than 100 tons of particulate matter (PM), these federally SIP requirements apply. This rule applies if a source exacerbates "any air quality standard" or is located in a non-attainment area.

Also shown in attachment #12 is the definition of "major offset source" which clearly indicates that a source exceeding 100 tons is considered as such a "major offset source" when it emits any pollutant regulated under the Act. Particulate matter is most definitely regulated by the Clean Air Act.

None of the preconditions for permit issuance provided in the approved SIP rule have been provided in the Marysville Ethanol application. There has been no demonstration of lowest achievable emission rate, emission offsets and reasonable further progress. The Applicant has not certified that other sources owned by, controlled by or in common control with the owner-partners of Marysville Ethanol are in compliance with the Clean Air Act, or are on an approved schedule of compliance. As a result, the current federally approved SIP rule applicable to major sources of particulate matter in a nonattainment area for PM 2.5 must be denied.

6.2 Michigan's Current Rule 220 Also Applies to Marysville Ethanol as a Major Source of Particulate Matter

Under Michigan's current rule definition of "major offset source," Marysville Ethanol is a "major offset source" of particulate matter:

> "(c) "Major offset source" means either of the following:
>
> > (i) A stationary source which has a potential to emit of 100 or more tons per year of any air contaminant regulated under the clean air act.
> >
> > (ii) A particular change at a minor offset source which results in an increase in the potential to emit of 100 or more tons per year of any air contaminant regulated under the clean air act."[4]

As a result, the present Michigan Rule 220 applies, which requires lowest achievable emission rate, emission offsets, alternatives analysis and a demonstration of compliance

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[4] MCL 336.1113(c)

by the owner/operator on other sources in the state. None of these things have been provided. Under the definition of "major non-attainment air contaminant"....

> "(a) "Major nonattainment air contaminant" means a nonattainment air contaminant for which the potential to emit is significant for a proposed major offset source or for which there is a significant net emissions increase for a proposed major offset modification."[5]

.....PM 2.5 as a subset of PM is still emitted by the facility in an amount which exceeds the "potential to emit" as being "significant" at the 15 ton[6] per year level for the subject facility. The Applicant has not provided the required emission offset that would ensure both reasonable further progress towards attainment of the PM 2.5 National Ambient Air Quality Standards and to otherwise ensure that construction and operation of the subject facility does not exacerbate the pre-existing problem of poor PM-2.5 air quality.

In addition, because it is a major offset source by virtue of at least its PM emissions, if not also its VOC emissions, and because it proposes to emit VOCs and NOX over the "significant" levels, Rule 220 requires that Marysville must offset those emissions, as well.

Finally, because it is a major offset source (by both PM and VOC emissions), the Applicant must meet demonstrate the lack of alternatives under Rule 220, which it has not done and cannot do.

6.3 Rule 220 Imposes a BACT Requirement on Emission Units and/or Groups of Emission Units Under Rule 336.1220(1)(a)(ii)

Applicant has not provided a BACT demonstration pursuant to Rule 336.1220(1)(a)(ii) covering PM-10 and NOX as provided by this rule. In fact, BACT has not been provided as ultra low NOX burner controls significantly below 0.05 lb NOX per million btu has become far more common in NOX emission limitation determination for natural gas fired combustion units. Several emission units have no annual and hourly PM and PM-10 emission limitation. Because BACT is defined as a numerical emission limitation where it is feasible to impose such numerical limitation, the failure to do so means that there is no assurance that BACT has been provided.

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[5] Rule 336.1113(a)

[6] See Rule 336.1119(e) for definition of "significant" emissions.

6.4 Rule 220 Imposes a LAER Requirement on Emission Units and/or Groups of Emission Units Under Rule 336.1220(1)(a)(i) for Nonattainment-Related Air Contaminants

Applicant has not provided a LAER demonstration, nor actually provided a LAER level of control for PM and VOCs at the subject facility. For example, leaving the grain cooler emissions be uncontrolled and not controlling miscellaneous process vents and failing to impose thermal oxidizer control on the fermentation scrubber exhaust all constitute failures to provide for LAER control for VOCs, among others.

7 The Draft Permit Must Not Be Issued Because of Applicant's and MDEQ-AQD's Failure to Carry Out Respective Duties and Uphold Required Approval Standards Addressing the Subject Facility's Exacerbation of the Pre-existing PM 2.5 and Ozone Air Quality Problem

7.1 MDEQ-AQD's Determination that Applicant's Submittal was Complete was Arbitrary

Under Michigan Part 2 air use rules:

> "(1) An application for a permit to install shall include information required by the department on the application form or by written notice. This information may include, as necessary, any of the following.....
>
>> .....(h) Data demonstrating that the emissions from the process will not have an unacceptable air quality impact in relation to all federal, state, and local air quality standards."[7]

In the present case, Applicant's submittal was incomplete and MDEQ-AQD's determination that the submittal was complete was arbitrary when both the Applicant and MDEQ-AQD completely ignored the PM 2.5 non-attainment status of the location where the proposed facility would be constructed. There was no attempt to examine or quantify the amount of problem exacerbation for PM 2.5 exposures to area residents would occur from operation of the subject facility. MDEQ-AQD's decision to completely ignore this problem by failing to evaluate it was an arbitrary decision.

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[7] Rule 336.1203(1)(h)

7.2 MDEQ-AQD's Decisions Under the Part 2 Rule Permit Denial Standards Were Arbitrary and Erroneous

The MDEQ-AQD Part 2 rules provide mandatory standards for denial of a permit to install under the text of the rule, shown in part below:

> "(1) The department shall deny an application for a permit to install if, in the judgment of the department, any of the following conditions exist:
>
> > (a) The equipment for which the permit is sought will not operate in compliance with the rules of the department or state law.........
> >
> > (b) Operation of the equipment for which the permit is sought will interfere with the attainment or maintenance of the air quality standard for any air contaminant..........
> >
> > ....(d) Sufficient information has not been submitted by the applicant to enable the department to make reasonable judgments as required by subdivisions (a) to (c) of this subrule."[8]

As represented by the decision to tentatively approve a draft permit for the Applicant, MDEQ-AQD's decisions under the mandatory permit denial standards for Rule 207 are arbitrary and erroneous.

In other sections of this Comment, we discuss a number of emission units where the Applicant has underestimated the potential to emit for its process equipment and such Applicant will not be able to comply with permitted emission limitations. An emission unit which cannot comply with emission limitations violates the requirements in the denial standards for Rule 207(1)(a).

In prior sections of this Comment, we note that the Applicant failed to demonstrate their impact on attainment and maintenance for the PM 2.5 National Ambient Air Quality Standards in St. Clair County. In fact, operation of the proposed facility is not mitigated in any way and the resulting situation will both fail to provide reasonable further progress towards attaining the PM 2.5 air quality standards and will exacerbate the pre-existing violation. The failure to submit proper information showing the impact of plant operations on PM 2.5 air quality violates Rule 207(1)(d). The fact that pre-existing violations of the PM 2.5 standard will be exacerbated without mitigation is a clear fact issue ignored by MDEQ-AQD in a manner which violates the permit denial standard under Rule 207(1)(b).

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[8] Rule 336.1207(1)

8 Comments Applicable to Multiple Emission Units

8.1 Various Emission Unit Sections of the Draft Permit Do Not Contain Sufficient Federally Enforceable Physical Production Rate and/or Throughput Limitations on the Potential to Emit to Ensure the Facility Does Not Exceed Major Stationary Source Thresholds and Individual Emission Unit Limitations

MDEQ-AQD must incorporate emission unit specific physical limitations on the production rate and/or process throughput rate in order to properly limit the potential to emit to reflect and validate potential to emit emission calculations in the application. Such limits must be stated on an hourly and an annual basis. Since air quality modeling demonstrations depend on short term emission rates, hourly emission limitation are also necessary to protect ambient significant deterioration increments.

MDEQ-AQD must also require enforceable requirements for monitoring, recordkeeping and reporting on such physical limitations on the potential to emit in order to assure compliance and practical enforceability.

Such physical limitations are also necessary to ensure that Marysville Ethanol remains below the 100 ton potential to emit threshold for major stationary source status (although we do not concede that this has, in fact, been achieved at this writing).

MDEQ-AQD is required to run its new source permitting activity pursuant to Clean Air Act requirements. Under the Court's holding in the case of U.S. v. Lousiana-Pacific Corporation, D. Colo., blanket emission limitations cannot be considered as provisions which limit the potential to emit of an emission unit. This court decision is described by EPA in its June 13, 1989 Guidance on Limiting the Potential to Emit:[9]

> "In United States v. Louisiana-Pacific Corporation, 682 F. Supp. 1122 (D. Colo. Oct. 30, 1987) and 682 F. Supp. 1141 (D. Colo. March 22, 1988), Judge Alfred Arraj discussed the type of permit restrictions which can be used to limit a source's potential to emit. The Judge concluded that:
>
> > ... not all federally enforceable restrictions are properly considered in the calculation of a source's potential to emit. While restrictions on hours of operation and on the amount of materials combusted or produced are properly included, blanket restrictions on actual emissions are not. (682 F. Supp. at 1133)

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[9] http://www.epa.gov/ttn/atw/pte/june13_89.pdf

The Court held that Louisiana-Pacific's permit conditions which limited carbon monoxide emissions to 78 tons per year and volatile organic compounds to 101.5 tons per year should not be considered in determining "potential to emit" because these blanket emission limits did not reflect the type of permit conditions which restricted operations or production such as limits on hours of operation, fuel consumption, or final product.

The Louisiana-Pacific court was guided in its reasoning by the D.C. Circuit's holding in Alabama Power v. Costle, 636 F. 2d 323 (D.C. Circuit 1979). Before Alabama Power, EPA regulations required potential to emit to be calculated according to a source's maximum uncontrolled emissions. In Alabama Power, the D. C. Circuit remanded those regulations to EPA with instructions that the Agency include the effect of in-place control equipment in defining potential to emit. EPA went beyond the minimum dictates of the D.C. Circuit in promulgating revised regulations in 1980 to include, in addition to control equipment, any federally enforceable physical or operational limitation. The Louisiana-Pacific court found that blanket limits on emissions did not fit within the concept of proper restrictions on potential to emit as set forth by Alabama Power.

Moreover, Judge Arraj found that:

> ...a fundamental distinction can be drawn between the federally enforceable limitations which are expressly included in the definition of potential to emit and (emission) limitations.... Restrictions on hours of operation or on the amount of material which may be combusted or produced ... are, relatively speaking, much easier to "federally enforce." Compliance with such conditions could be easily verified through the testimony of officers, all manner of internal correspondence and accounting, purchasing and production records. In contrast, compliance with blanket restrictions on actual emissions would be virtually impossible to verify or enforce.

Thus, Judge Arraj found that blanket emission limits were not enforceable as a practical matter.

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>
> Thus, Judge Arraj found that blanket emission limits were not enforceable as a practical matter." (EPA memo at p 8-10)

The draft permit features a physical limit on maximum annual grain to be loaded at a single emission unit, another limit on the maximum annual product to be run through loading racks at another emission unit and a source-wide natural gas combustion limit.. However, these physical limitations do not necessarily sufficiently limit the potential to emit on all of the other individual emission units on site because of pollutant-specific potential to emit and process issues. Examples of such circumstances are discussed in the specific emission unit sections of this Comment.

8.2 Neither the Draft Permit, Nor MDEQ's Current Policies on Approving Stack Testing Practices, Contain Any Assurances that the Total Mass Rate of Volatile Organic Compound Emissions is Measured for Emission Limitations Compliance Purposes, for Evaluation of the VOC BACT Stringency of VOC Emission Limitations and For Purposes of Determining the Major Source Status of the Proposed Facility

8.2.1 EPA Policy is Clear that the Clean Air Act New Source Review Programs Must Ensure Accountability for the Total Mass Rate of Volatile Organic Compound Emissions

EPA directives are clear that direct or unaltered use of "as carbon" or "as propane" measurements for purposes of new source review and Title V applicability and compliance are not permissible:

> "For the other regulated pollutants that you listed, with the exception of VOC, calculation of the actual or potential emissions for purposes of NSR and title V

> applicability should follow the EPA principles for developing emission factors, inventories and test methods for the subject pollutant. For VOC emissions, however, it is recognized that the EPA's test methods do not measure the pollutant mass exactly or only measure a subset of the pollutant mass. Nevertheless, for the purposes of both NSR and title V applicability, our policy has been that VOC emissions should be calculated as the total mass of VOCs. That is, a value for each volatile organic compound known to be emitted should be calculated separately and the sum of the individual values should be reported as total VOCs (e.g., 20 tpy of toluene and 26 tpy of methyl ethyl ketone should be calculated separately and then reported as 46 tpy of VOC). This follows our guidance in the document titled "Procedures for Preparing Emission Factor Documents," where we indicate that emission factors for VOCs should be reported "in terms of actual weight of the emitted substance." Those organic substances which are specifically excluded from EPA's definition of VOC at 40 CFR § 51.100(s), because they have "negligible photochemical reactivity," should not be included in the total VOC emission calculation for NSR and title V applicability. The document also provides an exception in the case of unknown species by stating that such emissions should be calculated using an "educated guess" or a molecular weight of 44 (for reporting as propane). Where necessary, this procedure should be used to calculate emissions of those volatile organic compounds that cannot otherwise be quantified."
>
> "It is the EPA's intent that a consistent approach be taken, wherever possible, to quantify and report pollutant emissions for its various air programs. Thus, the methods described above for quantifying pollutant emissions would also apply to our procedures for such things as NSR netting, emission trading and offsets, as well as for other SIP-related programs for criteria pollutants."[10]

This is clear articulation of EPA policy for new source review air permitting proceedings. As a result, reliance on emission estimation methods reflecting VOCs measured only as carbon or propane that understate the total mass of VOC species emitted cannot be used to compare to emission limitations and to evaluate the source status as to the 100 tons/year major stationary source threshold.

The draft permit should be amended to cite EPA's guidance document concerning the measurement of volatile organic compounds from ethanol plants entitled "Midwest Scaling Protocol for the Measurement of 'VOC Mass Emissions' VOC Sampling at Wet and Dry Grain Mills and Ethanol Production Facilities," August, 2004 (See Attachment #9). EPA further articulated the reasons the protocol was necessary (see Attachment #8).

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[10] June 5, 2001 letter from John Seitz, Director, EPA Office of Air Quality Planning and Standards, to D. Edward Settle, Manager, Air Quality, ThermoRetec Corporation, Golden, CO available on EPA's Region 7 NSR website or from Commentors.

Permit language should be added to clarify that all Method 25/25A determinations should be subject to EPA's current generic scalar of 2.2, or to be otherwise in compliance with the protocols contained in the Midwest Scaling Protocol. The draft permit should be amended to ensure that the result measured for volatile organic compound emissions be appropriately scaled if EPA Methods 25/25A are used before the VOC results are compared with the legally enforceable volatile organic compound emission limitations for the two emission units mentioned in the prior paragraph.

8.2.2 As Proposed, the Draft Permit Does Not Specify Any Test Methods or Compliance with EPA's Midwest Protocol for Total VOC Mass Rate Emissions Determination from Ethanol Plants

The draft permit contains no information or requirements on how the total mass rate of volatile organic compounds will be determined from the dryer and the scrubber emission points. Failure to specify such information means there is no way to evaluated the stringency of VOC BACT determinations since the compliance test method chosen will have a large effect on the ultimate stringency of the compliance test.

MDEQ-AQD must not place sole reliance on unmodified and/or unadjusted compliance determinations by the Applicant's use of EPA Methods 25 and 25a for VOC emission limitation compliance purposes. However, the lack of any specific test method information and the failure to embrace EPA's Midwest Protocol for dry mill ethanol plant testing virtually ensures that MDEQ-AQD will allow the facility to used methods which do not measure the total mass rate of oxygenated VOC compounds expected to be emitted by the facility.

EPA volatile organic compound emission test Methods 25 and 25A do not account for the full mass rate of all volatile organic compound emissions in a manner that accounts for the full molecular weight of VOC compounds emitted by ethanol production operations. EPA Method 25 (as carbon) and 25A (as propane) completely discount the effect on the reported VOC mass emission rate from the presence of oxygenated compounds. Most of the VOC compound species emitted by ethanol production operations are oxygenates, including alcohols, aldehydes, acids, ketones, glycerols, etc.

Without a clearly delineated test method and means to determine compliance set forth in the Draft Permit, it is impossible to have a context to understand the stringency of any particular VOC emission limitation. EPA Method 25 and 25A can be expected to yield results which are less than 45% of the true value of the actual VOC mass emission rate from ethanol production emission units. As a result, sole reliance on reported results of EPA Method 25 and 25A test methods will allow the facility to evade actual compliance with VOC BACT requirements in Michigan's State Implementation Plan and a verifiable compliance determination with major stationary source thresholds for volatile organic compounds.

Without a clearly delineated compliance procedure, emission limitations for VOC in the proposed permit are not practically and federally enforceable.

8.2.3 MDEQ's Apparent Practice with Ethanol Facilities is to Unlawfully and Impermissibly Use Unadjusted EPA Test Method 25 and 25A Determinations to Stand for VOC Emission Limitation Compliance

Attachment #10 is an MDEQ approval letter on a test method protocol for Michigan Ethanol in Caro. This protocol indicates that Michigan DEQ-AQD is approving VOC determinations using Method 25A that embraces only one small part of EPA's recommended Midwest Protocol for determination of total mass rate VOC emissions. In the Michigan Ethanol approval letter, the Method 25A analyzer response is compared to a known ethanol standard and then MDEQ-AQD simply lets the source reports an "as ethanol" result for VOC emissions.

Michigan's stack testing approach for ethanol plants as articulated in January, 2006 for Michigan Ethanol doesn't come close to reaching a determination on the total mass rate of volatile organic compound species for compliance purposes, cannot be considered a valid compliance determination for ethanol plant dryer, DDGS cooler and fermentation/distillation scrubber emissions determination. for the following reasons.

First, the method doesn't recognize EPA's finding that Method 25A FID units have a diminished response to oxygenates and that a response curve against a known compound standard for each oxygenate component must be determined. Doing such a response determination against ethanol only neglects the multiplicity of other oxygenated compounds found in typical exhausts. For dryer units, ethanol will not necessarily be the most important or even the largest ethanol species present. As a result of this Michigan-approved practice, Method 25A FID unit determinations in Michigan will never be properly calibrated to account for their problems in detecting oxygenates.

Second, reporting volatile organic compounds "as ethanol" means that the mass rate contributions from multiple oxygenates (e.g. acetic acid - 2O; lactic acid – 30; glycerol - 3O) which will be predominate species in some flows will not be reflected in the reported results. Reporting VOCs "as ethanol" means the full effect of such multiple oxygenates is neglected and inaccuracies in determining higher molecular weight VOC species.

Michigan DEQ should fully embrace the EPA Midwest Protocol in its ethanol plant testing results and follow the example of states like Minnesota who have previously confronted these problems. See Attachment #11, pages 3-6 on "Quantifying VOC Emissions" and "Data Summary and Interpretation." Embrace of the EPA protocol should be incorporated into permits as Illinois EPA has done in order to give notice to all parties about the problematic VOC emission determination problems associated with these facilities.

8.2.4 MDEQ-AQD Does Not Have Rules or Firm Policies About "Department Requirements" on Ethanol Plant Testing

Each of the testing sections in the draft permit contains language saying that testing will be required "....in accordance with Department requirements..." However, MDEQ-AQD does not have any rules for testing ethanol plants. MDEQ-AQD *ad hoc* determinations in the compliance testing protocol approval process cannot ensure uniform stringency across multiple situations and ethanol plant compliance testing programs. MDEQ-AQD should be able to articulate the fundamentals of what should be required in the text of the testing requirements of its permits, but apparently chooses not do so by stripping all such specifications from its ethanol plant permits. No other state in the Midwest has chosen this indefinite and arbitrary path on specificity for ethanol compliance plant testing requirements.

At this writing, Michigan's air pollution control rules provide the following; first, the definition of "volatile organic compound":

> "(f) "Volatile organic compound" means any compound of carbon or mixture of compounds of carbon that participates in photochemical reactions, excluding the following materials, all of which have been determined by the United States environmental protection agency to have negligible photochemical reactivity:
>
> [text omitted]
>
> ***The methods described in R 336.2004 and R 336.2040 <u>shall</u> be used for measuring volatile organic compounds for purposes of determining compliance with emission limits***. Where such a method also measures compounds with negligible photochemical reactivity, these negligibly-photochemical reactive compounds may be excluded as volatile organic compounds if the amount of such compounds is accurately quantified and such exclusion is approved by the department." R 336.1122(f) (emphasis added)

Then, in reviewing R 336.2004 and R336.2040 there are no rules or methods listed which explicitly address the measurement of the total mass rate of emissions from ethanol plants. The effect of the rule in the definition of "volatile organic compounds" is to absolutely require use of methods which are not appropriate when taken alone in doing compliance testing with such plants. Until Michigan enacts appropriate rules to address this situation, clear articulation of testing methods and requirements must be put into permits in order to properly enforce and carry out Clean Air Act new source review and compliance requirements. Placing the matter into the realm of post-permit-process negotiated informal agreements between sources and MDEQ compliance test evaluation staff denies opportunities for public comment and accountability and undermines the enforcement process by failing to enact clearly known and publicly vetted enforceable compliance testing requirements.

8.2.5 Compliance Testing During Maximum Emissions Potential

Although Michigan rules require that compliance testing occur during maximum emissions from maximum process rates, this requirement has not been written into the testing provisions of the draft permit and such a change should be made.

During recent ethanol plant emission testing of scrubbers at the US BioEnergy plant at Woodbury, MI, MDEQ-AQD field staff allowed VOC/acetaldehyde testing to occur during a time when one of three fermenters was being emptied to a beer well. This process mode interval is not one when maximum VOC emissions would be generated.

8.2.6 Chemical Speciation Listing for EPA Method 18 Determinations Should be Extended

EPA Method 18 or 320 determinations (or determinations using altered methods suggested by NCASI) should include all of the following specific speciated volatile organic compound emissions:

> acetaldehyde, acetic acid, ethanol, formaldehyde, formic acid, 2-furaldehyde, methanol, butyric acid, glycerol, pyruvic acid, lactic acid, propionic acid, butanol, acrylamide, acrolein, isoamyl alcohol, ethyl acetate, succinic acid, butanediol, isoamyl acetate, acetone and urethane

Several of these compounds are well known yeast fermentation byproducts with higher boiling points (100 -300 Deg C) that will be present in “syrup” that is evaporated product from thin stillage and which is introduced to DGS dryers where such material is either directly volatilized or subject to thermal decomposition and incomplete combustion.

Acrolein, in particular, is a carcinogen which is a thermal breakdown product of glycerol, a principle fermentation byproduct present in syrup.

8.3 The Draft Permit Does Not Have a Realistic, Practical Enforcement Method for FG-FACILITY Emission Limitations

Although the Draft Permit has facility-wide emission limitations, there is no practical method provided in that section of the permit to actually enforce such facility-wide limitations. Any such compliance method would necessarily involve testing and compliance evaluation determinations at individual emission units and flexible groups. However, many such sections in the draft permit are written without annual emission limitations and without any limitations or compliance measures relating to fugitive emission sources. This is an unacceptable, not practically enforceable situation as it relates to FG-FACILITY emission limitations.

The Draft Permit must be rewritten to include annual emission limitations on all point and fugitive emission sources in addition to the hourly limitations provided. Each such section must include a specific compliance determination method for annual emission limitation compliance evaluation. Each emission limitation, either short or long term, must have an accompanying physical throughput or production rate limitation on the potential to emit in order to ensure that there will be actual emission limitation compliance.

Failure to provide enforceable provisions and procedures to ensure the FG-FACILITY emission limitations are met is an arbitrary decision by MDEQ-AQD that will allow the Applicant to evade major stationary source thresholds for PM and criteria pollutants and for hazardous air pollutants. In addition, such failure to include sufficient physical potential to emit limitations and numerical emission limitations means that compliance with prevention of significant deterioration will be jeopardized.

8.4 Compliance Monitoring of Fabric Filter Controlled Emission Units

As presently written, there are no requirements that test ongoing fabric filter performance after a single, initial stack test. Fabric filter controls can deteriorate from wear and aging effects on equipment. There is no way that the single stack test conducted shortly after the commencement of operations is capable of detecting the future current performance of the fabric filter emission control units potentially many years later. The draft permit should be amended to provide for fabric filter leak detection monitoring on all fabric filter controlled emission units.

Although the permit does require EPA Method 9 determinations and pressure drop monitoring to check on fabric filter emissions, such determinations cannot be used to assure compliance with numerical emission limitations because they are not sensitive enough to detect more subtle fabric filter defects, such as pinholes. Additional leak detection, physical inspection requirements and periodic testing requirements should be placed in the permit for all fabric filter controlled units.

8.5 Testing Requirements for Condensible Particulate Emissions

The Fact Sheet claims:

> “By definition, testing for PM10 includes condensible particulate.”

However, the terms “condensible particulate” and “PM10" are not defined in Michigan air rules. The approved testing methods in MDEQ air pollution control rules for “particulate matter” do not list EPA Methods 201, 201A and 202 in Michigan’s rules on compliance testing. Rule 336.1116(c) defines “particulate matter:”

> “(c) "Particulate matter" means any air contaminant existing as a finely divided liquid or solid, other than uncombined water, as measured by a reference test specified in R 336.2004(5) or by an equivalent or alternative method.”

Unfortunately, condensible particulate matter can be emitted as a gas consisting of high molecular weight hydrocarbons so it doesn’t necessarily exist as a “liquid or solid” at the point of emission. Moreover, the referenced EPA tests for EPA Method 5 and its progeny at rule R 336.2004(5) do not require the collection and reporting of ‘back half’ sampling and collection train particulate.

EPA Method 5 leaves the matter of whether condensible particulate matter in the “back half” of the PM sampling train is collected for purposes of reporting along with the filterable PM at the sole discretion of the stack testing operator and/or Applicant in the absence of a legally enforceable requirement to incorporate the back half catch in the reported results.[11]

As a result, MDEQ-AQD is asking for a “faith-based” determination that a test method which is not specified in the draft permit will always result in reporting of both filterable and condensible particulate matter for all future tests conducted and that such requirements not be made federally enforceable. This is highly objectionable and does not ensure accountability of the regulated party for proper emissions determination after the commencement of source operation. EPA Method 5 leaves the matter of whether condensible particulate matter in the “back half” of the PM sampling train is collected for purposes of reporting along with the filterable PM at the sole discretion of the stack testing operator and/or Applicant in the absence of a legally enforceable requirement to incorporate the back half catch in the reported results.[12]

The draft permit should be amended to require with affirmative language in all testing provisions involving PM and PM-10 compliance stack tests that any EPA Method 5 determinations require the “back half” catch of the Method 5 sampling train to be incorporated in the reported PM/PM-10 emission totals, or that the source should otherwise be required to use EPA methods 201/201A and 202.

Commenters remind Michigan DEQ-AQD that compliance determinations for ensuring that modeled PM10 air quality demonstrations are representative of actual emissions require that filterable and condensible PM stack test results must be added together to evaluate compliance with PM10 emission limitations and this is a matter of considerable federal interest. In fact, EPA does not approve the approach of setting PM 10

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[11] See the note in EPA Method 5 at the top of page 378 prior to section 6.1.1.9 of the method.

[12] See the note in EPA Method 5 at the top of page 378 prior to section 6.1.1.9 of the method.

compliance only to filterable "front half" PM stack test determinations. EPA has recognized that....

> "...condensible emissions are also PM10, and that emissions that contribute to ambient PM10 concentrations are the sum of in-stack PM10 and condensible emissions."[13]

Similarly, EPA's Office of Air Quality Planning and Standards has stated unequivocally that....

> "[s]ince CPM is considered PM-10 and, when emitted, can contribute to ambient PM-10 levels, applicants for PSD permits must address CPM if the proposed emission unit is a potential CPM emitter."[14]

EPA has repeatedly required permitting authorities to include condensible PM10 limits and testing methods in permits.

In retrospect, the draft permit language on all emission units where PM-10 testing is to be accomplished must be amended to ensure that condensible PM is reported in PM emission totals.

8.6 The Applicant Has Failed to Disclose or Evaluate its Emissions, Pollution Controls and Ambient Health Impacts from of an Important Hazardous Material at the Planned Marysville Facility

Applicant's technology provider, ICM, Inc. has published information about ICM's process technology on its website as shown in Attachment #13. This process information indicates that the Applicant plans on using the industrial protease enzymes alpha-amylase and glucoamylase in its production process. The expected amounts of use of these materials which are supplied in 100% form as a dry powder in the ethanol production process will be large. Another recent ethanol plant permit applicant, E85 - Corunna, stated it plans to use 2.8 million pounds of "enzymes" in the power point presentation provided to that community at the January 24, 2007 public meeting about the planned

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[13] 55 Fed. Reg. 12426 (March 17, 1990). See also 55 Fed. Reg. 14246 (April 17, 1990) ("emissions that contribute to ambient PM10 concentrations are the sum of in-stack [non-Condensible] PM10 . . . and Condensible emissions."); 55 Fed. Reg. 41546 (October 12, 1990) ("Condensible particulate matter (CPM) emissions form very fine particles in the PM10 size range and are considered PM10 emissions"); 56 Fed. Reg. 65433 (December 17, 1991) (same).

[14] March 31, 1994 letter from Thompson Pace, SO2/Particulate Matter Program Branch, EPA Office of Air Quality Planning and Standards to Sean Fitzsimmons, Iowa Department of Natural Resources

Corunna facility.[15] The Applicant's submittals indicate that alpha-amylase is used to break down starches to dextrins and gluco-amylase is added to convert dextrins to glucose.

Applicant's submittal contains absolutely no information about methods of delivery of these enzyme powders to the facility, how they are delivered for loading, their storage, transfer and other pertinent facts. There is no information on emissions in the application of these materials or arrangements for emission control from loading and transfer operations of these powders. No information is provided on possible ambient impacts or health effects of these materials.

Alpha-amylase is recognized as an important airborne toxicant by MDEQ-AQD Toxics Unit. The MDEQ-AQD Toxics Unit has developed an Initial Threshold Screening Level for alpha-amylase of a very, very low 0.02 micrograms/cubic meter for a 1 hour average. Alpha-amylase is a member of a substances class known as a "subtilisin" and is also known as a proteolytic enzyme. Risk determinations must address the totality of all subtilisins used in the process and their emissions.

This class of compounds are known as respiratory sensitizers and can induce human respiratory asthma, which is the reason for the very low Michigan Initial Threshold Screening Level.

The Applicant must disclose details about its use of this material, including what form it will be receiving it in, what concentration alpha-amylase will be in with the materials as received and what arrangements will be used for receipt of alpha-amylase and glucoamylase if they are received as dry powders, including emissions, emission controls and predicted ambient impacts.

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[15] See http://www.corm.us/images/stories/Ethanol/townmeetingpresentation--corunna.pdf slide 11. If this material is no longer available at that site, contact the preparer of these comments for copy. E85's planned use of the subject enzymes may ultimately exceed 3 million pounds per year. Process information from Figure F-3 in the E85-Corunna application indicates the use of 159 lbs per hour of alpha-amylase and 191 lbs per hour of gluco-amylase for a total usage of 350 lbs per hour of these enzymes. That suggests annual enzyme usage over 3 million pounds per year.

9 MDEQ-AQD and the Applicant Have Not Established an Orderly and Accountable Final Draft Emission Unit Inventory in the Record for All Criteria Pollutants, Hazardous Air Pollutants and Toxic Air Contaminants on a Potential to Emit Basis

Neither the MDEQ-AQD, nor the Applicant, have established on the record in an orderly, trackable and accountable manner exactly what the potential to emit will be on both an annual and an hourly basis for all criteria pollutants, hazardous air pollutants and toxic air contaminants from each emission unit. No such characterization appears in the MDEQ-AQD "Fact Sheet." The Applicant's submittals contain depictions of some of the potential to emit numbers on an annual basis, but not all. Nothing tracks for purposes of public review and final MDEQ-AQD determination and findings of fact as to what the actual potential to emit for the facility will be for annual and hourly averaging times and for all pollutants. In particular, where there has been negotiated settlements on characterizing expected emissions, MDEQ-AQD has failed to make clear, accountable and orderly depictions in the form of findings of fact on what the potentials to emit will be on an emission unit basis.

The failure of MDEQ-AQD to set hourly and annual emission limitations for each emission unit and for each pollutant in the final draft permit means the permit cannot provide such emission unit specific potential to emit information.

The collective failure to place on the record a final orderly depiction of all criteria pollutants, hazardous air pollutants and toxic air contaminants for public review deprives public commenters of due process of law since there isn't a clear embrace by MDEQ-AQD of all emission-unit-specific potential to emit characterizations in a clear agency finding of fact. It is difficult or impossible to tell whether MDEQ-AQD agreed or disagreed as to a final emission characterization, when it made such a decision and the basis for such a decision. If there is no clear finding of fact by MDEQ-AQD to examine during public comment, the public is deprived of important rights to know how and why the facility is to be regulated in a final permit.

In particular, the public has no clear access to a clear finding by MDEQ as to what emission units will be emitting volatile organic compounds in a manner that occupies the field as to the total VOC listed for plant-wide emissions listed at 98 tons per year in FG-FACILITY.

For hazardous air pollutants, FG-FACILITY indicates the limit is "less than 10 tpy" for each individual HAP and "less than 22 tpy" for the aggregation of HAPs, both of which are limits for the entire facility. In looking at all of the other emission units sections listed, there are only pound per hour limits for a subset of emission units for acetaldehyde and acrolein. There isn't the slightest basis from the permit for understanding what each emission unit will be expected to emit with hazardous air pollutants in the form of a final finding.

The Fact Sheet contains Table 3 which lists "Proposed emissions of toxic air contaminant" in total pounds per hour. But this table is not a complete exposition of all of the hazardous air pollutants to be emitted by the facility.

Table 3 of the Fact Sheet shows Acetaldehyde is shown at 1.91 lbs/hr. That would be 8.37 tons per year on an annual basis. But the applicant is showing 9.87 tons per year in the original application. Did the Applicant later reduce their estimate? Is it the 1.51 tons per year of acetaldehyde from fugitives the Applicant listed but MDEQ does not limit? It is almost impossible to tell for certain from review of the file, especially when the total allowed acetaldehyde in the permit is only 1.78 lbs/hour for a total of 7.8 tons/year.....but with other acetaldehyde emitted from other emission units with no recognition in emission limits. If one emission unit exceeds its acetaldehyde limit later, it is almost impossible to enforce any single HAP/multiple HAP FG-FACILITY HAP emission limitation for purposes of major HAP threshold review since there is no agreement or finding as to MDEQ-AQD's and the Applicant's admissions as to what the HAP PTE will be on an emission unit basis – no such finding was made at the close of the permit review.

While the Applicant submitted Table 3-1 for criteria pollutants and Table 3-2 for hazardous air pollutants in the original application, neither of these two tables were formally updated with revised and final determinations reflecting final agreement by MDEQ-AQD and Applicant as to what the potential to emit would be on an emission unit specific basis.

10 For Toxic Air Contaminant Review, Neither the Applicant, Nor MDEQ-AQD Have Made Final Findings of Fact on Emission Characterizations Covering Such Contaminants on an Emission Unit Basis – Even as Applicant's Toxic Air Contaminant Emission Unit Characterizations Are Defective and Full of Gaps; Under this Circumstance, the Permit Must Not Be Issued for Gross Failure to Comply with Toxic Air Contaminant Evaluation

For toxic air contaminants that are not listed hazardous air pollutants, the Applicant submitted worksheets for each emission unit and some additional information for modeling, but it is readily apparent that the Applicant failed to include all toxic air contaminants in these worksheet comparisons, notably for all toxic air contaminants that are volatile organic compounds.

Either the Applicant submitted VOC emission estimates that are based on EPA Method 25/25A and thus are insufficient characterizations of the VOC potential to emit in violation of new source review requirements, or the Applicant frequently and significantly understated its toxic air contaminant emissions. Either of these constitute a failure to comply with new source review requirements and Michigan Part 2 air use rules. If the VOC rates were stated as unscaled Method 25/25A equivalents, then Applicant's conduct must be regarded as violating the requirements to subject this facility to major stationary source review for volatile organic compound emissions at the 100 ton annual emission threshold level.

What follows are several examples that show the Applicant has significantly understated toxic air contaminant emission rates. In failing to properly characterize the toxic air contaminants from its emission units and process equipment, the Applicant's submittal is not approvable because it isn't technically complete. Part 2 rules and Michigan airborne toxicant risk/evaluation procedure requires sufficient emission characterization in order to understand what toxic air contaminants are emitted from what emission units, process equipment and stacks

RTO/Dryer Units

The RTO/Dryers are shown at a total of 17.84 tons per year of VOC with 7.66 tons per year of the VOC total in listed hazardous air pollutants. This leaves over 10 tons per year of toxic air contaminants that are VOCs from the RTO/Dryer units that are not identified or accounted for anywhere on an emission unit specific basis, except for butyric acid at 0.0302 grams/second or 1.05 tons per year. Other important airborne toxicants known to be released by DDGS drying processes include glycerol, acetic acid, lactic acid, acetone, acetoin, methanol, ethyl acetate and ethanol. However, the Applicant has neglected to attribute any of the 10 tons per year of non-accounted VOCs to any of these airborne toxicants. As a result, Applicant's entire toxic air contaminant emission characterization and its airborne toxicant screening evaluations are all understated, unreliable and/or wrong. The permit must not issue unless and until such corrections are made and subjected to additional public and comment as Applicant's submittals were substantially inchoate.

CO2 Scrubber

The CO2 Scrubber discharge points are shown at a total of 44.0 tons per year of VOC with 7.57 tons per year of the VOC total in listed hazardous air pollutants. The Applicant goes on to list at total of 18.04 tons per year consisting of acetic acid, butyric acid, lactic acid, furfural, glycerol, 2-furaldehyde and formic acid. But this leaves a massive total of 18.39 tons per year of toxic air contaminants that are volatile organic compounds for which there is absolutely no accounting on either a total plant wide or emission unit basis.

This all means that a massive gap exists in the emission characterization with either the listed toxic air contaminants being understated or many compounds were not reported for purpose of toxic air contaminant emission characterization and evaluation As a result, Applicant's entire toxic air contaminant emission characterization and its airborne toxicant screening evaluations are all understated, unreliable and/or wrong because of such a massive defect for the largest single VOC emitting process units at the facility.

The permit must not issue unless and until such corrections are made and subjected to additional public and comment as Applicant's submittals were substantially inchoate.

DDGS Cooler

The DDGS Coolers are shown at a total of 13.20 tons per year with 1.02 tons per year of the VOC total in listed hazardous air pollutants. This leaves over 12 tons per year of toxic air contaminants that are VOCs from the DDGS Cooler units that are not identified or accounted for anywhere on an emission unit specific basis for toxic air contaminants. Other important airborne toxicants known to be released by DDGS drying/cooling processes include glycerol, acetic acid, lactic acid, acetone, acetoin, methanol, ethyl acetate and ethanol. However, the Applicant has neglected to attribute any of the 12 tons per year of non-accounted VOCs to any of these airborne toxicants. As a result, Applicant's entire toxic air contaminant emission characterization and its airborne toxicant screening evaluations are all understated, unreliable and/or wrong. The permit must not issue unless and until such corrections are made and subjected to additional public and comment as Applicant's submittals were substantially inchoate.

Equipment/Component Leaks

The Equipment/Component Leaks emission unit is shown at a total of 9.76 tons per year of VOC with 1.70 tons per year of the VOC total in listed hazardous air pollutants. This leaves over 8 tons per year of toxic air contaminants that are VOCs from the Equipment/Component Leaks emissions unit that are not identified or otherwise accounted for anywhere on an emission unit specific basis for toxic air contaminants. Other important airborne toxicants known to be present for release by components leaks would include ethanol, acetic acid, lactic acid, glycerol, ethyl acetate and other fermentation products as well as gasoline denaturants. However, the Applicant has neglected to attribute any of the 8 tons per year of non-accounted VOCs to any of these airborne toxicants.

As a result, Applicant's entire toxic air contaminant emission characterization and its airborne toxicant screening evaluations are all understated, unreliable and/or wrong. The permit must not issue unless and until such corrections are made and subjected to additional public and comment as Applicant's submittals were substantially inchoate.

Truck Loading Losses

The Truck Loading Losses emission unit is shown at a total of 6.01 tons per year of flare VOC release and 2.43 tons per year of fugitive release; Applicant shows 2.26 tons per year of HAPs from the flare and 0.909 tons per year HAPs from fugitive losses. This leaves a total of 5.27 tons per year of truck loading loss VOCs that are toxic air contaminants.

Gasoline vapor emissions was subject to more detailed modeling, but Applicant's Table 6-10, Modeled Toxic Air Contaminants, shows that only gasoline fugitive emissions were modeled and not flare stack point source emissions, which is the larger source of gasoline vapors. This means that Applicant's air toxics modeling as submitted didn't address the more concentrated effect of gasoline emissions from a flare as opposed to fugitive sources.

In summary

The analysis in this subsection shows that over 48 tons of volatile organic compounds that are toxic air contaminants subject to MDEQ-AQD Part 2 rule requirements for toxic air contaminant emission characterization and airborne toxicant screening level risk review were never characterized and analyzed by the Applicant. This is a gross and unlawful defect in Applicant's submittals and this failure renders the entire toxic air contaminant emission characterization and air toxics screening/modeling evaluation as completely defective and not approvable. MDEQ-AQD's acceptance of the airborne toxicant analysis and screening review under these circumstances constitutes an arbitrary decision. The permit must not issue unless and until this problem has been remedied and the revised information subjected to an additional public review and comment proceeding.

10.1 The Applicant Has Not Properly Characterized Acrolein and Urethane Emissions for the Subject Facility

Urethane is a federally regulated hazardous air pollutant whose emissions must be properly characterized in proposed facilities. Urethane is also a known fermentation byproduct and contaminant that is formed when ammonia and urea as nitrogen compounds are blended with fermentation feed. Such characterization or urethane emissions is necessary to make a determination whether a facility is major or minor for hazardous air pollutants and to determine the health and environmental impact of the facility under Michigan Part 2 air use rules.

10.2 Other Comments

Appendix B does not require determination and reporting of “out of control” periods for continuous emission monitoring equipment in addition to the requirement to determine and report full scan exceedances. Such “out of control” periods must be determined, quantified and reported as per 40 C.F.R. Part 60, Appendix F – Quality Assurance Procedures.

11 Discussion of Permit Regulatory Sections and Emission Calculations by Individual Emission Unit and Process Groupings

11.1 Site Roads Fugitive Emission Unit

11.1.1 Applicant Has Underestimated Particulate Emissions from Site Roadways by Using an Unrealistically Low Silt Loading Factor Not Supported by AP-42 Factors and Not Typical of Agricultural Commodity-Related Facility Roads as Demonstrated by the Experience of Other Nearby States

11.1.1.1 Applicant’s 0.4 g/M^2 Silt Loading Factor is Not Supported by the Text of the Relevant AP-42 Standard

Applicant has proposed and MDEQ-AQD has accepted use of a silt loading factor of 0.4 g/M^2 in arriving at emissions estimates of 26.9 tons of PM per year. Applicant’s claim of an average factor of 0.4 g/M^2 for silt loading on a non-public road and that this is based on the relevant AP-42 information at AP-42 Table 13.2.1-3 is not correct. Applicant’s road network is not a public road network. Applicant will operate industrial paved roads on the site.

Even if Applicant’s road network was a public road, the minimum factor cited as the “ubiquitous baseline” for public roads with less than 500 average daily traffic (ADT) volume is 0.6 g/M^2. Even this factor is subject to multipliers associated with winter road treatments for anti-skidding.

Calculation of Applicant’s fugitive road dust emissions using a silt factor 0.6 g/M^2 with all other factors being the same (including Applicants permit PTE limit of 73,640 vehicle miles traveled is shown below (without multipliers for application of winter road treatments):

Mean vehicle weight = 27.5 tons

$$E = [(k[sL/2]^{0.65} * [W/3]^{1.5}) - C] * [1 - (P/4N)]$$

$$E_{PM} = [(0.082 * [0.6/2]^{0.65} * [27.5/3]^{1.5}) - 0.00047] * [1 - [100/(4 * 365)]]$$

E_{PM} = [(0.082 * 0.457 * 27.8) - 0.00047] * [1 - 0.0685]

E_{PM} = [1.041] * 0.9315 = 0.970 lb PM / VMT

@ 73640 VMT/year, PM emission = 35.7 tons PM/year

$E_{PM-10} = [(0.016 * [0.6/2]^{0.65} * [27.5/3]^{1.5}) - 0.00047] * [1 - [100/(4 * 365)]]$

E_{PM-10} = [(0.016 * 0.457 * 27.8) - 0.00047] * [1 - 0.0685]

E_{PM-10} = [0.203] * 0.9315 = 0.189 lb PM-10 / VMT

@ 73640 VMT/year, PM-10 emission = 6.96 tons PM-10/year

As a result, use of a 0.6 grams per meter square silt loading factors shows the fugitive road PM emissions would be 35.7 tons per year, which is 8.8 tons per year larger than Applicant’s emission estimate. **This additional amount of PM emissions would render Applicant’s facility a major stationary source over 100 tons per particulate matter emissions with all of Applicant’s other PM potential to emit emissions of 94.7 tons per year as admissions.**

In offering this calculation, Commenters do not accept that a 0.6 gram per square meter silt loading is the most appropriate value. Recently, MDEQ-AQD accepted a permit application for an ethanol plant for the E85-Corunna facility in which the applicant determined that their silt loading would be 5.0 grams per square meter with a 50% control factor against the calculation of uncontrolled fugitive road emissions. Such a silt loading level is a more realistic appraisal of expected emissions and its use would push Applicant’s facility even farther over the major stationary source threshold.

11.1.1.2 Applicant’s 0.4 g/M^2 Silt Loading Factor is Not Supported by Actual Industry Experience, Accepted Permitting Practices and the Common Practices of Other Nearby State Jurisdictions

A review of actual industry data of silt loading factors and permitting practices of other nearby states involving silt loading factors is reviewed in the table below:

Case	**Description of Cited Information**	**Silt Loading Factor Cited (g/M^2)**	**See Attach-ment**
MN-1	Measured silt factor at a cereal production facility – Malt-O-Meal cited at air modeling training	0.5	1
MN-2	Measured silt factor in summer at ethanol plant – Chippewa Valley- Benson	0.6	1
MN-3	Measured silt factor in summer at ethanol plant – ADM Marshall, Year 2001 (no cleaning)	0.76 to 2.93	1
MN-4	Measured silt factor in summer at ethanol plant – ADM Marshall, Year 2003 (with cleaning)	0.7 to 0.72	1
MN-5	MPCA Policy - do extensive on-site testing/cleaning, or use AP-42 industrial road values	7.4+ for industrial roads	1
NE-6	Nebraska PSD permit for Archer Daniels Midland Company - Columbus, NE	3.0 - uncontrolled 1.26 - controlled permit limit	2
NE-7	Nebraska PSD permit for Cargill, with actual silt loading values tested by Cargill-MCP	0.92	3
IN-8	Indiana minor source permitting practice for Anderson Clymer and ASA Linden, LLC, with factor taken from AP-42 public road “ubiquitous baseline”	0.6	4

Actual test values at shown in the table indicate that a 0.4 g/M^2 silt loading factor used for emission characterization of the subject facility is too low to reflect loadings actually achieved in practice by the selection of ethanol or agricultural commodity facilities.

A recent email shown in Attachment #5 indicates the technical judgement from air quality officials in Wisconsin that 3 g/m2 is a representative level for typical ethanol plants road silt loading and that an exemplary control level with daily sweeping and other controls cannot achieve beyond 0.6 grams per meter squared.

Attachment #6 is a page from a draft Ohio EPA permit to install for E85, Inc., a proposed ethanol plant in Newark, OH, in which that company proposed and EPA accepted a silt loading value of 5.0 grams per square meter for that proposed facility. An identical provision is also in the draft permit for E85, Inc. for Lancaster, OH. For the E85, Inc. Corunna, MI facility, the company also came in with a 5.0 grams per square meter silt loading value for calculation of fugitive emissions in their air permit application.

Given that a 0.6 g/M^2 silt loading produces a particulate emission projection that causes the entire facility to exceed the major stationary source threshold, all of the other loadings in the table higher than 0.6 and the examples above which would appropriately apply to Applicant would make such an exceedance even larger.

11.1.1.3 Nothing in the Draft Permit Requires a Determinant Amount of Fugitive Road Dust Control That Can Be Assured of Achieving the Claimed Low Particulate Emissions

The draft permit contains no effective measures which will ensure that the 0.4 g/M^2 silt loading and the associated limitation on emissions will actually be achieved. There are no firm requirements for periodic sweeping and cleaning that would allow such a level of silt loading performance to be achieved. Mere reliance on a future plan and completely Applicant-discretionary measures which are not enforceable in practice cannot ensure compliance with the claimed emission limitation.

At a minimum, any permit based on such a low level of silt loading should contain a permit provision actually requiring this silt loading level to be achieved in practice, together with monthly testing requirements, recordkeeping and reporting. No such measures are presently in the draft permit.

There are no emission limitations which ensure that the Applicant not exceed either an hourly and/or annual emission limitation from the EU-TRUCKTRAFFIC emission unit. Nothing restrains the operator from having any emission that the operator, in their sole discretion, chooses to have. With no emission limitations that can be enforced on the EU-TRUCKTRAFFIC emission unit, there can be no effective and practical enforcement of the FG-FACILITY emission limitations.

11.1.2 The Draft Permit Doesn’t Contain Any Requirements to Verify Compliance with Silt Loading Rates Assumed in the Emission Calculation

The Draft Permit should be amended to require quarterly testing of road silt loading and the direct specification of a recognized test method for such silt loading determination. The Owner/Operator should be put under a burden of proving through silt loading testing that the assumptions made during potential to emit characterizations remain reflective of facility operations during the life of the operation. Determination of actual emissions should incorporate a real world determination of the silt loading rates and vehicle miles traveled at the site.

11.1.3 Applicant Fugitive Road Emission Calculation Failed to Account for VMT from Truck Delivery of Process-Related Chemicals

Another ethanol production plant permit applicant has indicated in a power point presentation concerning its facilities to local governments involved[16] the type of miscellaneous truck deliveries that will typically occur at a 110+ million gallon per year ethanol plant. These deliveries are shown below:

2.8 MM lbs of enzymes per year
7.5 MM lbs of urea per year
5.9 MM lbs of sulfuric acid per year
3.9 MM lbs of ammonia per year

This is a total of 20.1 MM lbs of cargo deliveries or just over 10,000 tons of deliverables. If we assume that these deliveries will be roughly in 25 ton cargo increments based on 80,000 lb truck loads, this means 400 additional truck trips that Applicant has not accounted for in their fugitive road emission calculations and VMT budget. Such a facility is incapable of operating without deliveries of this approximate magnitude. As a result, the Applicant has underestimated its maximum potential to emit worst case VMT and thus underestimated its potential to emit.

11.1.4 Condition 9.4 Should Require Improved Recordkeeping and Contemporaneous Collection of Actual Truck Traffic Data

Condition 9.4 should be amended to increase the specificity of recordkeeping by requiring Applicant to record the type and purpose of truck traffic coming and going from the subject facility in addition to the vehicle miles traveled since the amount of VMT varies for each type of truck trip. In addition, the draft permit must be amended to put the Applicant under a duty to determine the actual truck trip length for each type of truck delivery and shipment that occurs as a class of transit operations on the property of the facility..

The Applicant must not rely on erroneous truck trip length assumptions that they have attempted to foist upon the MDEQ in their application. Because the trip length depends on the type of shipment or delivery being made, recordkeeping must take place contemporaneously with vehicles arriving. Recordkeeping to properly support appropriate physical limits on the potential to emit must indicate the date of each truck arriving and its purpose for shipments and/or deliveries. The recordkeeping must reflect

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[16] See http://www.corm.us/images/stories/Ethanol/townmeetingpresentation--corunna.pdf slide 11. This material is available from Commenters if it is no longer posted.

actual data collected with contemporaneous recordkeeping of actual truck traffic, not iterations of assumptions about what traffic has occurred.

Finally, the Applicant must be put under an obligation of reporting any exception to the requirements to conform in a specific reporting condition that must be added to the draft permit. The Applicant must be put under an obligation to inform MDEQ on a quarterly basis if its fugitive road emission units exceeds planned limitations.

11.1.5 The Draft Permit Should be Amended to Require that the Applicant Maintain a Working Street Sweeper On-site at All Times

Identification in the emission unit table for EU-TRKTRAFFIC doesn't contain any identification of the emission control for this emission unit. The Owner/Operator should be placed under a condition requiring that the facility purchase or lease and maintain onsite at all time a working street sweeper to support the claim Applicant has made for 50% control efficiency in the fugitive emission calculation. Merely having a fugitive emissions control plan in place is not sufficient to ensure that the emission limitation will be maintained in the absence of (or failure to maintain in working condition) such a physical piece of equipment.

11.1.6 Section 9 of the Draft Permit for EU-TRKTRAFFIC Must be Amended to Incorporate an Annual and an Hourly Numerical PM and PM-10 Emission Limitations in Addition to the Physical Limitation on the Potential to Emit

There is no way to enforce Section 17 of the permit for EU-FACILITY for PM and PM-10 annual emission limitations unless there is a means to make PM and PM-10 emission limitations enforceable at each emission unit at the facility. If there are no emission limitations for PM and PM-10 applicable to fugitive road emissions at the site, there isn't any effective way of enforcing an overall EU-FACILITY PM and PM-10 emission limitation.

EU-TRKTRAFFIC must have hourly emission limitations (or other short term limit not to exceed a 24 hour averaging time) in order to ensure the facility does not cause a nuisance and does not jeopardize compliance with the PM-10 National Ambient Air Quality Standards and the 24 hour PM-10 PSD increments. If there is no emission limitation, there is no way to ensure that the facility will comply with a level of emissions reflecting what was used in the modeling study. In addition, there will be no way to use annual emission inventory reports to enforce against PM and PM-10 emissions violations at this emission unit.

11.1.7 The Draft Permit Fails to Require that Applicant Maintain All Roadways and Parking Lots in a Paved Condition

Nothing in the draft permit actually requires the Applicant to maintain all of its roadways, parking lots and staging areas in a paved condition.

11.1.8 Monitoring and Reporting Requirements Must Embrace Enforcement of Road Sweeping Requirements

Recordkeeping requirements must emphasis daily sweeping and recordkeeping to show such measures have been completed. In addition, recordkeeping and exception reporting must address any downtime on the functioning of the roadway sweeper or other control equipment.

11.1.9 MDEQ-AQD Must Ensure that Applicant Provides and MDEQ-AQD Deliberates Upon a Valid Pre-Construction Review as to Fugitive Emissions from Site Roads

Since Rule 220 provides for a control technology basis for PM and PM-10 emissions from site roads, such BACT or LAER requirements for a source attempting to be a synthetic minor must reflect practically enforceable numerical emission limits borne of a pre-construction review and determination. Such a process is not satisfied by an after-the-fact determination of the quantity of emissions based on an after the fact determination of the actual silt loading rate that the facility can achieve in practice. The source must be assumed as a major source under the present circumstances, or actually be able to demonstrate they are under 100 tons of particulate matter; delaying any such determination until after the plant is built and is operating is contrary to Michigan law and it is arbitrary decision-making.

11.2 Loading Rack Emissions from Truck and Railcar Tanker Loadout

11.2.1 The Draft Permit Must be Amended to Incorporate Enforceable VOC, NOX and CO Emission Limitations

The present draft permit contains no hourly or annual emission limitations for VOC, NOX and CO. Failure to provide for enforceable emission limitations for both flare stack and fugitive emissions associated with loading rack operations means there can be no effective enforceable of facility wide emission limitations.

A potential to emit calculation must reflect the highest amounts of emissions that can occur consistent with equipment design constraints and federally enforceable physical limitations on the potential to emit.

11.2.2 The Draft Permit Should be Amended to Require Compliance with All Features of Flare Control and Monitoring Requirements Specified in 40 C.F.R. §60.18, Including Testing and Monitoring Requirements

The draft permit presently contains no effective requirements for monitoring, testing and reporting to ensure that all features of 40 C.F.R. §60.18 flare requirements are met. There is no requirement to test by a date certain the BTU content of flare gas and the maximum flare gas exit velocity during times when the maximum gas flow is expected to the flare. These requirements should be incorporated into the permit. There is no requirement that the Owner/Operator physically install and maintain a continuous pilot flame monitor as provided in 40 C.F.R. §60.18(f)(2), for example. There is no requirement that the Owner/Operator report all times when a pilot flame monitor was not working or when the applicant operated the loading rack system when there was no pilot flame. These are critical omissions since the uncontrolled rate of emissions from the loading rack will be very high during a flare pilot outage.

There is no requirement that the Owner/Operator file quarterly reports showing either continuous proper flare operation or environmental exception reports showing improper flare operation, loss of flare pilot or loss of flare pilot monitoring capability.

11.2.3 No Practically Enforceable Provisions in the Draft Permit Provide Federally Enforceable Requirements Ensuring That All Truck and Railcar Tankers to be Loaded or Unloaded at the Facility Meet Appropriate On-Board Vapor System Collection Efficiency and Vapor "Tightness" Performance Standards and That the Facility Ensure Compliance with Such Requirements Through Monitoring, Recordkeeping and Reporting

Nothing in the draft permit requires that the Applicant not load a truck or railcar unless the owner/operator obtains evidence from the tanker owner that such transportation equipment has passed an annual leak test within the past year for vapor tightness and that any conveyance portions of vapor control systems on the tanker itself are properly installed and operating before the facility loads that tanker. On-board tanker vapor collection systems include piping, hatch opening seals, block valves, vapor control valves, vacuum breakers, etc.

Proper operation and collection efficiency of vapor collection systems depends on both the fixed elements at the ethanol rack process area as well as mobile elements on the transportation equipment. Failure to hold Applicant responsible for not loading noncompliant and leaky truck and railcar tankers will significantly increase fugitive volatile organic compound emissions from product loading operations. Such operations may also pose a safety risk at the subject facility.

Both the existing AP-42 and the 1995 draft revised AP-42 5.2 sections indicate that the overall collection efficiency for truck tanker loading when such a truck tanker has not passed an annual leak test be assessed at 70%. The Applicant's emission calculation didn't conform to the AP-42 loading emission characterization, notwithstanding their claims to the contrary.

11.3 Rail and Truck Grain Receiving

11.3.1 The Draft Permit Contains No Federally Enforceable Requirements for Emission Limitations and Fugitive Emissions Control for Grain Receiving

Nothing in the draft permit requires the Owner/Operator to construct, maintain or use fugitive dust emission controls and practices and to observe numerical emission limitations for grain receiving fugitive PM and PM-10. Without such measures there can be no assurance that the facility grain receiving fugitive emissions will be limited to what was depicted for fugitives in the emission inventory worksheet.

The Applicant's emission characterization is predicated on a 95% collection efficiency for both PM and PM-10 and would include the use of choke flow conditions for unloading of hopper cars and building enclosures for both truck and railcar unloading. There are no federally enforceable provisions in the permit to ensure choke flow work practices (including grate manipulation) are carried out and that the enclosures are constructed and maintained to ensure the claimed 95% control efficiency. There is no accountability required in the draft permit to maintain numerical emission limitations for the 2.999 ton PM/year and 1.322 ton PM-10/year level of grain receiving fugitive emissions. The permit should not issue without amendments to correct these problems. There can be no firm assurances that PSD increments for PM 10 will be protected without such federally enforceable conditions and required work practice conditions.

11.3.2 The Draft Permit Does Not Maintain Sufficient Conditions Physically Limiting the Fugitive PM and PM-10 Potential to Emit

While Condition 6.2 of the draft permit does contain a provision limiting grain deliveries to 1,148,000 tons per rolling 12 month year, this condition alone cannot physically limit the potential to emit for fugitive PM and PM-10 emissions from truck grain receiving when both hopper trucks and straight trucks used the facility.

EPA AP-42 emission factors from grain receiving are shown in the table below:

AP-42 Grain Receiving Uncontrolled Emission Factors (lbs of emissions per ton received)		
Emission Source	**PM Emission Factor**	**PM-10 Emission Factor**
Straight Truck (SCC 3-02-005-05)	0.18	0.059
Hopper Truck (SCC 3-02-005-51)	0.035	0.0078

As can be seen from the table, the uncontrolled PM emission factor for straight truck grain receiving is over 5 times higher, and the PM-10 uncontrolled factor is over 7.5 times higher, than corresponding uncontrolled emission factors for hopper truck unloading. Applicant's emission characterization from grain receiving only considered fugitive emissions and 95% collection efficiency for receiving grain from hopper trucks.

Nothing in the draft permit prohibits straight truck deliveries and associated higher emission rates and lower collection efficiencies which were never reflected in the emission characterization. A federally enforceable provision making such a limitation enforceable by permit requirement is necessary to limit the potential to emit for fugitive emissions from truck grain receiving operations; the draft permit must be amended to incorporate such a requirement along with the necessary recordkeeping in Condition 6.9 as to straight truck deliveries. Otherwise, the emission calculation should be re-done to recognize straight truck deliveries with their increased fugitive emissions.

With a federally enforceable condition to prohibit use of straight grain truck deliveries, the facility will have additional PM emissions pushing it even further over the 100 ton major stationary source threshold.

11.4 Cooling Tower

11.4.1 The Draft Permit Fails to Provide Federally Enforceable PM/PM-10 Emission Limitations, Monitoring Requirements and Physical Limitations on the Potential to Emit

Although the cooling tower is depicted as having a potential to emit of 13.7 tons PM/PM-10 per year, nothing in the draft permit provides for an enforceable emission limitation and testing requirements that reach the issue of the drift eliminator efficiency.

The absence of enforceable PM/PM-10 emission limitations renders any attempt to enforce facility-wide PM/PM-10 emission requirements as being impractical.

11.5 Thermal Oxidizer/Dryers

11.5.1 The Draft Permit Should Require Testing for both Filterable and Condensible Particulate Matter

Merely saying that a stack should be tested for PM-10 doesn’t mean that there is an enforceable requirement to test for both filterable and condensible particulate matter. A stack can be tested for PM-10 by Method 201 and the facility can legitimately claim it tested for PM-10. The draft permit should explicitly require that EPA Method 201 and 202 be used to test for PM-10, or that EPA Method 5 be used provided the back half of the PM catch is reported in with total test results.

11.5.2 Startup and Shutdown Emissions for the Dryers

Sections 12 and 13 of the permit should be amended to include a startup condition for process operation of the dryers that prohibits introduction of WDGS into the dryer units during startup until the dryer units and thermal oxidizers are fired and are up to operating temperature. Similarly, the operator must maintain an adequate incineration point in the thermal oxidizers despite drops in steam demand during product run-out into the dryers during shutdown of the plant.

11.5.3 Limits on Dryer Natural Gas Usage are Not Sufficient to Limit the Potential to Emit of Dryer Process Unit Emissions of CO, PM-10 and VOC

The draft permit contains a provision at Condition 12.4 and 13.4 limiting the natural gas and biomethanator charged to the dryer thermal oxidizer to 789 million standard cubic feet per 12 month rolling time period per dryer. This limitation will only limit the potential to emit of this process unit for NOX and then only partially because of the NOX produce by incineration of nitrogen-containing PM matter. It is fully expected that a maximum production rate of DDGS will occur most of the time when the natural gas firing rate in the thermal oxidizer and dryers is less than 100% of the heat input capability of these combustion units.

As a result, it is necessary to place addition physical limitations on either the DDGS production rate, the rate of thin stillage fed to the centrifuge or the rate of WDGS charged to the dryers. It is not clear that most ethanol plants have the capability to continuously weight DDGS produced, but stillage feed can be volumetrically metered.

The carbon monoxide, VOC , PM and NOX emission rates are not solely surrogates of the dryer thermal oxidizer heat input rate. Dryer NOX, for example, consists of thermal NOX formed from dryer thermal oxidizers plus NOX derived from nitrogen containing dryer exhaust PM burned in the thermal oxidizers. Derivation of dryer exhaust PM, VOC and NOX are primarily a function of dryer process material throughputs rather than heat input rates.

As a result, the draft permit should be amended to physically limit the potential to emit of the two dryers by limiting the DDGS production rate to 20.4 tons DDGS per hour per dryer, provided there is a clear method for measuring the actual dryer DDGS production rate. Any such physical limitation of the potential to emit for the TO/dryer process units must also have sufficient monitoring, recordkeeping and reporting functions enacted to make such physical limitations to limit potential to emit federally and practically enforceable.

11.5.4 The Application and the Draft Permit Do Not Include Sufficient Parameter Monitoring and Other Testing Provisions to Assure Compliance with Volatile Organic Compound and Hazardous Air Pollutant Emission Limitations

Apart from a single stack test and ongoing thermal oxidizer temperature monitoring, no other monitoring is conducted to ensure that all criteria and hazardous air pollutant emissions remain within emission limitations. There is no volatile organic compound continuous monitoring.

In order to comply with the Clean Air Act, at the very least, the draft permit should be amended to include a requirement for a continuous oxygen monitor at the thermal oxidizer exhaust. Both oxidizer temperature and oxygen monitoring are necessary to ensure proper combustion conditions in the oxidizer as a parameter monitoring surrogate for control of volatile organic compounds and hazardous air pollutants.

11.5.5 Continuous Monitoring Provisions of the Draft Permit Should Require Stack Gas Flow Monitoring at the Stack Location Where Continuous Monitors are Located

Unlike simple combustion systems, the TO/dryer units do not allow a single source parameter to be used in conjunction with an F-factor in order to accurately determine stack gas flow. The draft permit should be amended to include a requirement for a stack flow monitor to be used in association with continuous emission monitoring to ensure accurate flue gas volume flow rate determination with integration of this information with the continuous monitoring system for carbon monoxide and nitrogen oxides.

11.5.6 The Draft Permit Should Be Amended to Clearly Allow NOX and CO Emission Limitation Violation Enforcement at the TO/Dryer #1 and #2 Emission Units Through Use of Continuous NOX and CO Emission Monitoring Results

The draft permit should be amended to clearly indicate that continuous emission monitoring information for NOX and CO can be used for compliance evaluation and enforcement purposes.

11.5.7 Applicant Underestimated TO/Dryer Acetaldehyde Emissions

The Applicant is showing thermal oxidizer/dryer acetaldehyde emissions at 1.50 tons per year. However, a stack test at Vera Sun Ethanol at Aurora, SD showed higher emissions. The Vera Sun facility is a similar sized facility using ICM technology that is the similar as to what is being provided at the Marysville Ethanol site.

The Vera Sun-Aurora test on March, 30, 2004 showed a 3 run average of 0.74 lb per hour of acetaldehyde emissions from the plant in South Dakota. That would be equivalent to a potential to emit of 3.24 tons per year, which is over twice the predicted emission from the Marysville Ethanol plant.

As such, Marysville Ethanol significantly underestimated acetaldehyde from this emission unit. Taking all of the other annual potential to emit figures for acetaldehyde as Applicant admissions for the other process and emission units, Applicant shows total acetaldehyde emissions in Table 3-2 as 9.78 tons per year. **However, the under-estimation of the acetaldehyde emissions from the thermal oxidizer dryer would add an additional 1.74 tons of acetaldehyde emissions per year, pushing the entire plant into major hazardous air pollutant status, requiring implementation of case by case MACT which has not been provided.**

11.6 DDGS Cooler

11.6.1 Applicant's 100% Uncontrolled VOC Emissions from DDGS Coolers Process Gas Flow Not Constitute BACT When Most of This Industry Controls at Least a Portion of Such Flow

Michigan rule 336.1702(a) requires that new sources of volatile organic compounds, even for minor sources, apply "best available control technology" (BACT) which is a federally approved Michigan State Implementation Plan rule. Michigan BACT for new sources of volatile organic compounds is fully as stringent as, and equivalent to, BACT as applied to volatile organic compound emissions from major stationary sources in federal

Prevention of Significant Deterioration permits under the Federal Clean Air Act BACT definition.

When it is common practice in an industry to exert a certain level of control, then such a level of control is considered BACT even in the face of a BACT determination attempting to show that controls are not economical. In the present case, the Applicant is attempting to make exactly that case...that the controls are not economic even as the vast majority of ICM-designed ethanol plants control over 50% of the gas flow from DDGS product coolers. This was the case for the Liberty Renewable Fuels plant in Michigan. Other plants in the industry control 100% of the DDGS cooler flow. Under these circumstances, the Applicant cannot claim that a high cost for control precludes thermal incineration of over 50% of the DDGS cooler process gas flow.

Apparently the Applicant has sited the DDGS cooler remotely from the dryers and doesn't want to run two conveyors, one for hot DDGS and another from WDGS. That Applicant designed their plant in this manner is not a sufficient justification allowing the facility to evade BACT for the DDGS process gas.

Applicant submitted a remarkably misleading document in justification of the proposition that 100% of the DDGS cooler flow should be uncontrolled for VOCs (See Attachment #15).

This document attempts to claim that somehow the dryers proposed for Marysville Ethanol are some type of advanced technology with recirculation that will lower the amount of VOC emissions from the DDGS coolers. This claim does not pass muster. Review of schematic drawings of submitted by the Applicant does show recirculation of dryer flow, but review of the analogous drawing at Liberty Renewable Fuels also shows the same recirculation. VOC emission factors for both Marysville Ethanol and Liberty Renewable Fuels are both equal at 0.100 lbs of VOC per ton DDGS produced. Applicant's claim that somehow the Marysville Ethanol unit is some type of special technology that better controls VOCs than ICM's traditional dryer technology is not borne out by review.

The document also attempts to claim that DDGS process gas cannot be fed back to the thermal oxidizer because of safety reasons. Ductwork to transfer such gas can be fitted with flame arresters that will ensure safety of such process gas flow transfer.

11.6.2 Applicant has Understated Acetaldehyde Emissions from the Uncontrolled DDGS Cooler Emissions

Applicant is claiming a 0.535 ton per year acetaldehyde emission rate from the uncontrolled process gas flow from the DDGS cooler. This volumetric emission rate is 28,000 acfm.

Review of ICM technology plants indicates a basis for expecting higher acetaldehyde emissions from the DDGS cooler process gas flow. The acetaldehyde emissions during a March 31, 2004 stack test at the Vera Sun - Fort Dodge, IA facility indicated a 3 run average of 0.09 lbs per hour emissions contained process gas having a 3 run average of 17,670 acfm. This facility incinerates a portion of its DDGS process gas flow and the overall process rate of the facility is similar to the proposed Marysville Ethanol facility. If the Vera Sun - Aurora process gas was completely uncontrolled and the total gas flow was the same as what is planned for Marysville Ethanol, the emission would be 0.143 lbs per hour for a potential to emit of 0.626 tons per year, which exceeds the indicated Marysville Ethanol DDGS cooler emission of 0.535 tons per year.

11.7 Fermentation Scrubber Emission Unit

11.7.1 Applicant's Acetaldehyde Emission Characterization for the Scrubber Controlled Units is Subject to Challenge as Unrealistically Low

In information submitted by the State of Nebraska to US EPA in a rulemaking proceeding (see Attachment #14) that agency cited information indicating that ethanol facilities in that state have had a great deal of difficulty achieving evan a 98% control efficiency on scrubber-related acetaldehyde emissions. Controlled acetaldehyde hourly emission rates in some of the Nebraska examples of fermentation scrubbers cited significantly exceeded the proposed MDEQ-AQD draft permit combined acetaldehyde emission rate of 1.44 lbs per hour.

11.7.2 Compliance Testing and Parameter Monitoring in the Draft Permit for Scrubber-Controlled Emission Units is Not Sufficient to Ensure Compliance

Only a single compliance stack test is required under the draft permit. The parameter monitoring provided is not sufficient to assure compliance with the acetaldehyde emission limitation. There is no requirement to maintain required parameters on an hourly integrated basis. There is no requirement to address scrubber inlet temperature and scrubber liquid flow temperatures and verification of the molar concentration of bisulfite liquid injection to the scrubbers.

For a wet, packed tower scrubber attempting to control gaseous pollutants, the parameter monitoring provided in the draft permit is not sufficient to ensure compliance and to ensure that control efficiency is maintained at least to the level demonstrated by the last stack test.

For all the parameters cited in the draft permit and in this section of the comment, stack testing must be used to establish suitable floors or ceilings on parameters demonstrating compliance with emission limitations. In addition, thresholds and time intervals of maximum deviation before a malfunction condition is declared must be established. Once the performance test is completed, the draft permit should provide for a process to establish all needed levels of parameter performance and acceptable conditions, and these parameter monitoring protocols should be subject to MDEQ-AQD approval after proposal by the Owner/Operator.

11.7.3 The Draft Permit Should Be Amended to Require Continuous VOC Emission Monitoring for the Fermentation Scrubber Emission Unit

Because the uncontrolled emission rates are high and the Applicant has made a claim for very high control efficiency on the fermentation scrubber emission unit, continuous emission monitoring for VOC should be required for this emission unit. Continuous monitoring is also justified in circumstances where the process is subject to variability because of stages of fermentation in the units the fermentation scrubber controls.

Attachment #1

517-332 4987

Minnesota Air, Water, and Waste Environmental Conf.

Air Modeling – Training (8am-noon)
Sheraton Bloomington Hotel, Atrium 7

February 14, 2006
Chris Nelson & Dennis Becker
Minnesota Pollution Control Agency

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aq-ppt1-04

4

AP42 Silt Loading (grams/m2) Section 13.2.1 – Paved Roads

- AP42 Range for "Public" Roads (Table 13.2.1-3)
  - Non-winter Conditions
    - 0.6 for ADT<500
    - 0.2 for ADT 500-5000
    - 0.06 for ADT 5000-10000
    - 0.03 for ADT>10000
  - Winter Conditions
    - 2.4 for ADT<500
    - 0.6 for ADT 500-5000
    - 0.12 for ADT 5000-10000
    - 0.03 for ADT>10000

3

AP42 Silt Loading (grams/m2) Section 13.2.1 – Paved Roads

- AP42 Range for Industrial Facilities
  - Table 13.2.1-4
  - Mean Silt Loading: 7.4-292 g/m^2
  - Range of Values: 0.09-400 g/m^2
  - MPCA Title V Default: 10.0 g/m^2
- Most Common Errors
  - Assuming "public roads" for "industrial facilities"
  - Assuming 0.015 g/m^2 for "limited access" roads
    - Baseline value for public, limited access roads with > 10,000 ADT (i.e., freeways)

Measured Silt Loading Values

- Measured Values in Minnesota (Summer)
  - OSB Manufacturers (Ainsworth [formerly Potlatch] – Grand Rapids, Bemidji): GR=0.39, B=1.19 g/m^2
    - Similar facilities
    - Both use natural gas and wood
    - Silt loadings differ by factor of 3
  - Cereal Production (N. Gas) (Malt-O-Meal - Northfield): 0.5 g/m^2
  - Soybean Processing (N. Gas, Diesel) (Minnesota Soybean Processors - Brewster): 0.11 g/m^2
  - Coal-Fired Public Utility (Virginia Public Utilities): 0.67 to 9.3 g/m2

5

Measured Silt Loading Values at Selected Ethanol Facilities

- Measured Values at Ethanol Plants (<u>Summer</u>)
  - Chippewa Valley-Benson (N. Gas): 0.37, 0.6 g/m^2
  - ADM-Marshall (2001): 0.76 to 2.93 g/m^2 (no cleaning)
  - ADM-Marshall (2003): 0.70 to 0.72 g/m^2 (w/ cleaning)
    - Two coal-fired boilers; truck & rail delivery of grain, coal, etc.
    - Silt loading approach <u>and</u> exposure profiling method
    - <u>Daily</u> road cleaning (sweeping, vacuuming, <u>and</u> washing)
    - Onsite speed limit of 5 MPH
    - South Coast Air Quality Management District (SCAQMD) Rule 1186 Certified (80% control) – see next slide
- Companies should expect "some" testing

9

MPCA Expectations - Silt Loading

- MPCA Expectations
  - Good documentation for proposed silt loading values
  - Companies will do some (extensive) on-site testing/cleaning, or use
    - AP42 Table 13.2.1-4 (Industrial Facilities)

- Permit Requirements
  - Cleaning: sweeping, vacuuming, washing
  - Frequency: daily, weekly, monthly, annual
  - Testing: silt loading and/or exposure profiling

- Other possible solutions
  - Speed limits
  - Salt applications only – no sanding
  - EMISFACT scalars (e.g., SHRDOW7)

t

Silt Content – Unpaved Roads

- MPCA Title V Default: 10%
- EPA AP-42 Range for Industrial Sites
  - Mean Silt Content: 4.3 – 24%
  - Range of Values: 0.2 – 29%
- No recent testing in Minnesota
- Usual control: paving or watering or chemical dust suppression

Attachment #2

CONSTRUCTION PERMIT

PERMIT NUMBER: CPM02-0006

PREVENTION OF SIGNIFICANT DETERIORATION (PSD)
PERMIT TO MODIFY AN AIR CONTAMINANT SOURCE IS HEREBY ISSUED TO:

Archer Daniels Midland Company (ADM)
3000 East 8th Street
Columbus, Nebraska 68601-9073

FOR THE SPECIFIC MODIFICATION OF:

A Wet Corn Milling and Ethanol Production Facility

TO BE LOCATED AT

3000 East 8th Street
Columbus, Nebraska 68601-9073

Pursuant to Chapter 14 of the Nebraska Air Quality Regulations, the public has been notified by prominent advertisement of this proposed modification of an air contaminant source and the thirty (30) day period allowed for comments has elapsed. This Construction Permit approves the proposed construction of two new coal-fired boilers and support equipment, one new natural gas-fired boiler, and modification of the existing gluten flash dryer #2 and the fluid bed germ dryer. In addition, this Construction Permit approves the construction of new control equipment for several existing sources, places new and/or revised emission limits on existing equipment, and supersedes all previous construction permits issued for this source. The operations covered by this permit consists of a facility that manufactures ethanol (primary SIC 2046, secondary SIC 2869), starches, high fructose corn syrup, and animal feed products utilizing the wet milling process.

This permit may contain abbreviations and symbols of units of measure, which are defined in 40 CFR Part 60.3. Other abbreviations may include, but are not limited to, the following: Ammonia (NH_3), Best Available Control Technology (BACT), Boiler Operating Day (BOD), Circulating Fluidized Bed Boiler (CFB Boiler), Carbon Monoxide (CO), Chemical Abstract Service Number (CAS #), Code of Federal Regulations (CFR), Compilation of Air Pollutant Emission Factors, Volume I, Stationary Point and Area Sources (AP-42), Construction Permit (CP), Continuous Emissions Monitor System (CEMs), Continuous Opacity Monitoring System (COMS), Factor Information and Retrieval System (FIRE), Hazardous Air Pollutant (HAP), Hydrochloric acid (HCl), Hydrofluoric acid (HF), Hydrogen Sulfide (H_2S), Lead Compounds (Pb), Lowest Achievable Emission Rate (LAER), Maximum Achievable Control Technology (MACT), Mechanical Recompression (MR), Mercury Compounds (Hg), Million British Thermal Units (MMBtu), National Ambient Air Quality Standards (NAAQS), New Source Performance

APPLICABLE REQUIREMENTS AND VARIANCES OR ALTERNATIVES TO REQUIRED STANDARDS:

Consent Decree

On August 21, 2003, a Consent Decree negotiated under United States v. ADM (C.D. IL, NO. 03-CV-2066), was filed with the U.S. District Court – Central District of Illinois. This Consent Decree required several actions from ADM, including the submittal of a revised PSD application for this facility. This submittal was received by the Department on December 15, 2003 and is covered under this permit. In addition, the Consent Decree contained specific requirements on existing emission units, as well as requiring the source to reduce emissions over time by installing various pieces of control equipment, and by optimizing the performance of existing control equipment.

This permit includes the following revisions, which address the specific control requirements contained within the Consent Decree:

- optimization of the scrubber and establishment of a new PM emissions limit (3.03 lb/hr) for Starch Dryer #1;
- submittal of a road silt management plan for the facility (this plan was submitted as part of the application);
- establishment of revised emission limits for Germ Dryers 1-3 (95% VOC control or 20 ppmvd VOC), the Fluidized Bed Germ Dryer (1.5 lb/hr VOC and 4.02 lb/hr CO), Gluten Flash Dryer #1 (22.8 lb/hr VOC and 15.2 lb/hr CO), and Gluten Flash Dryer #2 (22.2 lb/hr VOC and 4.74 lb/hr CO);
- routing of the Stillage/Steepwater evaporator vents (SV-69 and SV-70) and the Gluten RVF Vents (SV 66-68) to the millhouse scrubber (these units were previously uncontrolled) and 95% control of VOC, or a 20 ppmvd VOC emission limit;
- routing of the distillation operation emissions and non-condensable gas stream to the Fermentation/Distillation scrubber system (SV-32, SV-33, and SV-34) with a VOC limit of 13.5 (lb/hr), which represents greater than 95% control; and
- modification of Boiler #1 to replace the existing burner with a low-NO$_x$ burner capable of meeting a NO$_x$ emission limit of 0.06 lb/MMBtu.

As noted above, the CD also requires ADM to install or optimize controls or other mitigation measures to support the NAAQS and increment compliance demonstration, and to use current information to establish more accurate emissions limits for CO and VOC from certain sources. This permit includes the following conditions, which address these goals:

- establishment of revised PM$_{10}$, CO, and VOC emission limits for the Carbon Furnaces 1 and 2;
- increased stack height requirements for several existing stacks; and
- establishment of a VOC emission limit for the Fiber Dewatering process.

Title 129, Chapter 4 -National Ambient Air Quality Standards (NAAQS)

The potential hourly emissions of PM$_{10}$, NO$_x$, CO, and SO$_x$ from the proposed facility modification exceed the threshold for requiring modeling to show compliance with the applicable 24-hour and annual PM$_{10}$ NAAQS, the 1-hour and 8-hour CO NAAQS, the 3-hour and 24-hour SO$_2$ NAAQS, and the annual NO$_2$ NAAQS. The air quality analyses adequately demonstrate compliance with applicable NAAQS for NO$_x$, CO, and SO$_x$. The modeling predicted violations to the PM$_{10}$ 24-hour and annual NAAQS, however a receptor significance analysis demonstrates that ADM does not cause or contribute significantly to the modeled violations. Additional information is provided in the "PSD Air Quality Impact Analysis"

11

RESPONSE TO PUBLIC COMMENTS SUMMARY
On the issuance of a Construction Permit for ethanol production increase and Coal-fired Boiler Project (Facility #39285)

Background Information:

Archer Daniel Midland Company (ADM) submitted a revised Prevention of Significant Deterioration (PSD) Construction Permit application on August 4, 2005. This permit approves the expansion of ethanol production to approximately 120 million gallons per year, and construction of two new coal-fired boilers and support equipment, one new natural gas-fired boiler, and modification of the existing gluten flash dryer #2 and the fluid bed germ dryer.

During the public comment period, The Department received comments from EPA Region VII in Kansas City and from ADM. The following are the Department's responses to the comments received during the public comment period:

COMMENT #1:

EPA recommends that the requirements outlined in the "Truck Traffic Fugitive Control Strategy And Monitoring Plan" (Plan), submitted by ADM with their PSD application, be stated as applicable requirements in the permit.

RESPONSE AND RATIONALE:

Condition XIII.(O)(1)(a) of the draft permit required ADM to develop, maintain, and implement a Plan, however the permit did not specifically address the minimum requirements of the Plan. The requirements outlined in the Plan submitted with the original PSD application include three items:

1) Paving facility roads that will support routine daily process traffic. The draft permit already requires that all roads be paved in Condition XIII.(O)(1).
2) Vacuum sweeping the facility roads three (3) times per week. Instead of a minimum vacuum sweeping frequency mandated in the permit, the Department included in the draft permit the requirement for ADM to conduct daily facility-wide dust surveys to determine when dust control measures should be implemented (Condition XIII.(O)(1)(b)). Visible dust surveys may conclude that vacuum sweeping is required more or less frequently than three times per week. The Department, however, is not opposed to including specific requirements in the permit for ADM to vacuum sweep their roads three times per week. Note that the facility only vacuum swept their roads weekly during the development of site specific emission factors and during the time they were required to test their silt loading to demonstrate compliance with a permit limit of 1.26 grams/square meter.
3) Silt load testing of paved roads between the months of April and October. The Department has determined that silt testing is not necessary to demonstrate that dust emissions from the paved roads are being minimized. This is due to the permit requirement that increases the frequency of vacuum sweeping (three times per week instead of once per week) and because ADM has assumed a more conservative silt loading value of 3.0 grams/square meter when calculating potential emissions from the source. Past testing results show that with weekly vacuum sweeping, ADM has maintained silt loading values well below 3.0 grams/square meter. The requirement to vacuum sweep three times per week makes it even more likely roads will stay clean.

CHANGES:

Permit Conditions XIII.(O)(1)(a) was revised to specify minimum requirements for vacuum sweeping of the ADM paved roads. A corresponding discussion was updated in the Fact Sheet.

APPLICABLE REGULATIONS:

Title 129, Chapter 19 – Prevention of Significant Deterioration; Title 129, Chapter 32 – Duty to Prevent Escape of Dust.

Appendix A: Emission Calculations
Traffic Fugitive PM Emissions (SV TRUCK_FUG)

Condition XIII.(O)

Road Description	Travel Distance	Potential Rate	Paved PM EF[a]	Paved PM_{10} EF[a]	Potential PM Emissions	Potential PM_{10} Emissions
	(miles)	(trucks/yr)	(lb/VMT)	(lb/VMT)	(tons/yr)	(tons/yr)
Grain Transportation	0.96	155,125	0.31	0.06	22.74	4.43
Starch	1.08	365	0.31	0.06	0.06	0.01
Germ	1.08	5,475	0.31	0.06	0.90	0.18
Gluten	1.08	365	0.31	0.06	0.06	0.01
Feed	0.24	27,375	0.31	0.06	1.00	0.20
Ethanol	1.08	2,190	0.31	0.06	0.36	0.07
By-Product	0.89	12,045	0.31	0.06	1.64	0.32
Chem Deliveries - Route 1	0.89	730	0.31	0.06	0.10	0.02
Chem Deliveries - Route 2	1.08	1,095	0.31	0.06	0.18	0.04
Chem Deliveries - Route 3	0.62	365	0.31	0.06	0.03	0.01
Chem Deliveries - Route 4	0.57	365	0.31	0.06	0.03	0.01
Fructose	1.13	4,745	0.31	0.06	0.82	0.16
CoGen Ash	1.51	5,840	0.31	0.06	1.35	0.26
CoGen Lime	1.51	1,460	0.31	0.06	0.34	0.07
CoGen Coal	1.54	16,425	0.31	0.06	3.86	0.75
				Total:	33.5	6.5

Methodology

Potential to Emit (tons/yr) = Travel Distance (miles) x Number of Trucks/yr x Paved EF (lb/VMT) * (ton/2,000 lb)

[a] Paved road emission factor calculated using the paved road equation in AP-42, Section 13.2.1 (12/03 Version), with an adjustment factor of (1/9.1) applied to reflect ADM testing data at their Columbus, NE and Marshall, MN corn wet mills:

$$Lbs/VMT=\left[k\left(\frac{sL}{2}\right)^{0.65}\left(\frac{W}{3}\right)^{1.5}-C\right]\left(1-\frac{P}{4N}\right)(1/9.1)$$

Where:

Constants	Value	Units
Average Truck Weight (W)	27.5	tons
Rainy Days (P)	90	days/yr
Days in Period (N)	365	days/yr
Paved Road Silt Loading (sL)	3	g/m2
Paved PM particle size factor (k)	0.082	lb/VMT
Paved PM_{10} particle size factor (k)	0.016	lb/VMT
Brake wear emission factor (C)	0.00047	lb/VMT

Attachment #3

DRAFT

CONSTRUCTION PERMIT

PERMIT NUMBER: CP06-0008

PREVENTION OF SIGNIFICANT DETERIORATION (PSD) PERMIT TO MODIFY AN AIR CONTAMINANT SOURCE IS HEREBY ISSUED TO:

Cargill, Incorporated
PO Box 300
Blair, Nebraska 68008-0300

FOR THE SPECIFIC MODIFICATION OF:

A Wet Corn Milling and Ethanol Production Facility

TO BE LOCATED AT:

650 Industrial Road
Blair, Nebraska

Pursuant to Chapter 14 of the Nebraska Air Quality Regulations, the public has been notified by prominent advertisement of this proposed modification of an air contaminant source and the thirty (30) day period allowed for comments has elapsed. This Construction Permit approves the proposed construction of a new 1,500 MMBtu/hr coal-fired boiler and the expansion of the wet corn milling and ethanol facility to increase production by 140 million gallons per year. Conditions XIII.(A), (D), and (G) of this permit supercede Conditions XVIII.(A)(1), XIX.(C), and XX.(C) of the December 3, 2002 construction permit. No other conditions of the December 3, 2002 are being modified by this construction permit.

This permit may contain abbreviations and symbols of units of measure, which are defined in 40 CFR Part 60.3. Other abbreviations may include, but are not limited to, the following: Best Available Control Technology (BACT), Code of Federal Regulations (CFR), Carbon Monoxide (CO), Construction Permit (CP), Circulating Fluidized Bed (CFB), grains per dry standard cubic foot (gr/dscf), Hazardous Air Pollutant (HAP), Hazardous Air Pollutants (HAPs), Maximum Achievable Control Technology (MACT), Million British thermal units per hour (MMBtu/hr), National Ambient Air Quality Standards (NAAQS), New Source Performance Standards (NSPS), Nitrogen Oxides (NO_x), Particulate Matter (PM), Particulate Matter less than or equal to 10 micrometers (PM_{10}), parts per million-volume dry (ppmvd), Prevention of Significant Deterioration (PSD), Regenerative Thermal Oxidizer (RTO), Sulfur Dioxide (SO_2), Volatile Organic Compounds (VOC).

This permit is issued with the following conditions under the authority of Title 129 - Nebraska Air Quality Regulations as amended March 14, 2006:

(4) The owner or operator shall report and keep records as described in 40 CFR 60.487 – Reporting requirements and in 40 CFR 60.486 – Recordkeeping requirements. Each owner or operator shall submit semiannual reports to the Department beginning six months after the initial startup date.

(5) Emissions shall be controlled by the Leak Detection and Repair Program as defined in 40 CFR 60.482-1 through 60.482-10.

Condition XIII.(P) Requirements for the HAUL ROADS

The existing source has a Truck Traffic Fugitive Control Strategy and Monitoring Plan (Plan) that requires sweeping of roads twice a week and requires that all non-paved roads used to support production-related truck traffic will be paved within 6 months of construction in that area. The most recent approved plan, dated September 27, 2000, also requires annual silt testing. Cargill has used an emission factor of 0.04 lb/VMT for haul road emissions estimates, which is based upon a study conducted by MCP, and which has been approved for use by the Department. During the derivation of the lb/VMT emission factor, MCP also tested silt loading values and the average was 0.92 g/m^2. The Department has determined that as long as the future average silt loading values for all samples taken for each periodic testing event, as established by the Plan, are generally at or below 1.0 g/m^2, continued use of the 0.04 lb/VMT emission factor by Cargill would be appropriate; however, if the average silt loading is above 1.0 g/m^2, the Department may decide that use of the 0.04 lb/VMT emission factor is no longer appropriate. The Plan requires that the source sample silt loading each year for a one-month period, one sample per week on each of the road segments. The Plan also requires an average to be calculated for each road segment in order to ensure compliance with the ambient air quality standards. The average that is to be calculated for purposes of Condition XIII.(P) is the average of all samples for all road segments, because the Department has determined that this method will provide adequate support for use of the 0.04 lb/VMT emission factor for purposes of emissions calculations for emissions inventory purposes.

Condition XIII.(Q) Requirements for NAAQS

This condition establishes minimum stack heights and maximum stack diameters as modeled to demonstrate compliance with the NAAQS, and establishes the public access restriction.

Condition XIII.(R) Requirements for TESTING

This condition outlines the procedures the source must follow for performance testing conducted as required by the permit.

Condition XIII.(S) Requirements for BAGHOUSES

This condition outlines operation and maintenance procedures that the source must follow to ensure proper baghouse operation.

The source has elected to use a leak detection device in lieu of having to conduct routine observations, as required by Condition XIII.(S)(5). The source found that an on-line leak detection system would provide a sensitive and accurate method for locating damaged bags. A leak detection system allows quick detection of the troubled module, which leads to quick repair of a damaged bag. After evaluating the capital cost and value to good operation, the source felt that use of a leak detection system is something that should be added to the scope of the project. The source is considering several technologies, including the Auburn Systems Triboguard (Model 4002) and the PCME-US (Dust Sense 30); however, the vendor

Attachment #4

Appendix A: Emission Calculations
Fugitive Emissions From Paved Roads

Company Name: Premier Ethanol, LLC
Address: Portland, Indiana
FESOP: 075-22858-00032
Reviewer: ERG/MP
Date: May 1, 2006

1. Emission Factors: AP-42

According to AP-42, Chapter 13.2.1 - Paved Roads (12/03), the PM/PM10 emission factors for paved roads can be estimated from the following equation:

$$E = (k \times (sL/2)^a \times (w/3)^b - C) \times (1 - p/(4 \times 365))$$

where:

E = emission factor (lb/vehicle mile traveled)
sL = road surface silt loading (g/m^2) = 0.6 (g/m^2) (AP-42, Table 13.2.1-3)
w = mean vehicle weight (tons) = 27.5 tons
k = empirical constant = 0.082 for PM and 0.016 for PM10
a = empirical constant = 0.65
b = empirical constant = 1.5
C = emission factor for exhaust, brake and tire wear 0.00047 for PM and PM10
p = number of days per year with 0.01 inches precipitation 120

PM Emission Factor = $(0.082 \times (0.6/2)^{0.65} \times (27.5/3)^{1.5} - 0.00047) \times (1 \quad 120/1460) =$ **0.95** lbs/mile

PM10 Emission Factor = $(0.016 \times (0.6/2)^{0.65} \times (27.5/3)^{1.5} - 0.00047) \times (1 - 120/1460) =$ **0.19** lbs/mile

2. Potential to Emit (PTE) of PM/PM10 Before Control from Paved Roads:

Vehicle Type	*Ave Weight of Vehicles (tons)	*Trip Number (trips/yr)	* Round Trip Distance (mile/trip)	Vehicle Mile Traveled (VMT) (miles/yr)	Traffic Component (%)	Component Vehicle Weight (tons)	PTE of PM (tons/yr)	PTE of PM10 (tons/yr)
DDGS Load Out	27.5	3,504	0.75	2,628	9.9%	2.73	1.25	0.24
Ethanol Load Out	27.5	4,313	0.75	3,235	12.2%	3.36	1.54	0.30
Denaturant Delivery	27.5	190	0.75	143	0.54%	0.15	0.07	0.01
Grain Delivery	27.5	27,331	0.75	20,498	77.3%	21.27	9.78	1.91
Total				**26,504**	**100%**	**27.5**	**12.6**	**2.46**

* This information is provided by the source.

Methodology

Vehicle Mile Traveled (miles/yr) = Trip Number (trips/yr) x Round-Trip Distance (mile/trip)
Traffic Component (%) = VMT / Total VMT
Component Vehicle Weight = Ave. Weight of Vehicles (ton) x Traffic Component (%)
PTE of PM/PM10 before Control (tons/yr) = VMT (miles/yr) x PM/PM10 Emission Factors x 1 ton/2000 lbs

Appendix A: Emission Calculations
Fugitive Emissions From Paved Roads

Company Name: ASA Linden, LLC
Address: 173 West County Road 1100 North, Linden, IN 47955
FESOP: 107-21453-00061
Reviewer: ERG/YC
Date: November 10, 2005

1. Emission Factors: AP-42

According to AP-42, Chapter 13.2.1 - Paved Roads (12/03), the PM/PM10 emission factors for paved roads can be estimated from the following equation:

$$E = (k \times (sL/2)^a \times (w/3)^b - C) \times (1 - p/(4 \times 365))$$

where:

E = emission factor (lb/vehicle mile traveled)
sL = road surface silt loading (g/m^2) = 0.6 (g/m^2) (AP-42, Table 13 2 1-3)
w = mean vehicle weight (tons) = 29 0 tons
k = empirical constant = 0.082 for PM and 0.016 for PM10
a = empirical constant = 0 65
b = empirical constant = 1 5
C = emission factor for exhaust, brake and tire wear 0.00047 for PM and PM10
p = number of days per year with 0.01 inches precipitation 120

PM Emission Factor = $(0.082 \times (7.4/2)^{0.65} \times (29/3)^{1.5} - 0.00047) \times (1 - 120/1460)$ = **1.03** lbs/mile

PM10 Emission Factor = $(0.016 \times (7.4/2)^{0.65} \times (29/3)^{1.5} - 0.00047) \times (1 - 120/1460)$ = **0.20** lbs/mile

2. Potential to Emit (PTE) of PM/PM10 Before Control from Paved Roads:

Vehicle Type	*Ave Weight of Vehicles (tons)	*Trip Number (trips/yr)	* Round Trip Distance (mile/trip)	Vehicle Mile Traveled (VMT) (miles/yr)	Traffic Component (%)	Component Vehicle Weight (tons)	PTE of PM before Control (tons/yr)	PTE of PM10 before Control (tons/yr)
DDGS Load Out	29	14,814	0.95	14,073	47.7%	13.84	7.27	1.42
Ethanol Load Out	29	15,488	0.95	14,714	49 9%	14 47	7 61	1 48
Denaturant Delivery	29	738	0.95	701	2 38%	0.69	0.36	0.07
Total				**29,488**	**100%**	**29.0**	**15.2**	**2.97**

* This information is provided by the source

Methodology

Vehicle Mile Traveled (miles/yr) = Trip Number (trips/yr) x Round-Trip Distance (mile/trip)
Traffic Component (%) = VMT / Total VMT
Component Vehicle Weight = Ave. Weight of Vehicles (ton) x Traffic Component (%)
PTE of PM/PM10 before Control (tons/yr) = VMT (miles/yr) x PM/PM10 Emission Factors x 1 ton/2000 lbs

3. Potential to Emit (PTE) of PM/PM10 after Control from Paved Roads:

The source proposed to use periodic sweeping to control the fugitive dust emissions.
The control efficiency from sweeping is assumed to be 50%.

PTE of PM after Control = 15.2 tons/yr x (1-50%) = **7.62 tons/yr**

PTE of PM10 after Control = 2.97 tons/yr x (1-50%) = **1.48 tons/yr**

6-11

Attachment #5

From: john.williams3@comcast.net
To: ajs@sagady.com
Subject: FW: RE: FW: ethanol records request
Date: Tue, 22 May 2007 17:39:30 +0000
X-Mailer: AT&T Message Center Version 1 (Oct 4 2006)
X-Authenticated-Sender: am9obi53aWxsaWFtczNAY29tY2FzdC5uZXQ=
X-ELNK-Info: spv=0;
X-ELNK-AV: 0
X-ELNK-Info: sbv=0; sbrc=.0; sbf=00; sbw=000;

Alex, Apparently there are also Wisconsin permits with a 3.0 gram m2 silt factor. Please see following.

-------------- Forwarded Message: --------------
From: "Faith III, Don C - DNR" <Don.FaithIII@Wisconsin.gov>
To: <john.williams3@comcast.net>
Subject: RE: FW: ethanol records request
Date: Tue, 3 Apr 2007 21:56:46 +0000
> Mr. Williams,
>
> I am not aware that we have any state guidance document that deals with silt
> loading factor. I recently became aware that this was being done in other
> nearby states at a regional ethanol conference that I attended last fall. The
> value I noted of 3.0 g/m2 is reported to be a value that can generally be met
> using reasonably good housekeeping (which corresponds with information from
> research of the web).
>
> I've also heard that 0.6 g/m2 is about as low as can reasonably be achieved, but
> this requires considerable effort (excellent fugitive dust practices, daily
> cleaning, etc.) to achieve.
>
> Functionally, the 0.6 g/m2 results in about 1/2 of the fugitive emissions of the
> 3.0 factor (due to an exponent within the formula).
>
> We have just begun incorporating these factors within the permits, based on the
> experiences related to us by other states, but don't have any quantitative
> measures of this factor as yet. The facilities have been using these factors
> within their calculation of fugitive dust emissions even before we were
> examining them, but now the permits note that emissions calculations are based

> on the values chosen by the facility, and they can be measured, to confirm that
> the facility is a synthetic minor source as proposed.
>
> I suggest that you also review the EPA AP-42 chapter and related information
> that deals with this issue.
>
> Don C. Faith III, P.E.
>
>
> -----Original Message-----
> From: john.williams3@comcast.net [mailto:john.williams3@comcast.net]
> Sent: Tue 4/3/2007 4:37 PM
> To: Faith III, Don C - DNR
> Subject: Re: FW: ethanol records request
>
> Dear Don:
>
> Does your agency have a guidance document discussing the appropriate silt factor
> for ethanol plants and/or industrial facilities? I heard you do, if so, can I
> get a copy or on-line access?
>
> John Williams
> -------------- Original message ----------------------
> From: "Faith III, Don C - DNR" <Don.FaithIII@Wisconsin.gov>
> > Mr. Williams
> >
> > I am an engineer with the Wisc. DNR that deals with many of the ethanol
> > plant reviews. With regard to silt content, we have just begun
> > including silt loading factors within our permits, and those issued or
> > proposed recently have had values high enough (3.0 g/m2) that no formal
> > routine monitoring or testing has been conducted as yet.
> >
> > I am not aware of any tests of emissions from wet distillers grain. I
> > believe that there have been tests of baghouse controls of dried
> > distillers grain handling processes, but these are not tests of
> > emissions from the DDGS itself, but from the baghouse controls.
> >
> > You or a representative are welcome to view and/or request copies of
> > specific records (for which there are copying costs either through us,

> > or private firms which have approval to conduct copying), but we cannot
> > conduct a search of all of the records of ethanol plant stack tests on
> > your behalf.
> >
> > I am not involved with enforcement / compliance issues.
> >
> > Regards, Don C. Faith III, P.E.
> >
> >
> > --
> > ---
> >
> > From: john.williams3@comcast.net [mailto:john.williams3@comcast.net]
> > Sent: Sunday, February 25, 2007 11:04 AM
> > To: Urbanski, Anne - DNR
> > Subject: ethanol records request
> >
> > JOHN WILLIAMS
> > 19815 NW NESTUCCA DR.
> > PORTLAND OR, 97229
> > 503-439-9028
> > FAX-503-533-4082, CELL-503-310-0875
> > john.williams3@comcast.net,
> > February 24, 2007
> > BY E-MAIL TO:Anne.Urbanski@dnr.state.wi.us Dear Ms. Urbanski:
> >
> > I would like to obtain copies of the following documents from your
> > agency.
> >
> > 1. Typically, air permits to ethanol plants require the facilities to
> > limit their dust emissions from the site's paved areas, using
> > assumptions about the silt content on those areas. I am seeking copies
> > of any actual tests, samplings or monitoring results conducted to
> > determine the silt deposition on paved areas of ethanol plants, and the
> > resulting particulate emissions from fugitive road dust generated by
> > vehicle traffic at the ethanol plant site.
> >
> > 2. Any actual tests, samplings or monitoring results conducted to
> > determine the emissions from bulk quantities of wet or dry Distillers

> > Grain Solids stored at ethanol plants.
> >
> > 3. Copies of any pollution violations notices issued to ethanol plants
> > in your state since January 1, 2006 for air, water or waste violations.
> >
> > I am willing to pay reasonable costs. Please tell me in advance if
> > costs will exceed $200.
> >
> > Yours, John Williams
>
>

From: "Faith III, Don C - DNR" <Don.FaithIII@Wisconsin.gov>
To: <john.williams3@comcast.net>
Subject: RE: FW: ethanol records request
Date: Tue, 3 Apr 2007 21:56:46 +0000
Content-Type: Multipart/alternative;
 boundary="NextPart_Webmail_9m3u9jl4l_9139_1179855570_1"

Mr. Williams,

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Functionally, the 0.6 g/m2 results in about 1/2 of the fugitive emissions of the 3.0 factor (due to an exponent within the formula).

We have just begun incorporating these factors within the permits, based on the experiences related to us by other states, but don't have any quantitative measures of this factor as yet. The facilities have been using these factors within their calculation of fugitive dust emissions even before we were examining them, but now the permits note that emissions calculations are based on the values chosen by the facility, and they can be measured, to confirm that the facility is a synthetic minor source as proposed.

I suggest that you also review the EPA AP-42 chapter and related information that deals with this issue.

Don C. Faith III, P.E.

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To: Faith III, Don C - DNR
Subject: Re: FW: ethanol records request

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John Williams
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> believe that there have been tests of baghouse controls of dried
> distillers grain handling processes, but these are not tests of
> emissions from the DDGS itself, but from the baghouse controls.
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> You or a representative are welcome to view and/or request copies of

> specific records (for which there are copying costs either through us,
> or private firms which have approval to conduct copying), but we cannot
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> ---
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> From: john.williams3@comcast.net [mailto:john.williams3@comcast.net]
> Sent: Sunday, February 25, 2007 11:04 AM
> To: Urbanski, Anne - DNR
> Subject: ethanol records request
>
> JOHN WILLIAMS
> 19815 NW NESTUCCA DR.
> PORTLAND OR, 97229
> 503-439-9028
> FAX-503-533-4082, CELL-503-310-0875
> john.williams3@comcast.net,
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> vehicle traffic at the ethanol plant site.
>
> 2. Any actual tests, samplings or monitoring results conducted to

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> Grain Solids stored at ethanol plants.
>
> 3. Copies of any pollution violations notices issued to ethanol plants
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>
> I am willing to pay reasonable costs. Please tell me in advance if
> costs will exceed $200.
>
> Yours, John Williams

Attachment #6

b. each instance when a control measure, that was to be implemented as a result of an inspection, was not implemented.

E. Testing Requirements

1. Compliance with the emissions limitations in Section A.1 of these terms and conditions shall be determined in accordance with the following methods:

a. Emission Limitation
Fugitive PE shall not exceed 12.9 tons per rolling 12-month period.

Applicable Compliance Method
Compliance for paved roadways and parking areas TPY shall be demonstrated by calculations in AP-42 section 13.2.1 (November 2006). Compliance has been demonstrated using inputs representing Potential To Emit (PTE) conditions as follows:

$$E = [k(sL/2)^{0.65} (W/3)^{1.5} - C](1-P/4N)$$

where
E= size-specific emission factor (lb PE/vehicle mile traveled (VMT)
k= particle size multiplier= 0.082
sL= silt content of road surface material (g/m^2)= 5 g/m^2
W= mean vehicle weight (tons)= 22.5
C= emission factor for 1980s vehicle fleet exhaust, brake wear and tire wear= 0.00047 lb/VMT
P= number of wet days per averaging period with at least 0.01 inches of precipitation= 100
N= number of days per averaging period= 365

Using the values in the above equations, the PE factors were used to calculate emissions as follows:

E (paved)= 2.85 lb PE/VMT

To calculate the allowable emissions, multiply the emission factor by VMT/yr (18,125) and apply a control factor of 50 % for roadway sweeping, to obtain the annual PE rates:

Total PE= (2.85 lb/VMT)x(18,125VMT/yr)/(2000lbs/ton)= 12.9 TPY

b. Emission Limitation
No visible particulate emissions except for one minute during any 60-minute period

Attachment #7

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

APR -5 2005

MEMORANDUM

SUBJECT: Implementation of New Source Review Requirements in PM-2.5 Nonattainment Areas

FROM: Stephen D. Page
Director

TO: See Addressees

What is the purpose of this memorandum?

This memorandum provides guidance on the implementation of the major New Source Review (NSR) provisions under title 1, Part D of the Clean Air Act (Act) in fine particulate (PM-2.5) nonattainment areas in the interim period between the effective date of the PM-2.5 National Ambient Air Quality Standard (NAAQS) designations (April 5, 2005) and when we promulgate regulations to implement nonattainment major NSR for the PM-2.5 NAAQS. This memorandum also re-affirms the Memorandum from John S. Seitz, Director Office of Air Quality Planning and Standards, to Regional Air Directors, *Interim Implementation of New Source Review for PM2.5* (Oct. 23, 1997) that applies in Prevention of Significant Deterioration of Air Quality (PSD) programs for PM-2.5 attainment and unclassifiable areas.

Why are we issuing this memorandum?

On January 5, 2005, we promulgated nonattainment designations for the PM-2.5 NAAQS. These designations become effective on April 5, 2005. *See* 70 FR 944. Under Section 172(b) of the Clean Air Act (Act), the Administrator may provide States up to 3 years from the effective date of designations to submit State Implementation Plan (SIP) revisions meeting the applicable nonattainment requirements. In the near future, we plan to issue a proposed and final rule setting forth the schedule for these plan submissions. We also plan to establish the requirements that State and local agencies (States) and Tribes must meet in their implementation plans for attainment of the PM-2.5 NAAQS including provisions to address the major NSR requirements of title I, Part D of the Act (nonattainment major NSR program). Notwithstanding the absence of these implementing regulations, we interpret Section 172(c)(5) of the Act to require States to issue major New Source Review (NSR) permits for the construction and major modifications of major stationary sources located in any nonattainment area. Accordingly, once nonattainment designations for PM-2.5 become effective on April 5, 2005, States must issue major NSR permits that address the Section 173, nonattainment major NSR requirements for PM-2.5. We are issuing this memorandum to address how States should implement major NSR for PM-2.5 until we promulgate the PM-2.5 implementation rule.

Internet Address (URL) • http://www.epa.gov

What applies in PM-2.5 nonattainment areas?

During the SIP development period, EPA generally requires States to issue major NSR permits using the authority of States' approved nonattainment major NSR programs (to the extent these provisions apply automatically to the pollutant) or using the authority of 40 CFR Part 51, Appendix S (where a State lacks a nonattainment major NSR program covering the pollutant.) [1] However, in this case, the absence of a final PM-2.5 implementation rule makes administering a PM-2.5 nonattainment major NSR program infeasible. Accordingly, until we promulgate the PM-2.5 major NSR regulations, States should use a PM-10 nonattainment major NSR program as a surrogate to address the requirements of nonattainment major NSR for the PM-2.5 NAAQS. By applying a PM-10 nonattainment major NSR program in the interim period, States will effectively mitigate increases in PM-2.5 emissions and protect air quality because PM-2.5 is a subset of PM-10 emissions.

Using the surrogate PM-2.5 nonattainment major NSR program, States should assume that a major stationary source's PM-10 emissions represent PM-2.5 emissions and regulate these emissions using either Appendix S or the State's SIP-approved nonattainment major NSR program for PM-10. In most cases, we believe that States will need to rely on Appendix S for authority to issue permits during this interim period, because their existing State programs are not designed to accommodate the surrogate PM-2.5 nonattainment major NSR program.[2] Moreover, we expect that most States will need to implement a transitional PM-2.5 nonattainment major NSR program under Appendix S even after we finalize the PM-2.5 implementation rule until EPA approves changes to the States' SIP programs.

What is the major stationary source threshold and offset ratio under the surrogate PM-2.5 nonattainment major NSR program?

Section 302(j) defines a major stationary source as any source that emits or has the potential to emit 100 tpy of any regulated pollutant, and Section 173(c) of the Act requires major stationary sources to offset emissions increases resulting from construction or major modifications in a ratio of at least 1 to 1. Appendix S and the majority of SIP-approved PM-10 nonattainment major NSR programs apply this major source threshold and corresponding offset requirement. Accordingly, these provisions should be used to define the major stationary source threshold and offset ratio for the surrogate PM-2.5 nonattainment major NSR program. This means that during the interim period, a source is major for PM-2.5 if it emits or has the potential

---

[1] The terms of 40 CFR 52.24(k), Appendix S of Part 51 provide provisions for a transitional nonattainment major NSR program until we approve a State's Part D major NSR program into the SIP.

[2] If a State lacks authority to issue a major NSR permit consistent with these requirements, then EPA will issue the permit under the authority of 40 CFR 52.24(k) and Appendix S.

to emit 100 tpy of PM-10.[3] A State that uses its SIP-approved PM-10 program as a surrogate PM-2.5 program need not apply the separate major stationary source level for serious PM-10 nonattainment areas in the surrogate PM-2.5 program. We do not interpret the specific PM-10 requirements of Part D, Subpart 4 of the Clean Air Act to apply to PM-2.5 and do not believe they should be applied under a surrogate PM-2.5 nonattainment major NSR program.

For any major stationary source whose particulate emissions are predominantly coarse particulate (particulate matter that ranges in size between PM-10 and PM-2.5), assuming that all of the source's PM-10 emissions represent the source's PM-2.5 emissions could inappropriately trigger nonattainment major NSR for PM-2.5. To avoid such an outcome, a source may quantify its PM-2.5 fraction. One approach is to apply two test methods in series - Conditional Test Method 40 (which adds a PM-2.5 cyclone separator between the Method 201A cyclone and filter) followed by the Method 202 sampler to collect condensible materials. The sum of the PM mass in these two fractions (i.e., the Conditional Test Method 40 filterable mass plus the Method 202 condensible mass) represents the primary PM-2.5 emissions from the source for the test period. Under appropriate circumstances (e.g., construction of a new unit, where it is not possible to conduct testing prior to start up), testing of similar existing units can be an appropriate means of obtaining relevant emissions data. Also, other approaches for quantifying PM-2.5 emissions besides the testing methods described above would be considered where they can be shown to produce reliable data.

If the source demonstrates that it is not a major stationary source for PM-2.5, then the nonattainment major NSR provisions for PM-2.5 need not be applied to the source. Conversely, if a source is major for PM-10 and does not quantify its PM-2.5 emissions, then States should presume that the source is major for PM-2.5 and subject it to the surrogate PM-2.5 nonattainment major NSR program if it constructs a major stationary source or undergoes a major modification.

What is the significant emissions rate for the surrogate PM-2.5 nonattainment major NSR program?

On July 1, 1987, we established a significant emissions rate for PM-10 of 15 tpy. *See* 52 FR 24683. States should use this rate for the surrogate PM-2.5 program. At the time we established the 15 tpy significant emissions rate, we amended only our PSD regulations to incorporate the PM-10 value because the PM-10 NAAQS did not yet apply to nonattainment areas. Nonetheless, we established the PM-10 significant emissions rate through notice and

---

[3] The definition of PM-10 includes condensible particulate matter. For a detailed discussion of condensible particulate matter, see the General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990 (April 16, 1992, 57 FR 13542).

comment rulemaking; and, accordingly, the same value should apply for PM-10 under Appendix S and State SIP-approved programs in the interim period.[4]

Will any precursors be regulated under the surrogate PM-2.5 nonattainment major NSR program?

Not at this time. Section 302 (g) includes precursors to the formation of any air pollutant within the term "air pollutant" to the extent the Administrator identifies the precursors for the particular purpose for which the term "air pollutant" is used. To date, the Administrator has not identified any precursors to the formation of PM-2.5 for purposes of the major NSR program. On November 5, 2003, the Administrator proposed to require that regional emissions analysis for the purposes of transportation conformity under Section 176(c) of the Act include certain precursors (68 FR 62690). In the Clean Air Interstate Rule, we require states to reduce emissions of NOx and SO2 on the grounds that they are precursors for PM-2.5. However, several novel issues need to be resolved before the NSR program can be applied to PM-2.5 precursors (e.g., how many SO2 or NOx offsets will be needed to accommodate the fine particles formed by these constituents; can SO2 emissions reductions be used to offset NOx emissions, and vice versa). We plan to request comment on regulating these pollutants and other potential PM-2.5 precursors for purposes of major NSR in the PM-2.5 implementation rule.

What major NSR requirements apply in PM-2.5 attainment and unclassifiable areas?

The revised NAAQS for particulate matter, which include the revised NAAQS for PM-10 and new NAAQS for PM-2.5, became effective on September 16, 1997. On October, 23, 1997, we issued a memorandum addressing the interim use of PM-10 as a surrogate for PM-2.5 in meeting Prevention of Significant Deterioration of Air Quality Program (PSD) provisions for PM-2.5 as required by title 1, Part C of the Act. *See* Memorandum from John S. Seitz, Director Office of Air Quality Planning and Standards, to Regional Air Directors, *Interim Implementation of New Source Review for PM2.5* (Oct. 23, 1997). This memorandum referenced provisions of Part C of the Act which we interpret to require PSD permits for PM-2.5 upon the effective date of the PM-2.5 NAAQS, and identified significant technical difficulties with implementing PSD for PM-2.5 because of limitations in ambient monitoring and modeling capabilities. Because we have not promulgated the PM-2.5 implementation rule, administration of a PM-2.5 PSD program remains impractical. Accordingly, States should continue to follow the October 23, 1997, guidance for PSD requirements.

This memorandum presents EPA's policy on the implementation of major NSR requirements until EPA promulgates a final PM-2.5 implementation rule. The statements in this policy guidance do not bind State and local governments and the public as a matter of law.

---

[4] We intend to issue a final rule adding a PM-10 significant emissions rate of 15 tpy to Appendix S in a forthcoming rulemaking.

If you have any questions concerning this memorandum, please contact Raj Rao at (919) 541-5344, or Lynn Hutchinson at (919) 541-5795.

Addresees:
Michael Kenyon, Region 1
Walter Mugdan, Region 2
Judith Katz, Region 3
Beverly Bannister, Region 4
Stephen Rothblatt, Region 5
Carl Edlund, Region 6
William Spratlin, Region 7
Richard Long, Region 8
Deborah Jordan, Region 9
Rick Albright, Region 10

cc:
Bill Harnett
Racqueline Shelton
Lydia Wegman
Richard Damberg
Brian Doster

Attachment #8

Ms. Mary A. Gade
Sonnenschein Nath and Rosenthal LLP
8000 Sears Tower
238 South Wacker Drive
Chicago, IL 60606

Dear Ms. Gade:

Thank you for your letter of December 10, 2003, to Ms. Walker Smith, Director of Office of Regulatory Enforcement (ORE), concerning the use of volatile organic compound (VOC) measurement methods for the corn wet milling industry. You requested the Environmental Protection Agency's (EPA) position on the status of the draft Midwest Scaling Method (which we now refer to as the Midwest Scaling Protocol, as described below), and also a statement on EPA's policy regarding compliance with permit emissions limits that are based on EPA reference methods and the use of promulgated EPA methods specified in permits.

First and foremost, to comply with the requirements of the New Source Review (NSR) program or the Title V operating permitting program under the Clean Air Act, the owner/operator of an emissions source must calculate the total emissions of criteria and hazardous air pollutants to determine the applicability of these programs. It is the responsibility of the owner/operator of the source to do so and to use a protocol that accurately measures the mass emissions. With regard to VOC's, emissions must be calculated on a total VOC mass basis ("as VOC basis"), not on the basis of a surrogate such as "mass as carbon" or "mass as propane" [see definition of VOC at 40 CFR 51.100(s)]. One cannot determine the applicability of a regulation under NSR and Title V unless the emissions are reported as VOC(s). In addition, for the purposes of reporting an annual total VOC emissions to the State or local agencies and the EPA, the total VOC mass must be identified.

The test methods in 40 CFR 60, Appendix A for measuring VOC emissions (e.g., Method 25/25A) do not directly address the issue of reporting VOC emissions "as VOC." Furthermore, these methods must be modified or an additional method must be added to measure the actual mass of VOC's emitted. Such modifications or alternative methods are allowed as specified in the excerpt of the regulation below:

> *Minor changes in the test methods should not necessarily affect the validity of the results*

> *and it is recognized that alternative and equivalent methods exist. Section 60.8 provides authority for the Administrator to specify or approve (1) equivalent methods, (2) alternative methods, and (3) minor changes in the methodology of the test methods.*

We developed the draft Midwest Scaling Protocol (MSP)[1] to help members of the ethanol producing industry determine their VOC mass emissions. The draft MSP is a generally acceptable protocol based on data and experience from the ethanol producing industry and contains the steps necessary to convert VOC emissions measured using Method 25 or 25A to "as VOC" mass emissions. It is comprised largely of the EPA methods with appropriate modifications in accordance with 40 CFR Part 60, Appendix A. The draft MSP is currently under public review and comment. It is intended to be advisory in nature. Owner/operators of sources for which the draft MSP is applicable may propose to use it when conducting a test for compliance and applicability determinations. Assuming a successful test, EPA will generally accept that the emissions are adequately quantified for regulatory purposes.

There might be other procedures, including scaling methods, that can be used to quantify the total mass of VOCs emitted from your industry that could also be approved by the EPA. One example might be Test Method 320, *Measurement of Vapor Phase Organic and Inorganic Emissions by Extractive Fourier Transform Infrared Spectroscopy (FTIR)* (see 40 CFR 63, Appendix A). This method uses FTIR to measure certain organic compounds on an individual basis. The individually measured organic compounds can then be summed to produce the total VOC mass, assuming that each VOC in the emissions stream can be measured with FTIR within adequate limits of detection. Similarly, EPA Method 18 (40 CFR 60, Appendix A), in which gas chromatography is used to isolate individual organic compounds prior to measuring them, can be used to measure total VOCs if the quality assurance steps are sufficient to quantitatively measure all of the individual organic compounds. As you are aware, we are currently working with the Corn Refiners Association (CRA) to investigate the feasibility of a method for that industry. As we have suggested with the MSP, a facility may also propose to modify existing test methods or develop new test methods as alternatives to existing test methods. If a facility submits an alternative test method request to your office, you should forward the request to the Office of Air Quality Planning and Standards for review and approval.

If the owner/operator of a source has used only Method 25 or 25A to determine the applicability of NSR or Title V without appropriate modifications or use of an additional approved method to determine the "as VOC" mass emissions, then the VOC emissions may be substantially underestimated and the owner/operator may not be in compliance with those programs. Owner/operators who are in this situation should estimate their "as VOC" mass emissions as soon as possible. To the degree that an owner/operator identifies that he or she may not be in compliance with NSR and/or Title V, then contact should be made with EPA's appropriate Regional Office or ORE to resolve any such issues. As of the date of this letter,

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[1] This procedure, which we originally called the "Midwest Scaling Method," is now referred to as the Midwest Scaling Protocol (MSP). To avoid confusion some have expressed regarding the term "method."

owners/operators who disclose this information expeditiously will have the same opportunities as are described in the recent settlements with the ethanol producing industry (see for example, www.epa.gov/compliance/civil/programs/caa/ethanol).

Regarding the existing emission limits in permits related to Federal or State and local standards, as noted in 51.100(s)(2), it is appropriate to base those limits and the compliance method in the permit on the reference method that was used in setting the standard. Title 40 CFR section 51.100(s)(2) states: "For purposes of determining compliance with emission limits, VOC will be measured by the test methods in the approved [SIP] . . . ." For example, if a standard specified that Method 25 or 25A should be used to establish the percent reduction of a control device, it is appropriate to use only Method 25 or 25A as the compliance method in the permit because estimating the total mass of the VOC emissions is not necessary to judge compliance with such a standard. If a compliance method was not specified in the standard, then an appropriate one must be developed and approved by the permitting authority during the process of obtaining a permit. In addition, when permit limits are designed to maintain a facility's emissions below an applicable threshold (e.g., NSR), the limits should require the use of methods that quantify the actual mass of the VOC's emitted. Where such information is needed for applicability determinations and compliance, and an existing permit requires a test protocol that does not accurately identify mass emissions, the permit-holder should notify the permit authority and request a change in its test protocol.

I appreciate the ongoing work of the CRA with us on investigating alternative methods for that industry. I also appreciate this opportunity to respond to your questions, and I hope this response answers your questions. If you have additional questions on the appropriate use of different test methods, please contact Gary McAlister at (919) 541-1062. For questions related to potential compliance issues with NSR or Title V, please contact Mr. Cary Secrest of ORE at (202) 564-8661.

Sincerely,

Stephen D. Page
Director
Office of Air Quality Planning
and Standards

/s/ 12/30/2003

Attachment #9

Midwest Scaling Protocol for the Measurement of “VOC Mass Emissions”

VOC Sampling at Wet and Dry Grain Mills and Ethanol Production Facilities

U.S. Environmental Protection Agency
Office of Air Quality Planing and Standards
Office of Regulatory Enforcement

August 2004

VOC Sampling from Wet and Dry Grain Mills and Ethanol Production Facilities

Introduction

This protocol is designed to determine the actual volatile organic compound (VOC) mass emission rates from sources where significant amounts of oxygen-containing organic compounds are emitted. Either U.S. EPA Method 25 or Method 25A is used to determine the total organic compound concentration of the emission samples. The concentration data are then converted to carbon mass (or propane mass) emission rates. Simultaneously, the concentrations of the most significant individual organic compounds in the emission sample are measured with Method 18.

This protocol is designed to be used in conjunction with Methods 25 or 25A to provide accurate VOC mass emission measurements from most air emission units at grain mills and ethanol production facilities. VOC mass emissions based on concentration measurements with Methods 25 or 25A reported “as carbon” or “as propane” results in reported VOC emission rates less than the actual emissions of the VOC pollutants. The Midwest Scaling Protocol (MSP) provides a way to convert the VOC results from “as carbon,” when Method 25 is used, or from “as propane,” when Method 25A is used, to “as VOC ” emission rates.

Sources in this industry may opt to use a standard scaling factor (SF) of 2.2 pounds of VOC per pound of VOC as carbon instead of performing quantitative measurements of individual volatile organic compounds in order to derive individual scaling factors for each source. Alternatively, the MSP provides an acceptable means for the quantitative measurements of air emissions of individual volatile organic compounds from sources at grain mills and ethanol production facilities. The MSP also serves as a reference for equations used to convert VOC concentration measurements reported “as carbon” or “as propane” to actual VOC mass emissions.

The decision to use Method 25 or Method 25A to measure total VOC concentrations is source dependent. In general, Method 25 is applicable to all sources with total VOC concentrations >50 ppmC (parts per million carbon). Methane and carbon monoxide concentrations are also measured with Method 25. However, referring to Method 25A, section 1.1 of Method 25 states:

> “Direct measurement of an effluent with a flame ionization detector (FID) analyzer may be appropriate with prior characterization of the gas stream and knowledge that the detector responds predictably to the organic compounds in the stream. If present, methane (CH_4) will, of course, also be measured. The FID can be applied to the determination of the mass concentration of the total molecular structure of the organic emissions under any of the following limited conditions:
> (1) Where only one compound is known to exist;
> (2) when the organic compounds consist only of hydrogen and carbon;

(3) where the relative percentages of the compounds are known or can be determined, and the FID response to the compounds are known;
(4) where a consistent mixture of the compounds exist before and after emission control and *only* the relative concentrations are to be assessed; or
(5) where the FID can be calibrated against mass standards of the compounds emitted (solvent emissions, for example)."

The FID used in Method 25A has a depressed response to organic compounds that contain oxygen. The tester must determine, for the specific FID unit used for each test, the response factor for each organic compound that constitutes 5% or more of the total mass of the individual VOC species analyzed. A weighted average of these response factors shall be used to adjust the FID's response to the actual emission samples. The tester shall adjust the analyzer's response prior to converting the response to a mass emission rate.

If the tester uses Method 25A to measure VOC from a source where the moisture content is greater than 10%, then the tester must normally dilute the sample using the procedures in Method 205 to reduce the water content of the sample to less than 10%. The tester shall use a heated sample line to transport the sample from the stack to the analyzer to prevent condensation of water and organic compounds. At the time of this writing, at least one FID analyzer has a tolerance for moisture content up to 40%. The moisture content for which Method 205 dilution is required is analyzer-dependent.

One specific application of Method 18 for measuring the kinds of oxygen containing compounds that are most common in the emissions from grain mills is the impinger method developed by the National Council for Air and Stream Improvement, Inc. (NCASI). NCASI has designated this method as NCASI CI/SG/PULP-94.02, Chilled Impinger/Silica Gel Tube Test Method at Pulp Mill Sources for Methanol, Acetone, Acetaldehyde, Methyl Ethyl Ketone and Formaldehyde (NCASI 94.02). Water soluble organic compounds are collected in impingers filled with chilled laboratory grade water. Any target compounds that break through the chilled water are collected on organic grade silica gel. Method 18 analytical procedures, gas chromatography with flame ionization detection or mass spectrometric detection, are used to measure the target organic compounds listed in Table 1.1 that are collected in the sampling train, except for formaldehyde which is measured by a colorimetric procedure. The sample collection, recovery and preservation procedures for this specific application of Method 18 are described in Appendix B along with recommended GC/FID procedures for most target compounds. The analytical procedures to measure formaldehyde are described in Appendix C. Additional GC operating conditions may be necessary to quantify all of the water-soluble volatile organic compounds on the target list.

These data are used to calculate the weighted average ratio of the VOC molecular weight divided by the VOC carbon mass (or VOC propane mass). This SF is then used to convert the total organic carbon mass emission rate to the total VOC mass emission rate (i.e., the results are converted from "as carbon" or "as propane" to "as VOC").

It should be noted that the VOC mass emission calculation based on a conversion of Method 25 or Method 25A data using Method 18 measurements of a specific list of oxygenated organic compounds may slightly bias the true total mass VOC emission rate compared to the use of a complete set of organic compound concentrations, including all non-oxygenated hydrocarbons. The source is allowed, at its discretion and with the EPA's approval, to perform additional sampling and analysis to quantify the concentrations of other hydrocarbon compounds, including non-oxygenated compounds, and use the overall average molecular weight for all quantified organic compounds in the calculations discussed below. Failure to conduct additional testing indicates that the source accepts the oxygenated organics weighted average molecular weight to carbon weight ratio as representative of the actual average molecular weight to carbon weight ratio of all organic compounds present in the emissions from the specific unit being tested.

1.0 Scope and Applicability.

1.1 Analytes. The analytes in Table 1.1 must be measured from each source being tested. These compounds have been found to comprise the bulk of the identified VOC emitted from sources at grain mills and ethanol production facilities.

Analyte	CAS Number	Interference-Free Analytical Sensitivity
Total Organic Compounds	NA	M25A ~3 ppmC, M25 ~50 ppmC
Acetaldehyde	75070	~ 1 ug/ml
Acetic Acid	64197	~ 1 ug/ml
Ethanol	64175	~ 1 ug/ml
Formaldehyde	50000	~ 1 ug/ml
Formic Acid	64186	~ 1 ug/ml
2-Furaldehyde	98011	~ 1 ug/ml
Methanol	67561	~ 1 ug/ml

1.2 Applicability. This protocol is applicable to determining the actual VOC mass emission rates from sources at grain mills and ethanol production facilities.

1.3 Data Quality Objectives. The quality of the data needed is determined by the needs of the data user. If the test using this protocol is required as part of a regulatory process and if the tester follows and meets the performance criteria in the protocol, including all Method 18 spike requirements, it is presumed that the MSP produces data of suitable quality to determine compliance with that regulation. The performance criteria in the protocol are set at levels that an operator properly using well designed equipment will consistently attain or exceed. However, because the protocol allows different options to comply with some of the performance criteria, it is the responsibility of the owner or operator of the emission unit, as the data provider, to identify the specific requirements in the protocol that were followed and document that the protocol's performance criteria were met, or to identify deviations as an exception to the protocol. The regulatory agency is considered the data user and, therefore, is entitled to make the final assessment of data quality.

For the purpose of determining only the SF to be used in calculating VOC mass emissions, the spike requirements of Method 18 may be replaced with an analytical spike set consisting of one low concentration and one high concentration spike sample. These alternate spike samples shall be prepared in the field by spiking the first impinger of the sample collection train and drawing a measured amount of hydrocarbon-free air through the impinger train equivalent to the nominal sample volume. The spike samples shall be recovered and analyzed using the same procedures as those used to recover and analyze the source samples.

2.0 Summary of Protocol. Total organic emissions are measured based on the carbon content of the sample. The list of individual organic compounds that are present in significant quantities are measured individually by Method 18 (using the specific application described in Appendix B) and used to convert the total carbon based measurements to a true VOC mass.

3.0 Definitions. Use the definitions as specified in the following methods.

3.1 EPA Methods. These are methods found in 40 CFR Part 60, Appendix A, and 40 CFR Part 51, Appendix M.

3.1.1 Method 25 — Determination Of Total Gaseous Non-methane Organic Emissions As Carbon

3.1.2 Method 25A — Determination Of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer

3.1.3 Method 18 — Measurement Of Gaseous Organic Compound Emissions By Gas Chromatography

3.1.4 Method 205 —Verification of Gas Dilution Systems for Field Instrument Calibrations

3.1.5 Method 5 —Determination Of Particulate Emissions From Stationary Sources

3.1.6 Method 1 — Sample And Velocity Traverses for Stationary Sources

3.1.7 Method 2 — Determination Of Stack Gas Velocity And Volumetric Flow Rate

3.1.8 Method 3A—Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure).

3.1.9 Method 4—Determination of Moisture Content in Stack Gases.

3.1.10 Method 10 —Determination Of Carbon Monoxide Emissions From Stationary Sources

3.1.11 Method 10B —Determination Of Carbon Monoxide Emissions From Stationary Sources

4.0 Interference. Interference as specified in the methods in Section 3 and Appendix B.

5.0 Safety. Follow the safety precautions as specified in the methods in Section 3 and Appendix B.
Note that some sources and some areas of grain processing and ethanol production facilities may be fire or explosion hazards. Use appropriate caution and selection of sample collection procedures.

6.0 Equipment and Supplies. Equipment and supplies as specified in the methods in Section 3 and Appendix B.

7.0 Reagents and Standards. Reagents and standards as specified in the methods in Section 3 and Appendix B, with the following exception:

7.1 For Method 25A, obtain a calibration standard of all individual target analytes in Section 1.1 and/or other target analytes found in screening tests at significant levels (>5% of the total VOC). The standards shall be within the range of 25 % to 200 % of the expected concentration of the individual compound. These calibration standards will be used to develop response factors for each individual compound. These gases shall meet the specifications of Section 7.1 of Method 25A.

8.0 Sample Collection, Preservation, Storage and Transport.

8.1 Test Protocol (TP). The procedures in Appendix A, entitled "A Guide for Stack Test Protocol Development and Submittal For VOC Emission Tests at Grain Processing and Ethanol Production Facilities," shall be used to assure consistency and adequacy. Failure to submit a complete TP could add cost and time due to postponements or additional submittals of the TP.

8.2 Operating Conditions. For the entire period of its performance test, each affected source shall operate at 90% to 100% of its maximum achievable capacity or its allowable/permitted capacity under representative conditions while maintaining safe and stable load conditions using the highest emitting fuel (normal power sources) and processing typical material resulting in normal product. Operational parameters shall be recorded at 15-minute intervals during the test to substantiate the load. The inlet and outlet gas temperatures of the dryers, syrup addition feed rate and solids content, wet cake feed rate (e.g. tons/hour) shall be recorded during the test.

8.3 The samples shall be collected using the following parameters:

8.3.1 Sources Without Entrained Water Droplets or Aerosols. If the tester intends to use procedures for sources that do not have entrained water droplets, the tester shall conduct a visual inspection and a saturation test of the exhaust gases immediately prior to testing to demonstrate the stack gas is not saturated. A saturation test consists of measuring the moisture content of the exhaust gases using Method 4 and comparing the measured moisture results to tabulated values for moisture content at 100 % relative humidity at the average temperature of the stack gas. If the measured moisture content exceeds the moisture content from the tabulated values, then the stack gas shall be considered to be saturated and to contain water droplets. If the stack gas does not contain water droplets or visible aerosols, collect the samples directly from the stack gas using the procedures in Method 25 or Method 25A and Method 18 as described in Appendix B. Use appropriate caution and unheated sample trains when collecting samples from explosion or fire hazard rated sources regardless of aerosol or water droplet content.

The need for unheated sample trains may dictate the requirement for using Method 25 if the Method 25A sample train would be subject to sample condensation.

8.3.2 Sources That Contain Entrained Water Droplets. If the stack gas contains entrained water droplets, the sample shall be extracted directly from it using the isokinetic sampling procedures described in Method 5 with the exception that the sample shall be drawn from a single representative point, preferably near the center of the stack or duct. Use Method 1 to determine the appropriate sampling location. The tester shall maintain the probe and filter of the Method 5 sampling train at 250° F ± 25° F. Between 20 and 30 dry standard cubic feet (dscf) shall be drawn through the Method 5 sampling train over a one-hour period for each of the three runs.

Use two stainless steel compression fittings behind the filter in the heated filter box of the Method 5 sampling train to withdraw the sample for the total organic compound quantification test (Method 25 or 25A) and for the individual organic compound analysis (Method 18 as described in Appendix B). Place a valve between the Method 5 and the Method 25 or 25A sampling system, and between the Method 5 and the Method 18 sampling systems to isolate each of the sampling systems for leak checks. The tester shall account for the amount of sample diverted to the total organic quantification test and to the Method 18 sampling trains when calculating the isokinetic sampling rates. Method 25 samples require ~5 dry standard liters (~0.2 dscf) per sample, and the Method 18 train requires ~30 dry standard liters (~1.1 dscf) per sample. Method 25A analyzers have different flow requirements and must be determined individually.

8.4.3 All Sources. Measure stack gas velocity according to the procedures in Methods 2 and 3 at the beginning and the end of each test. Measure the moisture content of the stack during each test according to the procedures in Method 4. If the moisture content of the sample stream is greater than 10% (or as otherwise specified for the specific FID used) and if the tester is measuring total organic compounds by Method 25A, the tester shall use the procedures in Method 205 to dilute the sample to reduce the moisture content to within the linear and unbiased operating range of the FID. The tester shall conduct cyclonic flow tests prior to the commencement of testing at all sampling locations. If cyclonic flow is determined, appropriate corrections must be conducted.

8.4.4 Dryers and Combustion Sources. Measure the carbon monoxide content of emissions from dryers and combustion sources using the procedures in Method 10 or Method10B.

8.5 Sample Recovery.

8.5.1 If using Method 25 for the total organic compound quantification test, follow the procedures in that method to recover the sample, store it and transport it to the laboratory.

8.5.2 Follow the recovery procedures in Method 18 as described in Appendix B with the following exception: If the tester uses an empty impinger as the final impinger in the sample train to collect any carryover impinger solution due to high moisture content in the stack, the tester shall recover any liquid in the final impinger and treat it as part of the sample. The tester may combine this recovered liquid with the sample from the impinger immediately in front of the final impinger or may recover it in a separate container.

9.0 Quality Control. Follow the quality control procedures as specified in the methods in Section 3 and Appendix B.

10.0 Calibration and Standardization. Follow the procedures for calibration and standardization as specified in the methods in Section 3 and Appendix B with the following exceptions:

10.1 For Method 25A, the tester shall determine the response factor of the actual instrument used for measuring the total organic compound concentration to each of the individual compounds in Section 1.1 that comprise >5% of the identifiable VOC in the sample. The response factor shall be determined by the instrument's response to the calibration gas used during the emissions test. The tester may determine the response factor in the laboratory, at the test site prior to the testing, or in the laboratory within 45 days after the first day of the testing provided that the instrument has not been modified or repaired in the interim. The response factor shall not be acceptable if the instrument is modified, repaired or adjusted between the test date and the date that the response factors are determined. After the tester has determined the response factor for an individual instrument, the tester may use this response factor for other tests on the same emission unit using the same instrument until the instrument is modified or repaired.

Immediately prior to determining the response factors, the tester must introduce zero gas and high-level calibration gas at the calibration valve assembly. The analyzer output shall be adjusted to the appropriate levels, if necessary. The predicted response as carbon shall be calculated for the compound for which a response factor is being determined by multiplying the concentration of the compound by the number of carbon atoms in each molecule of the compound. Then, the tester shall introduce the calibration gas to the measurement system, record the analyzer response, and calculate the response factor using the equation in Section 12.7.

11.0 Analytical Procedure. Follow the analytical procedures as specified in the methods in Section 3 and Appendix B.

12.0 Calculations and Data Analysis. Follow the calculation and data analysis procedures as specified in the methods in Section 3 and Appendix B with the following additions:

12.1 Scaling Factor, SF. Calculate the scaling factor using the following equation.

$$SF = \sum_{i=1}^{N} \frac{MW_i}{MWC_i} \times MFC_i \qquad \text{Equation 1}$$

Where

SF = Factor used to correct mass as carbon to “as VOC” or actual mass (expected to be 1.9-2.6)
N = Total number of compounds
MW_i = Molecular weight of compound i
MWC_i = Molecular weight of carbon per mole of compound i
MFC_i = Mole fraction of carbon contributed by compound i

12.2 Mole Fraction of Carbon.

$$MFC_i = \frac{m_{Ci}}{\sum_{i=1}^{N} m_{Ci}} \qquad \text{Equation 2}$$

Where

m_{Ci} = Milligrams of carbon contributed by compound i in the Method 18 sample.

12.3 Mass of Carbon Contributed by Each Compound.

$$m_{Ci} = m_i \times \frac{MW_{Ci}}{MW_i} \qquad \text{Equation 3}$$

Where

m_i = Milligrams of compound i in the Method 18 sample

12.4 Actual Mass Concentration VOC in the Sample Gas. Calculate the actual mass concentration of VOC in the sample gas from the measured VOC concentration as carbon using the following equation.

$$m_a = m_c \times SF \qquad \text{Equation 4}$$

Where

m_a = Actual mass concentration of VOC in the sample
m_c = Measured carbon mass concentration of VOC in the sample, mg/dscm.

12.5 Carbon Mass in the Sample Based on Method 25A Measurement. For Method 25A, calculate the carbon mass in the Method 25A measured sample using the following equation.

$$m_c = 0.4993\ C\ x\ RF_{ave} \qquad \text{Equation 5}$$

Where

m_c = Organic concentration as carbon, ppmv from Method 25A.
RF_{ave} = Weighted average response factor from Equation 6.

12.6 Average Response Factor for Method 25A. Calculate the weighted average response factor, RF_{ave}, for Method 25A using the following equation.

$$RF_{ave} = \frac{\sum_{i=1}^{N} C_i}{\sum_{i=1}^{N} C_i / RF_i}$$ Equation 6

Where

C_i = Concentration in ppm carbon of organic compound i
RF_i = Response Factor of organic compound i

12.7 Response Factor for Individual Compounds. Calculate the response factor for individual organic, RF_i, compounds using the following equation.

$$RF_i = \frac{C_{ci}}{C_{mi}}$$ Equation 7

Where

C_{ci} = Concentration in ppmv carbon of organic compound i as certified by the manufacturer of the standard
C_{mi} = Measured concentration in ppm carbon of organic compound i from Section 10.1

Appendix A

A Guide for
Stack Test Protocol Development and Submittal
For VOC Emission Tests at Grain Processing and Ethanol Production Facilities

PROTOCOL DEVELOPMENT

A detailed protocol, describing all test equipment, procedures, and quality assurance (QA) measures to be utilized, will help ensure that a complete and representative stack test is performed. The protocol must be specific for the test, facility, operating conditions, and parameters to be measured. Adherence to the protocol should eliminate unnecessary delays and costs in the performance of the test, whether the work is done in-house or by a consultant.

The term "tester" will be used to refer to the individual(s) performing the emission test, whether in-house or a consultant. The tester should make at least one on-site inspection of the emission point(s), testing ports, stack access and other parameters in order to prepare the protocol.

The following provides specific guidance pertinent to the major elements of the stack test protocol.

1. Project Description

Provides a general description of the project. This should include sufficient detail to allow those individuals responsible for review and approval to perform their tasks. Where appropriate, the following shall be included:

a. Intended end use of the acquired data.

b. Dates anticipated for the beginning and the completion of testing.

c. Description of plant processes and control equipment, including flow diagrams and permitted, or maximum achievable, process rates.

d. Description of plant operating conditions, including but not limited to production rate, fuel rate, process data (including relevant temperatures and/or flow rates), and pollution control operational data.

e. Proposed operation during the stack test . Unless approved or specified by U.S. EPA or the applicable state agency, the test will be deemed unacceptable if the relevant process(es) are operated at less than 90% of maximum capacity.

f. List of operating and emission parameters to be measured during the test, typical operating ranges for these parameters, and the maximum ranges for these parameters.

2. Project Organization and Responsibility

Include a table or chart showing the project organization and line of authority. List the key individuals, including the Quality Assurance Officer (QAO), who are responsible for ensuring the collection of valid measurement data and the routine assessment of measurement systems for precision and accuracy.

3. QA Objectives for Measuring Data

All measurements must be made to ensure that results are representative of the normal, or permitted, maximum operating conditions of the facility. Data quality objectives will be determined for each measurement and compared with the requirements for the specific project. This will ensure that the data collected will be appropriate for their intended use.

4. Sampling Procedure

For each major measurement parameter, provide a description of the sampling procedures to be used. Officially approved EPA procedures and Reference Methods should be used where applicable. The protocol should include the following:

a. A stack diagram showing test ports, their distances from upstream and downstream disturbances, the stack diameter, planned sampling equipment and monitoring locations.

b. The proposed method for the determination of the presence and quantification of cyclonic flow.

c. The proposed number of sample flow measurement points and the total sample volume.

d. A detailed description of all sampling, sample recovery, and analytical procedures. In the case of non-standard procedures or modifications to standard procedures, the entire procedure should be described with justifications and necessary data for backup. Options offered by the Reference Method should be selected and justified.

e. Any special conditions for the preparation of the sampling equipment and containers to avoid sample contamination.

f. Samples of forms to be used to record sample history, sampling conditions, and plant operating conditions.

g. The methodology for measurement of plant and pollution control device operating conditions.

h. If more than one sampling train is to be used, a detailed description of the relevant sequencing and logistics.

i. If Continuous Emission Monitors (CEMs) are to be used, a detailed description of the operating and data logging procedures.

5. Sampling Procedures for Ethanol Production Facility Dryers

The protocol for the emission test should include the following test methods to accurately characterize the VOC emissions from dryers:

Test Methods -

USEPA Method 1: Sampling Location and Cyclonic Flow Determination
USEPA Method 2: Stack Gas Velocity and Volumetric Flow Rate
USEPA Method 3: Stack Gas Molecular Weight
USEPA Method 4: Stack Gas Moisture Content
USEPA Method 18: Gas Chromatography

The preferred application of Method 18 based on similar sources is the NCASI Method CI/SG/PULP-94.02: Chilled Impinger/Silica Gel Tube Test Method at Pulp Mill Sources for Methanol, Acetone, Acetaldehyde, Methyl Ethyl Ketone and Formaldehyde

USEPA Method 25: Determination of Total Gaseous Non-Methane Emissions as Carbon
USEPA Method 25A: Determination Of Total Gaseous Organic Concentration Using A Flame Ionization Analyzer

Location - Sampling shall be performed at the exit of each stack. If the stack has a control device for VOC emissions, sampling shall occur before and after the control device where applicable and consistent with the Project Description listed above.

Isokinetics - Sample shall be drawn isokinetically from a single representative point for all methods in any stack that contains uncombined water or organic aerosols.

Detection Limits - The limits of detection for each targeted compound and for total VOC shall be calculated in Kg/hr and/or lbs/hr.

6. Sample Custody

Sample custody is a part of any good laboratory or field operation. At a minimum, the following sample custody procedures shall be addressed in the protocol:

a. Documentation of procedures for preparation of reagents or supplies that become an integral part of the sample (e.g., filters and absorbing reagents).

b. Procedures and forms for recording the exact location and specific considerations associated with sample acquisitions. As samples are transferred between individuals, the individuals should sign and date their relinquishing of, or receipt of, the samples on the Chain of Custody form.

c. Prepared sample labels containing all information necessary for effective sample tracking. Labels or custody seals should cover the sample container cap such that it would be evident if the sample was opened by a person other than the laboratory analyst.

7. Calibration Procedures and Frequency

Include calibration procedures and information for each major measurement device, including coefficients, by reference to a standard method or by providing written description. Provide the frequency planned for recalibration during the test and a list of all calibration standards, including their source and traceability. Equipment to be calibrated would include, for example, dry gas meters, orifice meters, pitot tubes, thermometers/thermocouples, nozzles, flow meters as well as all process parameter monitors. Also include a detailed description of spike preparation procedures.

8. Documentation

Include sample copies of all data log sheets and examples of any calculations that will be performed on the raw data. Note: copies of all raw data sheets, including manually and automatically recorded data (strip charts and data logger or computer printouts) will be submitted with the test report and copies must be available at the end of the day's testing.

Appendix B
Method 18 for Oxygenated Organics Other Than Formaldehyde

Introduction.

This appendix describes a specific application of the general Method 18 procedures to measure the individual oxygenated organic compounds other than formaldehyde that are required by the Midwest Scaling Protocol. Formaldehyde is collected in the same Method 18 sample, but is analyzed by a separate procedure found in Appendix C. Both this specific application of Method 18 and the formaldehyde procedure in Appendix C were developed by the NCASI and validated for their use at pulp mills. The NCASI identifies the procedure as NCASI Method CI/SG/PULP-94.02, Chilled Impinger/Silica Gel Tube Test Method at Pulp Mill Sources for Methanol, Acetone, Acetaldehyde, Methyl Ethyl Ketone and Formaldehyde.

Acknowledgment

This method was prepared by Dr. MaryAnn Gunshefski, Senior Research Scientist, and Ward Dickens, Research Associate, at the NCASI Southern Regional Center. Other assistance was provided by Terry Bousquet, Senior Research Scientist, with the NCASI West Coast Regional Center.

This specific application follows the general Method 18 procedure with the following additions to Method 18 taken directly from the NCASI Method CI/SG/PULP-94.02.

1.0 Scope and Application. Same as Method 18 with the following addition:
Stability - The stability of acetaldehyde in the impinger catch was found to be 10 days, with refrigeration at approximately 4°C. The stability of acetone, methyl ethyl ketone, and methanol was found to be 21 days, with refrigeration at approximately 4°C. The stability of acetaldehyde, acetone, methyl ethyl ketone, and methanol on the silica gel sorbent tubes was found to be approximately 10 days, with refrigeration at approximately 4°C. Once desorbed in 3% n-propanol, these same compounds are stable for up to 21 days, with refrigeration at approximately 4°C.

2.0 Summary of Method. Same as Method 18 with the following addition:
This method involves collection of an air sample by drawing it through a midget impinger, which is filled with water, and then through two 2-section silica gel sorbent tubes. The impinger is kept in an ice water bath during sampling to enhance collection efficiency. The impinger catch is analyzed for methanol, acetaldehyde, ethanol, formic acid, acetic acid, 2-furaldehyde, by direct injection into a gas chromatograph equipped with a flame ionization detector (GC/FID). The silica gel sorbent is desorbed with a 3% (v/v) solution of n-propanol. The desorbate is injected directly into the GC/FID for analysis of methanol, acetaldehyde, ethanol, formic acid, acetic acid, and 2-furaldehyde. Alternative GC procedures may be used with prior approval.

3.0 Definitions. Same as Method 18.

4.0 Interferences. Same as Method 18 with the following addition: method interferences may be caused by contaminants in solvents, reagents, glassware and other sample processing hardware. Clean all glassware by detergent washing with hot water and rinsing with tap water. The glassware should then be drained dry and baked at greater than 100°C for over 2 hours.

5.0 Safety. Same as Method 18.

6.0 Equipment and Supplies. Same as Method 18 with the following additions:

6.1.1 Sampling apparatus. A diagram of the sampling train is shown in Figure 1 (see below).

6.1.1.1 Probe/sampling line. The probe is made from Teflon tubing or stainless steel, which is then attached to the first impinger.

6.1.1.2 Impinger train. Three 30 mL capacity midget impingers are connected in series to the sampling probe. The impingers should have regular tapered stems. All impinger train connectors should be glass and/or Teflon.

6.1.1.3 Sorbent tubes Two 2-section silica gel sorbent tubes (SKC #226-15 GWS) are placed in line after the impingers.

6.1.1.4 Rotameter. A 1000 mL/min capacity rotameter should be placed in line after the silica gel sorbent tubes for a visual flow check during sampling and leak checking. The rotameter is not used to determine the actual flow rate through the impingers.

6.1.1.5 Critical orifice. A 400 ± 50 mL/min critical orifice should be used for flow control.

6.1.1.6 Vacuum pump - The critical orifice is followed by a pump capable of providing a vacuum of about 18 inches of Hg. Pump capacity should be sufficient to obtain and maintain critical conditions at the orifice.

6.1.1.7 Pressure gauges. One pressure gauge is placed before the critical orifice, and one pressure gauge is placed before the pump, and both are used when leak checking the sample train. The pressure gauge downstream of the critical orifice provides a check for critical flow conditions at the orifice.

6.1.1.8 On/off valve. An on/off valve is placed between the critical orifice and the second pressure gauge, and is used when leak checking the sample train.

6.1.1.9 Flowmeter. A bubble tube flowmeter is used to measure flow at the sampling line tip prior to and after sampling. Alternatively, a dry gas meter may be used.

Alternative Sampling Apparatus. An equivalent sample gas collection system may be proposed by the tester (e.g., use of a volumetrically calibrated evacuated vessel and controller consisting of a needle valve and rotameter along with pre- and post-tank temperature and absolute pressure measurements, or use of a Volatile Organic Sampling Train [VOST] console with its low-flow calibrated dry gas meter.)

6.1.1.10 Thermometer - An accurate thermometer is used to measure ambient temperature.

6.1.1.11 Barometer - A barometer is used to measure barometric pressure.

6.1.1.12 Sample storage bottles. Glass (i.e., 40 mL VOA vials) or polyethylene bottles can be used to store the impinger catch sample after stack sampling is complete.

6.1.2 GC/FID analysis apparatus

6.1.2.1 Laboratory glassware. Volumetric pipets, volumetric flasks, autosampler vials, syringes, and cuvettes necessary for standards preparation and analysis.

6.1.2.2 NCASI-recommended gas chromatography system. Gas chromatography/flame ionization detector system, complete with a temperature-programmable gas chromatograph suitable for splitless injection and all required accessories including syringes, analytical columns and gases. Note that we suspect systems with EPC are not designed to handle aqueous injections, and as a result the FID flame may begin to go out during the runs. This could be due to the water which builds up in the GC system after several injections on any type of GC. Bakeouts are necessary for any type of GC system, but more frequent bakeouts of a system with EPC may need to be performed.

6.1.2.3 Column - 30 m x 0.53 mm x 1 µm bonded phase DB-WAX fused silica capillary column (J&W Scientific or equivalent); 30 m x 0.32 mm x 0.25 µm bonded phase DB-WAX fused silica capillary column (J&W Scientific or equivalent); 30 m x 0.53 mm x 3 µm bonded phase DB-624 fused silica capillary column (J&W Scientific or equivalent); or other column shown to be capable of separating methanol, acetone, acetaldehyde, methyl ethyl ketone and n-propanol.

6.1.2.4 GC detector - Flame ionization detector with appropriate data system.

7.0 Reagents and Standards

7.1 Water - Deionized water is to be used as the impinger collection liquid, and in the preparation of all standard and spike solutions.

7.2 Pure compounds - Reagent grade methanol, acetaldehyde, ethanol, formic acid, acetic acid, 2-furaldehyde, formaldehyde solution in water (stabilized with methanol) for preparation of standard and spike solutions. Be sure to account for the methanol in the formaldehyde solution when calculating spike concentrations.

7.3 GC/FID calibration primary stock solution - Prepare stock solution by diluting 0.126 mL of pure methanol, 0.128 mL of pure acetaldehyde, 0.073 mL of glacial acetic acid, 0.127 mL of pure ethanol, 0.082 mL of pure formic acid, 0.086 mL of pure 2-furaldehyde, and 0.270 ml of 37% formaldehyde solution in 100 ml volumetric flask with DI water (1000 mg/L plus the methanol in the formaldehyde solution).

7.4 GC/FID calibration and matrix spike solutions - Prepare standard solutions by serial dilutions of the stock solution. The recommended calibration range is 0.5 to 1000 mg/L. It has been found that the linear range can be extended up to 10,000 mg/L. Prepare matrix spike solutions by calculating the concentration of analytes desired and diluting the primary stock solution.

7.5 GC/FID internal standard primary spiking solution (if used) - Prepare primary stock solution by adding 0.312 mL cyclohexanol and diluting to 100 mL with DI water in a 100 mL volumetric flask (3 mg/mL cyclohexanol). Another internal standard material could be used if it is demonstrated that it does not interfere with the analyte peaks in the chromatogram.

7.6 n-propanol - Prepare a 3% (v/v) n-propanol/water solution for desorption of the analytes from the silica gel sorbent tubes.

8.0 Sample Collection, Preservation, Storage, and Transport. Same as Method 18, Sections 8.2.4, 8.3, and 8.4.3 with the following additions:

8.1.1 Sample bottle preparation - Determine the number of sample bottles required for the sampling trip. Weigh each bottle and record the pre-sampling weight on the bottle.

8.1.2 Sampling.

8.1.2.1 Measure and record ambient temperature and barometric pressure.

8.1.2.2 Preparation of collection train. Measure 20 mL of DI water into each of the first and second impingers and assemble the sampling train.

8.1.2.3 Leak and flow check procedure. Make sure that the on/off valve is in the on position, close the valve to the M-5 train and turn on pump to draw a vacuum. When the vacuum reading is approximately 25 inches of Hg, turn the pump on/off valve to the off position, then record time and pressure reading on first pressure gauge. A leak is indicated by a flow of bubbles in the impinger, liquid being drawn into the stem of the impinger or a loss of vacuum. If a leak is present, tighten fittings, connections and impingers, and restart the leak check procedure. After 2 minutes, record the pressure reading on the first pressure gauge again. The leakage rate should not be in excess of 1 inch Hg (vacuum) in 2 minutes. Slowly and carefully open the valve to the M-5 train, and turn the on/off valve back to the on position. If using the critical orifice procedure, check the flow rate at the probe inlet with a bubble flowmeter. The flow rate should be comparable to the flow rate of the critical orifice with the impingers off-line. Record five measurements of the flow rate and turn off the pump.

8.1.2.4 Sample collection - Insert the probe into the stack and secure it. Start the pump, recording the time and the flow reading on the rotameter. End the sampling after 60 minutes. Record the time and remove the tubing from the vent. Recheck the sample flow rate at the probe inlet and turn off the pump. If the flow rate has changed significantly, redo sampling with fresh capture water. A slight variation (< 5%) in flow can be averaged. With the probe inlet end of the line elevated above the impinges, add about 5 mL of water into the inlet tip to rinse the line into the first impinger.

8.1.3 Sample recovery - Transfer the contents of the impingers into an appropriately labeled and pre-weighed sample storage bottle. The contents of both impingers can be combined into one bottle. If a large amount of water was collected in the dropout impinger, two bottles can be used. Remove the silica gel tubes from the sampling train, cap ends (tape caps on if necessary), and label. Store both impinger and sorbent tube samples in a cooler with ice until they can be stored in a laboratory refrigerator at approximately 4°C.

9.0 Quality Control. Same as Method 18 with the following exception: for the purpose of determining only the Scaling Factor to be used in calculating VOC mass emissions, the spike requirements of Method 18 may be replaced with an analytical spike set consisting of one low concentration and one high concentration spike sample. These alternate spike samples shall be prepared in the field by spiking the first impinger of the sample collection train and drawing a measured amount of filtered air through the impinger train equivalent to the nominal sample volume. The spike samples shall be recovered and analyzed using the same procedures as those used to recover and analyze the source samples.

10.0 Calibration and Standardization. Obtain calibration standards for each target compound to be analyzed. Prepare or obtain enough calibration standards so that there are three different concentrations of each organic compound expected to be measured in the source sample. For each organic compound, select those concentrations that bracket the concentrations expected in the source samples. A calibration standard may contain more than one organic compound. Prepare or obtain standards in the same solvent used for the sample extraction procedure. Verify the stability of all standards for the time periods they are used. Analyze each standard in triplicate.

10.1 GC/FID analysis of calibration standards.

10.1.1 Internal standard calibration.

10.1.1.1 Inject 1 µL of a methanol, acetaldehyde, ethanol, formic acid, acetic acid, and 2-furaldehyde calibration solution containing the internal standard and determine the retention time of the analytes relative to the internal standard. Each analyst should optimize the temperature program or instrument conditions, as necessary, to establish distinct separate peaks.

10.1.1.2 Calculate the relative response factor for the analytes (RRF_M) using Equation 1 (section 12.1, below). If the average of the relative response factor for the analytes is constant, i.e., exhibits a coefficient of variation less than 20%, the calibration is acceptable and the average RRF_M can be used in all subsequent calculations; otherwise, the calibration curve solutions must be reanalyzed and reevaluated. It may be necessary to perform instrument maintenance prior to reanalysis. If reanalysis also fails to produce a linear curve, new calibration standards must be prepared and analyzed.

10.1.1.3 Analyze and calculate the relative response factor of a midrange calibration standard daily, prior to each sample set, using Equation 2 (section 12.2, below) to verify the calibration. The relative response factors must be within an acceptable range. If they are not, either prepare a new standard or perform instrument maintenance. If necessary, re-calibrate the instrument.

10.2.2 External standard calibration

10.2.2.1 Inject 1 µL of a methanol, acetaldehyde, ethanol, formic acid, acetic acid, and 2-furaldehyde calibration solution and determine the retention time of each analyte. Each analyst should optimize the temperature program or instrument conditions, as necessary, to establish distinct separate peaks.

10.2.2.2 Measure and plot the response of each analyte vs. concentration. If the correlation coefficient of the graph is greater than 0.99, the calibration is acceptable and the equation of the curve can be used in all subsequent calculations; otherwise, the calibration curve solutions must be reanalyzed and reevaluated. It may be necessary to perform instrument maintenance prior to reanalysis. If reanalysis also fails to produce a correlated curve, new calibration standards must be prepared and analyzed.

10.2.2.3 Analyze and calculate the concentration of a mid-range calibration standard daily, prior to each sample set, to verify the calibration. The recovery should be between 70 and 130%. If it is not, either prepare a new standard or perform instrument maintenance. If necessary, re-calibrate the instrument.

10.3 Analytical range and minimum calibration level

10.3.1 Demonstrate that the calibration curve is acceptable (relative response factors exhibit a coefficient of variation less than 20%, or correlation coefficient greater than 0.99) throughout the range of the calibration curve.

10.3.2 Demonstrate that the analytes are detectable at the minimum levels using the lowest level calibration curve solution.

11.0 Analytical Procedures.

11.1 Preparation of impinger samples. Remove bottles from refrigerator. Weigh the sample bottles and record weights on the bottle. Transcribe initial and final bottle weight to sample field data sheet. Bottles do not need to be at room temperature before weighing. Remove an aliquot of sample and place in the sampler vial, add 10 µL of internal standard solution (if using internal standard calibration curve), and cap vial.

11.2 Preparation of sorbent tube samples. Remove sorbent tubes from refrigerator. Remove end caps and score glass to remove the silica gel from one section. All sections of the silica gel tubes can be combined and analyzed together. This is considered the "back half" of the sample collection train. Pour into a 4.0 mL screw-capped vial and add 3.0 mL of a 3% (v/v) n-propanol/water desorption solution. Allow to sit for 30 minutes, with occasional light shaking. Vigorous shaking causes the silica gel particles to adhere to the cap and walls of the vial. Remove an aliquot of the desorption solution and place in an autosampler vial. Add 10 µL of internal standard solution (if using internal standard calibration curve) and cap vial.

11.3 GC/FID analysis. Analysis is performed by direct aqueous injection into the GC/FID. Representative conditions for the GC/FID analysis are given in Tables 1, 2 and 3 (section 18, below). Other chromatographic columns and conditions may be used if it has been established that the compounds are separated and quality control parameters are met. Once the GC/FID system is optimized for analytical separation and sensitivity, the sample operating conditions must be used to analyze all samples, blanks, calibration standards and quality assurance samples. Note that constant injections of aqueous samples can cause water to build up in the system. This will cause the retention times to shift, and the peaks to broaden. It is recommended that after approximately 50 injections a bakeout of the system be performed. This should consist of heating the injector to 250°C, the oven to over 200°C and the detector to 275°C for at least several hours.

12.0 Data Analysis and Calculations. Same as Method 18 Sections 12.7 -12.9 with the following additions:

12.1 Relative Response Factor. Calculate the relative response factor (RRF_M using the following equation.

$$RRF_M = \frac{C_M A_{IS}}{C_{IS} A_M} \qquad \text{Equation 1}$$

Where:

A_M = area of analyte peak

A_{IS} = area of internal standard peak
C_M = concentration of analyte injected
C_{IS} = concentration of internal standard injected

12.2 Calibration Verification. Calculate the concentration of the midrange standard using the following equation.

$$C_M = \frac{RRF_M A_M C_{IS}}{A_{IS}} \qquad \text{Equation 2}$$

Where:
A_M = Area of the analyte peak
C_{IS} = Concentration of the internal standard (mg/L)
A_{IS} = Area of the internal standard peak
RRF_M = Relative response factor of analyte

13.0 Method Performance. Same as Method 18.

14.0 Pollution Prevention. [Reserved]

15.0 Waste Management. [Reserved]

16.0 Alternative Procedures. [Reserved]

17.0 References. Same as Method 18 with the following addition:
17.1 National Council for Air and Stream Improvement, Inc. (NCASI). Methods Manual - NCASI Method CI/SG/PULP-94.02 Chilled Impinger/silica Gel Tube Test Method at Pulp Mill Sources for Methanol, Acetone, Acetaldehyde, Methyl Ethyl Ketone and Formaldehyde. National Council for Air and Stream Improvement, Inc.. Research Triangle Park, N.C. 1998.

18.0 Tables, Diagrams, Flowcharts, and Validation Data.

Table 1: GC/FID Operating Conditions for Methanol, Acetaldehyde, Acetone and Methyl Ethyl Ketone Analysis-DB-WAX Column
Injection: Direct
Injector Temperature: 150°C
Injection Volume: 1 µL
FID Detector Temperature: 250°C
Carrier Gas: Helium
Column: DB-WAX, 30 m x 0.53 mm id x 1 micron
fused silica capillary column
Temperature Program °C:

Initial: 18vC for 8 min
Ramp 1: 3°C/min to 20°C for 2 minutes
Ramp 2: 50°C/min to 220°C
Ramp 3: [deliberately blank]
Final Hold Time: 5 minutes
Retention Time Order: acetaldehyde, acetone, methyl ethyl ketone, methanol, n-propanol, cyclohexanol

Table 2: GC/FID Operating Conditions for Methanol, Acetaldehyde, Acetone and Methyl Ethyl Ketone Analysis-DB-WAX Column
Injection: Direct
Injector Temperature: 170°C
Injection Volume: 1 µL
FID Detector Temperature: 275°C
Carrier Gas: Helium
Column: DB-WAX, 30 m x 0.32 mm id x 0.25 micron fused silica capillary column
Temperature Program °C:
Initial: 0°C for 3 min
Ramp 1: 5°C/min to 50°C for 4 minutes
Ramp 2: 70°C/min to 100°C for 10 min
Ramp 3: 70°C/min to 200°C
Final Hold Time: 4 minutes
Retention Time Order: acetaldehyde, acetone, methyl ethyl ketone, methanol, n-propanol, cyclohexanol

Table 3: GC/FID Operating Conditions for Methanol, Acetaldehyde, Acetone and Methyl Ethyl Ketone Analysis-DB-624 Column
Injection: Direct
Injector Temperature: 170°C
Injection Volume: 1 µL
FID Detector Temperature: 275°C
Carrier Gas: Helium
Column: DB-624, 30 m x 0.53 mm id x 3 micron fused silica capillary column
Temperature Program °C:
Initial: 0°C for 3 min
Ramp 1: 5°C/min to 50°C for 0 minutes
Ramp 2: 70°C/min to 105°C for 17 min
Ramp 3: 70°C/min to 220°C
Final Hold Time: 3 minutes
Retention Time Order: acetaldehyde, methanol, acetone, n-propanol, methyl ethyl ketone, cyclohexanol

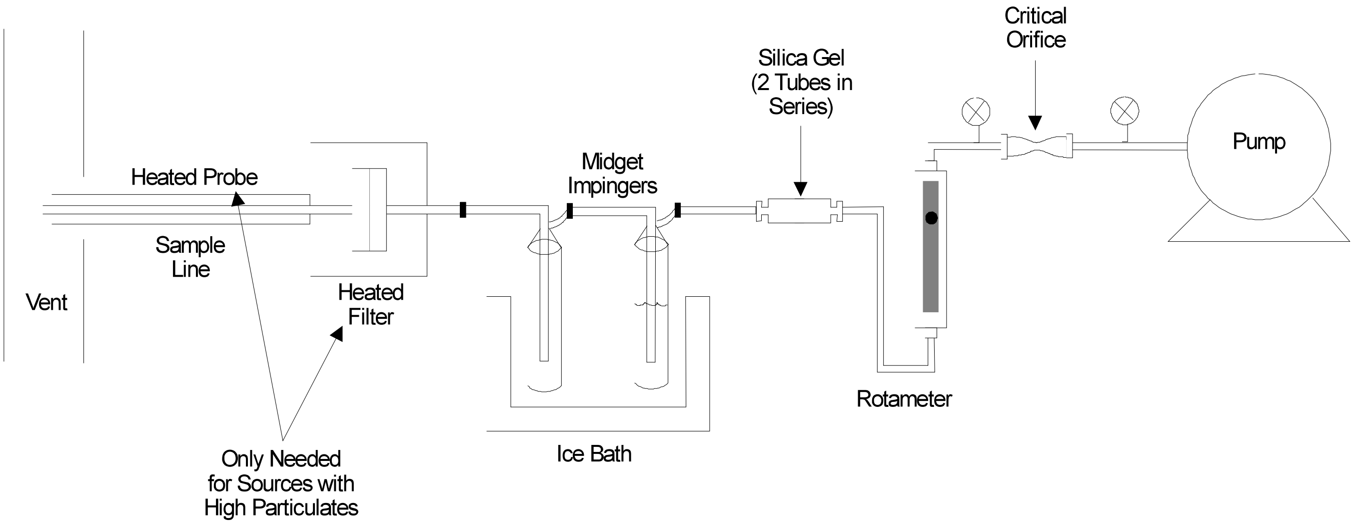


Figure 1. NCASI Formaldehyde Sampling Train

Appendix C
Analysis of Method 18 Samples for Formaldehyde

1.0 Scope and Application. Same as Appendix B with the following addition:
The stability of formaldehyde was found to be 21 days, with refrigeration at approximately 4°C.

2.0 Summary of Method.
This method contains procedures for analyzing the samples collected by the Method 18 procedure described in Appendix B for formaldehyde. To analyze for formaldehyde, the acetylacetone derivatization/spectrophotometric analysis method is used on an aliquot of the impinger solution collected according to Appendix B.

3.0 Definitions. Same as Appendix B.

4. Interferences. Same as Appendix B with the following addition:

Interferences with the formaldehyde analysis can be caused by the presence of sulfur compounds (i.e. SO_2) in the source gas.

5.0 Safety. Same as Appendix B.

6.0 Equipment and Supplies. Same as Appendix B with the following addition:

6.1. Formaldehyde analysis apparatus

6.1.1 Spectrophotometer - A spectrophotometer capable of measuring absorbance at 412 nm.

7.0 Reagents and Standards.

7.1 Water. Deionized water is to be used as the impinger collection liquid, and in the preparation of all standard and spike solutions.

7.2 Pure compound. Reagent grade 37% formaldehyde solution (formalin) for preparation of standard and spike solutions.

7.3 Acetylacetone reagent. Prepare by dissolving 15.4 g of ammonium acetate in about 50 mL of DI water in a 100 mL volumetric flask. Add 0.20 mL of acetylacetone to this solution, along with 0.30 mL of glacial acetic acid. Mix thoroughly and dilute to 100 mL with DI water. Store reagent in a brown glass bottle in the refrigerator. Reagent is stable for at least two weeks.

7.4 Formaldehyde analysis primary stock solution. Prepare stock solution by diluting 2.7 mL of formalin in a 1000 mL volumetric flask with DI water (1000 mg/L formaldehyde).

7.4.1 Formaldehyde analysis calibration standard solution. Prepare standard solution by diluting 1.0 mL of primary stock solution in a 100 mL volumetric flask with DI water (10 mg/L formaldehyde).

8.0 Sample Collection, Preservation, Storage, and Transport. The sample is collected according to the procedures in Appendix B.

9.0 Quality Control. Each field sampling program or laboratory that uses this method is required to operate a formal quality assurance program. Laboratory or field performance is compared to established criteria to determine if the results of analyses meet the performance criteria of the method.

9.1 Field blank samples. A field blank sample of water must be prepared to assure that the water being used in the impingers is not contaminated. It is made in the field by filling a 40 mL VOA vial or polyethylene bottle with the same water being used to fill the impingers.

9.2 Field spike sample. A field spike sample should be prepared by spiking the impinger with a known amount of analyte before sampling. The spike solution described in Appendix A should be used for this purpose. After the impinger is spiked, a sample bottle containing DI water should also be spiked. This provides a check of the spiking solution and spiking procedure. The impinger spiking may be done on a duplicate sampling train if the equipment is available or may be done during a normal sampling run. This type of spiking is performed when a check of the complete sampling procedure, sample storage and sample analysis is desired.

9.3 Laboratory blank sample. A laboratory blank sample should be analyzed with each batch of samples. A batch is considered no more than 10 samples of similar matrix type.

9.4 Laboratory duplicates. A replicate injection of one sample in the analytical batch should be performed. The results of the duplicate analysis should be within 10% of the mean of the original and duplicate sample analysis.

9.5 Laboratory matrix spike samples. A laboratory matrix spike sample may be prepared with each group of similar matrix type. Using the mean concentration determined by the replicate analyses or the background level determined from a single measurement, determine the spiking level which will give one to four times the background. If the background sample does not have detectable levels of analytes, spike the sample at approximately five times the lowest calibration level of the instrument. Spike the sample with the determined amount of the calibration standard/matrix spike solution and proceed to analyze the sample in the normal manner. The results can be considered acceptable if the calculated spike recovery is 70 to 130%. In cases where multiple analytes are present, the analyte with the highest concentration should govern the acceptance criteria.

10.0 Calibration and Standardization.

10.1 Formaldehyde analysis calibration solutions. A series of calibration standards are made from the standard solution (Section 7.1.4.1) by adding 0, 0.1, 0.2, 0.4, 1.0 and 1.5 mL of the standard solution to individual screw-capped vials. The volume in each vial is adjusted to 2.0 mL with DI water. This corresponds to 0, 0.5, 1, 2, 5 and 7.5 mg/L calibration solutions. To each vial, 2.0 mL of the acetylacetone reagent is added, and the procedure described in Section 11.1 is then followed.

11.0 Analytical Procedures.

11.1 Formaldehyde sample analysis. Remove a 2.0 mL aliquot of the impinger sample and transfer to a screw-capped vial. Add 2.0 mL of the acetylacetone reagent and mix thoroughly. Place vial in a water bath at 60˚C for 10 minutes. Allow vials to cool to room temperature. Transfer the solution to a cuvette and measure the absorbance at 412 nm. If the sample solution concentration is above the calibration curve, dilute original sample and repeat entire procedure. Do not dilute colored (derivitized) samples.

12.0 Data Analysis and Calculations.

13.0 Method Performance. [Reserved]

14.0 Pollution Prevention. [Reserved]

15.0 Waste Management. [Reserved]

16.0 Alternative Procedures. [Reserved]

17.0 References. Same as Appendix B.

18.0 Tables, Diagrams, Flowcharts, and Validation Data. [Reserved]

Attachment #10

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

ENNIFER M. GRANHOLM
GOVERNOR

STEVEN E. CHESTER
DIRECTOR

Mich Ethanol
N699
Tusc.
Co

MDEQ-AQD
JAN 24 2006
SAGINAW BAY

January 18, 2006

Mr. Ken Miceli
Michigan Ethanol
1551 Empire Drive
Caro, Michigan 48723

Dear Mr. Miceli:

SUBJECT: Michigan Ethanol, Emission Testing, Permit: 210-01C, SRN: N6996

The protocol for emission testing at Michigan Ethanol has been reviewed. This protocol covers testing of the fluid bed cooler (FBC), the thermal oxidizer/heat recovery steam generator (TO/HRSG), and the regenerative thermal oxidizer (RTO). Testing will be performed by Interpol Laboratories, Inc. (Interpol).

The TO/HRSG and RTO will each be sampled for volatile organic compounds (VOC) in accordance with Title 40 of the Code of Federal Regulations, Part 60, Appendix A, Methods 1-4 and 25A. The Method 25A analyzer will be calibrated with propane. An ethanol standard will be analyzed onsite during testing in order to develop a response factor to correct VOC as propane to VOC as ethanol. Emissions will be calculated as pounds per hour (lb/hr) for the individual units, and the combined emissions.

The FBC will be sampled for emissions of VOC and 2,3 butanediol. The VOC emissions will be sampled as described above with emissions reported in lb/hr VOC as ethanol. For 2,3 butanediol sampling, stack gas will be collected through a heat probe, filter, Teflon transport line, and manifold. Two samples will be simultaneously collected from the manifold into midget impingers. One of the impingers will be spiked with a known amount of 2,3 butanediol. Emission of 2,3 butanediol will be reported as lb/hr.

During testing sufficient data will be recorded to demonstrate that the units operated at maximum load. The combustion chamber temperatures of the oxidizers will be recorded at least once during each test run.

The test report will include:

- the gas analyzer calibration error, system bias, zero and calibration drift, and all sampling data in tabular format;
- all pre-test and post-test meter box calibration, pitot tube calibration, and field data sheets;
- all analysis data, including quality assurance audits and spike recoveries;
- process and control device data specified above.

CONSTITUTION HALL • 525 WEST ALLEGAN STREET • P.O. BOX 30260 • LANSING, MICHIGAN 48909-7760
www.michigan.gov • (517) 373-7023

Testing dates have not yet been scheduled. Please inform Mr. George Eurich, of the Saginaw Bay District Office, Air Quality Division (AQD), at 989-686-8025, ext. 8255, and me of the test dates. If you have any questions regarding this letter, please contact me by telephone or e-mail at gaslolit@michigan.gov.

Sincerely,

Tom Gasloli
Technical Programs Unit
Field Operations Section
Air Quality Division
517-335-4861

tg:ml

cc: Mr. Daren Zigich, Broin Companies
Mr. Dan Despen, Interpol
Mr. George Eurich, AQD

Attachment #11

Minnesota
Pollution
Control
Agency

ENVIRONMENTAL BULLETIN

Volatile Organic Compound Emissions from Dry Mill Ethanol Production

by Daniel Brady and Gregory C. Pratt, Ph.D.

August 2006
Number 8

Abstract—Ethanol fuel production is a rapidly growing industry in the rural Midwest and is becoming a powerful economic and political force. With this rapid growth has come scrutiny of the environmental impacts of the industry. In 2002, the U.S. Environmental Protection Agency (EPA) and the Minnesota Pollution Control Agency (MPCA) entered into enforcement actions with 12 ethanol plants in Minnesota. The consent decrees that were ultimately negotiated revealed underreported emissions and required pollution control equipment to be installed in an effort to accurately quantify and reduce air emissions from ethanol plants. This effort also required stack testing that presented a number of challenges including developing testing protocols, quantifying and characterizing volatile organic compound emissions, and generating and analyzing data that could ultimately be used to assess health risks and inform regulatory action.

This case study chronicles Minnesota's experience applying air quality regulations to ethanol plants. A key component in this process was the collection of volatile organic chemical emissions data which were used to develop permit limits, gauge compliance and estimate risks. The database is relatively small, with several values below detection limits. In addition, emissions from some facilities are systematically different from others. These characteristics complicate the analysis of the data. To account for these issues a nested bootstrap procedure on the Kaplan-Meier method was used to calculate means and upper confident limits. The bootstrapping was done first over facilities and then over measurements within facility for 1000 repetitions of the Kaplan-Meier mean, taking the 50th percentile value as the mean, and the 95th percentile value as the upper confidence limit. The estimates of the 95% upper confidence limit of the mean may be used in risk analysis.

Introduction

Ethanol production in Minnesota was commercialized around 1990 with 11 million gallons produced in the state that year. In 2004, Minnesota generated approximately 400 million gallons from 14 plants that employed hundreds of people (Minnesota Department of Agriculture, 2005). There are presently three more plants under construction and two of the existing facilities are planning to expand to produce 100 million gallons individually each year. In a short period of time, fuel ethanol has become a booming business in Minnesota.

In October of 2002, 12 Minnesota ethanol plants entered into consent decrees with the EPA, MPCA, and the U.S. Department of Justice for violations of the Clean Air Act Prevention of Significant Deterioration (PSD) regulations as a result of underestimating emissions. The consent decrees required each facility to pay a monetary penalty and to install best available control technology (BACT) to control nitrogen oxides (NOx), carbon monoxide (CO) and volatile organic compound (VOC) emissions. In addition, the plants were required to test their emission units upon installation of control equipment to demonstrate compliance with the established emission limits in the consent decrees. These requirements were intended to easily confirm that the facilities' emissions were properly controlled and quantified. However, due to a number of unforeseen complications with regard to quantifying VOC emissions, the testing requirements proved problematic.

The consent decrees developed for Minnesota ethanol production facilities represent a significant accomplishment in correcting a calculation and design error that had resulted in underestimated and uncontrolled emissions from fuel ethanol plants. They also have helped to ensure that future facilities will be constructed with the appropriate control technologies, thereby preventing excess pollutants from being emitted into the atmosphere. Minnesota's ethanol industry experience also led to the development of stack testing methodologies and information gathering that has implications not only for the ethanol industry but also for other industrial processes that involve drying of organic materials. This innovative source sampling effort produced a baseline data set that is the first of its kind. The testing that was carried out under these consent decrees provides a basis for permit conditions and for state VOC stack testing policy pursuant to those permit conditions.

The industry is expected to continue to grow in rural Minnesota as new plants are constructed to capitalize on tax incentives and a supportive political climate. The influx of facilities requires that regulators devote additional resources to permitting and related activities such as risk analyses that inform the permitting process. Perhaps one of the most useful products of the consent decrees is the generation of information that can be shared with all stakeholders, including regulators in other states. By initiating transparent processes and sharing information, regulators can fulfill their role of preventing unsafe levels of pollutants from being emitted during a time of enormous growth by this industry.

Fuel Ethanol Production Process

All of the 12 plants named in the Minnesota consent decrees were dry mill plants meaning that they dry the distilled grains, prior to shipping them as animal feed. Figure 1 shows the location of the ethanol plants subject to the consent decrees. Dry mill facilities account for about 55% of all fuel ethanol produced in the United States (Yacobucci and Womach, 2004). In this process, grain corn is initially run through a hammer mill and placed into a fermentation tank where enzyme additions and fermentation chemistry begins to convert the grain-water mixture into ethanol. After a series of fermentation tanks, the ethanol-containing mash is processed by distillation and molecular sieves into the final fuel product. The wet grain is removed from the fuel ethanol, sent to a rotary drum dryer and then sold as animal feed. The rotary drum dryer, which was typically vented to the outdoors, is the primary emission source on which BACT was required to control VOCs under the consent decrees. BACT has typically been determined to be some configuration of a thermal oxidizer that combusts the organic compounds in the effluent stream. Figure 2 shows a schematic of the dry mill ethanol process.

Figure 1: Location of Fuel Ethanol Plants in Case Study.

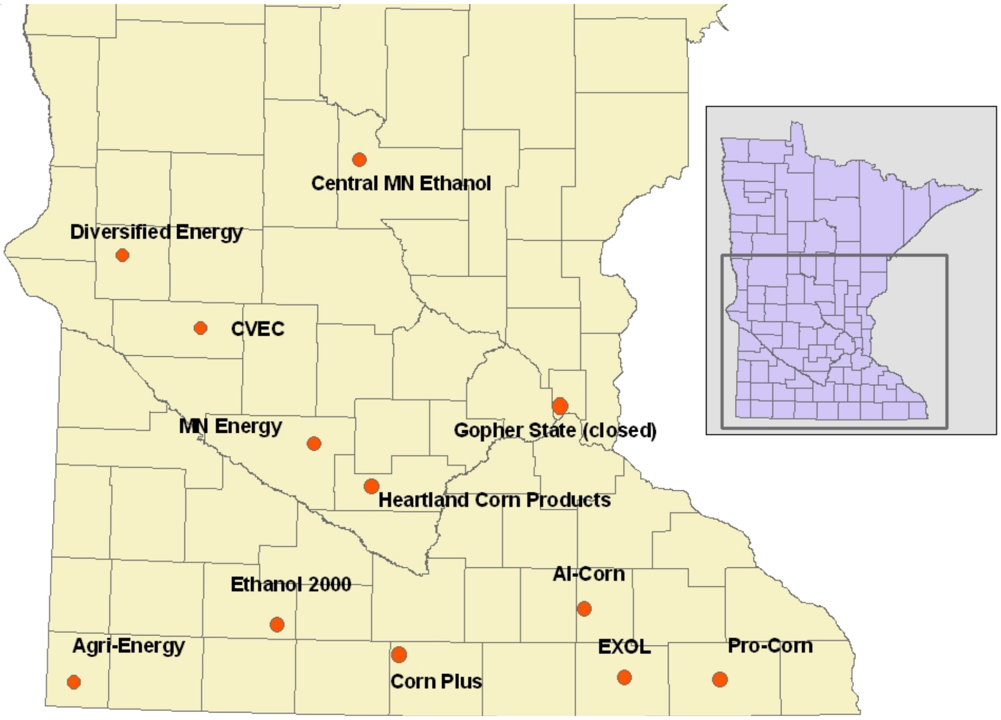
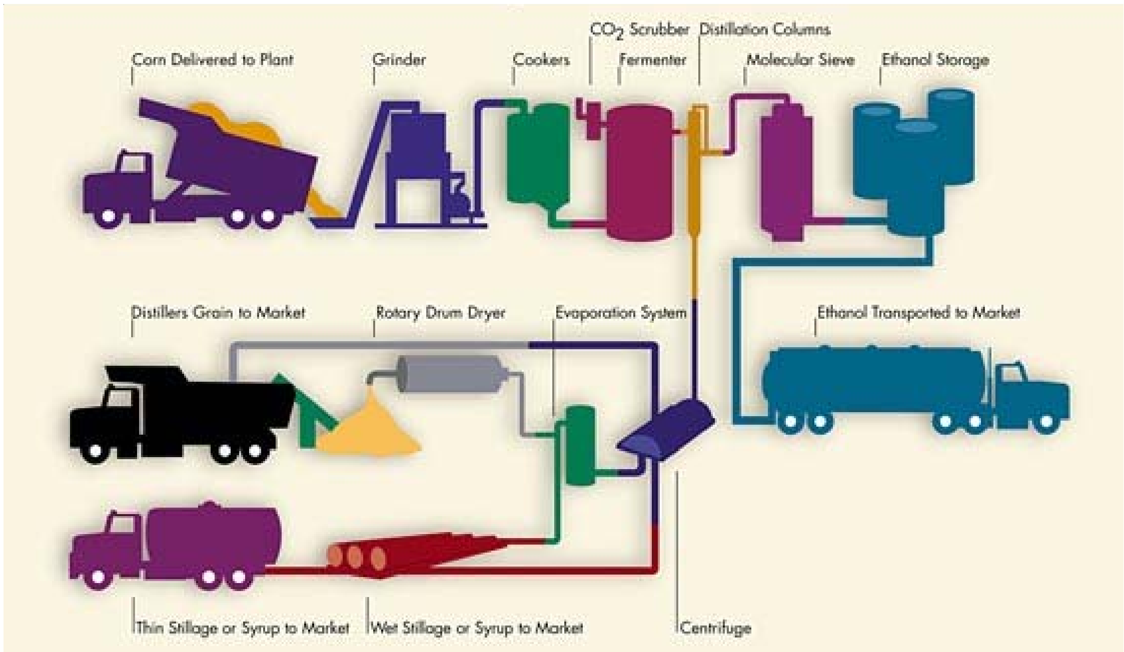


Figure 2: Schematic of the Dry Mill Ethanol Production Process.



Source: Renewable Fuels Association

All of Minnesota's ethanol facilities currently in operation fire natural gas to run their process and control equipment with propane often used as a back-up fuel. One plant under construction and another proposed facility will burn coal as a primary fuel source. The major sources of NOx emissions from dry mill plants are the boilers used for facility operations, the dryer, and the control equipment ultimately placed on the dryers. In almost every case, this control equipment was a thermal oxidizer (TO) or a regenerative thermal oxidizer (RTO). Both are referred to here as simply thermal oxidizers (TOs). VOCs proved more elusive coming from multiple units at the plants including the dryer, distillation columns, fermentation tanks and scrubbers associated with these sources.

Quantifying VOC Emissions

Both regulators and the fuel ethanol industry agree that there are at least 8 to 10 VOC species that can be quantified from the gas stream of ethanol plant emission units. These species include acrolein, acetaldehyde, ethanol, furfuraldehyde, formaldehyde, acetic acid, lactic acid, and formic acid with some substitutions to this list at specific plants (EPA, 2004). EPA estimates that this list comprises approximately 60 to 90 percent of the gas stream while industry representatives maintain that these constituents account for 90 percent or more of the gas stream. There is little quantitative evidence to substantiate either position.

The effluent gas from ethanol plants can have a moisture content as high as 50 percent. The in-stack gas contains a large volume of moisture droplets that entrain organic chemicals and act like particles in the gas stream. Conventional stack testing for total VOCs (EPA method 25A) relies on instruments that draw gas through sampling equipment at a constant rate. The moisture in the gas is removed and the sample then passes through a flame ionization detector where volatiles are ignited and radiative energy at specific wavelenghts is recorded. Because the equipment used in this method does not adjust for isokinetic sampling (modifying the sampling rate to match the uneven flow across the stack diameter) as is generally done for particulate testing, the method is likely to underquantify any VOC that may be contained in the water droplets.

VOC testing currently accepted under method 25A is designed to report total VOC as "carbon" meaning it assigns a mass to the sample based on the amount of carbon present. It does not account for unevenly distributed species and larger oxygenated molecules. For example, in a gas stream where ethanol (CH_3CH_2OH) contributes more to the total mass than acetaldehyde (CH_3CHO, i.e., both having two carbon atoms), this test method would be unable to differentiate between the two and therefore fail to accurately characterize VOC emissions.

The chemicals listed earlier were only a starting point, and subsequent testing has indicated the presence of other species in the gas streams at most plants. Many compounds have been reported as "non-detect" values or "below detection limit" because the equipment used to sample the gas stream was not sensitive enough to quantify the actual amount present in the gas stream. This does not necessarily mean that the chemical is not present but rather that the chemical is likely present in some quantity between zero and the detection limit. Since there are possibly many compounds present below detection limits, the total VOC emissions represented by the sum of these unquantified emissions could be significant.

EPA attempted to resolve some of the measurement uncertainties by developing a testing protocol specifically for ethanol plants. This procedure, entitled the "Midwest Scaling Protocol," employed a combination of existing testing methods. Since the major obstacle to traditional VOC testing was the entrainment of organic chemicals in water droplets, the solution was to sample the stack gases as if the source were emitting a particulate gas stream. This method required isokinetic testing and collection of samples in glass impingers, some containing sodium bisulfite solutions in order to precipitate out individual chemicals (EPA, 2004).

A "scaling factor" was developed to increase the total mass emissions quantified under Method 25A in order to account for the mass of chemicals not measurable. This factor was calculated from the speciated VOC data and applied to the total organic carbon mass measured by Method 25A which was performed in conjunction with the methodology as implemented by the Midwest Scaling Protocol. EPA developed a default scaling factor of 2.2 that could be applied to total VOC results from Method 25A in lieu of conducting speciated testing. In other words, the total VOC would be increased by a factor of more than two to account for the portion of chemicals not measured by the stack test but still contributing to the total mass of VOC. This scaling factor was designed to be "conservative," that is, designed so that any error would be on the side of overestimating emissions.

Table 1 presents the averaged results from these tests between December 2002 and August 2004. For all facilities, these tests were performed after control equipment was installed as required by the consent decree. All tests were conducted by an independent testing consultant. Pre-test meetings were held with facility personnel, testing consultants, and MPCA staff to ensure that the test would comply with the combined methodologies described above. These meetings also served to discuss how the data would be reported (speciated, total mass, etc.). MPCA staff witnessed parts of most tests. Prior to submittal to the MPCA, reports were sent to the ethanol facility's management or consultants for review and approval. Reports were then reviewed by the MPCA for accuracy, compliance with approved test methodologies, calibration of equipment, any problematic occurrences in the field, and chain of custody sample handliing parameters, and ultimate verification of results.

Data Summary and Interpretation

Summary statistics for the ethanol plant emissions test data are presented in Table 1. Figure 3 is a graphical representation of the distribution of emission rates for each chemical from each type of emission unit. In general, most facilities consistently reported detectable levels of acetaldehyde, acetic acid, ethyl acetate, formaldehyde, ethanol and methanol at one or more emissions units. The amount of each species and that which is the predominant constituent varies across sources. Acetic acid and ethanol were the predominant emissions from cooling cyclones. From the single fluid bed cooler tested, acetic acid was the dominant emission. Acetaldehyde and acetic acid accounted for most of the emissions from thermal oxidizers. Fermentation scrubbers had the most diverse and highest overall emissions with significant amounts of acetaldehyde, acetic acid, ethanol, ethyl acetate, and isoamyl alcohol. Emissions of all substances were low from distillation scrubbers.

Several limitations in the data should be stated clearly. First, not all emissions units were tested for the same analytes, confounding comparisons among units and facilities. There is also considerable variation in the quantities of analytes across facilities, which we believe represents actual differences among facilities. The data are also left-censored, including values reported as zero and values reported as below detection limits. The proper treatment of values reported as zero or below detection is a matter of discussion. Ignoring such values will bias the data and lead to incorrect estimates of emissions.

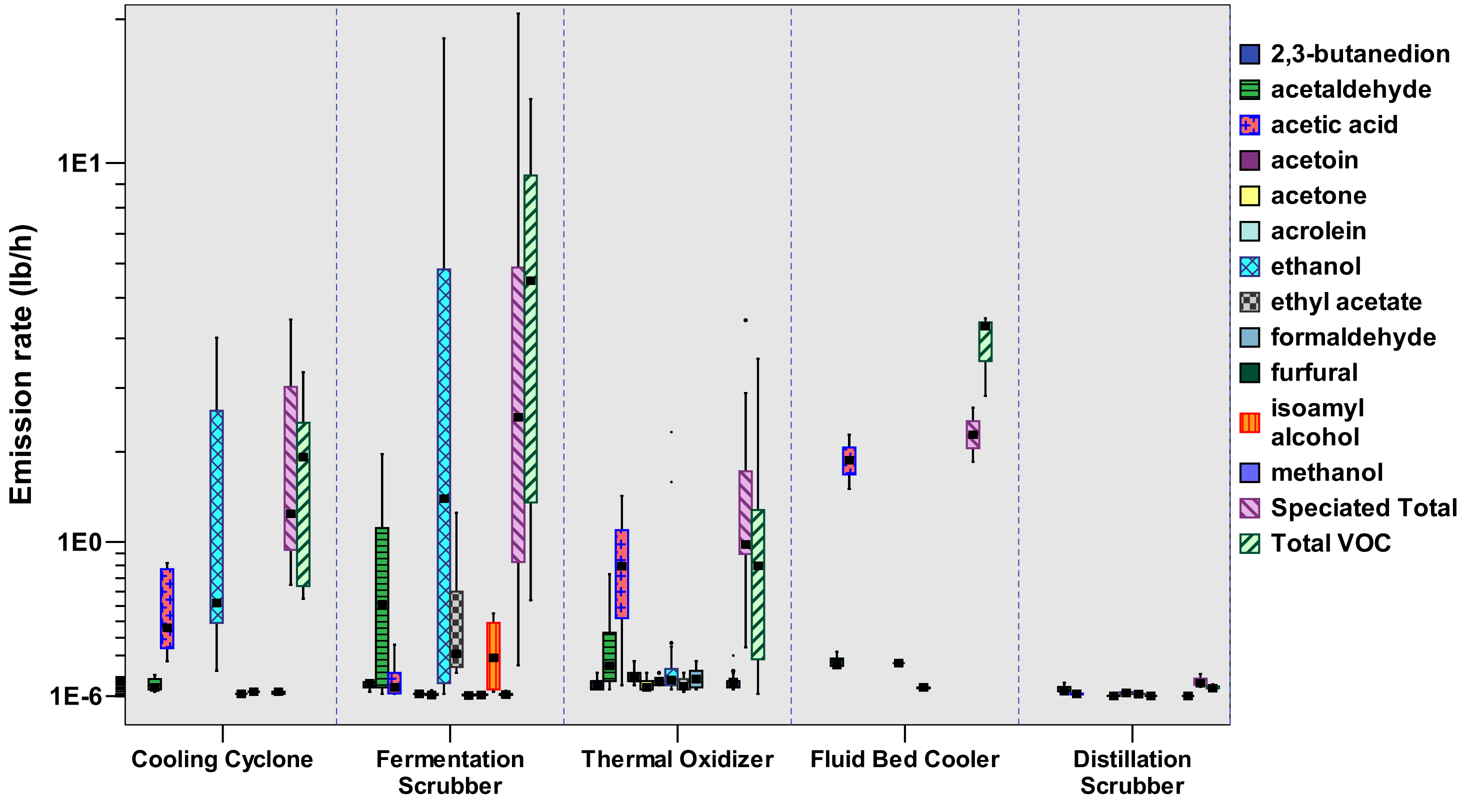
In some cases the total speciated emissions (Method 18) did not match well with the total VOC measurement (Method 25A). The discrepancies were greatest for the thermal oxidizer test results at the Agri-Energy and Al-Corn facilities, along with one of the test runs at the EXOL facility. For these tests, the speciated VOC emissions were much larger than the total VOC measurement, a finding that appeared to be due to suspiciously low total VOC measurements and perhaps a better accounting of larger oxygenated compounds

Table 1: Summary Statistics of VOC Measurements at Ethanol Production Facilities. Units are Pounds per Hour (lb/hr).

Emission Unit	Statistic	acetaldehyde	2,3-butanedion	acetic acid	acetoin	acetone	acrolein	ethanol	ethyl acetate	formaldehyde	furfural	isoamyl alcohol	methanol	total speciated	total VOCs	percent speciated
Cooling Cyclone	**n**	9		9				9		9	6		9	9	9	9
	n<dl	0		0				0		3	3		6	0	0	0
	min	0.02		0.17				0.12		<0.01	<0.02		<0.01	0.65	0.55	54%
	max	0.10		0.82				4.01		0.01	0.03		0.03	4.44	3.29	145%
	mean	0.05		0.44				1.28		0.01	0.02		0.02	1.83	1.78	105%
	95% UCL	0.08		0.65				2.48		NA	0.03		0.03	2.94	2.4	127%
Distillation Scrubber	**n**	3		3			3	3	3	3			3	3	3	3
	n<dl	0		0			1	0	0	0			0	0	0	0
	min	0.02		0.01			0.00	0.01	0.01	0.00a			0.00a	0.04	0.03	120%
	max	0.06		0.01			<0.0005	0.02	0.01	0.00a			0.00a	0.1	0.05	194%
	mean	0.04		0.01			NA	0.01	0.01	NA			NA	0.07	0.04	163%
	95% UCL	NA		NA			NA	NA	NA	NA			NA	NA	NA	NA
Fermentation Scrubber	**n**	17	3	17	3		17	17	14	17	6	6	14	17	17	17
	n<dl	0	0	6	3		15	0	0	6	5	0	10	0	0	0
	min	0.01	0.02	<0.01	<0.01		<0.005	0.01	0.11	0.00a	<0.005	0.02	<0.005	0.15	0.54	15%
	max	1.97	0.07	0.26	<0.01		0.02	18.27	1.28	0.01	0.01	0.45	0.02	20.56	13.67	183%
	mean	0.66	0.05	0.08	NA		0.006	4.20	0.39	0.005	0.01	0.22	0.007	5.62	5.9	88%
	95% UCL	1.19	NA	0.14	NA		0.009	9.41	0.73	0.007	0.01	0.45	0.012	10.11	7.76	127%
Fluid Bed Cooler	**n**	3		3				3		3				3	3	3
	n<dl	0		0				0		0				0	0	0
	min	0.14		1.54				0.16		0.03				1.87	2.86	44%
	max	0.22		2.24				0.16		0.04				2.66	4.47	93%
	mean	0.17		1.89				0.16		0.04				2.26	3.87	62%
	95% UCL	NA		NA				NA		NA				NA	NA	NA
Thermal Oxidizer	**n**	18	6	18	6	6	15	18	12	18			18	18	18	18
	n<dl	6	3	3	3	3	13	9	7	6			12	0	0	0
	min	<0.03	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03	<0.03	<0.03			<0.03	0.25	0.01	25%
	max	0.73	0.06	1.46	0.17	0.03	0.07	2.28	0.11	0.17			0.20	4.43	3.56	9900%
	mean	0.21	0.03	0.73	0.08	0.03	0.05	0.28	0.04	0.08			0.05	1.46	1.1	877%
	95% UCL	0.36	0.07	1.00	0.11	0.11	0.06	0.68	0.07	0.11			0.09	1.97	1.88	3352%

a - values reported as zero on test report

Figure 3: Bar Chart of Speciated VOC Emission Rates by Emissions Unit.



through speciated testing than provided in Method 25A alone. The total VOC measurements also appeared anomalously low at the one distillation scrubber tested at the Al-Corn facility. At other emission units and other facilities the two test methods were in better agreement, although the variance among the test results was large.

While this small data set is far from perfect, it is still the most extensive available that we're aware of. It is clear that further, systematic testing is necessary to thoroughly characterize the complex gas stream from these facilities. EPA estimates that this testing captures approximately 60 to 90 percent of the constituents based on testing at one facility in 2001 comparing Method 18 results as carbon to Method 25A results. The ethanol industry believes the true percentage captured to be at the higher end of that range. The available data are insufficient to strongly support either contention. The percentage quantified may not be important to the type of controls installed or how the facility routinely operates, but imprecision in the information complicates accurate health risk analysis of the emissions from these facilities.

Use of Data in Risk Analysis

The MPCA has developed some experience in permitting ethanol plants. Recently, newly proposed plants have been asked to perform a risk analysis prior to permitting. Evaluating potential health effects from a facility is something new to the permitting process for ethanol production facilities and, as such, presents challenges. VOCs are usually risk drivers at ethanol plants, so scarcity and imprecision in VOC emissions data complicates the Air Emission Risk Analysis (AERA) process. The MPCA uses the AERA tool to identify potentially unacceptable health risks at new and expanding facilities. For most ethanol production facilities, the chemicals that pose the greatest risk are NOx, acetaldehyde, formaldehyde, and acrolein. With the exception of NOx, which can usually be well controlled and characterized, these chemicals are part of the complex VOC gas stream emitted by the plants.

In order to quantify potential risk, the analysis requires both reliable emission data and chemical-specific toxicity values that can be applied to the emission data. As discussed, VOC emissions at fuel ethanol production facilities are not yet completely characterized. In addition, many of the measurable VOC species lack toxicity values and, therefore, can not be included in the quantitative assessment. In response to concerns over the lack of health benchmarks or toxicity values, the Minnesota Department of Health in 2005 developed interim benchmarks specific to chemicals emitted from ethanol plants. Even with the application of these values, however, only slightly more than half of the volatile organic compounds can be assessed quantitatively. The exposure durations indicated as problematic for an ethanol plant by the AERA are acute (one hour) and chronic cancer/non-cancer (evaluated based upon one year average concentrations). Generally, the chemicals from natural gas-fired ethanol plants are of concern to human health for short periods of exposure. However, we cannot say with complete certainty whether the data gaps have implications for risk analysis.

There is considerable toxicological information about a few of the ethanol plant emissions such as acetaldehyde and acrolein, and the respiratory impairments often attributed to NOx are well known. However, toxicity information about most of the rest of the identified emissions is less certain. Other chemicals yet unidentified could possibly increase the risk in one of the exposure scenarios (acute, chronic, subchronic or cancer, including multipathway). The data and the level of confidence in that data required for successful permitting is not necessarily adequate for a thorough human health risk assessment. The initial data collection was driven by the consent decrees, but that mandate does not require risk analysis at these facilities.

For purposes of cancer and chronic non-cancer risk assessment, EPA guidance recommends using the 95 percent upper confidence limit (95% UCL) of the arithmetic mean of stack test data: “The 95% UCL of a mean is defined as a value that, when calculated repeatedly for randomly drawn subsets of site data, equals or exceeds the true mean 95 percent of the time. The 95% UCL provides a conservative estimate of the average concentration. Due to the uncertainty associated with estimating the true average emission rate, the 95 percent UCL of the arithmetic mean should be used because it provides reasonable confidence that the true average emission rate will not be underestimated.” The EPA guidance does not address data sets with left censored (below detection) data.

The ethanol plant VOC emissions data contain many instances of left censored values. These were reported as less than a detection limit value or in a few cases as zero. In addition, it is clear from the data that emissions from some facilities are systematically different from others. To account for facility effects and for censored data a nested bootstrap procedure on the Kaplan-Meier method was used to calculate means and UCLs. The Kaplan-Meier method, also known as a product-limit estimate, is an estimator of the survival curve that does not assume any particular parametric family. It can be applied with flipping to treat left censored data. The bootstrapping was done first over facilities and then over measurements within facility for 1000 repetitions of the Kaplan-Meier mean. The 50th percentile value of the bootstrap Kaplan-Meier means was taken as the mean, and the 95th percentile value was taken as the UCL (Table 1). These 95% UCL values are suitable for use in a risk analysis.

Figure 4: Aerial View of a Typical Ethanol Facility.

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Correspondence with the author about this bulletin can be directed to Daniel Brady at daniel.brady@pca.state.mn.us or (651) 282-6144 or Gregory Pratt at gregory.pratt@pca.state.mn.us or (651) 296-7664. For more information about the Environmental Bulletin Series, contact either of the following MPCA staff of the Environmental Information and Reporting Unit.

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Attachment #12

MICHIGAN AIR POLLUTION CONTROL COMMISSION

GENERAL RULES

PART 2. AIR USE APPROVAL

R 336.1221 Construction of sources of particulate matter, sulfur dioxide, or carbon monoxide in or near nonattainment areas; conditions for approval. (7/17/80)

Rule 221. Unless the following conditions are met, the commission shall deny a permit to install for a major offset source of particulate matter, sulfur dioxide, or carbon monoxide if such source may exacerbate an existing violation of any air quality standard or if such source is proposed for location in a nonattainment area:

(a) The proposed equipment shall comply with the lowest achievable emission rate for the pollutant for which the area is nonattainment.

(b) All existing sources in the state owned or controlled by the owner or operator of the proposed source shall be in compliance with all applicable local, state, and federal air quality regulations or shall be in compliance with a consent order or other legally enforceable agreement specifying a schedule and timetable for compliance.

(c) Prior to start-up of the proposed equipment, an emission reduction (offset) from existing sources in the area of the proposed source shall be provided such that, in the commission's judgment, there is a net air quality benefit and reasonable progress toward attainment of the applicable air quality standard. Such offsets shall be on a time frame compatible with the applicable air quality standard. If the proposed equipment is to be located in an area not meeting the applicable health-related air quality standard, the emission reduction shall be not less than 1.2 to 1. If the proposed equipment is to be located in an area not meeting the welfare-related air quality standard, the emission reduction shall be more than 1 for 1. If the offsetting emissions involve the control of fugitive particulate emissions, the emission reduction shall be not less than 1.5 to 1.

(d) The requirements of subdivision (a) of this rule do not apply to particulate, sulfur dioxide, and carbon monoxide emissions if the increased allowable emissions are less than 50 tons per year and 1,000 pounds per day.

(e) The requirements of subdivision (c) of this rule do not apply to particulate and sulfur dioxide emissions if the increased allowable emissions are less than 50 tons per year and 1,000 pounds per day.

(f) The requirements of subdivision (c) of this rule do not apply to carbon monoxide emissions.

Filed with the Secretary of State on May 20, 2002.
These rules take effect 7 days after filing with the Secretary of State.

PART 1. GENERAL PROVISIONS

R 336.1113 Definitions; M.

Rule 113. As used in these rules:

(a) "Major nonattainment air contaminant" means a nonattainment air contaminant for which the potential to emit is significant for a proposed major offset source or for which there is a significant net emissions increase for a proposed major offset modification.

(b) "Major offset modification" means the addition of a process or process equipment or a physical change in, or change in the method of operation of, a process or process equipment at a major offset source which results in a significant net emissions increase of any air contaminant regulated under the clean air act.

(c) "Major offset source" means either of the following:

(i) A stationary source which has a potential to emit of 100 or more tons per year of any air contaminant regulated under the clean air act.

(ii) A particular change at a minor offset source which results in an increase in the potential to emit of 100 or more tons per year of any air contaminant regulated under the clean air act.

(d) "Malfunction" means any sudden, infrequent and not reasonably preventable failure of a source, process, process equipment, or air pollution control equipment to operate in a normal or usual manner. Failures that are caused in part by poor maintenance or careless operation are not malfunctions.

(e) "Manufacturing location" means a place where a person is engaged in the making of goods or wares, including the generation of electricity in the processing of material or primarily in the disposal or treatment of solid or liquid waste. For the purpose of assessing a surveillance fee, "manufacturing location" includes all such places, whether publicly or privately owned and contained within 1 geographical site, except places owned and operated by the state government. A power plant, as defined in table 42 of R 336.1401, constitutes a separate manufacturing location when used to supply steam or energy to more than 1 other manufacturing or commercial location. In any case, a power plant that has a capacity of more than

Attachment #13

the energy of innovation

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home › ethanol › production process

working at ICM

DAVE VANDER GRIEND

"Our mission is to find ways to turn agricultural products into renewable energy."

NOW HIRING!

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ethanol news

Survey suggests more awareness of ethanol [June 30, 2006]

Students Breathe Easier on Cleaner-Burning School Buses

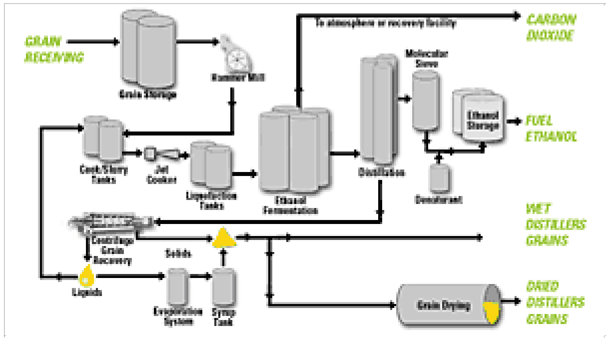
links

Ethanol delivers high-octane performance at racetracks across the country.

Ethanol Production Process

Ethanol is commercially produced in one of two ways, using either the wet mill or dry mill process. Wet milling involves separating the corn kernel into its component parts (germ, fiber, protein, and starch) prior to fermentation. ICM-designed plants utilize the dry mill process, where the entire corn kernel is ground into flour. The starch in the flour is converted to ethanol during the fermentation process, creating carbon dioxide and distillers grain.

Learn more about the Dry Mill Process when you click on the diagram below and mouse over the steps.



Delivery / Storage

Corn (or milo) is delivered by truck or rail to the ethanol plant where it’s loaded in storage bins designed to hold enough grain to supply the plant for 7–10 days.

Milling

The grain is screened to remove debris, such as corn stalks, and ground into course flour.

Cooking (Hot Slurry, Primary Liquefaction, and Secondary Liquefaction)

During the cook process, the starch in the flour is physically and chemically prepared for fermentation.

Hot Slurry

The milled grain is mixed with process water, the pH is adjusted to about 5.8, and an alpha-amylase enzyme is added. The slurry is heated to 180–190°F for 30–45 minutes to reduce viscosity.

Primary Liquefaction

The slurry is then pumped through a pressurized jet cooker at 221°F and held for 5 minutes. The mixture is then cooled by an atmospheric or vacuum flash condenser.

Secondary Liquefaction

After the flash condensation cooling, the mixture is held for 1–2 hours at 180–190°F to give the alpha-amylase enzyme time to break down the starch into short chain dextrins.

After pH and temperature adjustment, a second enzyme, glucoamylase, is added as the mixture is pumped into the fermentation tanks.

Simultaneous Saccharification Fermentation

Once inside the fermentation tanks, the mixture is referred to as mash. The glucoamylase enzyme breaks down the dextrins to form simple sugars. Yeast is added to convert the sugar to ethanol and carbon dioxide. The mash is then allowed to ferment for 50–60 hours, resulting in a mixture that contains about 15% ethanol as well as the solids from the grain and added yeast.

Distillation

The fermented mash is pumped into a multi-column distillation system where additional heat is added. The columns utilize the differences in the boiling points of ethanol and water to boil off and separate the ethanol. By the time the product stream is ready to leave the distillation columns, it contains about 95% ethanol by volume (190-proof). The residue from this process, called stillage, contains non-fermentable solids and water and is pumped out from the bottom of the columns into the centrifuges.

Dehydration

The 190-proof ethanol still contains about 5% water. It's passed through a molecular sieve to physically separate the remaining water from the ethanol based on the different sizes of the molecules. This step

Ethanol Storage

Before the ethanol is sent to storage tanks, a small amount of denaturant is added, making it unfit for human consumption. Most ethanol plants' storage tanks are sized to allow storage of 7–10 days' production capacity.

Co-Product Processing

During the ethanol production process, two valuable co-products are created: carbon dioxide and distillers grains.

As yeast ferment the sugar, they release large amounts of carbon dioxide gas. It can be released into the atmosphere, but it's commonly captured and purified with a scrubber so it can be marketed to the food processing industry for use in carbonated beverages and flash-freezing applications.

The stillage from the bottom of the distillation tanks contains solids from the grain and added yeast as well as liquid from the water added during the process. It's sent to centrifuges for separation into thin stillage (a liquid with 5–10% solids) and wet distillers grain.

Some of the thin stillage is routed back to the cook/slurry tanks as makeup water, reducing the amount of fresh water required by the cook process. The rest is sent through a multiple-effect evaporation system where it is concentrated into syrup containing 25–50% solids. This syrup, which is high in protein and fat content, is then mixed back in with the wet distillers grain (WDG).

With the added syrup, the WDG still contains most of the nutritive value of the original feedstock plus the added yeast, so it makes an excellent cattle ration for local feedlots and dairies. After the addition of the syrup, it's conveyed to a wet cake pad, where it is loaded for transport.

Many ethanol facilities do not have enough nearby cattle to utilize all of the WDG. It must be used soon after it's produced because it spoils easily. So, it's often sent through a drying system to remove moisture and extend its shelf life. This dried distillers grain (DDG) is commonly used as a high-protein ingredient in cattle, swine, poultry, and fish diets. It's also being researched for human consumption.

Midwest Grain Processors Cooperative

Located in Lakota, IA, and featuring our design, dryer system, thermal oxidizer, and bio-methanator, this plant was completed in 2002 with a guarantee of 40 MGY. The plant was expanded to 100 MGY in 2005.

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P.O. Box 397, 310 N. First Street, Colwich, KS 67030-0397
Phone: Toll-Free 877.426.3113 or 316.796.0900 Fax: 316.796.0570

Attachment #14

May 8, 2006

Attention Docket ID No. EPA-HQ-OAR-2006-0089
U.S. Environmental Protection Agency, EPA West (Air Docket)
Mail Code 6102T
Room B-102
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460

Dear Sir or Madam:

On behalf of the Nebraska Department of Environmental Quality (NDEQ), I thank you for this opportunity to comment on the proposed Prevention of Significant Deterioration, Nonattainment New Source Review, and Title V: Treatment of Corn Milling Facilities Under the "Major Emitting Facility Definition, which were published in the *Federal Register* on March 9, 2006. We are commenting in a neutral capacity on the proposal, but would like to provide input on several issues where the EPA asked for the input. We are also providing the EPA with supplementary information for consideration. Please refer to information provided in the enclosed document *EPA PROPOSAL ON FUEL GRADE ETHANOL PLANTS.*

Should EPA decide to finalize Option 1 of the proposal, please consider the following. Option 1 is limited to "corn" wet and dry milling to make fuel ethanol. Several plants currently use milo along with corn to make fuel ethanol. The future of ethanol appears to include production from the use of biomass, i.e., cellulosic material. The only difference would be the feedstock is a biomass material other than corn; fermentation and distillation processes would be essentially unchanged. If left as is, the rule change could negatively impact the growth of cellulosic ethanol.

Thank you for considering this letter and attachments in your evaluation of this proposal. If you have any questions or would like additional information, please contact me at shelley.kaderly@ndeq.state.ne.us or (402) 471-4299.

Sincerely,

Shelley Kaderly
Air Quality Division Administrator
Nebraska Dept of Environmental Quality
PO Box 98922
Lincoln, NE 68509-8922

Attachments

Drying of the DGS results in significant quantities of volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) being emitted. As an example, the uncontrolled dryer emissions from a 50 MMgal/yr ethanol plant were approximately 800 tons per year (tpy) VOCs and approximately 25 tpy for a single HAP and approximately 44 tpy for all HAPs.[2] In addition to the dryer emissions, an ethanol source will have VOC emissions from the fermentation and distillation processes, as well as other emission points. The uncontrolled emissions from fermentation and distillation at the above ethanol source were as high as 2317 tpy and 3094 tpy VOC, respectively and as high as 37 tpy and 35 tpy total HAPs, respectively.[2] With this quantity of pollutants being emitted, ethanol sources larger than 50 MMgal/yr will have to install controls to be considered a minor source under the PSD program even at the 250 tpy threshold. However, the PSD program is not the only driving force for controls.

Under the National Emission Standard for Hazardous Air Pollutant (NESHAP) program, new major sources of HAPs must comply with all applicable standards and install Maximum Available Control Technology (MACT) when there is not an applicable standard, or take enforceable limitations to keep their emissions below the major source thresholds.[3] An ethanol plant subject to the NESHAP program may be required to comply with at least two standards: one of the industrial boiler and process heater NESHAPs; and, the Miscellaneous Organic NESHAP, Subpart FFFF.

Of all the NESHAP standards that may apply to an ethanol plant, the standard that is most problematic for this type of source is the Miscellaneous Organic NESHAP commonly referred to as the MON. The MON applies to miscellaneous organic chemical manufacturing process units that are located at, or are part of, a major source of HAP emissions. A miscellaneous organic chemical manufacturing process unit includes all equipment that collectively function to produce a product or material described in the standard. This includes sources that produce denatured alcohol.

The MON applies to what are defined as continuous process vents and batch process vents. Vents are classified as either Group 1 or Group 2 depending on the emission characteristics of each respective vent. The applicability threshold for Group 1 and Group 2 vents are different for new and existing sources (the thresholds are more stringent for new sources).

During review of a 100 MMgal/yr ethanol expansion application (source will be 240 MMgal/yr total production), the source identified the new fermentation, distillation, and evaporation vents as continuous process vents. Process vents such as these must control organic HAP by 98% or to a level of 20 ppmv; use a flare; or use a recovery device to demonstrate compliance. The requirement to control HAP emissions would also control VOC emissions from these types of vents.

As pointed out above, fermentation and distillation process units are very large sources of HAP emissions (approximately 9 tpy and 20 tpy total HAPs, respectively). One HAP, acetaldehyde, is responsible for the majority of these emissions. To date, it has been very difficult for Nebraska sources to consistently demonstrate greater than 98 percent control for acetaldehyde. Sources that do approach this level of control have very high costs associated

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[2] See Attachment A – Test Results Summary for Abengoa, York, Nebraska. Values provided represent the maximum emissions documented over several tests.

[3] A major source under the NESHAP program is any source that emits, or has the potential to emit, more than 10 tpy of a single HAP, or 25 tpy of all HAPs.

with it. A recent Toxics Best Available Control Technology (TBACT) analysis shows that to achieve 96% control efficiency, the costs will be $127,546/yr combined, or $12,021/ton of acetaldehyde removed.[4] In regard to the 20 ppmv requirement, a review of data available to the Department shows that, to date, there hasn't been a source in Nebraska capable of meeting this requirement.

As discussed earlier, the DGS dryer is also a large source of HAP emissions (approximately 15 tpy for a single HAP and approximately 29 tpy for all HAPs). However, this emission unit is not subject to a NESHAP standard. Because of this, the source must do a case-by-case Maximum Available Control Technology (MACT) evaluation if it decides to remain a major source of HAPs. For new sources, this equates to installing the same control as the best-controlled similar source. For DGS dryers, the best-controlled similar source will be what the existing ethanol plants have installed, which, in Nebraska, is a thermal oxidizer. To remain a minor source, they would have to take limits and install controls to keep their emissions below the major source thresholds for HAPs. Installing a thermal oxidizer would likely be the choice of a source to remain minor for the HAP program as well as the PSD program. Since they will have to install the same level of control under the HAP program as they will under the PSD, there is very little, if anything, gained by an ethanol plant under this proposal.

For the reasons stated above, it is the Departments opinion that sources will decide to remain minor for HAPs where possible. For ethanol plants, the only way to become a minor source is to install controls on their emission points. While the source will likely use the same control techniques to remain minor, the cost will be less. To be considered a minor source a control rate of at least 60 percent will be needed. We do not have data on the reduction in cost of meeting this lower level of control, but do know that the costs will be reduced. In the TBACT analysis referenced above, there was a reduction in control costs when the level of control was reduced. However, the analysis did not include the costs at the 60 percent control rate.

One matter not addressed by the EPA is that moving fuel ethanol plants out of the Chemical Processing Plant category may not get the full effect they think it will. In their proposal, they did not discuss another 100 tpy source category – "Fossil-fuel boilers (or combination thereof) totaling more than 250 million British Thermal units per hour heat input" – which will have an impact on ethanol plants under this proposal. Most 100 + gallon per year ethanol plants have a boiler heat input demand in the 250 to 500 Million British Thermal Units (MMBtu) range.[5] All of these sources have limitations very close to 100 tpy. So, the boilers would fall into this source category.

According to EPA policy letters on "nested activities," a permitting authority needs to consider whether there are any major source categories, or "nested activities," within the source you are evaluating.[6] When permitting sources, you first look at the primary activity of the source. If it falls under one of the listed source categories, you use the 100 tpy threshold. If it does not fall under one of the listed source categories, you need to consider whether there are any "nested activities." If so, "It is the Agency's practice to use the threshold applicability level of the nested activity's source category to determine the PSD applicability for that

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[4] Nebraska has Toxics BACT requirements for sources emitting HAPs in excess of 2.5 tpy of a single HAP and 10 tpy total HAPs.

[5] See Attachment B – Summary of Boiler Sizes for Larger Ethanol Plants

[6] 1997 applicability determination letter from Cheryl Newton, Chief, Permits and Grants Section, USEPA Region 5, to Robert Hodanbosi, Chief, Division of Air Pollution Control, Ohio Environmental Protection Agency. Copy attached.

Attachment A

Air Emissions Testing Results:
Abengoa BioEnergy, York

Note: – signifies that the pollutant was not tested for during that testing event.

Controlled Emissions Results from January 8-9, 2002 Testing

Emission Unit	Emissions (tpy) VOCs	PM	HAPs Acetaldehyde
CO_2 Scrubber	45.51	--	3.61
Vent Scrubber	258.38	--	4.13
DDGS Dryer Stack	--	54.22	--
Total	**303.88**	**54.22**	**7.74**
		Total HAPs	**7.74**

Emissions Results from September 11-14, 2002 Testing

Emission Unit	Emissions (tpy) VOCs	PM	HAPs Acetaldehyde	Formaldehyde	Methanol	Acrolein
CO_2 Scrubber	251.85	--	2.41	0.09	0.35	0.35
Vent Scrubber	196.22	--	2.19	0.09	0.26	0.26
DDGS Dryer Stack #2	396.83	43.27	9.81	3.24	0.92	0.83
DDGS Dryer Stack #3	406.90	184.09	15.29	9.07	2.67	1.71
Total	**1251.80**	**227.37**	**29.70**	**12.48**	**4.20**	**3.15**
					Total HAPs	**49.54**

5-9

Attachment A

Controlled Emissions Results from September 1-2, 2004 Testing

	Emissions(tpy)		HAPs			
Emission Unit	**VOCs**	**PM**	**Acetaldehyde**	**Formaldehyde**	**Methanol**	**Acrolein**
CO_2 Scrubber	108.01	--	5.74	0.00	0.09	0.09
Vent Scrubber	80.33	--	15.46	0.00	0.04	0.04
Total	**188.34**	--	**21.20**	**0.00**	**0.13**	**0.13**
					Total HAPs	**21.46**

Uncontrolled Emissions Results from September 1-2, 2004 Testing

	Emissions(tpy)		HAPs			
Emission Unit	**VOCs**	**PM**	**Acetaldehyde**	**Formaldehyde**	**Methanol**	**Acrolein**
CO_2 Scrubber	2317.28	--	8.02	0.09	0.57	0.09
Vent Scrubber	1631.94	--	19.18	0.00	0.48	0.04
Total	**3949.23**	--	**27.20**	**0.09**	**1.05**	**0.13**
					Total HAPs	**28.47**

Controlled Emissions Results from December 15-18, 2004 Testing

	Emissions (tpy)		HAPs		
Emission Unit	**VOCs**	**PM**	**Acetaldehyde**	**Methanol**	**Acrolein**
CO_2 Scrubber	25.84	--	9.64	0.00	0.00
Vent Scrubber	36.79	--	4.38	0.00	0.00
Total	**62.63**	--	**14.02**	**0.00**	**0.00**
				Total HAPs	**14.02**

Attachment A

Uncontrolled Emissions Results from December 15-18, 2004 Testing

Emission Unit	Emissions(tpy)		HAPs		
	VOCs	PM	Acetaldehyde	Methanol	Acrolein
CO_2 Scrubber	1514.60	--	11.83	0.00	0.00
Vent Scrubber	3094.47	--	21.90	0.00	0.00
Total	**4609.07**	--	**33.73**	**0.00**	**0.00**
				Total HAPs	**33.73**

Controlled Emissions Results from June 26-28, 2004 Testing

Emission Unit	Emissions (tpy)		HAPs		
	VOCs	PM	Acetaldehyde	Methanol	Formaldehyde
CO_2 Scrubber	25.84	--	0.48	0.83	0.48
Vent Scrubber	7.45	--	0.48	0.53	0.31
Total	**33.29**	--	**0.96**	**1.36**	**0.79**
				Total HAPs	**3.11**

Uncontrolled Emissions Results from June 26-28, 2004 Testing

Emission Unit	Emissions(tpy)		HAPs		
	VOCs	PM	Acetaldehyde	Methanol	Formaldehyde
CO_2 Scrubber	2031.88	--	23.21	8.32	5.69
Vent Scrubber	1254.43	--	26.28	5.26	3.94
Total	**3286.31**	--	**49.49**	**13.58**	**9.64**
				Total HAPs	**72.71**

Attachment #15

3-19-05 e-mail from
John Shrock

DISCUSSION OF DDGS COOLER DESIGN PROPOSED FOR MARYSVILLE ETHANOL, LLC

Prepared by ECT, Inc

February 27, 2007

The 110 million gallon per year (Mgpy) Marysville Ethanol facility consists of two identical 55 Mgpy ethanol production process trains. The following discussion addresses the control of volatile organic compounds (VOC) from the dry distillers grain with solubles (DDGS) cooling systems. Some facilities divert some of the cooler exhaust to the DDGS dryers as combustion air that is subsequently controlled by a thermal oxidizer (TO) system. Marysville Ethanol, as designed by Industry Consulting & Marketing, Inc. (ICM) does not include a mechanism for routing cooler exhaust to the dryer/TO system for the 55 Mgpy process trains. However, the design for this size plant does include refinements to the dryer systems, which result in less emissions being emitted by the DDGS cooler systems. Essentially the dryer systems recirculate air so the DDGS going to the coolers contain less VOC. The costs associated with this dryer system, as well as the cost of other options for controlling emissions from the cooler systems are discussed below. The emissions and estimates of cost per ton for the different control options all relate to a single 55 Mgpy process train, since any modifications would have to be applied to each process train separately.

DDGS Cooling System

The DDGS cooling process consists of equipment necessary to cool the DDGS after leaving the dryer and prior to discharge in the DDGS storage building. EPA Test Method 25A (scaled) was conducted by an outside stack testing consultant in order to determine typical VOC emission rates for the DDGS Cooling System. The quantity of VOCs are based on actual testing performed on the DDGS Cooling System at Glacial Lakes Energy (GLE). This facility was also designed by ICM and contains a dryer system similar to the one being constructed at the Marysville Ethanol facility. This analysis is based on the total emission reductions that can be achieved by controlling the cooling cyclone exhaust using the emission factor from developed from the GLE test data. The VOC emission factor of 0.074 pound (lb) VOC/ton DDGS were used to estimate the emissions for each 55 Mgpy process train as follows:

0.074 lb/ton DDGS x 178,440 tons DDGS/year/2,000 lb/ton = 6.6 tons VOC/year

POTENTIAL CONTROL TECHNOLOGIES

Several methods for controlling VOC from the DDGS coolers were identified. Since the DDGS dryers were designed with "air recirculation" in order to minimize emissions from the DDGS coolers, it is appropriate to discuss the cost of incorporating this refinement into the design. Also, of interest is the option of routing a portion, or all, of the cooler emissions to the recuperative thermal oxidizer. In addition, the following add on controls were considered:

- Regenerative thermal oxidizer,
- Flare,
- Carbon adsorption,
- Carbon absorption.

ADVANCED DRYER DESIGN

The Dryer is equipped with "air recirculation" which is expected to result in substantially less VOC emissions (0.074 lb/ton DDGS) being entrained in the DDGS transported to the Cooling System than if the dryer system was a single pass design. Previous testing at US Energy Partners in Russell, Kansas, revealed that a single pass Dryer configuration resulted in 1.12 lbs VOC/ton DDGS being aspirated from the Dryer and emitted to atmosphere from the Cooling Cyclone exhaust. Based on Marysville Ethanol's maximum potential throughput of 178,440 tons DDGS per process train, annual VOC emissions would be 99.9 tons/yr (based on 1.12 lb/ton single pass). Incorporating the recirculating design dryer system results in emission reductions of VOCs from 1.12 lb/ton to 0.074 lb/ton, based on Method 25A (scaled). Thus, a recirculating Dryer system can be expected to achieve VOC reductions of approximately 93% in comparison to single pass dryers. The estimated incremental cost to design, manufacture and install the recirculating dryer system is estimated at $200,000 over 10 years or $20,000 per year to achieve these annual VOC reductions. The VOC emission reductions (93%) are estimated at 92.9 tons/year. Without considering operation and maintenance (O & M) costs, this relates to a cost effectiveness of $215/ton.

Based on VOC cost effectiveness criteria, this method of reducing VOC emissions from drying and Cooling Cyclone process is very cost effective per EPA guidelines, and incorporation of this design is preferable to add on emission controls.

PROCESS MODIFICATION

The facility is equipped with a recuperative thermal oxidation (TO) unit, which serves the DDGS dryers and several process vents. The recuperative TO is currently sized to provide only the required steam for the facility. Routing DDGS cooler exhaust to this unit would require increasing the heat input capacity of the unit from 125 million British thermal units per hour (MMBtu/hr) to approximately 150 MMBtu/hr. Modifying the planned TO of 125 MMBtu/hr and 110,000 actual cubic feet per minute (acfm) by increasing its capacity to handle the additional DDGS cooling exhaust of 28,000 acfm would result in increased cost. It is estimated that the total VOCs to the larger TO would be those from the Dyer, Distillation and Process Vents and the Cooling Cyclone.

- Incremental cost for a re-designed (larger) and installed Recuperative TO of this size is estimated at $500,000 in incremental capital costs ($50,000/year).
- Cost of additional gas is estimated at 25,000 cubic feet per hour (cfh) @ $6.00 per 1,000 cubic feet (cf) for a cost of $1,314,000/year.
- No additional maintenance costs are estimated.

Controlled VOCs from the cooling cyclone would be nearly 6.6 tpy, assuming greater than 99% + control efficiency for the TO. Total annual cost is estimated at $1,364,000/year or $206,700/ton VOC to control ~6.6 tpy. The option of ventilating an additional 28,000 acfm would require a larger Recuperative TO, and based on the preceding estimate is not cost effective or technologically feasible due to safety (flashback) concerns. Additionally, and very important is that increasing the TO size will increase emissions of other criteria pollutants, such as carbon monoxide (CO) and nitrogen oxides (NO_x), which is counter productive in relation to the incremental amount of VOCs that will be reduced.

REGENERATIVE THERMAL OXIDATION

Another option is to add a stand alone regenerative TO system to serve the DDGS cooler system. This add-on VOC destruction method (regenerative TO) could potentially eliminate 99%+ of VOC emissions. In order to achieve these high efficiencies, combustion temperatures of approximately 1400 - 1600 degrees Fahrenheit and a residence time of at least 0.3 - 0.5 seconds would need to be maintained. It is estimated that a 6.0 MMBtu/hr Thermal Oxidizer would be necessary to control the DDGS Cooling System VOC emissions:

- Capital cost is estimated at $1.0 million ($100,000/yr),
- Natural gas consumption: 6,000 cfh @ $6.00 per 1000 cf ($315,000/yr),
- Maintenance ($50,000/yr).

Controlled VOC emissions would approach 6.6 tons/year (after air recirculating dryer). Total annual cost is estimated at $465,000/year or $70,500/ton VOC. This option of ventilating 28,000 acfm to a stand alone Regenerative TO is not cost effective or technologically feasible due to safety (flashback) concerns. In addition, the RTO would emit approximately 2.6 tons/year of NO_x and 2.2 tpy CO. Bake out emissions and puffing when switching cans have not been estimated.

FLARING

A flare in this application is not considered feasible because the heat content of the waste gases (VOC chemicals with makeup air) does not approach 300 Btu/scf. Therefore, a destruction efficiency of 98% cannot likely be achieved without substantial use of supplemental natural gas. Note, a $150,000 flare ($15,000/yr capital cost) of 20 MMBtu/hr would require natural gas consumption of 20,000 cfh, equivalent to $1,051,200/year for natural gas at $6/cf. Maintenance is estimated at $25,000/yr. Total annual costs approximate $1,091,200/yr. Assuming 6.5 tons per year of VOC would be controlled, the cost to achieve 98% efficiency would be approximately $161,700/ton.

CARBON ADSORPTION

Carbon adsorption vapor recovery can "theoretically" achieve VOC emission reductions in the 95% plus efficiency range, which would result in approximately 6.3 tpy being controlled. It is assumed that the VOC recovered cannot be reused because of the number of chemicals involved and the high cost for VOC recovery. More important, is that carbon adsorption cannot be reliably employed for technical reasons due to the presence of particulate matter contained within the VOC gas stream. The potential for immediate carbon fouling (by DDGS particulate matter) would have a negative impact on adsorption efficiency, resulting in plugging up the carbon and having breakthrough emissions. The Dryer system also has potential to create a fire in the DDGS that could get carried by the cooling cyclone into the carbon adsorption system thus destroying the carbon unit. A review of similar ethanol plants and the Minnesota Consent Decrees has not revealed use of Carbon Adsorption for this application.

Therefore, it is concluded that the Carbon Adsorption technology is not a suitable candidate for VOC emission control for the cooling cyclone because it is technologically infeasible and impractical.

CARBON ABSORPTION

A column absorption packed tower scrubbing system (e.g. water) with removal efficiency in the 95% + range can reduce organic gas emissions. Packed scrubber towers are most efficient at low gas flow rates and high liquor flow rates in order to achieve economy of scale. Additional equipment will be necessary to recover organic emissions and particulate matter emissions from the scrubber liquor. As the water is considered "excess" from the plant's water balance perspective, additional waste water treatment is required.

- Capital cost of scrubber is $100,000 or $10,000/yr.
- Capital cost of waste water treatment plant is $2,000,000 or $200,000/yr.
- O & M (for both the scrubber and waste water treatment plant, labor, supervision, utilities, maintenance) is estimated at $200,000/year.
- Waste management costs are unknown.
- Total annual costs are estimated at $410,000/yr.
- Total cost of controlling 6.3 tons/year VOC would be approximately $65,000/ton.

It is therefore concluded, that Column Absorption technology is not a suitable candidate for VOC emission control for the DDGS coolers based on the plant's water balance alone. A number of consultants were contacted and column absorption has yet to be employed as a cost effective control technology for DDGS cooling system VOC control.

RANKING OF CONTROL TECHNOLOGIES FOR VOC REDUCTIONS

The following table summarizes the results of the evaluation.

Control Option	Control Efficiency	VOC Reduction (tpy)	Cost of Control ($/ton VOC)
Cooler Exhaust to TO	99+	~6.6	$206,700
Add On TO	99+	~6.6	$70,500
Flaring	98	6.5	$161,700
Carbon Adsorption	95	6.3	Not feasible

Carbon Absorption	95	6.3	$65,000
Recirculating Dryer	na	na	na

Table notes:

- The option of increasing the size of the TO in order to accommodate Cooling Cyclone VOCs is estimated to cost $206,700/ton (the largest cost is natural gas at $6.00 per 1000 cf). This option is believed to not be incrementally cost effective as the TO is sized to provide sufficient steam, and any increase in steam from the TO would be in excess of the plant's water balance.
- A stand alone Thermal Oxidizer or larger Thermal Oxidizer would also result in increased CO and NO_x emissions which is counter productive in reducing emissions. Note, the Thermal Oxidizer is being installed on the Dryer System in order to reduce Dryer CO and VOC emissions and to eliminate potential for nuisance odor.
- Carbon Adsorption is not technologically feasible due to particulate matter in the gas stream that will result in fouling and breakthrough, and has not been employed on a similar ethanol plant.
- Column absorption is not technologically feasible (or cost effective) due to the plant's need to maintain a water balance. The excess water and potential water treatment associated with the column absorption would be required.
- The Recirculating Dryer will not reduce the estimated 6.6 tpy from the cooler system and is identified only to the extent that as a "process" it inherently is a lower VOC emitter than a single pass dryer. While it does inherently reduce emissions from a single pass dryer, it results in 6.6 tpy emitted rather than other technologies (above table) that emit 0.1 to 0.3 tpy.

SUMMARY AND CONCLUSIONS

The following findings were obtained from the evaluation:

a) Thermal Oxidation is a highly efficient means of disposing of a certain VOCs without creating a solid and hazardous waste problem. Purely based on economics, VOC oxidation costs of 6.6 tpy VOCs do not qualify as being cost effective for a stand alone or increased size TO. Due to the plant's water balance, increasing the size of the planned TO is not technologically feasible as the required water will be in excess of the plant's water balance. It is noteworthy to mention, that the proposed Recuperative Thermal Oxidizer is being used in conjunction with a recirculating dryer system and will minimize drying process VOC emissions.

b) Flaring is an efficient means of disposing of a certain VOCs, without creating a solid and hazardous waste problem. Based on economics (high cost of gas and low heat content of gas stream), VOC oxidation costs do not qualify as being cost effective.

c) Column Absorption - Scrubbing VOC emissions with a suitable liquor (water) will achieve emission reductions. The estimated cost is not cost effective. The DDGS cooling and transport system at dry ethanol plants have not been controlled before by a scrubber and the Minnesota Consent Decrees negotiated by EPA and the state of Minnesota, do not specify any add-on type of VOC controls, e.g., scrubber to the cyclone cooling system exhaust.

d) Carbon Adsorption - A carbon vapor recovery system theoretically can generate emission reductions. However, due to high probability for fouling and breakthrough, this technology is eliminated as being technologically infeasible.

e) Advanced DDGS Dryer Design - The dryer system in this particular application are believed to be a very effective in that it is inherently a low VOC emitting source. Due to the highly cost effective nature of the Dryer Recirculation design and the reductions from a base case, estimated at 93%, Advanced Dryer Process Design is selected at the technology of choice. Note, recent testing on this new recirculation dryer system in South Dakota reveals emission reductions approaching 93% from the base case.

In conclusion, all add-on control options are not cost effective, technologically infeasible or impractical in order to qualify as being cost effective on dollar/ton basis. However, the proposed DDGS dryer system design will achieve approximately a 93% reduction of VOC from the DDGS cooler system, versus what would occur with a traditional single pass dryer system. After reviewing the BACT/LAER Clearinghouse data, surveying a number of dry mill ethanol plants and Third Party Consultants, ICM is unaware of any similar situations where reductions of VOC with cost effective VOC control equipment would qualify as existing technology in a cost effective range. The use of the Recirculating Dryer to reduce Cooling System VOC emissions is very cost effective and applicable in this specific application.

Based on the above analysis, the proposed design, i.e., recirculation air for the DDGS dryer system, is selected as the control technology most appropriate for the Marysville Ethanol facility. Other technologies are not believed to be technologically feasible and in use, or do not generate emission reductions or incremental emission reductions in a cost effective dollar per ton range basis.