DNR Guidance Disclaimer

This document is intended solely as guidance and does not contain any mandatory requirements except where requirements found in statute or administrative rule are referenced. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.

Air Management Program

Air Program Fact Sheet
MTE Calculations for Air Permit Exemptions

February 2020

In order to use certain exemptions from air pollution operation or construction permits, a facility's Maximum Theoretical Emissions (MTE) must be calculated. For more details on the different air permit exemption options, go to the *Air Permit Exemptions* webpage: http://dnr.wi.gov/topic/smallbusiness/exemptions.html.

What does Maximum Theoretical Emissions (MTE) mean?

There are two different definitions for MTE in the air pollution rules in the Wisconsin Administrative Code. This fact sheet will address the definition of MTE in s. NR 400.02(95), Wis. Adm. Code:

> *"[…] means the quantity of air contaminants that theoretically could be emitted by a stationary source without control devices based on the design capacity or maximum production capacity of the source. When determining annual maximum theoretical emissions, a source shall be presumed to operate 8,760 hours per year unless its physical design precludes 8,760 hours of operation per year. Where a source's physical design restricts the number of hours it may operate, annual maximum theoretical emissions shall be calculated taking this restriction into account. In determining the maximum theoretical emissions of VOCs [Volatile Organic Compounds] for a source, the design capacity or maximum production capacity shall include the use of raw materials, coatings and inks with the highest VOC content used in practice by the source. In determining the maximum theoretical emissions of a hazardous air contaminant for a source, the design capacity or maximum production capacity shall include the use of raw materials, coatings, inks and fuels with the highest hazardous air contaminant content used in practice by the source. Realistic operating conditions shall be taken into account in determining emissions under this subsection."*

There are important aspects to the MTE definition facilities should review carefully. MTE allows for design elements that limit a facility from operating a full 8,760 hours or *"realistic operating conditions"* that otherwise restrict emissions. MTE is also calculated as if the raw material with the highest air pollutant content available to the source were used all the time.

The annual MTE is important for determining which type of permit is appropriate. However, the hourly MTE is used to show whether a facility is exempt from either construction or operation permit requirements. A facility can use *realistic operating conditions* to determine whether hourly MTE conditions truly limit the operations on an hour-by-hour basis. Operating conditions that only affect or limit operations over longer periods of time (i.e., a facility must shut down machinery for maintenance once every three months for a full week) cannot be used to determine the hourly MTE, only the annual MTE.

Volatile Organic Compounds (VOC)

Volatile organic compounds (VOCs) are found in many operations; often coming from painting, solvent cleaning or combustion of a fuel in a boiler or oven. For facilities operating a paint spray booth, the MTE are calculated based on operating the spray gun at full open and using the coating with the highest VOC content that could be sprayed or applied continuously for 24 hours per day, 365 days per year (8,760 hours per year). The VOC content of a coating is found on Safety Data Sheets (SDS) provided by the manufacturer or supplier.

If the highest VOC content coating has 5.60 pounds VOC per gallon and, at full open, the gun can spray 14 gallons per hour, the MTE for that paint spray booth would be calculated as:

> 14 gal/hr x 5.6 lb VOC/gal = 78.4 lbs VOC/hr
>
> 78.4 lb/hr x 8760 hr/yr ÷ 2000 lb/ton = **343.4 tons VOC/year**

If the facility used a coating with low VOC content—in this example, 2.4 lbs VOC/gal— the emissions would be:

> 14 gal/hr x 2.4 lb VOC/gal = 33.6 lbs VOC/hr
>
> 33.6 lb/hr x 8760 hr/yr ÷ 2000 lb/ton = **147.2 tons VOC/year**

Some processes do not have clearly defined maximum production capacities or design capacities. In those cases, MTE can be projected from actual VOC emissions based on the MTE of associated processes that do have defined maximum production capacities or design capacities. Using an example of cleaning operations on a coating line, one can estimate the MTE by looking at a maximum production or design capacity operating scenario for the coating line and using other available information, including production and maintenance records, to establish the cleaning operations worst case schedule.

- For example, assume that one production cycle (seven hours of production and one hour of cleaning) occurs daily and the production area is cleaned after each production cycle. However, if three production cycles (21 hours of production and three hours of cleaning) could be completed daily under a maximum production scenario, one can assume three times the quantity of cleaning materials would be required daily. This would triple the actual emissions from cleaning materials. However, if actual production records indicate that cleaning is necessary only after every other production cycle, this practice would be taken into account in the MTE calculation. For an example of this type of calculation, refer to the VOC Emissions tab on the MTE spreadsheet: http://dnr.wi.gov/topic/SmallBusiness/documents/air/EmissionsWorksheetMTE.xlsx.

Calculating the total MTE of VOCs for a facility requires this type of calculation for every process that emits VOCs, for both the hourly and annual MTE. **The facility-wide MTE of each pollutant is the sum total of the MTE from all processes at the facility that have emissions of that pollutant.**

Realistic operating conditions that can be taken into account for MTE **do not** include operation of a control device or permit restrictions taken to limit the annual operations at the source (such as hours per year or gallons per year). Only conditions specific to the design of the operations can be considered. For a construction permit, it could be difficult to account for these conditions, since no operational track record exists for a new process.

Examples of operating conditions that could restrict MTE include:

- If a process line **must** be taken off-line for two weeks of every year for regular maintenance,

then it can only operate 8424 hours per year.

14 gal/hr x 5.6 lb VOC/gal x 8424 hr/yr ÷ 2000 lb/ton = **330.2 tons VOC/year**

- A painting operation applies paint to very large parts, and only one part can be painted per hour because it also must dry within the paint booth. The hourly paint spray rate is limited to the gun operating at full open for the time it takes to paint the largest part during that hour. For this example, if paint is applied for no more than 15 minutes in any hour:

1) (14 gal/hr x 0.25 hr) + (0 gal/hr x 0.75 hr) ÷ 1 hr = **3.5 gal/hr**
2) 3.5 gal/hr x 5.6 lb VOC/gal x 8760 hr/yr ÷ 2000 lb/ton = **85.8 tons VOC/year**

Conditions used to determine MTE must be documented to show Wisconsin Department of Natural Resources (DNR) and U.S. Environmental Protection Agency (EPA) that they cannot be altered or changed in any way without requiring a construction permit.

Certain control measures may be used to determine MTE if they are not used solely for reducing air pollution. In Wisconsin, DNR defines this scenario as control devices that are "part of the process."

- For example, a whey drying process uses a fabric filter baghouse to capture dried whey. The baghouse reduces the particulate matter emissions, but more importantly is the primary way in which the facility collects their final product and moves it to the bagging and shipping stage of production.

Contact the facility's assigned DNR compliance inspector to ask if a scenario will meet the criteria. Decisions are made on a case-by-case basis to establish whether the control is truly part of the process. If a facility has received a determination from the DNR in the past, be sure to have on file any records needed to demonstrate the criteria used in that scenario continue to apply.

Sulfur dioxide (SO_2)

For some fuels, the calculation of SO_2 MTE is not simply a matter of multiplying a unit of material used by an emission factor. Fuels such as fuel oil or coal will have a sulfur content in percent by weight that must be used in the calculation of MTE.

Starting in 1993 fuel oil with 5000 ppm (0.5% sulfur) was no longer allowed in any vehicles. As of 2006, on-road diesel fuel could no longer be sold with more than 15 ppm (or 0.0015% by weight) sulfur content; however, off-road vehicles could still use 500 ppm (0.05% sulfur). While both low-sulfur diesel and ultra-low sulfur diesel are allowed in the appropriate circumstances, most suppliers do not carry fuel oil with multiple levels of sulfur content; requiring multiple storage tanks.

Therefore, permits using the old assumption of a worst-case sulfur content at 0.5% by weight are no longer correct. At most, the worst-case assumption of 0.05% sulfur should be used to calculate SO_2 MTE. Some generator engines are required by the federal NESHAP/NSPS to use the ultra-low sulfur diesel at 0.0015% sulfur. When required by rule, this sulfur content should be used for MTE calculations.

Sulfur dioxide EF (lb/1000 gal) = 142 * % S = 142 * (0.05) = **7.1 lb/1000 gal or lb/gal3**

MTE (lb/hr) = Boiler maximum heat input rating (mmBTU/hr) * EF (lb/gal3) ÷ 140 mmBTU/gal3

MTE (TPY) = MTE (lb/hr) * 8760 hr/yr ÷ 2000 lb/ton

Biogas SO_2

Many facilities are using biogas, which adds complexity to the SO_2 MTE calculation. First, the concentration of hydrogen sulfide (H_2S) in the biogas is needed.

Concentration of H_2S in mg/m^3 = (500 ppm) * (34 molecular weight of H_2S)/(24.45) = **695 mg/m^3**

Gas flow rate convert to m^3/hr = (5,880 scfh) * (1 m3/35.28 ft3) = **166.7 m^3/hr**

Mass of H_2S = Concentration * Flow = (695 mg/m^3) * (166.7 m^3/hr) * (1/1000) * (1 lb/454 g) = **0.26 lb/hr H_2S**

Convert H_2S to SO_2 = (0.26 lb/hr H_2S) * (64 molecular weight of SO_2)/(34 molecular weight of H_2S) = **0.49 lb/hr SO_2**

MTE SO_2 in TPY = (0.49 lb/hr SO_2) * (8760 hr/year) * (1 ton/2000 lb) = **2.14 TPY SO_2**

Assumptions

- Calculations based on potential of 500 parts per million (ppm) H_2S in biogas
- Reaction when H_2S is combusted = $2\ H_2S + 3\ O_2 \rightarrow 2\ SO_2 + 2\ H_2O$
- Constant of 24.45 in the equation is the volume in liters of a mole (gram molecular weight) of a gas or vapor when the pressure is at 1 atmosphere and at 25°C
- Fuel consumption in standard cubic feet/hour (scfh) at 100% load per engine specifications is needed for the calculation (use 5880 scfh for this example)
- Conservative calculation as it assumes enough gas is available to run the engine 8,760 hours per year

It is important to note that each source of biogas will have different concentrations of H_2S and the fuel consumption flow rate will change for each engine. Those values should be adjusted for each situation.

Engines

Each engine will require its own set of emissions calculations based on the size of the engine, the fuel type used and any limit on hours of operation. In Wisconsin, emergency engines (now defined as "restricted use reciprocating internal combustion engines" or "restricted use RICE") can assume a 200 hr/yr operation limit based on s. NR 400.02(136m), Wis. Adm. Code, and this does not need to be written into a permit. All others must use 8760 hr/yr unless operation hours are limited in a permit.

Fugitive Emissions

"Fugitive emissions" are defined in s. NR 407.02(3e), Wis. Adm. Code, as those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening. There is often confusion about when fugitive emissions must be included to determine permit applicability.

Except for the Natural Minor Source Operation Permit Exemption in s. NR 407.03(1s), Wis. Adm. Code, fugitive emissions are **always** included in MTE or actual emissions calculations for both construction and operation permit exemptions.

For the Natural Minor Source Operation Permit Exemption, fugitive emissions are **not included** in MTE calculations **unless** the source is in one of the source categories listed in s. NR 407.02(4)(b), Wis. Adm. Code:

<table>
<tr><td>Carbon black plants, furnace process.</td><td>Charcoal production plants.</td><td>Coal cleaning plants with thermal dryers.</td><td>Coke oven batteries.</td></tr>
<tr><td colspan="4">Chemical process plants. (Except ethanol production facilities that use natural fermentation, as described by 312140 or 325193 in 2007 NAICS.)</td></tr>
<tr><td colspan="2">Fossil-fuel boilers, or combination thereof, totaling more than 250 million British thermal units per hour heat input.</td><td colspan="2">Fossil-fuel-fired steam electric plants of more than 250 million British thermal units per hour heat input.</td></tr>
<tr><td>Fuel conversion plants.</td><td>Glass fiber processing plants.</td><td>Hydrofluoric, sulfuric or nitric acid plants.</td><td>Iron and steel mills.</td></tr>
<tr><td>Kraft pulp mills.</td><td>Lime plants.</td><td colspan="2">Municipal incinerators capable of charging more than 250 tons of refuse per day.</td></tr>
<tr><td>Petroleum refineries.</td><td colspan="2">Petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels.</td><td>Phosphate rock processing plants.</td></tr>
<tr><td>Portland cement plants.</td><td>Primary aluminum ore reduction plants.</td><td>Primary copper smelters.</td><td>Primary lead smelters.</td></tr>
<tr><td>Primary zinc smelters.</td><td>Secondary metal production plants.</td><td>Sintering plants.</td><td>Sulfur recovery plants.</td></tr>
<tr><td>Taconite ore processing plants.</td><td colspan="3">Any other stationary source category not listed, which as of August 7, 1980 is being regulated under section 111 or 112 of the Clean Air Act:
s. 111 - incinerators, Portland cement plants, nitric acid and sulfuric acid plants, asphalt plants, petroleum refineries, storage vessels for petroleum liquids, secondary lead smelter, secondary brass and bronze production, basic oxygen process furnaces, sewage treatment plants, primary copper, zinc, lead smelters, primary aluminum reduction plants, phosphate fertilizer industry, ferroalloy production facility, steel plants - electric arc furnaces, kraft pulp mills, grain elevator, stationary gas turbines
s. 112 – industry required to control emissions of Beryllium, Mercury, and Vinyl Chloride</td></tr>
</table>

Examples of fugitive emissions include those from truck traffic on haul roads, loading and unloading to outdoor storage piles, and other dust from outdoor storage piles. Indoor uncaptured emissions that are not vented outside the building are a different situation and should be discussed with DNR staff for questions whether certain emissions should be considered "fugitive emissions" for MTE calculations.

Fugitive emissions are **always** included for purposes of **reporting** emissions under ch. NR 438, Wis. Adm. Code.

Demonstrating use of an exemption

In the event a facility wishes to use the MTE calculations to demonstrate they meet certain exemptions, it is best to review the eligibility requirements for those exemptions. The Small Business Environmental Assistance Program (SBEAP) recommends reviewing the exemptions webpage for more information. Go to http://dnr.wi.gov/topic/smallbusiness/ and scroll down to the box for *Air* and select the *Exemptions* link. Each exemption option tab describes the process for submitting a request to DNR.

When requesting use of one of the exemptions, calculations for each criteria pollutant, and hazardous air pollutant(s) if needed, should be provided to DNR for review. A spreadsheet containing example

MTE calculations for a wide range of operations is available here: http://dnr.wi.gov/topic/SmallBusiness/documents/air/EmissionsWorksheetMTE.xlsx.

If a particular situation example is not provided, contact the SBEAP staff at 1-855-889-3021 or DNRSmallBusiness@wisconsin.gov.

Contact for additional information

For additional questions or clarifications on the use of MTE in an exemption request, contact the **Air Permit Exemption Coordinator** at 608-266-7718 or email DNRAMAirPermit@Wisconsin.gov.

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AWISCONSIN DEPARTMENT OF NATURAL RESOURCES
NOTICE OF FINAL GUIDANCE & CERTIFICATION

Pursuant to ch. 227, Wis. Stats., the Wisconsin Department of Natural Resources has finalized and hereby certifies the following guidance document.

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AM-19-0083

DOCUMENT TITLE

MTE Calculations for Air Permit Exemptions

PROGRAM/BUREAU

Air Management

STATUTORY AUTHORITY OR LEGAL CITATION

Chapter NR 400 and Chapter NR 407, Wisconsin Administrative Code

DATE SENT TO LEGISLATIVE REFERENCE BUREAU (FOR PUBLIC COMMENTS)

4/20/2020

DATE FINALIZED

5/13/2020

No public comments were received during the public comment period between 4/20/20 and 5/11/20

DNR CERTIFICATION

I have reviewed this guidance document or proposed guidance document and I certify that it complies with sections 227.10 and 227.11 of the Wisconsin Statutes. I further certify that the guidance document or proposed guidance document contains no standard, requirement, or threshold that is not explicitly required or explicitly permitted by a statute or a rule that has been lawfully promulgated. I further certify that the guidance document or proposed guidance document contains no standard, requirement, or threshold that is more restrictive than a standard, requirement, or threshold contained in the Wisconsin Statutes.

Gail E. Good

5/13/2020

Signature

Date