

MTE and PTE Calculation Examples

If your facility requires an Air Pollution Permit, you will encounter the terms Maximum Theoretical Emissions (MTE) and Potential to Emit (PTE). If you are unfamiliar with the Air Pollution Permit process, read the Small Business Environmental Assistance Program (SBEAP) fact sheets discussing Air Pollution Construction Permit Basics or Air Operation Permits for Small Businesses before reading this sheet.

MTE and PTE are legally defined terms describing different levels of emissions from a facility. Correctly calculating values for MTE and PTE is critical to determining which type of permit is required. This fact sheet explains how to calculate these values.

Maximum Theoretical Emissions (MTE)

There are two different definitions for MTE in the air pollution rules in the Wisconsin Administrative Code NR 400-499 series. Definitions in chapter NR 400 hold for all other chapters in the series, unless defined specifically in a chapter or chapters.

MTE Definition #1

The definition of Maximum Theoretical Emissions in ch. NR 400 states that MTE is the amount of air pollutants that a facility could emit if it operated at full capacity for 24 hours per day and 365 days per year (8,760 hrs/year). MTE does allow for design elements that limit a facility from operating a full 8,760 hours or “reasonable 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 operation permit is appropriate. However, you first need the hourly MTE to determine if a facility is exempt from either construction or operation permit requirements. You can use *reasonable operating conditions* to restrict hourly MTE if they truly limit the operations on an hour-by-hour basis. Operating conditions that only affect or limit your operations over longer periods of time (i.e., you have to shut down machinery for maintenance once every three months for a full week) cannot be used in to restrict the hourly MTE.

For example, for a facility 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 volatile organic compound (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:

$$14 \text{ gal/hr} \times 5.6 \text{ lb VOC/gal} = 78.4 \text{ lbs VOC/hr}$$

$$78.4 \text{ lb/hr} \times 8760 \text{ hr/yr} \div 2000 \text{ lb/ton} = \mathbf{343.4 \text{ tons VOC/year}}$$

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

$$14 \text{ gal/hr} \times 2.4 \text{ lb VOC/gal} = 33.6 \text{ lbs VOC/hr}$$

$$33.6 \text{ lb/hr} \times 8760 \text{ hr/yr} \div 2000 \text{ lb/ton} = \mathbf{147.2 \text{ tons VOC/year}}$$

Some processes do not have clearly defined maximum production capacities, design capacities, or federally enforceable permit limits. 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, design capacities or federally enforceable permit limitations. Using an example of cleaning operations on a coating line, you can estimate the MTE by looking at a maximum production or design capacity operating scenario for the coating line and using whatever information is available, including production and maintenance records, to establish the cleaning operations 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 (twenty-one 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.

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.*

Reasonable operating conditions that can be taken into account for MTE **do not** include operation of a control device or restrictions taken on the annual operations at the source (like 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 reasonable 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.

$$14 \text{ gal/hr} \times 5.6 \text{ lb VOC/gal} \times 8424 \text{ hr/yr} \div 2000 \text{ lb/ton} = \mathbf{330.2 \text{ tons VOC/year}}$$

- 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:

$$\begin{aligned} 1) & (14 \text{ gal/hr} \times 0.25 \text{ hr}) + (0 \text{ gal/hr} \times 0.75 \text{ hr}) \div 1 \text{ hr} = \mathbf{3.5 \text{ gal/hr}} \\ 2) & 3.5 \text{ gal/hr} \times 5.6 \text{ lb VOC/gal} \times 8760 \text{ hr/yr} \div 2000 \text{ lb/ton} = \mathbf{85.8 \text{ tons VOC/year}} \end{aligned}$$

Conditions used to determine MTE must be documented to show DNR and EPA that they cannot be altered or changed in any way without requiring a construction permit.

This first MTE definition is used to establish facility-wide values for hourly and annual emissions, and is primarily used to determine if a facility exempt from permitting or if not, what type of permit should be issued.

MTE Definition #2

The second definition of MTE is in chapter NR 419 of the Wisconsin Administrative Code and is only used in relation to compliance with the organic compound rules in chapters NR 419-425. Many of the exemptions from requirements in ch. NR 419-425 are based on the MTE of VOCs from a specified process type. For these rules, a facility could accept restrictions on its MTE to keep emissions below the exemption level applicable to its process (e.g., painting and coating, printing, or fabric coating) to avoid requirements in those chapters.

Any limitations on the MTE (#2) must be included as conditions in a permit. Limits can include restrictions on raw material use, hours of operation, pollution content in raw materials (i.e., VOC content in inks or coatings), or a combination of these. Control devices cannot be taken into account for these limitations, unless they are considered “part of the process.” Including control devices when “part of the process” is the same as allowed in MTE definition #1.

This definition of MTE (#2) does not allow restrictions to extend longer than a one-month period, but does allow monthly averaging for up to 12 consecutive months. For example, you can set a limit on paint usage as either X gallons per day, Y gallons per week, or Z gallons per month, but not as A gallons per year. You can set the limit as Z gallons per month, averaged over each 12-consecutive month period. A 12-month averaging period allows the facility to balance the highs and lows in their operations over the year and avoid exceeding a limit in one unusually high month.

Establishing a restriction on a process specific MTE (#2) in a permit to avoid the requirements in chs. NR 419-425 **does not** mean that the facility-wide MTE (#1) has been restricted. Restrictions on the facility-wide MTE (#1) to establish your **Potential to Emit** (PTE) are explained as follows.

Potential to Emit (PTE)

PTE refers to a facility's maximum capacity to emit air pollutants if both physical design and operational limitations are taken into account. Limitations can include pollution control equipment, type of materials used in the process, and restricted hours of operation. PTE is used to establish the type of operation or construction permit a facility is issued. There are three types of permits that can be issued.

Major Source

An existing facility with PTE greater than the **major source** level is issued a Part 70 operation permit. For operation permits, the major source level for criteria pollutants (particulate matter, nitrogen oxides, sulfur dioxide, carbon monoxide, and ozone¹) is 100 tons per year. The major source level in construction permits is 250 tons per year. Exceptions to this level are specified for 27 specific source categories, for which the level is 100 tons per year.

If a business is located in a **nonattainment** area (counties that do not meet National Ambient Air Quality Standards), the major source levels for construction permits are the same as the operation permit levels for all sources. Table 1 shows levels for operation permits and non-attainment construction permits.

Table 1. Major source levels for operation permits in all areas and construction permits in nonattainment areas.	
Any single criteria pollutant.	100 tons/year
Any single hazardous air pollutant	10 tons/year
Total of all hazardous air pollutants	25 tons/year

Note: The major source level for VOCs is currently 100 tons per year in the southeastern counties in Wisconsin, considered nonattainment areas for ozone. This could change based if air quality in the area worsens and the nonattainment designation is changed as a result.

The PTE of hazardous air pollutant (HAP) emissions—the 187 HAPs listed by EPA in the 1990 Clean Air Act Amendments—also define whether an existing facility is a major source.

Minor Source

A source where PTE is below the major source level without any artificial restrictions is considered a minor source. For all sources, pollution prevention (P2) measures could reduce emissions by changing the way a process creates or generates emissions. Many solvent-based coating operations have changed to water-based coatings, UV coatings, or powder coatings. Such process changes will reduce emissions from a painting operation in varying amounts, depending on the media to which the paint is applied.

By changing a process, a major source could eventually be considered a minor source. Often such changes can take years to go from investigation to implementation. When the facility has completed changes and can operate as a minor source, it can apply to the DNR Air Program to revise the operation permit and change it to a Minor Source permit.

Synthetic Minor Source

If a source has PTE below the major source level because it has agreed to limit operations (e.g., operating only 6000 hours per year, or limiting paint use each month), it is called a **synthetic minor source**. The permit for a synthetic minor source will contain those limits used to keep the PTE below the major source level. Additional conditions may be necessary to demonstrate that emissions remain below restriction levels at all times.

PTE Limits

Limits on PTE can take many forms, due to the variety of businesses that use this option for restricting emissions. Limits can provide some flexibility to the facility but are often balanced by additional work required to prove compliance on a continuous basis.

Limits determined by hours of operation or raw material usage are the least flexible in terms of allowable emissions but the most flexible in that minimal records are required. Limits on **hours of operation or raw materials used** can be set on a monthly basis with simple monthly records required. However, these limits do not allow facilities to average emissions over various periods throughout the year. If emissions are very consistent all year, this option may work well for a facility.

The **raw materials used** restrictions are usually combined with a limit on the pollutant content within that raw material. This part of a limit might require more restrictive records because the facility must show that each container or batch of raw material received meets content restrictions. These amounts are usually expressed as:

- ◆ X gallons of paint/ink/coating used per month, with no more than Y pounds VOC per gallon in each; or
- ◆ X gallons of fuel oil burned per month, with no more than Y% sulfur content by weight.

For the limit on coating content of Y pounds VOC per gallon, the facility would have to agree to set that at a particular level or use an applicable limit in the Wisconsin Administrative Code. For example, one rule in the Code specifies that any paper coating operation must meet a level of 2.9 pounds VOC per gallon. That limit, combined with X gallons of coating used, may be sufficient to make a facility a synthetic minor source. If it's not, the facility could elect to meet a lower level, such as 2.5 pounds VOC per gallon:

So, a limit on the coating content of 2.5 pounds VOC per gallon will make a facility a synthetic minor source (less than 100 tons per year), whereas the limit from the rule will not. If the facility agrees to use less coating per month, it can use a coating that contains 2.9 pounds VOC per gallon. The facility may find that the extra flexibility in usage is more advantageous. Using the lower VOC content coating is also a good way to adopt pollution prevention.

$2.9 \text{ lb VOC/gal} \times 75,000 \text{ gal/mo} / 2000 \text{ lb/ton} = \mathbf{108.7 \text{ tons per year}}$ $2.5 \text{ lb VOC/gal} \times 75,000 \text{ gal/mo} / 2000 \text{ lb/ton} = \mathbf{93.75 \text{ tons per year}}$

Limits set as an **emissions cap** will allow a business to average periods of higher and lower emissions, but more frequent records are required. However, EPA has directed that operations with restrictions on PTE in terms of an emissions cap must determine if they are below the cap no less frequently than on a monthly basis.

As an example, a painting facility located in Dane County that could be a synthetic minor source might have the following emissions:

- ◆ MTE = 185 tons per year (TPY) of VOCs
- ◆ actual annual emissions = 25 TPY VOCs
- ◆ limit for PTE = 95 TPY VOCs

Dane County has a major source level at 100 TPY of VOC emissions. It is not likely that this facility will reach its MTE, because actual emissions are very low. A limit of 95 TPY VOCs will not restrict this facility's growth anytime in the near future. In addition, the facility knows from SDS data that its HAPs make up no more than 10% of the paints used (this is not usually the case, but it makes the example simple). Ten percent of a 95 TPY emissions cap gives it a PTE cap of 9.5 TPY for all HAPs and keeps the facility below both the 10 TPY and 25 TPY major source levels for HAPs.

Because both of the restrictions on PTE make this facility a synthetic minor source, it can avoid more onerous requirements that might apply to a major source. Such requirements might include a MACT standard that contains restrictive control requirements for HAP emissions. (*SBEAP has fact sheets for many of the existing MACT standards if you have questions about whether one might affect your facility.*) The PTE restrictions do result in more onerous record keeping requirements for the business than a major source would have.

PTE and Permit Requirements

According to EPA, the synthetic minor limits that restrict PTE for this facility **cannot** be left in terms of tons per year of emissions. With a limit set on a long-term basis, the facility could not demonstrate compliance until the end of the year. EPA and DNR can

base violations of the rules or permits on **each day** of violation. At the end of the year, if the facility emits 105 TPY instead of staying below the limit of 95 TPY in the permit, it would have a potential for many days of violation.

EPA prefers that a facility know at the end of each day whether it met the limit for the past 365 days. That entails recording the amount of materials used each day, compiling records from every process at the facility, and adding the totals to the running tally to calculate an annual total at the end of the day.

If the limit on PTE is an emissions cap, like the 95 TPY, it must be broken down to a cap over a period no longer than a monthly basis. Dividing 95 TPY by 12 months gives 7.91 tons per month. To make the limit more accurate, it could be expressed in terms of pounds, 15820 pounds per month.

$$\begin{aligned} 95 \text{ tons/year} \div 12 \text{ mo/yr} &= 7.916 \text{ tons/mo} \\ 7.91 \text{ tons/mo} \times 2000 \text{ lb/ton} &= \mathbf{15820 \text{ lbs VOC/mo}} \end{aligned}$$

You may notice that, if you try to repeat this calculation, you may arrive at a slightly different number—up to 15833.33 lb/mo. It all depends on the number of digits after the decimal point retained as you perform the calculations. Rounding up to the whole number of 15833 lb/mo would be the highest acceptable result for an emissions cap that would be included in a permit.

With a monthly emissions cap, the facility still needs to maintain records of amounts used **daily**. Owners may not be required to perform the calculations until the end of each week or month. DNR can allow more flexibility in how frequently calculations must be performed for businesses with long jobs (spread out over multiple days) or facilities that use such a large number of coatings that it would be very burdensome to compile and calculate the data each day or week.

In this case, daily records would be maintained by the coatings or process operators and brought to a central location to perform the calculations at the end of the allotted time frame. The flexibility to average monthly emissions over each 12 consecutive month period is also available in the event a facility has a fluctuating schedule. Then every 12-month average should balance out the high and low months.

As long as the daily records are available, a facility can calculate daily emissions and determine how often operations exceeded an emissions cap. This benefits the facility when a cap is exceeded but calculations show that the operation was only in violation for 5 days of that previous month, rather than the entire month.

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