

## Part 2: How to Calculate Potential to Emit

Part 2 of this workbook discusses how to determine your facility's potential to emit (PTE). The PTE calculation process is illustrated in steps using **Small Business, Inc.** To see an example of how to complete a potential to emit demonstration just follow along with the blue boxes such as the one below.

**Small Business, Inc.** is a metal coating operation that needs to determine whether or not they are a major source of air contaminants and, therefore, subject to the ROP Program.

The PTE process has been broken down into the steps and summarized below, but will be discussed in more detail in the following pages.

- STEP 1:** Conduct a facility inventory to identify process equipment.
- STEP 2:** Gather data for each emission source.
- STEP 3:** Categorize emission sources (permitted, grandfathered, or exempt).
- STEP 4:** Identify legally enforceable limitations.
- STEP 5:** Identify the emission calculation methods you will use.
- STEP 6:** Calculate the PTE for each emission source.
- STEP 7:** Calculate the PTE for the facility.

You can start the PTE process by using the *Potential to Emit Summary Worksheet* to enter information about your facility for Steps 1 - 5. The *Potential to Emit Summary Worksheet* can be found in Appendix B of this book (Figure 2-1).

Emission Source	Description	Permit Status	Legally Enforceable Limitation	Calculation Method
		<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ____/____/____ <input type="checkbox"/> Exempt: R 338.		
		<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ____/____/____ <input type="checkbox"/> Exempt: R 338.		
		<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ____/____/____ <input type="checkbox"/> Exempt: R 338.		
		<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ____/____/____ <input type="checkbox"/> Exempt: R 338.		
		<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ____/____/____ <input type="checkbox"/> Exempt: R 338.		
		<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ____/____/____ <input type="checkbox"/> Exempt: R 338.		
		<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ____/____/____ <input type="checkbox"/> Exempt: R 338.		
		<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ____/____/____ <input type="checkbox"/> Exempt: R 338.		
		<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ____/____/____ <input type="checkbox"/> Exempt: R 338.		
		<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ____/____/____ <input type="checkbox"/> Exempt: R 338.		
		<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ____/____/____ <input type="checkbox"/> Exempt: R 338.		
		<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ____/____/____ <input type="checkbox"/> Exempt: R 338.		

Figure 2-1: Summary Worksheet

## STEP 1: Conduct a Facility Inventory

In this first step you will conduct an inventory of all the processes at your facility or **stationary source**. Examine each piece of equipment or process and determine whether or not that process emits air contaminants.

First, draw a plan view of your facility. A facility may have a fixed location (e.g., factory, plant, or commercial establishment) or may be movable (e.g., concrete crusher). Operations located close to each other or tied together by other means (such as utilities or process operations) may also be part of the same facility if they are:

- located on connected or adjacent pieces of property;
- under control by the same owner; and
- belong to the same industrial grouping.

★ DEQ, Air Quality Division AQD-011 provides guidance on determining what is considered to be a **stationary source** (i.e., a facility). You can download this guidance at [www.michigan.gov/air](http://www.michigan.gov/air) (select "Permits" then "Potential to Emit")

**Small Business, Inc.'s** site diagram is below. A blank page is provided for you to draw a diagram of your facility in Appendix B.

Small Business, Inc.  
SITE DIAGRAM - Showing Emission Sources

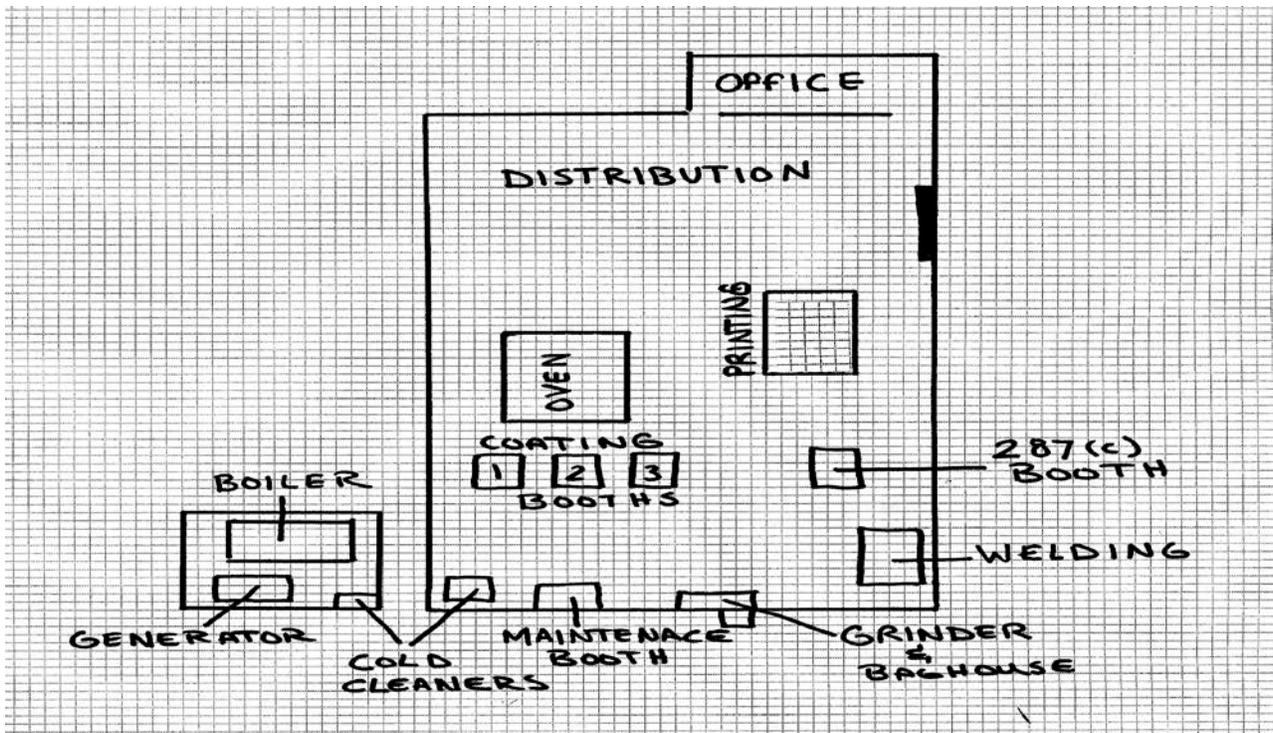


Figure 2-2: Example Site Diagram

Next, identify the emission sources. These are the processes at the facility (such as boilers, spray paint booths, degreasers, and generators) that generate air contaminants. If you have any air permits, use them to help identify your emission sources.

Even though some of your operations may not directly emit contaminants to the outside through a stack or vent, the emissions will eventually exhaust into the atmosphere through building ventilation or escape through doors or windows. These types of emissions must be included in your calculations.

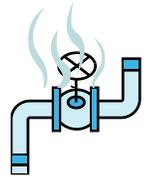
Be sure to include any processes not located in your main building. If you have an emergency generator, storage silo, or other equipment located within your stationary source, but away from the main building, it is still part of the facility. You may also have equipment that you do not operate anymore. If a process is still operable, it must be included in your PTE calculation.



As you identify emission sources, remember to include all sources of air contaminants, such as non-production units like welding or grinding. Also, be sure to include the emission of air contaminants resulting from all aspects of the operation of a process. Ancillary activities such as cleanup are often overlooked. Most paint application equipment is purged and cleaned with solvents that evaporate into the air. These emissions must be included in the PTE calculations for the process.

### Do I Need to Include Fugitive Emissions?

Air contaminants that cannot reasonably pass through a stack or a building structure are called fugitive emissions. Examples of fugitive emissions include dust blowing from rock or coal piles as well as dust kicked up by vehicles traveling on roadways. VOC emissions from outdoor leaking valves or flanges are also considered fugitive emissions.



You will include quantifiable fugitive emissions in your PTE calculation if:

1. The fugitive emissions are HAPs.  
**OR**
2. Your facility is one of those source categories listed in Table 2-1, in which case you will need to include the quantifiable fugitive emissions of all other regulated air pollutants (e.g., particulate matter, VOCs).  
**OR**
3. Your facility is subject to a NSPS or NESHAP promulgated before August 7, 1980.

Some large facilities may have a source category included in Table 2-1 as well as other source categories that are not listed. The fugitive emissions of all regulated air pollutants, other than HAPs from the non-listed source, would not have to be considered in the facility's PTE calculation.



If you need to include fugitive emissions, identify them as a separate emission source or part of an already established emission source.

Taking a walk through your facility is a great way to identify the sources of air contaminants in your facility. Another way to locate all of your emission sources is to review documents such as air permits, Michigan Air Emission Reporting System (MAERS) forms, and the Toxic Chemical Release Inventory Reporting Form (also known as Form R). The information contained in these reports will also be useful in completing your PTE calculations.

**Table 2-1: Types of Facilities that Must Include Fugitive Emissions PTE**

<ul style="list-style-type: none"> <li>• Coal cleaning plants - with thermal dryers</li> <li>• Portland cement plants</li> <li>• Iron and steel mills</li> <li>• Primary copper smelters</li> <li>• Hydrofluoric, sulfuric, or nitric acid plants</li> <li>• Lime plants</li> <li>• Coke oven batteries</li> <li>• Carbon black plants</li> <li>• Fuel conversion plants</li> <li>• Secondary metal production plants</li> <li>• Fossil-fuel boilers (or combination thereof) totaling more than 250 mmbtu/hr</li> <li>• Taconite ore processing plants</li> <li>• Charcoal production plants</li> <li>• Asphalt concrete plants</li> <li>• Secondary lead smelters and refineries</li> <li>• Sewage treatment plants</li> <li>• Ferro-alloy production plants</li> <li>• Stationary gas turbines</li> <li>• Kraft pulp mills</li> </ul>	<ul style="list-style-type: none"> <li>• Primary zinc smelters</li> <li>• Primary aluminum ore reduction plants</li> <li>• Municipal incinerators capable of charging more than 250 tons of refuse per day</li> <li>• Petroleum refineries</li> <li>• Phosphate rock processing plants</li> <li>• Sulfur recovery plants</li> <li>• Primary lead smelters</li> <li>• Sintering plants*</li> <li>• Chemical process plants- not including ethanol production by natural fermentation</li> <li>• Petroleum storage and transfer units, total storage capacity over 300,000 barrels- or 40,000 gallons</li> <li>• Glass fiber processing plants</li> <li>• Fossil fuel-fired steam electric plants of more than 250 mmbtu/hr</li> <li>• Phosphate fertilizer plants</li> <li>• Grain elevators</li> <li>• Stationary sources subject to NESHAP for asbestos, beryllium, mercury, vinyl chloride</li> </ul>
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\*Processing of fine grain materials into coarser lumps (performed primarily on ores).

### Insignificant Activities

Emissions from the insignificant activities listed in Table 2-2 are excluded from PTE calculations, unless the facility-wide PTE is very close to the major source thresholds, in which case you may need to include the emissions from these sources.

**Table 2-2: Insignificant Activities at a Stationary Source**

- Repair and maintenance of grounds and structures and repair and maintenance of process and process equipment pursuant to Michigan Rule R336.1285(a)-(c).
- Use of office supplies.
- Use of housekeeping and janitorial supplies.
- Sanitary plumbing and associated stacks or vents.
- Temporary activities related to the construction or dismantlement of buildings, utility lines, pipelines, wells, earthworks, or other structures.
- Storage and handling of drums or other transportable containers where the containers are sealed during storage and handling.
- Fire protection equipment, firefighting, and training in preparation for fighting fires.
- Use, servicing, and maintenance of motor vehicles including cars, trucks, lift trucks, locomotives, aircraft, or water craft, except where those activities are subject to an applicable requirement (e.g., requirement to have a fugitive dust control or operating program).
- Construction, repair, and maintenance of roads or other paved or unpaved areas, except where those activities are subject to an applicable requirement (e.g., requirement to have a fugitive dust control or operating program).
- Piping and storage of sweet natural gas, including emergency venting from pressure relief valves or purging of gas lines.

**Small Business, Inc.** identified the emission sources and included these sources on the PTE Summary Sheet. Please follow their example and complete the first two columns on your PTE Summary Worksheet.

PTE Summary Table for Small Business, Inc.

Emission Source	Description	Permit Status	Legally Enforceable Limitation	Calculation Method
COATING BOOTHS 1-3	3 spray booths	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input type="checkbox"/> Exempt: R 336. _____		
OVEN	2,500,000 Btu/hr natural gas fired	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input type="checkbox"/> Exempt: R 336. _____		
MAINTENANCE BOOTH	Booth used for touchup	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input type="checkbox"/> Exempt: R 336. _____		
PRINTING	Prints information on product	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input type="checkbox"/> Exempt: R 336. _____		
SPECIAL PROJECT BOOTH	Spray booth used for special projects	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input type="checkbox"/> Exempt: R 336. _____		
COLD CLEANERS	2 cold cleaners for parts washing	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input type="checkbox"/> Exempt: R 336. _____		
CLEANUP	Facility-wide cleanup solvents	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input type="checkbox"/> Exempt: R 336. _____		
GRINDER	Metal parts grinder connected to baghouse (29,000 cfm)	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input type="checkbox"/> Exempt: R 336. _____		
WELDING	Shielded metal arc welding	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input type="checkbox"/> Exempt: R 336. _____		
BOILER	10 million Btu/hr natural gas fired boiler	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input type="checkbox"/> Exempt: R 336. _____		
GENERATOR	Diesel fired emergency generator	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input type="checkbox"/> Exempt: R 336. _____		

## STEP 2: Gather Data for Each Emission Source

Before you begin calculating the PTE for each of your emission sources, you will want to gather process data that will help in determining the PTE.



Below is a list of items you should gather. This information will be used to calculate your PTE as well as what method of calculation. You may want to enter relevant capacity data on the PTE Summary Worksheet in the description column.

- Air permits.** Look for any Permits to Install or Renewable Operating Permits issued to your company.
- Safety Data Sheets (SDS) or technical data sheets, such as manufacturer's formulation data, for raw materials used in the processes.** This information will determine what pollutants may be emitted. For example, if the emission source is a boiler, gather information about the fuel(s) used. If the emission source is a coating line, gather SDS or manufacturer formulation data for the coatings used.



*If the emission source is a coating line that uses several different coatings per year, use an SDS that represents the worst-case coating i.e., the coating that has the highest VOC content and HAP content. (Note that this may be two different coatings).*

- Performance test results.** Collect data from stack tests that have been conducted or any other type of test conducted on the performance of the equipment, raw materials, or emissions.
- Capture and control efficiency of pollution control equipment.** If you have an air pollution control device (e.g., baghouse, scrubber), the manufacturer should be able to provide you with documentation that shows the percentage of a particular pollutant the device will capture and/or control.
- Vendor literature describing the process.**
  - Air emissions data that shows what pollutants are emitted from a process and, in some cases, an emission rate.
  - Maximum application rate of spray guns - gallons/hour or gallons/minute
  - Maximum heat input capacity of boilers and ovens - Btu/hour
  - Maximum capacity of fans that exhaust pollutants - cubic feet of air/minute
  - Production rate - products/hour or product/minute
  - Fuel usage rate of generators - gallons or cubic feet of fuel/hour



This information can usually be found in the vendor literature for the equipment or by contacting the manufacturer.

### STEP 3: Categorize Emission Sources (Permitted, Grandfathered, or Exempt)

In this step you will categorize each of the emission sources you identified in Step 1 as being permitted, grandfathered, or exempt from air permitting. Although an emission source may be exempt or grandfathered from permitting requirements, you will still need to include its emissions in your PTE calculation. The paragraphs below explain each of these categories.



**Need help?** Contact the Office of Environmental Assistance at 800-662-9278

#### **Permitted**

If the emission source is identified in a Permit to Install or a ROP then it is “permitted.” Review all permits that have been issued to your facility by the Michigan Department of Environmental Quality (DEQ) Air Quality Division (AQD). These permits contain valuable information which will assist you in calculating your PTE. For example, limits contained in a permit may be to restrict your PTE.

#### **Grandfathered**

To be considered grandfathered an emission unit must have been installed before August 15, 1967. Additionally, the emission unit must not have had any modifications or changes made to it since that date. There are very few processes that meet the grandfathered conditions; however, those that do are not required to have a Permit to Install. Emissions from grandfathered emission sources must still be included in your PTE calculation.

#### **Exempt**

The Michigan Air Pollution Control Rules exempt certain processes and equipment from the requirement to obtain a Permit to Install; however, an ROP has requirements to include some equipment that is exempt equipment. If the emission source is not included in a permit or grandfathered, it should be exempt from permitting pursuant to one of these rules. Identify the appropriate exemption for your emission source in R 336.1280 through R 336.1290 (Rules 280 - 290) (see Appendix A). Table 2-2 summarizes the exemption categories.



Be aware that R 336.1278 (Rule 278) excludes some emission sources from being exempt if emissions are considered significant. Review Rule 278 before determining whether or not the emission source is exempt.

**Table 2-2: Exempt Categories**

Examples of the broad categories where certain specific exemptions may be found are:

- Cooling and ventilating equipment (Rule 280)
- Cleaning, washing, and drying equipment (Rule 281)
- Furnaces, ovens, or heaters (Rule 282)
- Testing and inspection equipment (Rule 283)
- Containers, reservoirs, or tanks (Rule 284)
- Routine maintenance, parts replacement or repairs, and miscellaneous changes and operations (Rule 285)
- Plastic processing equipment (Rule 286)
- Surface coating equipment (Rule 287)
- Oil and gas processing equipment (Rule 288)
- Asphalt and concrete production equipment (Rule 289)
- Emission Units with limited emissions (Rule 290)

*Note: The rules must be read carefully to determine if a source really falls under an exemption category. If you determine that a source is exempt, keep a written record of how you arrived at that decision.*

**Small Business, Inc.** categorized all of its emission sources using the PTE Summary Worksheet. Use the PTE Summary Worksheet to categorize all of your emission sources.

PTE Summary Table for Small Business, Inc.

Emission Source	Description	Permit Status	Legally Enforceable Limitation	Calculation Method
COATING BOOTHS 1-3	3 spray booths	<input checked="" type="checkbox"/> Permitted: PTI # <b>999-89</b> ____ <input type="checkbox"/> Grandfathered: ___/___/___ <input type="checkbox"/> Exempt: R 336. _____		
OVEN	2,500,000 Btu/hr natural gas fired	<input checked="" type="checkbox"/> Permitted: PTI # <b>999-89</b> ____ <input type="checkbox"/> Grandfathered: ___/___/___ <input type="checkbox"/> Exempt: R 336. _____		
MAINTENANCE BOOTH	Booth used for touchup	<input checked="" type="checkbox"/> Permitted: PTI # <b>825-82</b> ____ <input type="checkbox"/> Grandfathered: ___/___/___ <input type="checkbox"/> Exempt: R 336. _____		
PRINTING	Prints information on product	<input type="checkbox"/> Permitted: PTI # _____ <input checked="" type="checkbox"/> Grandfathered: <b>10/15/1966</b> <input type="checkbox"/> Exempt: R 336. _____		
SPECIAL PROJECT BOOTH	Spray booth used for special projects	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1287(c)</b> ____		
COLD CLEANERS	2 cold cleaners for parts washing	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1281(h)</b> ____		
CLEANUP	Facility-wide cleanup solvents	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1290</b> ____		
GRINDER	Metal parts grinder connected to baghouse (29,000 cfm)	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1285(l)(vi)</b> ____		
WELDING	Shielded metal arc welding	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1285(i)</b> ____		
BOILER	10 million Btu/hr natural gas fired boiler	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1282(b)(i)</b> ____		
GENERATOR	Diesel fired emergency generator	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1285(g)</b> ____		

## STEP 4: Identify Legally Enforceable Limitations



Before calculating your PTE, you need to identify any legally enforceable limits that can be used to restrict your PTE. Legally and practically enforceable limitations may be identified in various places, such as permit conditions or state and federal rules. Some examples of these defining limitations are production or operating limits, emission limits, operational limits on control equipment combined with specific and required monitoring/recordkeeping.

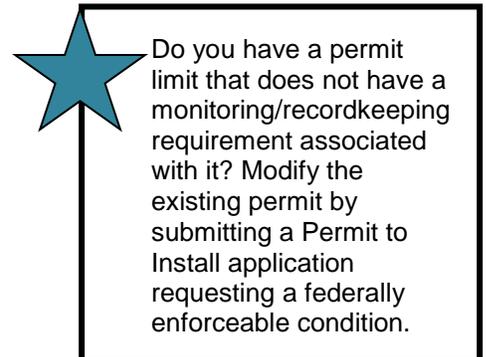
In this step you will identify limits that you may be able to take into consideration when calculating the PTE for each emission unit.

### Permit Conditions

Special conditions in Permit to Install may restrict an emission unit's potential emissions. Conditions that limit the emission of a pollutant to below a specific level or specify an operating capacity that is less than the maximum design capacity should be identified. The limits in these conditions should be taken into consideration when calculating PTE.

In order for a permit condition to be used as a means of restricting PTE, it must be legally and practically enforceable. If a permit was issued on or after **May 6, 1980** (the day the permit program was approved by U.S Environmental Protection Agency [EPA] and put into the Michigan State Implementation Plan), the condition would be considered legally enforceable, but may not be practically enforceable.

If your Permit to Install was issued prior to May 6, 1980, it must meet the criteria found in R 336.1209 (see Appendix A) before it can be used to limit PTE.



If you have a question about whether or not your permit condition would meet the requirements of being legally and practically enforceable, please contact the Office of Environmental Assistance, 1-800-662-9278.

The following restrictions, found in permit conditions, are *examples* of legally and practically enforceable limits used to restrict PTE.

- Emission limits (typically expressed as pounds of air contaminant emitted per hour, tons per month or 12-month rolling average) and operational restrictions, combined with recordkeeping requirements
- Requirements to operate an air pollution control device (filter, scrubber, etc.) including operational requirements to address efficiency, combined with recordkeeping requirements
- Limits on the amount of material to be used combined with recordkeeping requirements
- Limits on the type of fuel that can be used combined with recordkeeping requirements
- Limits on the operating hours combined with recordkeeping requirements
- Limits on production (e.g., number of production pieces/day) combined with recordkeeping requirements



Be aware that the limit must also be enforceable in a practical manner, meaning the permit must contain a monitoring/recordkeeping requirement that can be used to demonstrate compliance with the limit. For example, if there is a VOC limit, there should also be a requirement in the permit that requires you to monitor and record your mass balance VOC emissions over a specified time period, such as pounds per calendar day, tons per month and 12-month rolling time period calculations and recordkeeping.

## State and Federal Rules

State and federal rules may include requirements that can be used to restrict your PTE. If the process is permitted, these requirements should have already been incorporated into the conditions of the permit. If the requirements are not in Permit to Install or if the emission unit is exempt, review the state and federal air quality regulations. The Michigan Air Pollution Control Rules can be accessed on the Internet at: [www.michigan.gov/air](http://www.michigan.gov/air).

Restrictions found in state or federal rules should be identified so they can be used in the PTE calculation. Look for requirements from applicable state and federal rules that:

- Restrict the emission rates of air pollutants
- Limit the usage of raw materials
- Restrict operation
- Require specific control devices

Below are some examples of legally enforceable limitations contained in the Michigan Air Pollution Control Rules.

### ***Emission Limits:***

- R 336.1290 (Rule 290): 1,000 pounds of noncarcinogenic VOCs per month (6 tons VOC/year). This may be used to limit potential as long as the required mass balance records are kept. See example on page 2-30.
- R 336.1331 (Rule 331, Table 31): The maximum allowable emission rate is 0.10 pounds of particulate matter (PM) per 1,000 pounds of gas from an exhaust system servicing material handling equipment.
- R 336.1402 (Rule 402): 1.7 pounds of SO<sub>2</sub> per million Btu's of heat input from the combustion of oil fuel or in excess of 2.4 pounds per million Btu of heat input for coal fuel. The required testing and recordkeeping in the rule must also be kept.
- R 336.1621 (Rule 621): 3.5 pounds of VOC per gallon of coating (minus water) as applied for air dried coatings from an existing metallic surface coating line. In order to use this rule to limit PTE, current information and records must also be kept in accordance with the rule.

### ***Operation/Control Requirements:***

- R 336.1287(c) (Rule 287(c)) may assume that 200 gallons of the worst-case coating is used per month, provided it is in compliance with the requirements of the rule and records are kept. See example on page 2-28. This limit applies to each emission unit that is exempt under Rule 287(c).

- R 336.1611 (Rule 611): (a) A cover shall be installed and closed when parts are not being handled, (b) ... the parts shall be drained not less than 15 seconds or until dripping ceases, (c) waste organic solvent shall be stored only in closed containers... See Example on page 2-29.
- R 336.1708 (Rule 708): It is unlawful for a person to operate a new open top degreaser unless one of the following conditions is met... (b) the degreaser is equipped with a refrigerated freeboard device...

**Small Business, Inc.** has Permits to Install and some of their emission sources are subject to specific state rules. Requirements have been identified that limit PTE and are included PTE Summary Worksheet. Identify any restrictions on your PTE Summary Worksheet. See worksheet on page 2-13

PTE Summary Table for Small Business, Inc

Emission Source	Description	Permit Status	Legally Enforceable Limitation	Calculation Method
COATING BOOTHS 1-3	3 spray booths	<input checked="" type="checkbox"/> Permitted: PTI # <b>999-89</b> ____ <input type="checkbox"/> Grandfathered: ___/___/___ <input type="checkbox"/> Exempt: R 336.____	- Permit limit = 5.6 tons VOC/yr - Permit requires recordkeeping - Permit requires dry filter	
OVEN	2,500,000 Btu/hr natural gas fired	<input checked="" type="checkbox"/> Permitted: PTI # <b>999-89</b> ____ <input type="checkbox"/> Grandfathered: ___/___/___ <input type="checkbox"/> Exempt: R 336.____	None	
MAINTENANCE BOOTH	Booth used for touchup	<input checked="" type="checkbox"/> Permitted: PTI # <b>825-82</b> ____ <input type="checkbox"/> Grandfathered: ___/___/___ <input type="checkbox"/> Exempt: R 336.____	Permit requires dry filter	
PRINTING	Prints information on product	<input type="checkbox"/> Permitted: PTI #____ <input checked="" type="checkbox"/> Grandfathered: <b>10/15/1966</b> <input type="checkbox"/> Exempt: R 336.____	None (grandfathered)	
SPECIAL PROJECT BOOTH	Spray booth used for special projects	<input type="checkbox"/> Permitted: PTI #____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1287(c)</b> ____	Rule: R 336.1287(c) – limits coating usage to 200 gal/month, requires recordkeeping	
COLD CLEANERS	2 cold cleaners for parts washing	<input type="checkbox"/> Permitted: PTI #____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1281(h)</b> ____	Rule: R 336.1611 - Requires that cover be closed and that parts be drained	
CLEANUP	Facility-wide cleanup solvents	<input type="checkbox"/> Permitted: PTI #____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1290</b> ____	Rule: R 336.1290 – limits emission of non-carcinogenic VOCs to 1,000 lbs/month, recordkeeping required	
GRINDER	Metal parts grinder connected to baghouse (29,000 cfm)	<input type="checkbox"/> Permitted: PTI #____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1285(l)(vi)</b> ____	None	
WELDING	Shielded metal arc welding	<input type="checkbox"/> Permitted: PTI #____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1285(i)</b> ____	None	
BOILER	10 million Btu/hr natural gas fired boiler	<input type="checkbox"/> Permitted: PTI #____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1282(b)(i)</b> ____	None	
GENERATOR	Diesel fired emergency generator	<input type="checkbox"/> Permitted: PTI #____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1285(g)</b> ____	None	

## STEP 5: Identify the Emission Calculation Methods You Will Use

There are a variety of methods available to calculate the emission of air contaminants. Four common methods used to calculate PTE are:

- Legally enforceable limitations
- Performance test data
- Mass balance calculations
- Emissions factors

Appendix E also contains links to worksheets that may help with calculating your PTE. Following is a discussion of each of these calculation methods as well as an example of each for **Small Business, Inc.**

### Legally Enforceable Limitations

Regardless of what your process is physically capable of emitting, legally and practically enforceable limitations such as rules, conditions in an air permit, and compliance/enforcement documents cannot be exceeded. You can use these values to calculate your PTE. See Step 4 for a more in-depth discussion of legally enforceable limitations.



#### EXAMPLE 1: RULES as Legally Enforceable Limitations

**Small Business, Inc.** operates a metal parts grinder that is ventilated. According to the manufacturer, the exhaust system servicing the grinder is rated at 29,000 standard cubic feet (scf) per minute. Table 31 of R 336.1331 limits PM emissions from the exhaust system to 0.10 pounds of PM per 1,000 pounds of exhaust gas.

- *1 scf air = 0.075 pounds.*
- *Maximum operating hours/yr = 8,760*

#### Annual Potential Emission of PM

$(29,000 \text{ scf of air/min}) \times (60 \text{ min/hr}) = 1,740,000 \text{ scf of air/hr}$

$(1,740,000 \text{ scf of air/hr}) \times (0.075 \text{ lbs of air/1 scf of air}) = 130,500 \text{ lbs of air/hr}$

$(130,500 \text{ lbs of air/hr}) \times (0.10 \text{ lbs of PM/1,000 lbs of air}) = 13.05 \text{ lbs of PM/hr}$

$(13.05 \text{ lbs PM/hr}) \times (8,760 \text{ hrs/yr}) = 114,318 \text{ lbs of PM/yr}$

$(114,318 \text{ lbs PM/yr}) \times (1 \text{ ton/2,000 lbs}) = \mathbf{57 \text{ tons of PM/yr}}$



## EXAMPLE 2: PERMIT CONDITIONS as Legally Enforceable Limitations

**Small Business, Inc.** operates three coating booths. The booths were issued a Permit to Install for the coating line in 1989. One of the conditions of the permit limits VOC emissions to 5.6 tons per year and requires mass balance calculations and specific periodic recordkeeping. According to the SDS, the volatile portion of the coating is comprised of toluene and isopropyl alcohol.

### Annual Potential Emission of VOCs

The company's legally enforceable permit condition limits its VOC emissions to 5.6 tons/year. Before using this number to limit your PTE, the company must review their recordkeeping and calculations to ensure that they are in compliance with the permitted limit.

### Annual Potential Emission of HAPs

Toluene is the only HAP. However, since toluene is also a VOC and the permit limits VOC emissions to 5.6 tons per year, the potential emission of toluene cannot be greater than 5.6 tons/year. Therefore, the potential emission of toluene is 5.6 tons/year.

## Performance Test Data

Performance test data which may include data from a stack test, continuous emission monitoring, or manufacturer testing can be used to estimate your potential emissions. This data must be revised to reflect the maximum hourly operating rate of your process if your equipment was not operating at that level during the performance test.

Performance test data may provide an emission rate as well as other data that is useful for calculating PTE. For example, stack test results could contain data about an air contaminant for which there are not applicable regulations in a permit or rule. Performance test data may also provide an air flow rate that could be used in conjunction with the particulate emission rate found in R 336.1331 (Rule 331) to calculate PTE.



It is **not** appropriate to use performance test results in place of an applicable requirement when calculating PTE. For example, if a stack test reveals an actual emission rate of 0.09 pounds of PM per 1,000 pounds of gas and the applicable limit in its Permit to Install is 0.10 pounds of PM per 1,000 pounds of gas, the facility should use the 0.10 limit in its PTE calculations.



### EXAMPLE: PTE Calculations Using PERFORMANCE TEST DATA

Data from a stack test at **Small Business, Inc.** indicates that the actual air flow rate of the exhaust fan on the unpermitted metal parts grinder is 29,000 scf per minute. The emission source is subject to Rule 331, which limits PM emissions to 0.10 pounds of PM per 1,000 pounds of exhaust gas.

- $1 \text{ scf air} = 0.075 \text{ pounds}$ .
- $\text{Maximum operating hours/yr} = 8,760$

#### Annual Potential Emissions of PM

$(29,000 \text{ scf of air/min}) \times (60 \text{ min/hr}) \times (0.075 \text{ lbs of air/1 scf of air}) = 130,500 \text{ lbs of air/hr}$

$(130,500 \text{ lbs of air/hr}) \times (0.10 \text{ lbs of PM/1,000 lbs of air}) = 13.05 \text{ lbs of PM/hr}$

$(13.05 \text{ lbs PM/hr}) \times (8,760 \text{ hrs/yr}) \times (1 \text{ ton/2,000 lbs}) = \mathbf{57.0 \text{ tons PM/yr}}$

## Mass Balance

When considering the mass balance approach, it is assumed the weight of all raw materials going into a process must equal the weight of the product and waste material leaving the process. In other words, all VOCs contained in the material are assumed to be emitted. Mass balance is usually the best way to calculate emissions from operations that involve solvent evaporation such as coating lines, printing lines, and clean-up activities. A benefit to using the mass balance approach to calculate your PTE, you do not need to separately calculate fugitive emissions. Fugitive emissions are automatically included in a mass balance calculation.



### EXAMPLE: PTE Calculations Using MASS BALANCE

**Small Business, Inc.** has maintenance booth with a single spray gun. The gun capacity is 5 gallons per hour. The coating contains 65 percent VOC by weight and its density is 11.2 lbs/gal.

- $\text{VOC content} = (11.2 \text{ lbs coating/gal}) \times (0.65 \text{ lbs VOC/lb coating}) = 7.28 \text{ lbs VOC/gal coating}$
- $\text{Maximum operating hours/yr} = 8,760$

#### Annual Potential Emission of VOCs

$(5 \text{ gal coating/hr}) \times (7.28 \text{ lbs VOC/gal of coating}) = 36.4 \text{ lbs of VOC/hr}$

$(36.4 \text{ lbs VOC/hr}) \times (8,760 \text{ hrs/yr}) = 318,864 \text{ lbs of VOC/yr}$

$(318,864 \text{ lbs VOC/yr}) \times (1 \text{ ton/2,000 lbs}) = \mathbf{159.4 \text{ tons of VOC/yr}}$

## Emission Factors

If you cannot calculate your emissions using any of the methods described above, you may want to consider using an emission factor. Emission factors exist for many types of processes. An emission factor is an average emission value derived from industry data. The factor relates an activity or process to the quantity of an air contaminant released into the atmosphere. Factors are usually expressed as the weight of air contaminant released per volume or weight of the activity. Such as “100 lbs/10<sup>6</sup> scf natural gas,” which means 100 lbs of an air contaminant is emitted per million standard cubic feet of natural gas burned.

Be aware that emission factors **only provide an estimate** of your emissions. Use of them to calculate PTE may be subject to approval by the AQD.

You may need to know your process capacity or design rating to use an emission factor. Emission factors for air contaminants can be found in publications such as the EPA’s “AP-42, *Compilation of Air Pollutant Emission Factors*” (see Figure 2-3). You can access AP-42 on the Internet at: [www.epa.gov/ttn/chief/ap42/index.html](http://www.epa.gov/ttn/chief/ap42/index.html). You can also download the EPA’s Factor Information Retrieval (WebFIRE) database, which allows you to search all of the EPA emission factors. WebFIRE can be accessed and downloaded at: <http://cfpub.epa.gov/webfire/>.

If you use emission factors, make sure the factor you are using is appropriate for your process. For example, to select the right factor for a boiler, you need to know the size of your burner. Also, pay close attention to the units used with emission factor. Make sure your process data agrees with the units in the emission factor.

1.4-5

Table 1.4-1. EMISSION FACTORS FOR NITROGEN OXIDES (NO<sub>x</sub>) AND CARBON MONOXIDE (CO) FROM NATURAL GAS COMBUSTION<sup>a</sup>

Combustor Type (MMBtu/hr Heat Input) [SCC]	NO <sub>x</sub> <sup>b</sup>		CO	
	Emission Factor (lb/10 <sup>6</sup> scf)	Emission Factor Rating	Emission Factor (lb/10 <sup>6</sup> scf)	Emission Factor Rating
Large Wall-Fired Boilers (>100) [1-01-006-01, 1-02-006-01, 1-03-006-01]				
Uncontrolled (Pre-NSPS) <sup>c</sup>	280	A	84	B
Uncontrolled (Post-NSPS) <sup>c</sup>	190	A	84	B
Controlled - Low NO <sub>x</sub> burners	140	A	84	B
Controlled - Flue gas recirculation	100	D	84	B
Small Boilers (<100) [1-01-006-02, 1-02-006-02, 1-03-006-02, 1-03-006-03]				
Uncontrolled	100	B	84	B
Controlled - Low NO <sub>x</sub> burners	50	D	84	B
Controlled - Low NO <sub>x</sub> burners/Flue gas recirculation	32	C	84	B
Tangential-Fired Boilers (All Sizes) [1-01-006-04]				
Uncontrolled	170		24	
Controlled - Flue gas recirculation	76		98	
Residential Furnaces (<0.3) [No SCC]				
Uncontrolled	94	B	40	B

EMISSION COMBUSTION SOURCES

Emission factor for NO<sub>x</sub>

Emission factor for CO

Figure 2-3: AP-42



### **EXAMPLE: PTE Calculations Using EMISSION FACTORS**

**Small Business, Inc.** has a natural gas-fired boiler rated at 10 million Btu per hour. The NO<sub>x</sub> Emission Factor from Table 1.4-1 in Chapter 1.4 of AP-42 (see figure 2-3 above) is 100 pounds of NO<sub>x</sub> emitted per million scf of natural gas burned. In addition to NO<sub>x</sub> emissions the company would also use emission factors to calculate CO, SO<sub>2</sub>, PM, and VOC emissions.

- *1 scf of natural gas = 1,020 Btu*
- *Maximum operating hours/yr = 8,760*

#### **Annual Potential Emission of NO<sub>x</sub>:**

$$(10,000,000 \text{ Btu/hr}) \times (1 \text{ scf of fuel}/1,020 \text{ Btu}) = 9,803.9 \text{ scf of natural gas/hr}$$

$$(9,803.9 \text{ scf natural gas/hr}) \times (8,760 \text{ hrs/yr}) = 85,882,352.9 \text{ scf of natural gas/yr}$$

$$(85,882,352.9 \text{ scf/yr}) \times (100 \text{ lbs of NO}_x/1,000,000 \text{ scf of fuel}) = 8,588.2 \text{ lbs of NO}_x/\text{yr}$$

$$(8,588.2 \text{ lbs of NO}_x/\text{yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{4.3 \text{ tons of NO}_x/\text{yr}}$$

PTE Summary Table for Small Business Inc.

Emission Source	Description	Permit Status	Legally Enforceable Limitation	Calculation Method
COATING BOOTHS 1-3	3 spray booths	<input checked="" type="checkbox"/> Permitted: PTI # <b>999-89</b> ____ <input type="checkbox"/> Grandfathered: ___/___/___ <input type="checkbox"/> Exempt: R 336. _____	- Permit limit = 5.6 tons VOC/yr - Permit requires recordkeeping - Permit requires dry filter	Permit condition
OVEN	2,500,000 Btu/hr natural gas fired	<input checked="" type="checkbox"/> Permitted: PTI # <b>999-89</b> ____ <input type="checkbox"/> Grandfathered: ___/___/___ <input type="checkbox"/> Exempt: R 336. _____	None	Emission factor
MAINTENANCE BOOTH	Booth used for touchup	<input checked="" type="checkbox"/> Permitted: PTI # <b>825-82</b> ____ <input type="checkbox"/> Grandfathered: ___/___/___ <input type="checkbox"/> Exempt: R 336. _____	Permit requires dry filter	Mass balance equation
PRINTING	Prints information on product	<input type="checkbox"/> Permitted: PTI # _____ <input checked="" type="checkbox"/> Grandfathered: <b>10/15/1966</b> <input type="checkbox"/> Exempt: R 336. _____	None (grandfathered)	Mass balance equation
SPECIAL PROJECT BOOTH	Spray booth used for special projects	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1287(c)</b> ____	Rule: R 336.1287(c) – limits coating usage to 200 gal/month, requires recordkeeping	Limitation in rule
COLD CLEANERS	2 cold cleaners for parts washing	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1281(h)</b> ____	Rule: R 336.1611 - Requires that cover be closed and that parts be drained	Emission factor
CLEANUP	Facility-wide cleanup solvents	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1290</b> ____	Rule: R 336.1290 – limits emission of non-carcinogenic VOCs to 1,000 lbs/month, requires recordkeeping	Limitation in rule
GRINDER	Metal parts grinder connected to baghouse (29,000 cfm)	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1285(l)(vi)</b> _	None	Emission factor
WELDING	Shielded metal arc welding	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1285(i)</b> ____	None	Emission factor
BOILER	10 million Btu/hr natural gas fired boiler	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1282(b)(i)</b> _	None	Emission factor
GENERATOR	Diesel fired emergency generator	<input type="checkbox"/> Permitted: PTI # _____ <input type="checkbox"/> Grandfathered: ___/___/___ <input checked="" type="checkbox"/> Exempt: R 336. <b>1285(g)</b> ____	None	Emission factor

## STEP 6: Calculate the PTE for Each Emission Source

In this step you will calculate the PTE for each of the emission units you identified in Step 1. You will use the information gathered in Steps 1 through 5 to help you perform the calculations. The guidance below explains the assumptions you should be making when calculating your PTE, how to deal with “bottlenecks,” as well as how to identify the pollutants emitted.

Calculating PTE for each pollutant emitted from each process will result in numerous calculations. Usually, more than one pollutant will be emitted from each process. Keep the calculations, data, and assumptions for each process separate. Spreadsheets are a good place to store data for each process as well as being useful to help you calculate your facility’s PTE.



PTE Calculation Worksheets for several processes can be found at: [www.michigan.gov/air](http://www.michigan.gov/air) (select “Permits” then “Potential to Emit”).

When calculating your facility’s PTE be sure to **show your work**. When determining your applicability to certain regulations, the AQD will review how your PTE was calculated. If you use a computer spreadsheet, show a sample calculation or the formulas used. Identify all of the assumptions that were made and documents that were reviewed while completing the calculations.

**Small Business, Inc.** has calculated the PTE for each of the emission sources in their facility. The PTE calculations for each process are on pages 2-23 to 2-36.

### The PTE Equation

PTE refers to the amounts of air contaminants that the facility could release into the air while operating at the maximum design capacity, with the highest polluting materials and operating 100% of the time. The standard equation used in calculating PTE for each regulated air contaminant emitted from each process is:

$$\text{PTE} = (\text{maximum hourly emission rate of pollutant}) \times (8760 \text{ hours})$$

When calculating PTE, use the following assumptions:

- The maximum hourly emission rate reflects the quantity of air pollutants generated if the emission unit was operating at its maximum design capacity.
- Unless restricted as discussed in Step 4, assume the process operates continuously, 24 hours per day x 365 days per year. This amounts to **8,760** hours per year.
- Any emission reduction attributed to an air pollution control device, such as a bag filter, scrubber, or afterburner, can be included in the calculation only if the operation of the device is required by a legally and practically enforceable permit condition, rule, or compliance/enforcement document and only to the extent that is required to meet that requirement.



If a facility is required by a permit to operate a thermal oxidizer to meet a limit of 5.0 pounds per hour VOCs and the permitted control efficiency is 95%, based on the results of stack testing, the emission reductions from the control equipment could be applied after uncontrolled emissions were calculated.

- The material containing the highest amount of air contaminants and thus air emissions are processed or used 100 percent of the time.

### “Bottlenecks”

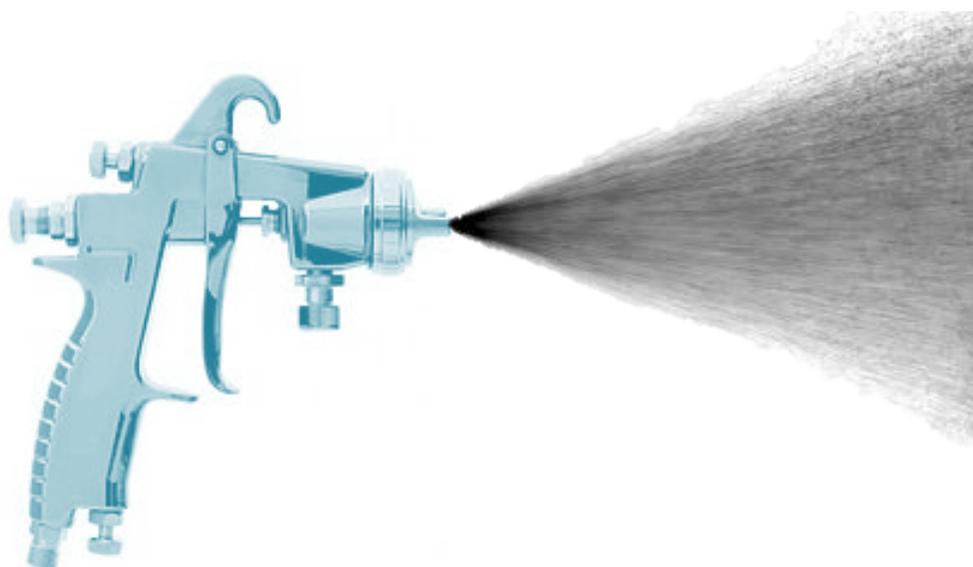
When calculating your PTE, be sure to take into consideration any inherent physical limitations in a process that would limit its PTE. When the output of a multi-step process is limited by the capacity of one emission unit or activity, that emission unit or activity is considered a bottleneck. If a process has a physical limitation which only allows it to operate during a certain season, such as an asphalt plant, the annual operating hours will be below the 8,760 hours/year that unrestricted processes are required to use for PTE calculations.



To make use of physical limitation or bottleneck when calculating your PTE, the limitation must be unavoidable, meaning it would be impossible to operate at a higher rate than you are using to calculate your PTE. You should be able to document that the inherent physical limitation exists and is unavoidable. If necessary, records (e.g., production records, operating hours, etc.) may be requested that demonstrate the inherent physical limitation is not exceeded. If you subsequently make a change that eliminates or changes the inherent limitation or bottleneck, you should recalculate your PTE to reflect the change in the process. An increase may be considered a modification to your facility.

If you are unsure as to whether a physical limitation may be used to limit your PTE, contact your Air Quality Division District Office (see Appendix D).

**Small Business, Inc.** has three coating booths that use oven-dried coatings. All coated parts must go to a curing oven. There is only one conveyor to the oven and the conveyor can only be connected to one line at a time. Here, the conveyor is the **bottleneck**. The company would only have to include the emissions from one of the coating lines in their PTE calculation since it is impossible for more than one coating line to operate simultaneously.



## Determining What Pollutants are Emitted

Determining what air contaminants are emitted from a process may take a little research. The examples on pages 2-23 to 2-36 of this document show the pollutants emitted from several common processes. Sometimes the equipment manufacturer will be able to give you information about the pollutants emitted and possibly an emission rate. Another potential place to look is in your permit to install application, if applicable.

SDS or manufacturer formulation data sheets can also be helpful in identifying pollutants that may be emitted. The information contained in these is particularly useful in determining emissions from sources of solvent evaporation (e.g., coating lines, cold cleaners, cleanup solvents). The manufacturer formulation data for coatings or solvents used will identify all the compounds that may be emitted, including VOCs and HAPs.

Publications such as EPA's "*AP-42, Compilation of Air Pollutant Emission Factors*" ([www.epa.gov/ttn/chieff/ap42/index.html](http://www.epa.gov/ttn/chieff/ap42/index.html)) and EPA's Factor Information Retrieval (WebFIRE) database (<http://cfpub.epa.gov/webfire/>) may also be helpful.



Some pollutants fit the definition of more than one regulated air contaminant. For example, many VOCs are also considered to be HAPs (e.g., Xylene, Toluene). If a solvent you are using emits Xylene it must be reported as both a HAP and a VOC.

# Small Business, Inc.

## COATING BOOTHS 1-3

This emission source consists of three spray booths. Each gun has a capacity of 5 gallons per hour. The booths are included in a Permit to Install. The permit has a condition that limits emission of VOCs to 5.6 tons/yr based on a 12-month rolling time period. The permit also has a condition that requires a dry filter. The regulated pollutants that are emitted are VOCs, HAPs, PM, PM10 and PM2.5. Because this is a non-heated source, one can assume that the PM10 emissions are less than or equal to the PM emissions. Additionally one can conservatively assume PM = PM10=PM2.5. Therefore, since we assume they are all equal, we will only calculate PM. Of all the HAPs contained in the coatings used, Xylene is present in the highest concentration.

### PTE of VOC

Permit to Install # 999-89 contains an emission limit of 5.6 tons of VOC/yr. Therefore, the PTE of VOC is **5.6 tons/yr**.

### PTE of HAPs

All the VOCs contained in the coatings used are also HAPs; therefore, the 5.6 tons VOC/yr limit can also be used here to restrict the PTE of HAPs. If the coatings used contain several different HAPs, assume the HAP present in the highest concentration is the only HAP emitted. In this example, Xylene is present in the highest concentration; therefore, the PTE of Xylene would be **5.6 tons/yr**.

### PTE of PM

To calculate the PTE of PM from coating, assume the highest solid content coating is used continuously. The permit requires a filter, so the control efficiency for the wall filter in the booths (95 percent based on manufacturer's specifications) can be used in calculating PTE. The transfer efficiency of the spray gun is 20 percent. This means 20 percent of the coating adheres to the part and 80 percent is overspray. Of the coatings used, the one with the highest solid content\* contains 2.66 pounds of solids/gallon of coating.

- (5 gal of coating/hr/spray gun) x (3 spray guns) = 15 gal of coating/hr
- (15 gal coating/hr) x (2.66 lbs of solid/gal of coating) x (0.80 overspray) = 31.92 lbs of solids/hr
- (31.92 lbs of solids/hr) x (8,760 hours/yr) x (1 ton/2,000 lbs) = 139.81 tons of solids/yr (uncontrolled)
- (139.81 tons of solids/yr) x ([100-95]/100) = **7.0 tons of solid(PM)/yr (controlled)**

### COATING BOOTHS 1-3 PTE SUMMARY (ton/yr)

- VOC = 5.6
- Xylene = 5.6
- PM = 7.0 (assume PM emissions = PM10 and PM2.5 emissions)



\* Contact the coating manufacturer if you are unable to determine the solid content of the coating.

# Small Business, Inc.

## OVEN

This is a 2,500,000 Btu/hr natural gas fired oven used to cure parts that are coated in coating booths 1-3 or the maintenance booth. The emission factors for a small boiler will be used to calculate emissions from this oven (see below).

Pollutant	Emission Factor
NOx	100 lbs/1,000,000 cubic feet (ft <sup>3</sup> ) natural gas
CO	84 lbs/1,000,000 ft <sup>3</sup> natural gas
Lead (Pb)	0.0005 lbs/1,000,000 ft <sup>3</sup> natural gas
PM10=PM2.5	7.6 lbs/1,000,000 ft <sup>3</sup> natural gas
PM	1.9 lbs/1,000,000 ft <sup>3</sup> natural gas
SO <sub>2</sub>	0.6 lbs/1,000,000 ft <sup>3</sup> natural gas
VOC	5.5 lbs/1,000,000 ft <sup>3</sup> natural gas
GHG (CO <sub>2</sub> e)	Various (see below)

With the exception of GHG, emission factors from the EPA's AP-42 Manual, Chapter 1.4, Tables 1.4-1 and 1.4-2.

Note: 1 ft<sup>3</sup> of natural gas = 1,020 Btu

### Maximum cubic feet (cf) of natural gas used per hour:

$$(2,500,000 \text{ Btu/hr}) \times (1 \text{ ft}^3 \text{ natural gas}/1,020 \text{ Btu}) = \mathbf{2,451 \text{ ft}^3 \text{ of natural gas/hr}}$$

### PTE of regulated pollutants using emission factors:

**NOx:**  $(2,451 \text{ ft}^3/\text{hr}) \times (100 \text{ lbs NOx}/1,000,000 \text{ ft}^3) = 0.25 \text{ lbs of NOx/hr}$   
 $(0.25 \text{ lbs NOx/hr}) \times (8,760 \text{ hrs/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{1.10 \text{ tons of NOx/yr}}$

**CO:**  $(2,451 \text{ ft}^3/\text{hr}) \times (84 \text{ lbs CO}/1,000,000 \text{ ft}^3) = 0.21 \text{ lbs of CO/hr}$   
 $(0.21 \text{ lbs CO/hr}) \times (8,760 \text{ hrs/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{0.92 \text{ tons of CO/yr}}$

**Pb:**  $(2,451 \text{ ft}^3/\text{hr}) \times (0.0005 \text{ lbs Pb}/1,000,000 \text{ ft}^3) = 0.000001 \text{ lbs of Pb/hr}$   
 $(0.000001 \text{ lbs Pb/hr}) \times (8,760 \text{ hrs/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{0.000004 \text{ tons of Pb/yr}}$

**PM10=PM2.5:**  $(2,451 \text{ ft}^3/\text{hr}) \times (7.6 \text{ lbs PM}/1,000,000 \text{ ft}^3) = 0.02 \text{ lbs of PM/hr}$   
 $(0.02 \text{ lbs PM/hr}) \times (8,760 \text{ hrs/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{0.09 \text{ tons of PM10=PM2.5/yr}}$

**PM:**  $(2,451 \text{ ft}^3/\text{hr}) \times (1.9 \text{ lbs PM}/1,000,000 \text{ ft}^3) = 0.004 \text{ lbs of PM/hr}$   
 $(0.004 \text{ lbs PM/hr}) \times (8,760 \text{ hrs/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{0.02 \text{ tons of PM/yr}}$

**SO<sub>2</sub>:**  $(2,451 \text{ ft}^3/\text{hr}) \times (0.6 \text{ lbs SO}_2/1,000,000 \text{ ft}^3) = 0.001 \text{ lbs of SO}_2/\text{hr}$   
 $(0.001 \text{ lbs SO}_2/\text{hr}) \times (8,760 \text{ hrs/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{0.004 \text{ tons of SO}_2/\text{yr}}$

**VOC:**  $(2,451 \text{ ft}^3/\text{hr}) \times (5.5 \text{ lbs VOC}/1,000,000 \text{ ft}^3) = 0.01 \text{ lbs of VOC/hr}$   
 $(0.01 \text{ lbs VOC/hr}) \times (8,760 \text{ hrs/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{0.04 \text{ tons of VOC/yr}}$

**PTE for GHG (CO<sub>2</sub>e) pollutants using 40 CFR 98 Subparts A and C:**

Total Heat Input Capacity x Emission Factor x Conversion Factor(s) x Global Warming Potential

**Total Heat Input Capacity in MMBtu/yr:** Total Btu/hr x (1 x 10<sup>-6</sup>) x 8760 hrs/yr  
2,500,000Btu/hr x (1 x 10<sup>-6</sup>) x 8760 hrs/yr = 21,900 MMBtu/yr

**CO<sub>2</sub>:**  $\frac{21,900 \text{ MMBtu}}{1 \text{ year}} \times \frac{53.06 \text{ kg}}{1 \text{ MMBtu}} \times \frac{2.2046 \text{ lbs}}{1 \text{ kg}} \times \frac{1 \text{ ton}}{2000 \text{ lbs}} \times 1 = 1,280 \text{ tons/yr}$

**CH<sub>4</sub>:**  $\frac{21,900 \text{ MMBtu}}{1 \text{ year}} \times \frac{0.001 \text{ kg}}{1 \text{ MMBtu}} \times \frac{2.2046 \text{ lbs}}{1 \text{ kg}} \times \frac{1 \text{ ton}}{2000 \text{ lbs}} \times 25 = 0.6 \text{ tons/yr}$

**N<sub>2</sub>O:**  $\frac{21,900 \text{ MMBtu}}{1 \text{ year}} \times \frac{0.0001 \text{ kg}}{1 \text{ MMBtu}} \times \frac{2.2046 \text{ lbs}}{1 \text{ kg}} \times \frac{1 \text{ ton}}{2000 \text{ lbs}} \times 298 = 0.72 \text{ tons/yr}$

**Total CO<sub>2</sub>e tons/yr = CO<sub>2</sub> + CH<sub>4</sub> + N<sub>2</sub>O**

(1,280 tons CO<sub>2</sub>/yr) + (0.6 tons CH<sub>4</sub>/yr) + (0.72 tons N<sub>2</sub>O/yr) = **1,281.32 tons CO<sub>2</sub>e/yr**

**OVEN PTE SUMMARY (ton/yr)**

- NO<sub>x</sub> = 1.10
- CO = 0.92
- Lead (Pb) = negligible
- PM<sub>10</sub>/PM<sub>2.5</sub> = 0.09
- PM = 0.02
- SO<sub>2</sub> = 0.004
- VOC = 0.04
- CO<sub>2</sub>e = 1,282

# Small Business, Inc.

## MAINTENANCE BOOTH

The maintenance booth consists of one spray gun, which is used for maintenance and touchup work. The gun capacity is 5 gallons per hour. This booth is included in a Permit to Install. The permit requires a dry filter but does not contain a VOC or HAP emission limit. The regulated pollutants that are emitted are VOCs, HAPs, PM, PM10 and PM2.5. Several different coatings are used in this booth; therefore, the company will need to choose a worst-case coating to use in the calculations. The worst-case coating will be the coating used with the highest VOC/HAP content. Information about the worst-case coating chosen is provided below.

Worst-Case Coating Info	
Density	11.2 lbs/gal
Solids	2.31 lbs/gal
VOC	6.16 lbs/gal
Xylene	35% by weight
Toluene	17% by weight
MEK	3% by weight

### PTE of VOC

- $(5 \text{ gal of coating/hr}) \times (6.16 \text{ lbs of VOC/gal of coating}) = 30.8 \text{ lbs of VOC/hr}$
- $(30.8 \text{ lbs of VOC/hr}) \times (8,760 \text{ hrs/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{134.9 \text{ tons of VOC/yr}}$

### PTE of HAPs (Calculate the PTE of each HAP in the coating)

#### **PTE of Xylene**

- $(0.35 \text{ lb Xylene/lb coating}) \times (11.2 \text{ lbs coating/gal coating}) = 3.92 \text{ lbs Xylene/gal coating}$
- $(5 \text{ gal of coating/hr}) \times (3.92 \text{ lbs Xylene/gal of coating}) = 19.6 \text{ lbs of Xylene/hr}$
- $(19.6 \text{ lbs Xylene/hr}) \times (8,760 \text{ hrs/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{85.85 \text{ tons of Xylene/yr}}$

#### **PTE of Toluene**

- $(0.17 \text{ lb Toluene/lb coating}) \times (11.2 \text{ lbs coating/gal coating}) = 1.9 \text{ lbs Toluene/gal coating}$
- $(5 \text{ gal of coating/hr}) \times (1.9 \text{ lbs toluene/gal of coating}) = 9.5 \text{ lbs of Toluene/hr}$
- $(9.5 \text{ lbs toluene/hr}) \times (8,760 \text{ hrs/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{41.61 \text{ tons of toluene/yr}}$

#### **PTE of MEK**

- $(0.03 \text{ lb MEK/lb coating}) \times (11.2 \text{ lbs coating/gal coating}) = 0.34 \text{ lbs MEK/gal coating}$
- $(5 \text{ gal of coating/hr}) \times (0.34 \text{ lbs MEK/gal of coating}) = 1.7 \text{ lbs of MEK/hr}$
- $(1.7 \text{ lbs MEK/hr}) \times (8,760 \text{ hrs/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{7.36 \text{ tons of MEK/yr}}$

### PTE of PM

The transfer efficiency of the spray gun is 20 percent. This means 20 percent of the coating adheres to the part and 80 percent is overspray. The permit requires a filter, so the control efficiency for the wall filter in the booths (95 percent) can be used in calculating PTE.

- $(5 \text{ gal of coating/hr}) \times (2.31 \text{ lbs of solids/gal of coating}) \times (0.80 \text{ overspray}) = 9.24 \text{ lbs of solids/hr}$
- $(9.24 \text{ lbs of solids/hr}) \times (8,760 \text{ hours/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = 40.47 \text{ tons of solids/yr}$
- $(40.47 \text{ tons of solids/yr}) \times ((100 - 95)/100) = \mathbf{2.02 \text{ tons solids (PM)/yr}}$

### **MAINTENANCE BOOTH PTE SUMMARY (ton/yr)**

- VOC = 134.9
- Xylene = 85.85
- Toluene = 41.61
- MEK = 7.36
- PM = 2.02 (assume PM emissions = PM10 and PM2.5 emissions)

# Small Business, Inc.

## PRINTING

This is a grandfathered printing machine that prints the product information on each of the items manufactured by this facility. Once the ink is applied to the part, the parts are sent to the packaging machine which boxes the parts for shipment. The actual ink usage is very small; however, since this emission unit is grandfathered, no legal enforceable limits exist to limit its PTE. Each part requires the same information be printed so the ink usage is consistent for each part (0.01 ounces of ink per part). The machine can apply the ink at a rate of 20 parts per minute; however, the packaging apparatus which boxes the parts for shipment can only package the product at a rate of 800 parts per hour. This means that the parts must be run through the machine in batches instead of continuously. Therefore, the packaging operation serves as a bottleneck that limits the amount of parts that can be run through this process per hour.

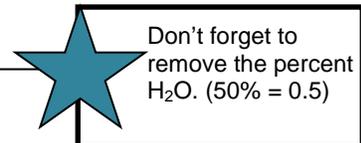
The company uses several water-based inks that contain no HAPs. The ink with the highest VOC content is 0.8 pounds per gallon (minus water). The water content is 50 percent by volume. The only regulated pollutant emitted is VOCs.

*Calculation hints:*      1 gallon = 128 ounces

*When calculating VOC emissions for water based coatings, it is important that the water is subtracted from the usage data before multiplying by a "minus water" VOC content figure. Failure to subtract water from the usage data will result in an over estimation of VOC emissions.*

### PTE of VOC

- $(0.01 \text{ oz ink/part}) \times (1 \text{ gal}/128 \text{ oz}) = 0.0001 \text{ gal of ink/part}$
- $(0.0001 \text{ gal ink/part}) \times (800 \text{ parts/hr}) = 0.08 \text{ gal of ink/hr}$
- $(0.08 \text{ gal ink/hr}) \times (1 - 0.5) = 0.04 \text{ gal of ink (minus water)/hr}$
- $(0.04 \text{ gal ink [minus water]}/\text{hr}) \times (0.8 \text{ lbs VOC/gal ink [minus water]}) = 0.032 \text{ lbs of VOC/hr}$
- $(0.032 \text{ lbs VOC/hr}) \times (8,760 \text{ hrs/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{0.14 \text{ tons of VOC/yr}}$



### PRINTING PTE SUMMARY (ton/yr)

- VOC            = 0.14



If you want to use a new ink, your PTE should be re-evaluated!!

# Small Business, Inc.

## SPECIAL PROJECT BOOTH

This coating booth consists of one spray gun, which is only used for special projects. Coating usage is very low so the booth is exempt from the requirement to obtain a Permit to Install under R 336.1287(c) (Rule 287(c)). Rule 287(c) contains a restriction that only allows the emission unit to use 200 gallons coating per month. Since several coatings are used at this booth, the company must choose a “worst-case” coating to calculate emissions. The worst-case coating should be the coating used with the highest VOC/HAP content. This is not always the same coating, but in this case we will assume it is. The information for the worst-case coating used at this booth is provided.

Worst-Case Coating Info	
Density	10.5 lbs/gal
Solids	3.68 lbs/gal
VOC	6.83 lbs/gal
Xylene	45% by weight
Toluene	18% by weight
MIBK	2% by weight

### PTE of VOC

- $(6.83 \text{ lbs VOC/gal coating}) \times (200 \text{ gal/month}) = 1,366 \text{ lbs VOC/month}$
- $(1,366 \text{ lbs VOC/month}) \times (12 \text{ month/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{8.2 \text{ tons VOC/yr}}$

### PTE of HAPs (Calculate the PTE of each HAP in the coating)

#### **PTE of Xylene**

- $(0.45 \text{ lb Xylene/lb coating}) \times (10.5 \text{ lbs coating/gal coating}) = 4.73 \text{ lbs Xylene/gal}$
- $(4.73 \text{ lbs Xylene/gal}) \times (200 \text{ gal/month}) = 946 \text{ lbs Xylene/month}$
- $(946 \text{ lbs Xylene/month}) \times (12 \text{ month/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{5.68 \text{ tons Xylene/yr}}$

#### **PTE of Toluene**

- $(0.18 \text{ lb Toluene/lb coating}) \times (10.5 \text{ lbs coating/gal coating}) = 1.89 \text{ lbs Toluene/gal}$
- $(1.89 \text{ lbs Toluene/gal}) \times (200 \text{ gal/month}) = 378 \text{ lbs Toluene/month}$
- $(378 \text{ lbs Toluene/month}) \times (12 \text{ month/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{2.27 \text{ tons Toluene/yr}}$

#### **PTE of MIBK**

- $(0.02 \text{ lb MIBK/lb coating}) \times (10.5 \text{ lbs coating/gal coating}) = 0.21 \text{ lbs MIBK/gal}$
- $(0.21 \text{ lbs MIBK/gal}) \times (200 \text{ gal/month}) = 42 \text{ lbs MIBK/month}$
- $(42 \text{ lbs MIBK/month}) \times (12 \text{ month/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{0.25 \text{ tons MIBK/yr}}$

### PTE of PM

The transfer efficiency of the spray gun is 25 percent. This means 25 percent of the coating adheres to the part and 75 percent is overspray.

- $(3.68 \text{ lbs solids/gal coating}) \times (200 \text{ gal coating/month}) \times (0.75 \text{ overspray}) = 552 \text{ lbs solids/month}$
- $(552 \text{ lbs solids/month}) \times (12 \text{ months/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{3.31 \text{ tons of solids (PM)/yr}}$

### **SPECIAL PROJECT PTE SUMMARY (ton/yr)**

- VOC = 8.2
- Xylene = 5.68
- Toluene = 2.27
- MIBK = 0.25
- PM = 3.31 (assume PM emissions = PM10 and PM2.5 emissions)

# Small Business, Inc.

## COLD CLEANERS

There are two cold cleaners at this facility that use SuperClean cleaning solvent. The SDS for the solvent shows that it contains 100 percent Stoddard solvent, which is a VOC. The cold cleaners are subject to R 336.1611 (Rule 611). Rule 611 requires that certain operating practices be adhered to, which serve as legally enforceable operational restrictions that may contribute to reduced emissions.

### PTE of VOC

PTE (uncontrolled) is based on emission factors from Chapter 4.6 of the EPA's AP-42.

$$(0.33 \text{ ton VOC/yr/unit}) \times (2 \text{ units}) = \mathbf{0.66 \text{ ton VOC/yr (uncontrolled)}}$$

Type Of Degreasing	Activity Measure	Uncontrolled Organic Emission Factor <sup>a</sup>	
All <sup>b</sup>	Solvent consumed	1,000 kg/Mg	2,000 lb/ton
Cold cleaner			
Entire unit <sup>c</sup>	Units in operation	0.30 Mg/yr/unit	0.33 tons/yr/unit
Waste solvent loss		0.165 Mg/yr/unit	0.18 tons/yr/unit
Solvent carryout		0.075 Mg/yr/unit	0.08 tons/yr/unit
Bath and spray evaporation			
Entire unit	Surface area and duty cycle <sup>d</sup>	0.06 Mg/yr/unit	0.07 tons/yr/unit
		0.4 kg/hr/m <sup>2</sup>	0.08 lb/hr/ft <sup>2</sup>
Open top vapor			
Entire unit	Units in operation	9.5 Mg/yr/unit	10.5 tons/yr/unit
Entire unit	Surface area and duty cycle <sup>e</sup>	0.7 kg/hr/m <sup>2</sup>	0.15 lb/hr/ft <sup>2</sup>

Emission Factor = 0.33 tons/yr/unit

Table 4.6-2 from Chapter 4.6 of AP-42

Since these cold cleaners are complying with the operational requirements in Rule 611, we can take into consideration emission reductions from control devices and operating procedures. Table 6-3 from Chapter 4.6 of AP-42 provides an emission reduction of 28 percent for cold cleaners.

$$(0.66 \text{ ton VOC/yr}) \times [(100 - 28)/100] \text{ total emission reduction} = \mathbf{0.475 \text{ ton VOC/yr (controlled)}}$$

Emission reduction = 28 percent (use the lowest number in range unless you can prove that a higher emission reduction is applicable.)

System	Cold Cleaner		Vapor Degreaser		Conveyorized Degreaser	
	A	B	A	B	A	B
Control devices						
Cover or enclosed design	X	X	X	X	X	X
Drainage facility	X	X	X			X
Water cover, refrigerated chiller, carbon adsorption or high freeboard <sup>b</sup>		X		X		X
Solid, fluid spray stream <sup>c</sup>		X		X		
Safety switches and thermostats				X		X
Emission reduction from control devices (%)	13-38	NA <sup>d</sup>	20-40	30-60		40-60
Operating procedures						
Use of equipment	X	X	X	X	X	X
Waste solvent management	X	X	X	X	X	X
Reduced exhaust			X	X	X	X
Reduced conveyor or entry speed			X	X	X	X
Emission reduction from operating procedures (%)	15-45	NA <sup>d</sup>	15-35	20-40	20-30	20-30
Total emission reduction (%)	28-83 <sup>e</sup>	55-69 <sup>f</sup>	30-60	45-75	20-30	50-70

**COLD CLEANERS PTE SUMMARY (ton/yr)**

- VOC = 0.475

# Small Business, Inc.

## CLEANUP

This emission unit consists of the cleanup activities that occur throughout the facility using "MaxClean" cleanup solvent. The MSDS for the solvent shows that it contains 90 percent Toluene, which is a VOC and a HAP. This activity is exempt from permitting under R336.1290(a)(i) or Rule 290(a)(i) of the Michigan Air Pollution Control Rules, and the company has conducted all the necessary recordkeeping as required under the rule.

### PTE of VOC

Rule 290(a)(i) limits the emission of non-carcinogenic VOCs to 1,000 lbs VOC per month. Since this activity is exempt under Rule 290(a)(i), we are allowed to assume that the **PTE VOCs is 1,000 lbs/month or 6 tons/yr.**



If the pollutant is a carcinogen then additional calculations and restrictions would apply according to Rule 290.

### PTE Toluene

Since Toluene is also considered a HAP the **PTE of Toluene is also 6 tons/yr.**

### CLEANUP PTE SUMMARY (ton/yr)

- VOC = 6.0
- Toluene = 6.0

# Small Business, Inc.

## GRINDER

The metal grinder is connected to a baghouse that operates at 29,000 cubic feet/min. The grinder is exempt from having to obtain a Permit to Install under R 336.1285(l)(vi) of the Michigan Air Pollution Control Rules. The only regulated pollutants emitted from this process are PM2.5, PM10 and PM.

WebFire has an emission factor for grinding for PM 17 lbs/ton of grey iron and PM10/PM2.5 or 1.7 lbs/ton of grey iron. Since no permit is associated with the grinder, the control efficiency of the baghouse cannot be taken into account when calculating PTE. The grinder is capable of processing 500 tons per year of grey iron. This is a very conservative number.

### PTE of PM

- 17 lbs/ton x 500 tons/year = 8500 lbs/year
- 8500 lbs/yr x 1/2000 lbs = **4.25 tons of PM/yr**

### PTE of PM10/PM2.5

- 1.7 lbs/ton x 500 tons/year = 850 lbs/year
- 850 lbs/yr x 1/2000 lbs = **0.425 tons of PM/yr**

### **GRINDER PTE SUMMARY (ton/yr)**

- PM10/PM2.5 = 0.425
- PM = 4.25

# Small Business, Inc.

## WELDING

This is a shielded metal arc welding booth. The welding operation is exempt from having to obtain a Permit to Install under R 336.1285(i) of the Michigan Air Pollution Control Rules. Emission factors will be used to calculate emissions from this operation (see below). To use the emission factor you must know the pounds of electrode consumed. There is no rated capacity available for this welding machine; however, facility data shows that the most electrode material the company has ever used over a 24 hour period is 15 pounds. The potential pounds of electrode used for the year will have to be calculated based upon 15 lbs/day. The following electrode type is used: E308.

1. Calculate the hourly electrode usage rate.

$$(15 \text{ lbs of E308/day}) \times (365 \text{ days/1 yr}) = \mathbf{5,475 \text{ lbs of E308/yr}}$$

2. Identify the emission factors that will be used to calculate emission of regulated pollutants (see AP-42, Chapter 12.19, Tables 12.19-1 and 12.19-2).

Pollutant	Emission Factor
PM	10.8 lb/10 <sup>3</sup> lb electrode used
Chromium (Cr)	3.93 lb 10 <sup>-1</sup> /10 <sup>3</sup> lb electrode used
Cr (VI)	3.59 lb 10 <sup>-1</sup> /10 <sup>3</sup> lb electrode used
Cobalt (Co)	0.01 lb 10 <sup>-1</sup> /10 <sup>3</sup> lb electrode used
Mn	2.52 lb 10 <sup>-1</sup> /10 <sup>3</sup> lb electrode used
Ni	0.43 lb 10 <sup>-1</sup> /10 <sup>3</sup> lb electrode used

3. Calculate emission of regulated pollutants using emission factors.

### **PTE of PM**

$$(5,475 \text{ lbs E308/yr}) \times (10.8 \text{ lbs PM}/1,000 \text{ lbs E308}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{0.03 \text{ ton of PM/yr}}$$

### **PTE of HAPs**

$$\mathbf{Cr:} (5,475 \text{ lbs E308/yr}) \times (0.393 \text{ lbs Cr}/1,000 \text{ lbs E308}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{0.001 \text{ ton of Cr/yr}}$$

$$\mathbf{Cr(VI):} (5,475 \text{ lbs E308/yr}) \times (0.359 \text{ lbs Cr(IV)}/1,000 \text{ lbs E308}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{0.001 \text{ ton of Cr(VI)/yr}}$$

$$\mathbf{Co:} (5,475 \text{ lbs E308/yr}) \times (0.001 \text{ lbs Co}/1,000 \text{ lbs E308}) = \mathbf{0.01 \text{ lbs of Co/yr}}$$

$$\mathbf{Mn:} (5,475 \text{ lbs E308/yr}) \times (0.252 \text{ lbs Mn}/1,000 \text{ lbs E308}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{0.001 \text{ ton of Mn/yr}}$$

$$\mathbf{Ni:} (5,475 \text{ lbs E308/yr}) \times (0.043 \text{ lbs Ni}/1,000 \text{ lbs E308}) = \mathbf{0.24 \text{ lbs of Ni/yr}}$$

### **WELDING PTE SUMMARY (ton/yr)**

- PM = 0.03
- Cr = 0.001
- Cr(VI) = 0.001
- Co = negligible
- Mn = 0.001
- Ni = negligible

# Small Business, Inc.

## BOILER

The boiler is natural gas fired only with a burner capacity of 10 million Btu/hr. The emission factors that will be used to calculate PTE are provided in the table below. These emission factors come from the EPA's AP-42 Manual, Chapter 1.4, Tables 1.4-1 and 1.4-2.

Pollutant	Emission Factor
NOx	100 lbs/1,000,000 cubic feet (ft <sup>3</sup> ) natural gas
CO	84 lbs/1,000,000 ft <sup>3</sup> natural gas
Lead (Pb)	0.0005 lbs/1,000,000 ft <sup>3</sup> natural gas
PM10=PM2.5	7.6 lbs/1,000,000 ft <sup>3</sup> natural gas
PM	1.9 lbs/1,000,000 ft <sup>3</sup> natural gas
SO <sub>2</sub>	0.6 lbs/1,000,000 ft <sup>3</sup> natural gas
VOC	5.5 lbs/1,000,000 ft <sup>3</sup> natural gas
GHG (CO <sub>2</sub> e)	Various (see below)

Note: 1 ft<sup>3</sup> of gas = 1,020 Btu

**1. Calculate the maximum cubic feet of natural gas used per hour:**

$$(10,000,000 \text{ Btu/hr}) \times (1 \text{ ft}^3 \text{ natural gas}/1,020 \text{ Btu}) = \mathbf{9,803.92 \text{ ft}^3 \text{ of natural gas/hr}}$$

**2. Calculate the PTE of regulated pollutants using emission factors.**

**NOx:**  $(9,803.92 \text{ ft}^3/\text{hr}) \times (100 \text{ lbs NOx}/1,000,000 \text{ ft}^3) = 0.98 \text{ lbs of NOx/hr}$   
 $(0.98 \text{ lbs NOx/hr}) \times (8,760 \text{ hrs/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{4.29 \text{ tons of NOx/yr}}$

**CO:**  $(9,803.92 \text{ ft}^3/\text{hr}) \times (84 \text{ lbs CO}/1,000,000 \text{ ft}^3) = 0.82 \text{ lbs of CO/hr}$   
 $(0.82 \text{ lbs CO/hr}) \times (8,760 \text{ hrs/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{3.59 \text{ tons of CO/yr}}$

**Pb:**  $(9,803.92 \text{ ft}^3/\text{hr}) \times (0.0005 \text{ lbs Pb}/1,000,000 \text{ ft}^3) = 0.000005 \text{ lbs of Pb/hr}$   
 $(0.000005 \text{ lbs Pb/hr}) \times (8,760 \text{ hrs/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{0.00002 \text{ tons of Pb/yr}}$

**PM10/PM2.5:**  $(9,803.92 \text{ ft}^3/\text{hr}) \times (7.6 \text{ lbs PM}/1,000,000 \text{ ft}^3) = 0.07 \text{ lbs of PM/hr}$   
 $(0.07 \text{ lbs PM/hr}) \times (8,760 \text{ hrs/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{0.31 \text{ tons of PM10/PM2.5/yr}}$

**PM:**  $(9,803.92 \text{ ft}^3/\text{hr}) \times (1.9 \text{ lbs PM}/1,000,000 \text{ ft}^3) = 0.02 \text{ lbs of PM/hr}$   
 $(0.02 \text{ lbs PM/hr}) \times (8,760 \text{ hrs/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{0.08 \text{ tons of PM/yr}}$

**SO<sub>2</sub>:**  $(9,803.92 \text{ ft}^3/\text{hr}) \times (0.6 \text{ lbs SO}_2/1,000,000 \text{ ft}^3) = 0.006 \text{ lbs of SO}_2/\text{hr}$   
 $(0.006 \text{ lbs SO}_2/\text{hr}) \times (8,760 \text{ hrs/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{0.03 \text{ tons of SO}_2/\text{yr}}$

**VOC:**  $(9,803.92 \text{ ft}^3/\text{hr}) \times (5.5 \text{ lbs VOC}/1,000,000 \text{ ft}^3) = 0.05 \text{ lbs of VOC/hr}$   
 $(0.05 \text{ lbs VOC/hr}) \times (8,760 \text{ hrs/yr}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{0.22 \text{ tons of VOC/yr}}$

**GHG (CO<sub>2</sub>e) pollutants using 40 CFR 98 Subparts A and C:**

Total Heat Input Capacity x Emission Factor x Conversion Factor(s) x Global Warming Potential

**Total Heat Input Capacity in MMBtu/yr:**  $\text{Total Btu/hr} \times (1 \times 10^{-6}) \times 8760 \text{ hrs/yr}$   
 $10,000,000 \text{ Btu/hr} \times (1 \times 10^{-6}) \times 8760 \text{ hrs/yr} = 87,600 \text{ MMBtu/yr}$

**CO<sub>2</sub>:**  $\frac{87,600 \text{ MMBtu}}{1 \text{ year}} \times \frac{53.06 \text{ kg}}{1 \text{ MMBtu}} \times \frac{2.2046 \text{ lbs}}{1 \text{ kg}} \times \frac{1 \text{ ton}}{2000 \text{ lbs}} \times 1 = 5,124 \text{ tons/yr}$

**CH<sub>4</sub>:**  $\frac{87,600 \text{ MMBtu}}{1 \text{ year}} \times \frac{0.001 \text{ kg}}{1 \text{ MMBtu}} \times \frac{2.2046 \text{ lbs}}{1 \text{ kg}} \times \frac{1 \text{ ton}}{2000 \text{ lbs}} \times 25 = 2.41 \text{ tons/yr}$

**N<sub>2</sub>O:**  $\frac{87,600 \text{ MMBtu}}{1 \text{ year}} \times \frac{0.0001 \text{ kg}}{1 \text{ MMBtu}} \times \frac{2.2046 \text{ lbs}}{1 \text{ kg}} \times \frac{1 \text{ ton}}{2000 \text{ lbs}} \times 298 = 2.88 \text{ tons/yr}$

**Total CO<sub>2</sub>e tons/yr = CO<sub>2</sub> + CH<sub>4</sub> + N<sub>2</sub>O**  
 $(5,124 \text{ tons CO}_2/\text{yr}) + (2.41 \text{ tons CH}_4/\text{yr}) + (2.88 \text{ tons N}_2\text{O}/\text{yr}) = \mathbf{5,129 \text{ tons CO}_2\text{e/yr}}$

**BOILER PTE SUMMARY (ton/yr)**

- NO<sub>x</sub> = 4.29
- CO = 3.59
- Lead (Pb) = negligible
- PM<sub>10</sub>/PM<sub>2.5</sub> = 0.31
- PM = 0.08
- SO<sub>2</sub> = 0.03
- VOC = 0.22
- CO<sub>2</sub>e = 5,129.29

# Small Business, Inc.

## GENERATOR

The generator is a 5 million Btu/hr diesel fired emergency unit. It is exempt from having to obtain a Permit to Install under R 336.1285(g) of the Michigan Air Pollution Control Rules. Emission factors from the EPA's AP-42 manual will be used to calculate the PTE. The emission factors require that you know the amount of diesel fuel the generator is capable of burning per hour. The maximum fuel usage for this generator is 100 gallons of fuel/hr.

The EPA has determined that if a generator's sole function is to provide backup power when electric power from the local utility is interrupted, then the worst-case operating hours should be 500 hours per year. The EPA's emergency generator PTE guidance is available at [www.michigan.gov/air](http://www.michigan.gov/air) (select the "Permits" tab then "Potential to Emit").

1. Identify the emission factors that will be used to calculate emission of regulated pollutants (these emission factors come from the Web FIRE emission factor database using the SCC 2-01-001-02).

Pollutant	Emission Factor
CO	130 lbs per 1000 gals diesel burned
NOx	604 lbs per 1000 gals diesel burned
SOx	39.7 lbs per 1000 gals diesel burned
PM10=PM2.5	42.5 lbs per 1000 gals diesel burned
PM*	42.5 lbs per 1000 gals diesel burned
VOC	116 lbs per 1000 gals diesel burned
GHG (CO <sub>e</sub> e)	Various (see below)

2. Calculate the potential amount of diesel fuel burned per year.

$$(100 \text{ gal fuel/hr}) \times (500 \text{ hrs/yr}) = \mathbf{50,000 \text{ gallons of fuel/yr}}$$

3. Calculate emission of regulated pollutants using emission factors.

**CO:**  $(50,000 \text{ gal fuel/yr}) \times (130 \text{ lbs CO}/1,000 \text{ gal fuel}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{3.25 \text{ tons of CO/yr}}$

**NOx:**  $(50,000 \text{ gal fuel/yr}) \times (604 \text{ lbs NOx}/1,000 \text{ gal fuel}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{15.1 \text{ tons of NOx/yr}}$

**SOx:**  $(50,000 \text{ gal fuel/yr}) \times (39.7 \text{ lbs SOx}/1,000 \text{ gal fuel}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{1 \text{ ton of SOx/yr}}$

**PM10=PM2.5:**  $(50,000 \text{ gal fuel/yr}) \times (42.5 \text{ lbs PM}/1,000 \text{ gal fuel}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{1.06 \text{ tons of PM10=PM2.5/yr}}$

**PM:**  $(50,000 \text{ gal fuel/yr}) \times (42.5 \text{ lbs PM}/1,000 \text{ gal fuel}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{1.06 \text{ tons of PM/yr}^*}$

**VOC:**  $(50,000 \text{ gal fuel/yr}) \times (116 \text{ lbs PM}/1,000 \text{ gal fuel}) \times (1 \text{ ton}/2,000 \text{ lbs}) = \mathbf{2.9 \text{ tons of VOC/yr}}$

**GHG (CO<sub>2</sub>e) pollutants using 40 CFR 98 Subparts A and C:**

Total Heat Input Capacity x Emission Factor x Conversion Factor(s) x Global Warming Potential

**Total Heat Input Capacity in MMBtu/yr:** Total Btu/hr x (1 x 10<sup>-6</sup>) x 8760 hrs/yr  
7,200,000Btu/hr x (1 x 10<sup>-6</sup>) x 8760 hrs/yr = 63,072 MMBtu/yr

**CO<sub>2</sub>:**  $\frac{63,072 \text{ MMBtu}}{1 \text{ year}} \times \frac{73.96 \text{ kg}}{1 \text{ MMBtu}} \times \frac{2.2046 \text{ lbs}}{1 \text{ kg}} \times \frac{1 \text{ ton}}{2000 \text{ lbs}} \times 1 = 5,142 \text{ tons/yr}$

**CH<sub>4</sub>:**  $\frac{63,072 \text{ MMBtu}}{1 \text{ year}} \times \frac{0.003 \text{ kg}}{1 \text{ MMBtu}} \times \frac{2.2046 \text{ lbs}}{1 \text{ kg}} \times \frac{1 \text{ ton}}{2000 \text{ lbs}} \times 25 = 5.21 \text{ tons/yr}$

**N<sub>2</sub>O:**  $\frac{63,072 \text{ MMBtu}}{1 \text{ year}} \times \frac{0.0006 \text{ kg}}{1 \text{ MMBtu}} \times \frac{2.2046 \text{ lbs}}{1 \text{ kg}} \times \frac{1 \text{ ton}}{2000 \text{ lbs}} \times 298 = 12.43 \text{ tons/yr}$

**Total CO<sub>2</sub>e tons/yr = CO<sub>2</sub> + CH<sub>4</sub> + N<sub>2</sub>O**

(5,142 tons CO<sub>2</sub>/yr) + (5.21 tons CH<sub>4</sub>/yr) + (12.43 tons N<sub>2</sub>O/yr) = **5,160 tons CO<sub>2</sub>e/yr**

**GENERATOR PTE SUMMARY (ton/yr)**

- CO = 3.25
- NO<sub>x</sub> = 15.1
- SO<sub>x</sub> = 1.0
- PM10=PM2.5 = 1.06
- PM = 1.06
- CO<sub>2</sub>e = 5,160

\* The emission factor for PM in this case is very conservative. The engine manufacture is likely to be able to provide a specific emission factor for your generator which should be used in the place of the emission factor above.

## STEP 7: Calculate the PTE for the Facility

Once you have calculated the PTE from each individual process, calculate the total PTE for each air contaminant emitted by your facility by summing up the PTE from all of the processes. Organize your PTE totals into spreadsheets like the ones shown below for **Small Business Inc.** Blank tally sheets are provided for Criteria Pollutants and HAPs in Appendix B.

Part 3 of this workbook uses the PTE that has been calculated in the previous steps to determine whether your facility is a “major” or “minor” source and also explains what that means.

### Small Business, Inc. - EMISSION TOTALS – CRITERIA POLLUTANTS

Emission Unit	CO (TON/YR)	NO <sub>x</sub> (TON/YR)	SO <sub>x</sub> (TON/YR)	PM (TON/YR)	PM10/PM2.5 (TON/YR)	VOC (TON/YR)	LEAD (TON/YR)	GHG CO <sub>2</sub> e (TON/YR)
COATING BOOTHS 1-3				7.0		5.6		
OVEN	0.92	1.10	0.004	0.02	0.09	0.04	negligible	1,282
MAINTENANCE BOOTH				2.02		134.9		
PRINTING						0.14		
287(C) BOOTH				3.31		8.2		
COLD CLEANERS						0.475		
CLEANUP						6.0		
GRINDER				57.16	5.72			
WELDING				0.03				
BOILER	3.59	4.29	0.03	0.08	0.31	0.22	negligible	5,129
GENERATOR	3.25	15.1	1.0	1.06	1.06	2.9		5,160
<b>TOTAL</b>	<b>7.76</b>	<b>20.49</b>	<b>1.03</b>	<b>70.68</b>	<b>7.18</b>	<b>158.5</b>	<b>0</b>	<b>11,571</b>

## Small Business, Inc. - EMISSION TOTALS - HAPs

Emission Unit	HAZARDOUS AIR POLLUTANT (TON/YR)						
	Xylene	Toluene	MEK	Chromium	Chromium (VI)	manganese	MIBK
COATING BOOTHS 1-3	5.6						
OVEN							
MAINTENANCE BOOTH	85.85	41.61	7.36				
PRINTING							
SPECIAL PROJECT BOOTH	5.68	2.27					0.25
COLD CLEANERS							
CLEANUP		6.0					
GRINDER							
WELDING				0.001	0.001	0.001	
BOILER							
GENERATOR							
<b>TOTAL</b>	97.13	49.88	7.36	0.001	0.001	0.001	0.25

**ALL HAPS TOTAL:** 154.62