



Michigan
Department of
Environmental
Quality

Air Quality Division

Volatile Organic Compound (VOC) Emissions at Food Manufacturing Facilities

What is a VOC? 1

Why Should Food
Manufacturing Facilities
be Concerned? 1

VOC Emission Audit 2

Air Permit Exemption
Summary 4

Calculating Potential to
Emit (PTE) VOC 7

PTE - VOC Summary 9

PTE - VOC Summary –
Example 10

The purpose of this fact sheet is to help food manufacturing facilities identify potential sources of VOC emissions at their facility, determine whether or not an air permit is required, and if the facility is a major source of VOCs. This fact sheet also provides guidance on ways to reduce your VOC emissions.

This fact sheet focuses on VOC emissions only. Food manufacturing facilities may emit other pollutants such as particulate matter, sulfur dioxide, carbon monoxide, and oxides of nitrogen from processes like boilers, generators, and anhydrous ammonia storage, which may require an air permit. If you have other sources of air emissions not covered by this fact sheet, you can contact the Environmental Assistance center at (800) 662.9278 or deq-ead-env-assist@michigan.gov for help.

What is a Volatile Organic Compound (VOC)?

Rule 122(f) of the Michigan Air Pollution Control Rules defines a VOC as any compound of carbon or mixture of compounds of carbon, excluding 29 compounds that the U.S. Environmental Protection Agency (U.S. EPA) identified to have negligible photochemical reactivity. Some of the 29 compounds are referred to as exempt organic solvents such as acetone and methyl chloroform. VOCs contribute to the formation of ground level ozone, an air contaminant that triggers a variety of health problems, including aggravated asthma, reduced lung capacity, and increased susceptibility to respiratory illnesses like pneumonia and bronchitis.

Why Should Food Manufacturing Facilities be Concerned about VOC Emissions?

Some processes at food manufacturing facilities use products that contain VOCs, such as flavorings, dyes, inks, adhesives, and other surface coatings. During production, the VOCs contained in these materials are released. R 336.1201 of the Michigan Air Pollution Control Rules requires that an air permit be obtained from the Michigan Department of Environmental Quality (DEQ) prior to the installation, construction, or modification of a source of air contamination. VOCs are considered air contaminants; therefore, a facility may be required to obtain an air permit for that process, unless the process is specifically exempted from the requirement to obtain an air permit under the Michigan Air Pollution Control Rules. It is important for facilities that use products containing VOCs to know if an air permit is needed for a particular process. Failure to obtain a permit when required is a violation of R 336.1201 (and may result in enforcement action by the DEQ).

The audit on the following pages has been designed to help a food manufacturing facility determine if they have processes that emit VOCs and if they require a permit.

FOOD MANUFACTURING FACILITY VOC EMISSIONS AUDIT

The VOC audit will help you determine what VOC emission sources may be at your facility and whether or not a permit is required. Answer all questions unless directed to do otherwise.

Food Production	
1. Does the facility have any processes that apply a flavor or food coloring to food material?	<input type="checkbox"/> Yes - Go to next question <input type="checkbox"/> No - skip to #7
2. Does the flavor or food coloring (coating) contain VOCs? <i>Review formulation data or contact supplier.</i>	<input type="checkbox"/> Yes - Go to next question <input type="checkbox"/> No - skip to #7
3. Is this process identified in an air permit?	<input type="checkbox"/> Yes - This process is already permitted. skip to #7 <input type="checkbox"/> No - Go to next question
4. Are less than 200 gallons of the coating applied per month at the process?	<input type="checkbox"/> Yes - May be exempt under Rule 287(c). See requirements on Page 5. Skip to #7. <input type="checkbox"/> No - Go to next question
5. Are less than 1,000 lbs of (uncontrolled) VOC emitted per month? See Table 1 on Page 5 to determine emissions.	<input type="checkbox"/> Yes - May be exempt under Rule 290. See requirements on Page 5. Go to next question. <input type="checkbox"/> No - Go to next question
6. Does the process involve applying a coating to a grain-based food product?	<input type="checkbox"/> Yes - May be exempt under Rule 285(dd). See requirements on Page 4. Go to next question <input type="checkbox"/> No - Permit Required. See Permit information on Page 6. Go to next question
7. Does the facility have any processes that involve bread baking?	<input type="checkbox"/> Yes - Go to next question <input type="checkbox"/> No - skip to #9
8. Is this process identified in an air permit?	<input type="checkbox"/> Yes - This process is already permitted. Go to next question <input type="checkbox"/> No - May be exempt under Rule 282(a)(v). See requirements on Page 4. Go to next question
9. Does the facility do any of the following, which may generate VOC emissions?	<input type="checkbox"/> Yes - Go to next question <input type="checkbox"/> No - skip to #11
<div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"><input type="checkbox"/> Cheese processing</div> <div style="width: 50%;"><input type="checkbox"/> Malt beverage production</div> <div style="width: 50%;"><input type="checkbox"/> Canning</div> <div style="width: 50%;"><input type="checkbox"/> Distilled spirits production</div> <div style="width: 50%;"><input type="checkbox"/> Pasta processing</div> <div style="width: 50%;"><input type="checkbox"/> Coffee roasting</div> <div style="width: 50%;"><input type="checkbox"/> Cane sugar processing</div> <div style="width: 50%;"><input type="checkbox"/> Snack chip frying</div> <div style="width: 50%;"><input type="checkbox"/> Sugar beet processing</div> <div style="width: 50%;"><input type="checkbox"/> Yeast production</div> <div style="width: 50%;"><input type="checkbox"/> Almond roasting</div> <div style="width: 50%;"><input type="checkbox"/> Meat/Fish smoking</div> <div style="width: 50%;"><input type="checkbox"/> Vegetable oil manufacturing</div> </div>	

<p>10. Is this process(es) identified above included in an air permit?</p>	<p><input type="checkbox"/> Yes - The process is already permitted. Go to next question.</p> <p><input type="checkbox"/> No - The process(es) identified in question 9 may need a permit and should be evaluated on a case-by-case basis. VOC emission calculation methods for these processes vary. It is recommended that you contact the Environmental Assistance Program or an air quality inspector for assistance at (800) 662-9278 or go to www.michigan.gov/deg and select "contact DEQ".</p> <p>Go to next question.</p>
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Other VOC Emission Sources

<p>11. Does the facility have any processes that apply an adhesive such as on packaging material?</p>	<p><input type="checkbox"/> Yes - Go to next question</p> <p><input type="checkbox"/> No - Skip to #16</p>
<p>12. Is the adhesive application process identified in an air permit?</p>	<p><input type="checkbox"/> Yes - This process is already permitted. Skip to #16</p> <p><input type="checkbox"/> No - Go to next question</p>
<p>13. Is the adhesive application rate less than 2 gallons per day AND are emissions released into the general in-plant environment?</p>	<p><input type="checkbox"/> Yes - May be exempt under Rule 287(a). See requirements on Page 5. Skip to #16.</p> <p><input type="checkbox"/> No - Go to next question</p>
<p>14. Are less than 200 gallons of the adhesive applied per month?</p>	<p><input type="checkbox"/> Yes - May be exempt under Rule 287(c). See requirements on Page 5. Skip to # 16.</p> <p><input type="checkbox"/> No - Go to next question</p>
<p>15. Are less than 1,000 lbs of (uncontrolled) VOC emitted per month? See Table 1 on Page 5 to determine emissions.</p>	<p><input type="checkbox"/> Yes - May be exempt under Rule 290. See requirements on Page 5. Go to next question</p> <p><input type="checkbox"/> No - Permit Required. See Permit information on Page 6. Go to next question</p>
<p>16. Does the facility have any printing operations?</p>	<p><input type="checkbox"/> Yes - Go to next question</p> <p><input type="checkbox"/> No - Skip to #20</p>
<p>17. Is this printing process identified in an air permit?</p>	<p><input type="checkbox"/> Yes - This process is already permitted. Skip to #20</p> <p><input type="checkbox"/> No - Go to next question</p>
<p>18. Are less than 200 gallons of ink applied per month at the process?</p>	<p><input type="checkbox"/> Yes - May be exempt under Rule 287(c). See requirements on Page 5. Skip to #20.</p> <p><input type="checkbox"/> No - Continue</p>
<p>19. Are less than 1,000 lbs of (uncontrolled) VOC emitted per month? See Table 1 on Page 5 to determine emissions.</p>	<p><input type="checkbox"/> Yes - May be exempt under Rule 290. See requirements on Page 5. Go to next question</p> <p><input type="checkbox"/> No - Permit Required. See Permit information on Page 6. Go to next question</p>
<p>20. Does the facility have a boiler?</p>	<p><input type="checkbox"/> Yes - Go to next question</p> <p><input type="checkbox"/> No - Skip to #22</p>

21. If natural gas fired, is maximum heat input capacity less than 50 million Btu/hr? If fuel oil fired, is the maximum heat input capacity less than 20 million Btu/hr?	<input type="checkbox"/> Yes – Boiler may be exempt under Rule 282(b). See requirements on Page 4. Go to next question <input type="checkbox"/> No - Permit Required . See Permit information on Page 6. Go to next question
Facility-Wide VOC Emissions	
22. Did you answer “yes” to question 2, 7, 9, 11, 16, or 20?	<input type="checkbox"/> Yes - Go to next question <input type="checkbox"/> No - Audit Complete
23. Is the total potential emission of VOC from all processes at the facility greater than 100 tons per year? Refer to the tables on Pages 7-8 to calculate the potential to emit from each VOC emitting process.	<input type="checkbox"/> Yes - This is a major source. See Page 6 for more information. <input type="checkbox"/> No – This is a minor source of VOC emissions. Audit Complete

AIR PERMIT EXEMPTION SUMMARY

The rules listed below are permit exemptions that may apply to processes at a food manufacturing facility. These exemptions are referenced in the audit on the previous pages. If a process or emission source meets the criteria in the rule then the process is exempted from the requirement to obtain a permit to install under R 336.1201 of the Michigan Air Pollution Control Rules. Please note that R 336.1278 (Rule 278) excludes sources of significant emissions from being exempt. This means that although the activity/process may meet the criteria for exemption as specified below, the activity/process may still be required to obtain an air permit if the emissions are deemed significant.

It is recommended that you verify with the DEQ, Air Quality Division (AQD) that the process meets the criteria of the exemption and is not excluded from exemption under Rule 278. A map of MDEQ district offices can be accessed at www.michigan.gov/deg (select “Contact DEQ”).

Exemption	Rule Criteria and Conditions
Rule 282(a)(v)	R 336.1282(a)(v) exempts bakery ovens and confection cookers where the products are edible and intended for human consumption.
Rule 282(b)	R 336.1282(b) exempts fuel-burning equipment, which is used for space heating, service water heating, electric power generation, oil and gas production or processing, or indirect heating and which burns only the following fuels: (i) Sweet natural gas, synthetic gas, liquefied petroleum gas, or a combination thereof and the equipment has a rated heat input capacity of not more than 50,000,000 Btu per hour. (ii) Number 1 fuel oil, number 2 fuel oil, distillate oil, the gaseous fuels specified in paragraph (i) of this subdivision, or a combination thereof which contains not more than 0.40% sulfur by weight and the equipment has a rated heat input capacity of not more than 20,000,000 Btu per hour.
Rule 285(dd)	R 336.1285(dd) exempts certain equipment used for handling, conveying, cleaning, milling, mixing, cooking, drying, coating and packaging grain based food products and ingredients. The process may be exempt under this rule if <u>any</u> of the following conditions are met: Equipment is used on a nonproduction basis. Equipment has emissions that are released only into the general in-plant environment. Equipment has externally vented emissions controlled by an appropriately designed and operated particulate control system.

Rule 287(a)	R 336.1287(a) exempts certain adhesive coating lines from the requirement to obtain an air permit. If the adhesive coating line has an application rate of less than 2 gallons per day and the emissions are released into the general in-plant environment (i.e. there is not a specific stack or vent that services the adhesive line) the process may be exempt. You will need to provide documentation that the adhesive usage rate is less than 2 gallons/day if requested by the AQD.
Rule 287(c)	R 336.1287(c) exempts certain coating lines from the requirement to obtain an air permit. The coating line may be exempt if the following conditions are met: The coating use rate is not more than 200 gallons, as applied, minus water, per month. Any exhaust system that serves only coating spray equipment is supplied with a properly installed and operating particulate control system. Monthly coating use records are maintained on file for the most recent 2-year period and are made available to the AQD upon request.
Rule 290(a)(i)	R 336.1290(a)(i) exempts certain processes with limited emissions from the requirement to obtain an air permit. The process may be exempt under this rule if the following conditions are met: The process only emits non carcinogenic VOCs. The uncontrolled emissions of VOCs is less than 1,000 lbs per month. Records of material use and calculations identifying the quality, nature, and quantity of the air contaminant emissions are maintained in sufficient detail to demonstrate that the emissions meet the emission limits outlined in this rule. Use Table 1 to verify that the emissions from the application of a coating (dye, flavorant, ink, adhesive) are less than 1,000 lbs/per month. Assume the maximum VOC coating content and usage rate. If VOC emissions are greater than 1,000 lbs, the unit is not exempt.

Table 1: Rule 290 Emission Calculation For Coating Application	
Complete the fields below to determine the actual VOC emissions from process.	
A. VOC content of coating (paint, ink, flavor, dye) (lbs/gal) ¹	lbs VOC/gallon coating
B. Coating usage (gallons/month)	gallons used/month
C. VOC emissions from process (lbs/month): (A) x (B) =	lbs VOC/month
<p>¹ Review formulation data to determine the lbs of VOC per gallon of coating. This is usually listed on the MSDS or some other technical specification or formulation data sheet. If VOC content is not listed as lbs/gallon, review the ingredients and determine the percent VOCs and the density of the product, then use the equation below to obtain the VOC content of the coating. If more than one coating is used at the line, use the coating with the highest VOC content in the calculation.</p> <p>$\% \text{ VOC of coating } (\% \text{VOC}) \times \text{Density of coating (lbs/gal)} = \text{VOC content of coating (lbs VOC/gal)}$</p>	

REDUCING YOUR VOC EMISSIONS

Reducing or eliminating your VOC emissions improves our air quality and can also save you money. VOC reduction can be as simple as switching to coatings, flavorants, dyes, and adhesives that contain little or no VOCs. Check with your supplier to see what they have to offer. You can also work with industry trade associations to find manufacturing techniques that reduce the amount of VOCs produced during production.

- ✓ Funding is available for businesses interested in financing pollution prevention activities through the Small Business Pollution Prevention Loan Program. Go to www.michigan.gov/deqp2loan for more information or call (800) 662-9278.
- ✓ The Retired Engineer Technical Assistance Program (ReTAP) provides free and confidential pollution prevention audits, which can help you save money and reduce your emissions. Go to www.michigan.gov/deqretap for more information.

What if a Permit is Required?

If the process that emits a VOC is not exempt from permitting, you will need to obtain an air permit from the MDEQ, AQD. If the process is already in operation you should initiate the permit process as soon as possible. It is recommended that you contact your Air Quality Division inspector to discuss the situation and verify that a permit is required and how best to resolve the issue. A map of MDEQ district offices can be accessed at www.michigan.gov/deq (select “contact DEQ”).

The air permit application can be accessed at www.deq.state.mi.us/aps/appinfoev.shtml . If you have questions after reviewing the application and instruction forms, you can contact the Environmental Assistance Program at (800) 662-9278.

Major Sources of Emissions

If the facility-wide potential to emit VOCs is 100 tons per year or more, it is considered a major source of air pollution (see question 23 of the audit). A major source of air contaminants can choose from any of the following compliance options:

- Switch to products that contain less or no VOCs to reduce the potential to emit to below the major source threshold (100 tons/yr) and become a “minor source.”
- Apply for a synthetic minor Permit to Install that includes a limitation on operating parameters and/or emissions to below the major source threshold (e.g., limit the amount of VOC containing product that can be used or the amount of VOCs that can be emitted).
- Apply for a Permit to Install that includes new or existing control equipment that will reduce your potential to emit VOCs to below the major source threshold (100 ton/year). A permit is required to make the reductions achieved through the use of the control equipment legally binding.
- Apply for a Renewable Operating Permit (ROP). Major sources that cannot reduce their potential to emit VOCs to below 100 tons/yr need to apply for an ROP within 12 months of becoming a major source.

If you determine that the facility is a major source, it is recommended that you immediately contact the facility's AQD inspector or the Environmental Assistance Program for guidance on how best to proceed.

CALCULATING POTENTIAL TO EMIT VOC

Calculate the potential VOC emissions from each VOC emission source identified in the audit on Pages 2-4. Use the guide below to determine which calculation table you should use to estimate emissions for each process. Once you have calculated the emissions from each process, add the VOC emissions together to obtain your facility-wide potential to emit VOCs and answer question 23 of the audit on Page 4. You can use the worksheet on Page 9 to enter all the emission data. Keep this information in your records.

- Boiler exempt under Rule 282(b) Table 2
- Coating line exempt under Rule 287(c) Table 3
- Adhesive line exempt under Rule 287(a) Table 4
- Process exempt under Rule 290 Table 5
- Process exempt under other rule (282(a), 285(dd), etc.) Table 6
- Process with permit that contains a VOC limit Table 7
- Process with permit that does not contain VOC limit Table 8

Table 2: Rule 282(b) Exempt Boiler (Natural Gas Fired)

Complete the fields below to determine the potential to emit VOCs from a Rule 282(b) exempt boiler. If the boiler is fuel oil fired you will have to use a different calculation. Contact the Environmental Assistance Program at (800) 662-9278 or deg_ead-env-assist@michigan.gov for help.

A. Heat Input Capacity (<i>must be below 100 million to use this form</i>): <div style="text-align: right;">Btu/hr</div>	B. Natural Gas Usage Rate (ft ³ /hr): (A) x (1 ft ³ /1,020 Btu) = ft³/hr
C. Potential to Emit VOC: (B) x (5.5 lbs VOC/1,000,000 ft ³) x (8,760 hrs/yr) x (1 ton/2,000 lbs) = tons VOC/yr	

Table 3: Rule 287(c) Exempt Coating Line

Complete the fields below to determine the potential to emit VOCs from a Rule 287(c) exempt coating line.

A. VOC content of coating (paint, ink, flavor, dye) (lbs/gal) ¹ :	lbs VOC/gallon coating
B. PTE VOC from coating line: (A) x (200 gal/month) x (12 month/year) x (0.0005) = tons VOC/year	
¹ Review formulation data to determine the lbs of VOC per gallon of coating. This is usually listed on the MSDS or some other technical specification or formulation data sheet. If VOC content is not listed as lbs/gallon, review the ingredients and determine the percent VOCs and the density of the product, then use the equation below to obtain the VOC content of the coating. If more than one coating is used at the line use the coating with the highest VOC content. $\% \text{ VOC of coating } (\% \text{VOC}) \times \text{Density of coating (lbs/gal)} = \text{VOC content of coating (lbs VOC/gal)}$	

Table 4: Rule 287(a) Exempt Adhesive Line	
Complete the fields below to determine the potential to emit VOCs from a Rule 287(a) exempt adhesive line.	
A. VOC content of adhesive (lbs/gal) ¹ :	lbs VOC/gallon coating
B. PTE VOC from coating line (A) x (2 gal/day) x (365 days/year) x (0.0005) =	tons VOC/year
¹ Review formulation data to determine the lbs of VOC per gallon of adhesive. This is usually listed on the MSDS or some other technical specification or formulation data sheet. If VOC content is not listed as lbs/gallon, review the ingredients and determine the percent VOCs and the density of the product, then use the equation below to obtain the VOC content of the coating. If more than one adhesive is used at the line use the coating with the highest VOC content. $\% \text{ VOC of adhesive (\%VOC)} \times \text{Density of coating (lbs/gal)} = \text{VOC content of coating (lbs VOC/gal)}$	

Table 5: Rule 290 Exempt Line
$(1,000 \text{ lbs VOC/month}) \times (12 \text{ months/year}) \times (0.0005) = 6 \text{ tons VOC/year}$

Table 6: Emission Source Exempt under other Rule (e.g., Rule 285(dd), Rule 282(a), etc)
Contact the contact the Environmental Assistance Program at (800) 662-9278 or your MDEQ, AQD district office for assistance.

Table 7: Emission Source that is permitted AND has a limit on VOC emissions
If the emission source is included in an air permit and the permit contains a condition that limits the emission of VOCs, the VOC limit should be used to calculate potential to emit. You can contact the contact the Environmental Assistance Program at (800) 662-9278 or your MDEQ, AQD district office for assistance.

Table 8: Emission Source that is permitted AND does NOT have a limit on VOC emissions
Must calculate potential to emit VOC based on other permit restrictions such as operating hours, material limits, etc. You can contact the contact the Environmental Assistance Program at (800) 662-9278 or your MDEQ, AQD district office for assistance.

POTENTIAL TO EMIT (PTE) VOC SUMMARY

Emission Source	Exemption Rule Number or Permit Number	VOC Potential to Emit (tons/year)
FACILITY PTE VOC EMISSION TOTAL *		

*If total VOC emissions are greater than 100 tons/yr this is a major source of VOC emissions. Refer to Page 6 for details on options for major sources.

POTENTIAL TO EMIT (PTE) VOC SUMMARY

Emission Source	Exemption Rule Number or Permit Number	VOC Potential to Emit (tons/year)
Spray Applicators	Rule 287(c)	3.60
Adhesive Application	Rule 287(a)	1.46
Boiler	Rule 282(b)	0.12
Label Printing Operation	Rule 287(c)	5.64
FACILITY PTE VOC EMISSION TOTAL *		10.82

EXAMPLE

*If total VOC emissions are greater than 100 tons/yr this is a major source of VOC emissions. Refer to Page 6 for details on options for major sources.

The Michigan Department of Environmental Quality (MDEQ) will not discriminate against any individual or group on the basis of race, sex, religion, age, national origin, color, marital status, disability, or political beliefs. Questions or concerns should be directed to the MDEQ Office of Human Resources, PO Box 30473, Lansing, MI 48909.