

Raw materials that a business might use to create a product may also, in the process, create air pollution. Air pollution from a business may be regulated under one of the air pollution control requirements carried out and enforced by the Department of Natural Resources' (DNR) Bureau of Air Management (or Air Program). The Material Safety Data Sheet (MSDS), provided by each supplier or manufacturer, is a tool used to determine if raw materials may create air pollution. There is no consistent format for the MSDS, so this fact sheet will show you how to determine if materials used at your facility will create air pollution and, if so, in what quantities.

What Is in a MSDS?

The only thing consistent about the format of the MSDS is the sections of information. Every MSDS must cover:

- ❖ what the material is
- ❖ who makes/sells it
- ❖ where the manufacturer and/or supplier are located
- ❖ why the material is hazardous
- ❖ how people might be exposed to the hazard
- ❖ what conditions could increase the hazard
- ❖ how to handle the material safely
- ❖ what protection to use when handling
- ❖ what to do when exposed
- ❖ how to respond to a spill or emergency

What Do I Need to Know?

MSDSs were not created as guides for air pollution emissions calculations. If information from the MSDS is used for emissions calculations, multiple steps could be necessary to determine required data. A more appropriate document for this purpose is the *Certified Product Data Sheet* that should be available from the material's supplier or manufacturer. If a Certified Product Data Sheet is not available, data from the MSDS must be used instead.

For air pollution control requirements, only information about *what the material is and why it's hazardous* is needed from the MSDS. This information is found in the **Hazardous Ingredients/Identity** section and the **Physical/Chemical Characteristics** section of the MSDS.

Hazardous Ingredients/Identity

This section of the MSDS includes a list of the material's hazardous components, their Chemical Abstract System (CAS) numbers and the amounts contained within the material by percent. Many MSDS provide a range within which each component may be found (*i.e., n-Butyl Alcohol, 10-25% wt.*) depending on the batch. If your MSDS provides ranges for each component, you should contact the supplier to obtain the precise values. It is important to know the exact amount of each hazardous component in each material used at your facility. This data will be used to determine if you meet air pollution requirements.

You must calculate specific hazardous air pollutant emission rates for:

- ❖ any air pollution permit applications
- ❖ the state hazardous air pollutant rule
- ❖ reporting on your annual air emissions inventory

If the material supplier or manufacturer will not provide precise values for each component for your emissions calculations, the highest value in the range should be used.

Physical/Chemical Characteristics

This section of the MSDS contains information about the material. Some data can be useful for air pollution control requirements. The key pieces of information are:

- density of the material (in pounds per gallon)
- specific gravity



- VOC content (in weight percent or pounds per gallon, if provided)
- solids content (in weight percent)

These data provide enough information to calculate volatile organic compound (VOC) or particulate matter (PM) emissions or, when combined with the hazardous component content values, the emissions of the hazardous components.

Example Calculations

The values calculated here will provide examples of VOC emissions, PM emissions, and emissions of a single hazardous air pollutant.

VOC Emissions

The data needed for VOC emissions calculations are:

- density or specific gravity
- VOC content or solids content (in weight percent or pounds per gallon)

To calculate emissions, you will also need the amount of the material used over a certain period of time.

❶ The MSDS or supplier information may provide the density of the coating. If not, you must do one calculation first. Using the specific gravity, which is a comparison of the material's density to the density of water, multiply the specific gravity by the density of water to get the value you need:

Specific Gravity (sg) = 0.84

Density = **specific gravity x density of water**
 = 0.84 x 8.34 lbs/gal = 7.00 pounds per gallon

❷ Next, figure the VOC content. If it is provided in units of pounds per gallon on the MSDS, then you can calculate emissions directly. If not, you may need to do one or two other calculations first. If the VOC content is provided in volume percent (% by vol), but not in weight percent, you need to use the solids content (in % by weight or wt) in the first calculation:

Solids content = 60% by wt.

VOC content = **1 - (solids content % by weight/100)**
 = 1 - (60/100) = 0.40 x 100 = 40% by wt

You want to end up with VOC content in pounds per gallon to calculate emissions. So, multiply the VOC content in weight percent by the density of the material (determined in step ❶ above):

VOC content = **(VOC percent by weight/100) x density**
 = (40 /100) x 7.00 lb/gal = 2.80 pounds per gallon

If you have more than one material, you need to repeat these first two calculations for each one depending on what data is provided in the MSDS.

❸ To calculate the emissions, multiply the VOC content by the number of gallons used. If you used 50 gallons in a month of just the one material, the emissions would be:

VOC emissions = **material used X VOC content**
 = 50 gal/mo x 2.8 lb VOC/gal
 = 140 pounds VOC per month

If you have used multiple materials, you need to figure the amount of VOC emissions for each one and then add them together. Here is what a multiple material calculation looks like:

#1 = 50 gal/mo x 2.8 lb VOC/gal = 140 lb/mo
 #2 = 75 gal/mo x 3.6 lb VOC/gal = 270 lb/mo
 #3 = 15 gal/mo x 5.4 lb VOC/gal = 81 lb/mo
 TOTAL VOC emissions = 140 + 270 + 81 = 491 lb VOC/mo

PM Emissions

Calculation of PM emissions is similar to VOCs. You need:

- density or specific gravity
- solids content (in weight percent or pounds per gallon)
- amount of material used

It is not likely that you will be provided the solids content in pounds per gallon, but that is the value you need to complete the emissions calculation.

❶ The density calculation is the same as shown in step ❶ for VOC emissions.

❷ Next, figure the solids content. You want to end up with solids content in pounds per gallon to calculate emissions. So you multiply the solids content in weight percent by the density of the material. We'll use 60% by weight again:

Solids Content = **(solids percent by weight /100) x density**
 = (60/100) x 7.00 lb/gal = 4.20 pounds per gallon

❸ Calculating the PM emissions is then the same process as VOCs. Multiply the solids content by the amount of material used:

PM Emissions = **material used x PM content**
 = 50 gal/mo x 4.2 lb PM/gal
 = 210 pounds PM per month

This data is needed for calculations for paints or coatings where there is a known percentage of the solids that are left on the part being painted. The fraction of solids left on the part compared to the total solids in the paint is called the transfer efficiency of the application method used.

The application method of electrostatic spray is known to have a transfer efficiency of 60%; then the true emission rate would be just the fraction of solids that does not stay on the part being painted:

$$\begin{aligned} \text{PM Emissions} &= \text{total solids emitted} \times (1 - \{\text{transfer efficiency}/100\}) \\ &= 210 \text{ lb PM/mo} \times (1 - [60/100]) \\ &= 84 \text{ lb PM/mo} \end{aligned}$$

Hazardous Air Pollutant Emissions

The hazardous air pollutant (HAP) emission calculation is very similar to the others. Before you start the HAP calculations, be sure to identify only those that are regulated by DNR or the US Environmental Protection Agency (EPA) as HAPs. Perform calculations only for those components that are regulated. **On line** you can find a list of the regulated HAPs, organized by CAS # so that you can match them with the compounds listed on your MSDS. The CAS # is the best match because many compounds have multiple common names that can make it confusing.

http://dnr.wi.gov/air/doc/finalTAG_NR445list_102001.xls

- ① Again, the density calculation is the same as used for VOC emissions above.
- ② Using the example of the range of 10-25% by wt. of n-Butyl Alcohol, without a precise value from the manufacturer or supplier you have to use the high end of the range.

$$\begin{aligned} \text{HAP Content} &= (\text{HAP percent by weight} / 100) \times \text{density} \\ &= (25/100) \times 7.00 \text{ lb/gal} = 1.75 \text{ lb HAP/gal} \end{aligned}$$

- ③ Calculating the emissions is the same process as the others above:

$$\begin{aligned} \text{HAP Emissions} &= \text{material used} \times \text{HAP content} \\ &= 50 \text{ gal/mo} \times 1.75 \text{ lb HAP/gal} \\ &= 87.5 \text{ lb HAP/mo} \end{aligned}$$

The Small Business Clean Air Assistance Program has designed a spreadsheet in MS Excel that can help you complete some of these calculations. You just need to collect the data from your MSDS and enter it into the spreadsheet. Go to <http://commerce.wi.gov/BD/docs/BD-CA-EmissionsCalcsWorksheet.xls> for this spreadsheet.



Contacts for More Information or Assistance

The Small Business Clean Air Assistance Program helps smaller businesses understand and comply with the Clean Air Act regulations. Contact the program's Clean Air Specialists for more assistance: Renée Lesjak Bashel at 608-264-6153 or Tom Coogan at 608-267-9214.



For further information on the MSDS, locate the appropriate contact at DNR by location or name at <http://dnr.wi.gov/air/pdf/AMStaffDir.pdf> or by topic <http://dnr.wi.gov/air/pdf/AMsubjects.pdf>. You will need Adobe Reader to view these documents.