# Material Balance Quick Guide

Information updated June 29, 2026

## Overview

The "Material Balance" method for estimating emissions uses the volatility of products to determine the emissions released after the product is used (example products would be paints, stains, glues, etc.). This method does not use emission factors (EFs) to determine emissions, but it does account for the amount of material used, wasted, or retained in the product. The material balance method is primarily used for volatile pollutants and particulate emissions associated with painting and coating operations. Facilities must record Material Balance emissions on Tabs 5 and 6 of the Air Toxics Emissions Inventory (ATEI) reporting form.

### Information to gather

Facilities need the following information to estimate emissions using Material Balance:

- Basic information about the type of activity (e.g. spray application or dip tank) and annual usage (volume or mass).
- Information from Safety Data Sheets (SDS) and/or Environmental Data Sheets (EDS), including product density, pollutant names and Chemical Abstract System (CAS) numbers, and the percent weight for each pollutant in the product.
- Material waste, including how much ends up as waste and is shipped off-site or drains as liquid to a collection/treatment system (by material, if available).
- Any control devices such as filter systems or thermal oxidizers, and their removal or destruction efficiencies (by pollutant, if available).
- Transfer efficiencies for spray or coating operations (if available).
- Retention efficiencies for the percentage of material components that react and are retained in the product (if available).

### Locate SDS/EDS pollutant information

Facilities can find information needed to calculate air emissions in the following sections of an SDS/EDS, or similar technical data sheet.

**Hazardous Ingredients/Composition Section:** This section contains a list of the material's hazardous ingredients, their CAS numbers and pollutant name, and their percent by weight or by volume. Sometimes a data sheet will list a range (e.g. Acetone 1-5% wt.) instead of an exact percentage. In such instances, use the mean value of the range (e.g., Acetone 3%).

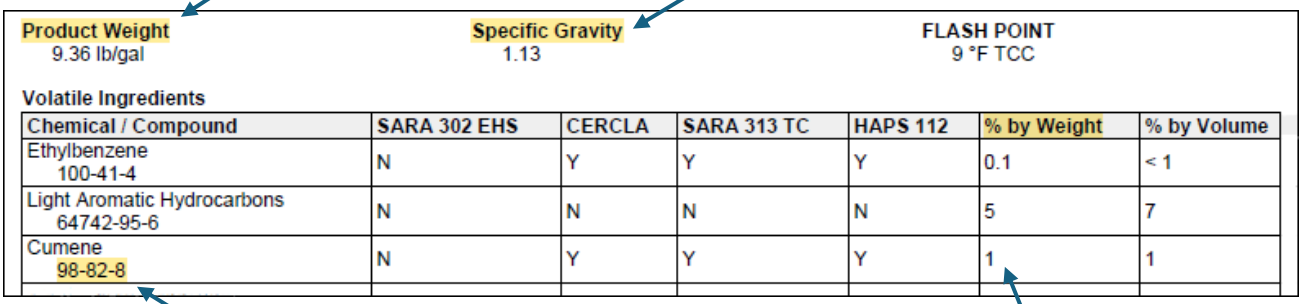
**Physical/Chemical Properties Section:** This section of the SDS typically contains information such as product density (also called "material density", the product weight per unit volume) and specific gravity (unitless), which are necessary to convert from product volume to weight if density is not provided.



LRAPA Lane Regional Air Protection Agency
1010 Main St.
Springfield, OR 97477
541-736-1056

**Product Weight**, **Product Density, or Material Density**: This is how much one unit of the material weighs.

**Specific Gravity or Relative Density**: This dimensionless number is the ratio of the product density to the density of water. It can be used if Product Density is not listed, by multiplying it by the density of water, 8.345 lb/gal.



Product Weight
9.36 lb/gal

Specific Gravity
1.13

FLASH POINT
9 °F TCC

Volatile Ingredients

| Chemical / Compound | SARA 302 EHS | CERCLA | SARA 313 TC | HAPS 112 | % by Weight | % by Volume |
|---|---|---|---|---|---|---|
| Ethylbenzene 100-41-4 | N | Y | Y | Y | 0.1 | < 1 |
| Light Aromatic Hydrocarbons 64742-95-6 | N | N | N | N | 5 | 7 |
| Cumene 98-82-8 | N | Y | Y | Y | 1 | 1 |

**CAS Number and Pollutant Name**: This will need to be cross-referenced with the DEQ Pollutant List. Use names as they appear on the DEQ Pollutant List.

**Percent Composition (by weight)**: This is the percent weight of the given pollutant in the product.

## Entering information on the ATEI reporting form

### Tab 5. Material Balance Activities

| Emissions Unit/Product Information | | | | | | Material Usage [lb/yr] | Material Waste [lb/yr] |
|---|---|---|---|---|---|---|---|
| Emissions Unit ID | Point/ Fugitive | Emission Unit Description | Material Name | Manufacturer | Control Device Type (if | | |
| EU-Booth | Point | Widget Paint Booth - atomizer spray gu | Widget Paint-A | Widget Paint Co. | booth filter | 13,188 | 2000 |
| EU-Booth | Fugitive | Epoxy resin (EXAMPLE) | Widget Epoxy | Widget Epoxy Co. | none | 950 | 15 |
| EU_ID | PointT | Description | MaterialName | Manufacturer | ControlDevice | laterialUs | laterialWa |
| WAX-EU | Fugitive | Wax Department - cast release | Cast mold release | Wax-R-Us | none | 100 | |
| FW | Fugitive | Marking Paint | Red marking paint | Dura Wear | none | 52 | |
| BOOTH | Point | Spray Coating, HVLP (60% efficiency) | Yellow epoxy primer | Match Paints | Fabric filter (95%) | 138 | 26 |

1. List all Emission Unit (EU) IDs and EU Descriptions with material balance emissions. For example, high volume low pressure (HVLP) spraying or coating operations performed in a spray booth might be captured as, **Emissions Unit ID**: "BOOTH" and **Emission Unit Description**: "HVLP spray coating". If the activities are listed in the source permit, please use the EU IDs and descriptions as found in the permit. A single EU ID and description may be used for multiple materials, but the combination of EU ID and Material Name should be unique for each product (i.e. each row).

2. List all products (e.g. paints, coatings, thinners, solvents, etc.) that contain pollutants on the DEQ Toxic Air Contaminant (TAC) List. Include the **Material Name** and **Manufacturer** for each.



LRAPA
Lane Regional Air Protection Agency
**1010 Main St.**
**Springfield, OR 97477**
**541-736-1056**

3. Identify the **Control Device Type**, (e.g. fabric filter or RTO). If no control devices are present, enter "none."

4. Record annual **Material Usage** quantities *in pounds* for each EU and material. Below are variations of material information and how to calculate material usage:
    - Where product weight or density is provided on the data sheet (e.g., lb/gal), convert from product volume (e.g., gallons/yr) using the density listed on the data sheet.
    - Where product weight or density is not provided on SDS, convert from Specific Gravity by multiplying the product specific gravity by the density of water, or 8.345 lb/gal to get product density (lb/gal), then multiply by product volume usage (gal/yr).

5. Record **Material Waste** as the amount of product that should be excluded from emissions calculation, in quantities of pounds per year.

## Tab 6. Pollutant Emissions – MB

| Emissions Unit ID | Material Name | Pollutant Information | | Emissions Data | | | Calculated Annual Emissions |
|---|---|---|---|---|---|---|---|
| | | CAS or DEQ ID | Pollutant Name | Control Efficiency | Percent Composition | Reference/Notes | |
| EU-BOOTH | Widget Paint-A | 67-56-1 | Methanol | 0.00% | 35.00% | | 3915.8 |
| EU-BOOTH | Widget Paint-A | 18540-29-9 | Chromium VI, chromate and dichromate par | 99.72% | 5.00% | Includes Transfer Efficiency (72%) and Filte | 1.56632 |
| EU-BOOTH | Widget Epoxy | 100-41-4 | Ethyl benzene | 0.00% | 5.00% | | 46.75 |
| EU-BOOTH | Widget Epoxy | 108-88-3 | Toluene | 0.00% | 3.00% | | 28.05 |
| EU_ID | MaterialName | CAS | PollutantName | ntrolEffic | rcentCompo | Notes | Emissions |
| WAX-EU | Cast mold release | 811-97-2 | 1,1,1,2-Tetrafluoroethane | 0.00% | 45.00% | volatile (gas), no control | 45 |
| FW | Red marking paint | 67-56-1 | Methanol | 0.00% | 7.50% | | 3.9 |
| FW | Red marking paint | 67-64-1 | Acetone | 0.00% | 15.00% | | 7.8 |
| FW | Red marking paint | 108-65-6 | Propylene glycol monomethyl ether acetate | 0.00% | 2.00% | | 1.04 |
| FW | Red marking paint | 108-10-1 | Methyl isobutyl ketone (MIBK, hexone) | 0.00% | 2.00% | | 1.04 |
| BOOTH | Yellow epoxy primer | 227 | Epoxy resins | 98.00% | 22.50% | 60% transfer efficiency, 95% filter efficiency | 0.504 |
| BOOTH | Yellow epoxy primer | 111-76-2 | Ethylene glycol monobutyl ether | 0.00% | 7.50% | | 8.4 |
| BOOTH | Yellow epoxy primer | 7789-06-2 | Strontium Chromate | 98.00% | 7.50% | 60% transfer efficiency, 95% filter efficiency | 0.168 |
| BOOTH | Yellow epoxy primer | 78-93-3 | 2-Butanone (methyl ethyl ketone) | 0.00% | 3.00% | | 3.36 |
| BOOTH | Yellow epoxy primer | 67-64-1 | Acetone | 0.00% | 3.00% | | 3.36 |
| BOOTH | Yellow epoxy primer | 67-63-0 | Isopropyl alcohol | 0.00% | 3.00% | | 3.36 |

1. Locate pollutant information on the data sheet. Use one row for each air toxic pollutant contained in a specified material. Enter each pollutant **CAS or DEQ ID** and the **Pollutant Name(s)** will auto populate. If the name does not auto populate, double check the CAS vs the DEQ TAC list. If you can't find the pollutant on the TAC list, it likely doesn't need to be reported. There are a few instances where pollutant compounds contain a portion of pollutants we want to know about (e.g., strontium chromate, cadmium chromate, ammonium dichromate, etc.) and those should be manually entered. See the ATEI FAQ for more information about these exceptions. You can also enter compounds you are not sure about, and we will follow up if we have questions.

   Note that the **Emissions Unit ID** and **Material Name** should be completed on each row and they should match exactly how they appear on Tab 4. If they do not match, the **Calculated Annual Emissions** column will return an error.

2. If a control device was identified on Tab 4 under **Control Device Type**, provide the **Control Efficiency** for each pollutant contained in a specified material, and note that this value may differ for pollutants within a given material. For example, a fabric filter may be effective at removing particulates, but does not remove volatile compounds.



LRAPA Lane Regional Air Protection Agency
**1010 Main St.**
**Springfield, OR 97477**
**541-736-1056**

Likewise, a thermal oxidizer breaks down VOCs but does not remove particulates. In each case, the control efficiency would only be applied to some of the pollutants but not others, as appropriate.

The **Control Efficiency** column is also the place to apply a product transfer or retention efficiency as if it were a secondary control. Transfer and retention efficiencies should be considered in addition to the effect of actual control devices such as filters (for particulates) or an oxidizer (for volatiles), as mentioned above. Use the **Reference/Notes** column to document that the control efficiency value includes transfer or retention efficiency and the percentages used. If no control device is present, a transfer or retention efficiency may still be applied.

When two or more efficiencies are combined, use the following equation to input a single efficiency into the **Control Efficiency** column:

**Total Control Efficiency = 1-[(1-CE)*(1-TE)*(1-RE)]**

**Where:**

CE = Control Efficiency, which includes removal and destruction efficiency

TE = Transfer Efficiency is the percentage of material that is successfully applied to the product

RE = Retention Efficiency is the percentage of the volatile compound(s) that is retained in the product once reacted.

**Example 1 – Transfer Efficiency:** If a spray coating application booth uses an assembly with a 60% transfer efficiency, and the booth's fabric filter has 95% control efficiency. The total control efficiency should be calculated as:

**Total CE** = 1-[(1-0.95)*(1-0.6)] = 0.98, or 98%

**Example 2 – Retention Efficiency:** Toluene diisocyanate (TDI) is used to manufacture a specific product but reacts during the process and a portion of the chemical is retained in the product. A reference material indicates that 0.4 lb TDI are emitted for every 10 lbs used, or 96% is retained in the product. Emissions from this process are then routed through a thermal oxidizer unit with a control efficiency for TDI of 92%. The total control efficiency should be calculated as:

**Total CE** = 1-[(1-0.92)*(1-0.96)] = 0.997, or 99.7%

3. Provide the **Percent Composition** for the Air Toxic in the specified material, as supplied by the SDS and using the pointers below:

- Where a range is given, use the mean value, (low end + high end)/2 = mean
- Where "≤" is given, use the provided value
- Where "<" is given, use the mean of the given value and zero
- Double check percentage decimal points to confirm they appear as intended.

4. Provide any **References/ Notes** relevant to the pollutant emissions - e.g. technical references, details of control efficiencies, etc. Utilize the "Facility Note" tab on the reporting form if more space or explanation is required.

5. **Calculate Annual Emissions**. The form includes an embedded formula for calculating emissions based on the equation below. This formula may be overwritten as necessary; however, explanation should be provided if a different calculation method is employed (e.g. in the **References/Notes** column, or a longer statement in the "Facility Note" tab).

**Equation**

The following material balance equation is used to estimate emissions. Note that Control Efficiency, Transfer Efficiency and Retention Efficiency are discussed above in the Tab 5 Instructions section.

$$E_a = [(C_X - W_X) * K_a] * (1 - CE_a)$$

**Where:**

E = Annual air toxic emissions (Pounds/Year)
a = Subscript "a" represents a specific pollutant within the material
X = Subscript "X" represents a specific material
C = Material usage (Pounds/Year)
W = Material waste (Pounds/Year)
K = Percent weight of pollutant "a" in material "X" expressed as a decimal (from data sheets)
CE = Total Control Efficiency expressed as a decimal, including Transfer or Retention Efficiencies

**Other Considerations**

- Retain all product data sheets but do not send them with the reporting form submission. LRAPA may contact you if review of the data sheet information is required.
- Some chemicals or pollutants may appear on data sheets under a different name than the DEQ Pollutant List - search by the CAS number to locate the version DEQ uses.
- A yellow cell background signifies a pollutant that does not appear on the DEQ Pollutant List. This does not indicate an error; it simply helps identify new compounds.
- Some data sheets contain a section for SARA 313 reporting, for which the compounds may appear differently, and with different ranges, than in the Hazardous Ingredient section. For consistency, default to using the primary hazardous ingredient section.

**LRAPA Program contacts**
**Please send reports and questions to:**
ATEI@lrapa-or.gov

**DEQ Program contacts**
For questions about the 2026 Air Toxics Emissions Inventory reporting, contact Clara Funk at Clara.FUNK@deq.oregon.gov or David Broderick David.Broderick@deq.oregon.gov. For all other permitting questions, contact your regional DEQ permitting office.

## Non-discrimination statement

LRAPA does not discriminate on the basis of race, color, national origin, disability, age or sex in administration of its programs or activities. Visit LRAPA's Civil Rights and Environmental Justice webpage.