Air Management Program

*August 2022*

*Pub AM-498*

# EMISSIONS INVENTORY AIR REPORTING SYSTEM (ARS) CALCULATIONS FOR PORTABLE SOURCES

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# AIR EMISSIONS INVENTORY EMISSION FACTORS

## WHAT ARE EMISSION FACTORS?

Emission factors are numbers generated from stack test information which, when multiplied by an activity (fuel burning, stone crushing, etc.) and corrected by a control efficiency, result in a calculated emission for an air pollutant. Emission factors can be single numbers or complex formulas.

For most emission sources the following equation is used:

$$E = (Q*EF*(1-C/100))$$

**E** = Calculated emissions in tons per year.
**Q** = Actual annual throughput.
**EF** = Emission factor. The emission factors are either supplied by the U.S. Environmental Protection Agency (EPA) or derived from a stack test or engineering calculation. In some cases, the sulfur % and/or the ash content will multiply the emission factor.
**C** = Collector efficiency, in %. This is the combination of the capture efficiency and the control efficiency. To calculate C, multiply the capture efficiency by the control efficiency and divide by 100.

## HOW ARE EMISSION FACTORS DEVELOPED?

Emission factors are developed from source test data. The emission factor information can be determined based on testing done on a facility's piece of equipment or from other information. The Wisconsin Department of Natural Resources (DNR) set a priority scheme for using emission factor information based on the source of the information.

1. Emission factors developed by the facility through emission testing or some other scientific means.
2. Emission factors developed by the United States Environmental Protection Agency (EPA) based on testing data completed on similar operations in the United States.
3. Emission factors developed by material balances and through engineering judgment.

There are four main sources of emission factors:

- EPA document **AP-42, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources,** 5th Edition, January 1995 (with subsequent supplements). The electronic version of the emission factors in this document is contained in the CHIEF database.
- The Emission Inventory Improvement Program (EIIP) was established in 1993 to promote the development and use of standard procedures for collecting, calculating, storing, reporting, and sharing air emissions data. EIIP generated 10 volumes of information regarding various air emitting sources.

- Stack test data approved by DNR.
- Engineering calculations approved by DNR.

## HOW ARE EMISSION FACTORS USED?

The Air Reporting System (ARS) Internet reporting software uses emission factors to calculate air emissions. A Source Classification Code (SCC) is an eight-digit EPA number specifying a process such as a fuel burned or a plastic extrusion process.

The ARS links the Material Group and SCC fields located in the General Process Data Area with the Annual Use data located on the Throughput and EmisFactor tabs on the bottom of the page. This data, in turn, is linked to a category in the device area.

The data field controlling all of these fields is the SCC field. The EPA established SCCs, of which, only a portion have uncontrolled emission factors. The ARS only uses SCCs with uncontrolled emission factors. The emission factor associated with the SCC also determines the units for the throughput tab in the area below the General Process Data on the webpage. Consequently, if the emission factor has a unit of mass (ton), ARS will only allow for a mass for an annual use amount.

After all emission factors are linked to the proper process, the emissions are calculated at the process, device, and source levels.

## CAN EMISSION FACTORS BE ADJUSTED?

Yes. The EmisFactor tab in the ARS process area contains information regarding the emission factor and where it came from. If the type column lists a type 'G' then this emission factor is an EPA emission factor associated with the SCC. If the type column lists a type 'S' then this is a source specific emission factor developed by the facility or someone associated with the emission factor.

Changing a 'G' emission factor or changing and deleting an 'S' emission factor is allowed. To do this, click the Select box located to the left of the pollutant name. Once the pollutant is selected, edit the factor value, unit, throughput material, and origin. If modifying any of these fields, add a comment stating why the change was necessary. For ARS to accept the change, click the ‘Save All’ button below the emission factor table.

Emission factors may also be added if the emission factor meets the business rule regarding units. For an SCC code with a mass emission factor, only add an emission factor with a mass. Do not enter an emission factor with a volume (gallon) for a mass (ton), for example.

## WILL DNR ACCEPT OTHER EMISSION FACTORS FOR SCCS NOT HAVING EPA EMISSION FACTORS?

Yes. If a company has supporting information that justifies the use of an emission factor for an SCC, DNR will add this information to its database, and it will become

the emission factor for that pollutant under that SCC.

Additional questions regarding this topic may be emailed to DNRAMEmissionsInventory@wisconsin.gov

## HOT MIX ASPHALT CALCULATIONS BASED ON 2001 HOT MIX ASPHALT AGREEMENT

The DNR entered into an agreement with the hot mix asphalt industry in 2001 regarding the calculation of emissions for hot mix asphalt (HMA) plants. The agreement defines which hot mix asphalt processes should be included in the air emission inventory and the calculation of emissions for HMA mixers. The industry also has requirements to meet under this guidance regarding sulfur dioxide emissions from the asphalt mixer. The DNR configures all new and existing HMA plants according to the information contained in this agreement for air emission inventory purposes. This agreement has applied to the reporting of air emissions since the agreement became effective.

The HMA agreement identifies equipment common to all Wisconsin HMA plants. The agreement also recognizes optional equipment. Each piece of equipment is assigned an emission factor for a particular pollutant. The intent of the agreement is to have HMA emissions calculated uniformly across Wisconsin with each HMA reporting emissions based on a representative base of equipment. The identified base equipment is:

- Rotary dryer or parallel flow/counter flow drum mixer
- Asphalt cement storage heater
- Loader
- Conveyor
- Primary collector
- Haul road (unpaved or paved)
- Screen
- Diesel/natural gas generators (gensets)

A provision in the agreement assumes sulfur dioxide emissions from the asphalt mixer calculations are decreased by 50% based on the industry's stack testing information This 50% correction occurs after the sulfur dioxide emissions are calculated using this emission factor developed through negotiations:

$$EMF = 26.784 \text{ lbs } SO_2/\text{ton product} \times \% \text{ Sulfur (weighted \%)}$$

In order to calculate the percent sulfur (weighted %) in the equation, the hot mix asphalt company can use a Microsoft Excel spreadsheet which calculates a weighted % sulfur after the HMA owner supplies their fuel oil usage numbers. The paper version of this Excel spreadsheet was supplied as Appendix A in the Hot Mix Asphalt Plant Agreement.

Additional questions regarding this topic may be emailed to DNRAMEmissionsInventory@wisconsin.gov

## NONMETALLIC MINING CALCULATIONS BASED ON 1998 NONMETALLIC MINING AGREEMENT

Beginning in 1995, DNR worked with the Wisconsin Road Builders Association (now Wisconsin Transportation Builders Association), Aggregate Producers of Wisconsin (APW) and independent nonmetallic mining operators to determine an emission calculation scheme that could be applied consistently throughout the state of Wisconsin. Nonmetallic mining agreements were written in 1996, 1997, and 1998. The DNR and the industry agreed to meet and update the 1998 agreement when EPA updated emission factors in either AP42 Section 3.3 Gasoline and Diesel Industrial Engines or Section 11.19.2 Crushed Stone Processing. Although EPA updated Section 11.19.2 there have been no plans to meet between DNR and industry to discuss updating the 1998 agreement . The DNR uses the 1998 Nonmetallic Mining Agreement to calculate air emissions from existing and new crushing spreads. The DNR also uses this agreement for calculating emissions for equipment that is used in other source categories. For example, conveyors are not only used by crushing spreads but also hot mix asphalt plants.

The agreement defined a typical crushing spread, identified the pollutants emitted at each piece of equipment, and assigned fugitive dust control efficiencies of 50%, 75%, or greater than 90%. As part of the agreement, DNR and industry developed a training course in which all or portions of the training course needed to be completed annually in order for a crushing spread to obtain a greater than 50% control efficiency on pieces of equipment identified in the 1998 nonmetallic mining agreement. After the 1998 nonmetallic mining agreement was signed, DNR and industry worked further on determining what comprised haul road emissions. The training course and nonmetallic mining agreement information can be downloaded from this website.

### TYPICAL CRUSHING SPREAD

The DNR and the industry agreed there are many pieces of equipment that could comprise a rock crushing spread but that some of these pieces of equipment were common for all portable crushing spreads.

The typical crushing spread was defined by the amount of rock output by the crushing spread.

1. Crushing spread that produces under 50,000 tons of rock per year has the following minimum configuration
    - One primary crusher
    - Two conveyors
    - One loader
    - One unpaved haul road
    - One storage pile
2. Crushing operation that produces more than 50,000 tons of rock per year and

less than 300,000 tons of rock per year.
    - One primary crusher
    - One secondary crusher
    - One screen
    - One unpaved haul road
    - Four conveyors
    - Two storage piles
    - One loader
3. Each crushing spread that produces more than 300,000 tons of rock per year
    - One primary crusher
    - One secondary crusher
    - One tertiary crusher
    - Three screens
    - One loader
    - One unpaved road
    - Six conveyors

## AIR POLLUTANT EMISSIONS AND SCC CODES

The agreement limited the sulfur dioxide ($SO_2$), oxides of nitrogen ($NO_X$), carbon monoxide (CO), and reactive organic gases (ROG) emissions to a few pieces of equipment and defined the particulate matter (PM and PM10) emissions for the additional pieces of equipment. Each emission factor was established and attached to a Source Classification Code (SCC). The SCC is used by the DNR computer database to assign emission factors to a certain piece of equipment and then calculate the emissions for that piece of equipment.

The DNR changed its computer database in fall 2008. The new database followed a business rule that a throughput unit corresponded directly to the emission factor unit. The agreement had a number of SCC codes in which there were two units of measure, a mass and a distance. To accommodate the new business rule, SCCs were added so the throughput information could be reported in distance. The table below shows the new SCC scheme:

| Process Name | Mass SCC | Distance SCC |
|---|---|---|
| Hauling to crusher using loader - unpaved haul road | 30502011 | 30502111 |
| Hauling to crusher using loader - paved haul roads | 30502037 | 30502137 |
| Haul Truck Traffic on unpaved haul roads | 30502033 | 30502133 |
| Haul Truck Traffic on paved haul roads | 30502034 | 30502134 |
| Mine truck traffic on unpaved haul roads | 30502035 | 30502135 |

## FUGITIVE DUST CONTROL EFFICIENCY

The DNR and the industry agreed that each particulate matter emitting process from a crushing spread should receive a fugitive dust control efficiency based on dust controls and the personnel trained to control fugitive dust at the crushing spread. The 1998 agreement set three different tiers of control (50%, 75% and greater than 90%). The emission factors listed in the particulate matter and PM10 tables in the 1998 agreement

(pages 20-25) were adjusted upward so that when the control efficiency is applied the emission factors are correct. For example, the 50% particulate matter emission factor written in the table (page 20) is 0.00035 lb PM/ton of process throughput. The actual AP42 emission factor is 0.000175 lb PM/ton of process throughput. The emission factor is identical depending on the control efficiency assigned:

- 50% control efficiency-Emission = throughput (tons stone) * 0.00035 lb/ton stone *(1-0.50)
- 0% control efficiency -Emission = throughput (tons stone) * 0.000175 lb/ton stone *(1-0.00)

### Tier 1 control – 50%

Because Wisconsin has regular precipitation (rain, snow), industry and DNR agreed that a 50% control would be assigned to all dust generating equipment in a crushing spread. This is an automatic control efficiency, and the owner or operator of the crushing spread does not need to supply supporting information to achieve the 50% control efficiency. The facility is required to keep records for different pieces of equipment:

- Screening, primary crushing, secondary crushing, tertiary crushing, fines crushing, loading grizzly
    - Document yearly throughput.
- Conveyor transfer points
    - Document yearly throughput and minimize drop height
- Haul to crusher using loader, haul truck traffic on unpaved haul roads, mine truck traffic on unpaved haul roads, stockpiles fed by unloading trucks
    - Document yearly throughput and speed control

### Tier 2 control – 75%

The crushing spread is assigned a 75% control efficiency for each dust generating piece of equipment if it meets personnel training requirements. The crushing spread must have an "On-site Fugitive Dust Observer" on-site during the nonmetallic mining operation or the operation is not eligible for the 75% control. The on-site fugitive dust observer must participate in a training course developed by DNR in cooperation with Wisconsin Transportation Building Association and Aggregate Producers of Wisconsin or complete another DNR approved training program to recognize when fugitive dust control measures need to be taken and what measures are appropriate. Once the person completes the training the on-site fugitive dust observer needs to sign the table in Appendix F of the 1998 agreement, keep that record at the crushing plant, and supply this training record to a DNR inspector during the site visit for verification of this training requirement. The training course consists of a training document with an accompanying film clip entitled *Pardon My Dust*. The training is to be completed each year. The 1998 agreement allows one person to be the "trainer" for people working on different crushing spreads run by the same company. The facility is required to keep records for different pieces of equipment:

- Screening, primary crushing, secondary crushing, tertiary crushing, fines crushing, loading grizzly

        - Document yearly throughput, log daily dust suppression activities and/or meteorological conditions at the site and have on-site fugitive dust observer present during hours of crushing spread operation.
    - Conveyor transfer points
        - Document yearly throughput, log daily dust suppression activities and/or meteorological conditions at the site, properly maintain dust suppression equipment, and have on-site fugitive dust observer present during hours of crushing spread operation.
    - Haul to crusher using loader, haul truck traffic on unpaved haul roads, mine truck traffic on unpaved haul roads, stockpiles fed by unloading trucks
        - Document yearly throughput: record water truck use, street sweeper use, or use of alternative dust control measures and/or documentation of meteorological conditions; implement speed control at crushing site; and have on-site fugitive dust observer present during hours of crushing spread operation.

Additional questions regarding training may be emailed to DNRAMEmissionsInventory@wisconsin.gov.

### Tier 3 control - Greater than 90%

For emission inventory purposes, DNR interprets greater than 90% control as 91% control. The intent of this dust suppression credit was to reward companies that have minimal visible emissions and therefore minimal dust. The requirements for greater than 90% control is the same as the 75% control requirements with two additions:

- The company needs to have a visible emission reader on staff. A visible emission reader is a person designated by the facility who has been certified at least once in the last twelve months to identify varying levels of visible emissions, using EPA Method 9 criteria.
- The company must document visible emissions at or below 10% once per 8-hour shift at site.

## HAUL ROAD EMISSIONS

Haul road emissions were discussed in depth with the nonmetallic mining industry. Haul road emissions were characterized as any particulate emission from a haul road. Most of these emissions were entrained dust emissions from truck and loader traffic. The questions discussed by DNR and the industry were:

- Who is responsible for reporting haul road emissions?
- Are haul road emissions direct or indirect sources of particulate matter?

Based on further discussions with the industry and DNR, haul road emissions are categorized as:

- Indirect Source Haul Road Emissions

    - The entrance road should be accounted as an indirect source similar to other facilities that attract motor vehicles. These emission sources are currently not reportable under Chapter NR 438, Wis. Adm. Code.
- Direct Source Haul Road Emissions
    - Emissions from the pit haul road to the crusher; crushing operation; and loading, unloading or stockpiling of materials are direct sources of particulate matter. These sources are assigned directly to the crusher. These emission sources are reportable under Chapter NR 438, Wis. Adm. Code.

## STORAGE TANK AIR EMISSION CALCULATIONS

The ARS requires sources to calculate and then directly report evaporative emissions from above ground storage tanks under the Reported tab.

### EPA TANKS

The TANKS Emissions Estimation Software is now outdated. Because of this, the model is not reliably functional on computers using certain operating systems such as Windows Vista or Windows 7. The model remains on the EPA website to be used at facility discretion. The EPA now recommends use of the equations/algorithms specified in AP-42 Chapter 7 for estimating VOC emissions from storage tanks. The equations specified in AP-42 Chapter 7 of EPA's Compilation of Air Pollutant Emission Factors can be employed with many current spreadsheet/software programs.

Additional questions regarding this topic may be emailed to DNRAMEmissionsInventory@wisconsin.gov.

## TYPICAL OZONE SEASON DAY

The DNR calculates a typical ozone season day because DNR is required to report this information to EPA.

A typical ozone season day is defined as a day from April 1st to October 15th in which reactive organic gasses or nitrogen oxides are emitted and contribute to the generation of ground-level ozone. The following equation is used to calculate this number:

EM = ( [ANNUAL X 3rd quarter percentage] / [DPW X 13] ) X 2000

**EM** = typical ozone season day emission
**ANNUAL** = annual emissions of ROG or NOx in tons. Ozone season days are used for ozone calculation and so the only two air pollutants used are Reactive Organic Gases (ROG) and nitrous oxides (NOx).

**3rd quarter percentage** = Percentage of production or fuel burning from July 1st - September 30th **DPW** = days per week the facility operates as reported to DNR
**13** = number of weeks in the ozone season months from July to September
**2000** = conversion from pounds to tons

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