**ASPHALT PAVING – Emulsified**

***a. Source Category Description***

Asphalt paving is the process of applying asphalt concrete to seal or repair the surface of roads, parking lots, driveways, walkways, or airport runways. Asphalt concrete is a composite material comprised of a binder and a mineral aggregate. The binder, referred to as asphalt cement, is a byproduct of petroleum refining and contains the semi-solid residual material left after the more volatile chemical fractions have been distilled off.1

Asphalt cements thinned with water and an emulsifying agent are known as emulsified asphalts. This thinning reduces the viscosity of the asphalt making it easier to work with the mixture. The primary uses of emulsified asphalt include tack and seal operations, priming roadbeds, and paving operations for pavements up to several inches thick.

Emulsified asphalt may contain up to 12 percent organic solvents by volume.1 Emissions from emulsified asphalt result from the evaporation of VOCs after the mixture is laid down. Compared to cutback asphalt, emulsified asphalt has lower VOCs emissions per ton used.

For this source category, the following SCC was assigned:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SCC** | **SCC Level 1** | **SCC Level 2** | **SCC Level 3** | **SCC Level 4** |
| 2461022000 | Solvent Utilization | Miscellaneous Non-industrial: Commercial | Emulsified Asphalt | Total: All Solvent Types |

The general approach to calculating emissions from emulsified asphalt paving is to multiply the estimated county-level emulsified asphalt usage by emission factors for VOCs.

***b. Activity Data***

State-level emulsified asphalt usage in 2008 was obtained from the Asphalt Institute’s *2008 Asphalt Usage Survey*.2 (the EPA used the same activity values for the 2011 as they did for the 2008 NEI due to limited resources.) State-level data were allocated to county-level according to the fraction of paved road vehicle miles traveled (VMT) in each county.

Total annual VMT estimates by State and roadway class were obtained from the Federal Highway Administration’s (FHWA) annual Highway Statistics report.3 Paved road VMT was calculated by subtracting the State/roadway class unpaved road VMT from total State/roadway class VMT. State-level paved road VMT was spatially allocated to counties according to the fraction of total VMT in each county for the specific roadway class as shown by the following equation:

VMTx,total = ∑VMTST,y \* VMTx,y / VMTST,y

where: VMTx,total = VMT (million miles) in county x on all paved roadways

VMTST,y = paved road VMT for the entire State for roadway class y

VMTx,y = total VMT (million miles) in county x and roadway class y

VMTST,y = total VMT (million miles) in entire State for roadway class y

The county-level total VMT by roadway class used in this calculation was previously developed by E.H. Pechan and Associates, Inc. to support the onroad national emissions inventory.4

***c. Emission Factors***Emission factors for emulsified asphalt usage were obtained from the *Technical Report Series* produced by the U.S. EPA’s Emission Inventory Improvement Program and are reported in Table 1 below.1

***d. Emissions***

Emissions were calculated by multiplying the county-level asphalt usage (barrels) by the emission factors listed in Table 1 and then dividing by 2000 to convert pounds to tons.

Emissionsx,y = (Asphalt Usagex \* EFy) / 2000

where: Emissionsx,y = emissions (tons) of pollutant y in county x

Asphalt Usagex = emulsified asphalt (barrels) used in county x

EFy = emission factor for pollutant y

To convert tons of asphalt reported in the *2008 Asphalt Usage Survey* to barrels, it was assumed that the density of asphalt is similar to that of water, 8.34 lbs/gal, and that one barrel equals 42 gallons.

Barrels of Asphalt = (tons of asphalt \* 2000 lbs / 8.34 lbs/gal) / 42 gal/barrel

Note that one barrel of asphalt weights approximately 350 pounds.

***e. Sample Calculation***

VOC emissions from emulsified asphalt usage in Autauga County, Alabama:

From the *2008 Asphalt Usage Survey*, the state of Alabama used 18,988 tons of emulsified asphalt in 2008. The fraction of paved road VMT traveled in Autauga County is 497 million miles divided by 53,633 million miles which equals 0.0093.

Asphalt UsageAutauga = ((18,988 tons \* 2000 lbs / 8.34 lbs/gal) / 42 gal/barrel) \* 0.0093

Asphalt UsageAutauga = 1,004 barrels

VOC EmissionsAutauga = (1,004 barrels \* 9.2 lbs/barrel) / 2000 lbs/ton

VOC EmissionsAutauga = 4.62 tons

**Table 1. Criteria Emission Factors for Emulsified Asphalt Paving**

|  |  |  |  |
| --- | --- | --- | --- |
| **Pollutant Description** | **Pollutant Code** | **Emission Factor (LBS/BARREL)** | **Emission Factor**  **Reference** |
| VOLATILE ORGANIC COMPOUNDS | VOC | 9.2 | 1 |

***f. References***

1. U.S. Environmental Protection Agency, Emissions Inventory Improvement Program, *Technical Report Series*, Volume III – Area Sources, Chapter 17, “Asphalt Paving,” prepared by Eastern Research Group, Inc. for EPA, Research Triangle Park, NC, 2001. Available at http://www.epa.gov/ttn/chief/eiip/techreport/volume03/index.html.
2. Asphalt Institute, *2008 Asphalt Usage Survey for the United States and Canada*, http://www.asphaltinstitute.org/.
3. U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics 2007,* Office of Highway Policy Information, Washington, DC, 2008. Available at http://www.fhwa.dot.gov/policyinformation/statistics/2007/.
4. E.H. Pechan & Associates, Inc. “Documentation for the Onroad National Emission Inventory (NEI) for Base Years 1970 - 2002,” report prepared for U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC. January 2004.