Potential To Emit Calculator for Hot Mix Asphalt Plants

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stimate a facility's potential to emit. It is provided for the convenience of the permitted community. EPA does not guarantee the accuracy or appropriateness of this tor sources are subject to revision or correction. It is the permittee's responsibility to verify the accuracy of the information. EPA is not liable for errors or omissions.

Enter the facility's information below.
Write the letter "Y" or "N" next to each fuel type to indicate that the facility does or does not burn that type of fuel.

The potential emissions of criteria pollutants for the facility will be displayed under the "Output - Criteria" tab.

This PTE calculator is only applicable to the asphalt plants subject to NSPS, Subpart I (i.e. all PM emission units are controlled) and only applicable to the asphalt plants with the dryers controlled by dry filters. The emission factors for the dryers controlled by scrubbers are not included in this spreadsheet since the use of scrubbers to control asphalt plants are rare.

If you are NOT subject to NSPS, Subpart I, the PM/PM10/PM2.5 emission factors in this spreadsheet need to be revised to be based on the uncontrolled emission factors.

Facility Profile

Type of Plant-		Drum			Select "Drum" or "Batch" from the drop-down menu.
Plant Capacity-	200.00	(tons/hr)			73,000 tons/month. Per Condition 17 of the HMA GP, a facility operating a drum mix
Burner Size-	53	(MMBtu/hr)			876,000 tons/yr asphalt plant that is co-located with a concrete batch plant is
Fuels Used in Dryer					
Natural Gas-	Y	(Y or N)			
Liquid Fuel (distillate, diesel, etc.)	n	(Y or N)			
Max Lime Usage-	1%	(weight %)	Default = 1%		
Max Hourly Lime Loading-	25	(ton)	Default = 25		
Bin Vent Efficiency-	98%	(%)	Default = 98%		
Aggregate					
Max. RAP Used-	10%	(%)	Default = 50%		RAP = Reclaimed Asphalt Pavement
# of Virgin Agg. Conveyors-	4	(#)			
# of Virgin Agg. Screens-	1	(#)			
# of RAP Conveyors-	1	(#)			
# of RAP Screens-	0	(#)			
Aggregate Moisture-	2.5	(%)	Default = 1.8%		
Auxiliary Heaters Capacity -	1	(MMBtu/hr)	Total		
Fuels Used					
Natural Gas-	Y	(Y or N)			
Propane-	N	(Y or N)	Sulfur %		
Liquid Fuel (distillate, diesel, etc.)	N	(Y or N)	0.0015	Default = 0.0015	
Generator/Engine Size-	0	(hp)			Note: Engines that are considered portable nonroad engines do not
Fuels Used			Sulfur %		need to be included (see 40 CFR 1068.30)
Diesel-	Y	(Y or N)	0.0015	Default = 0.0015	

Other Parameters

Asphalt Properties			
Temperature-	300	(F)	Default = 325
Volatility-	-0.5	(unitless)	Default = -0.5
Weather			
Mean Wind Speed-	15	(MPH)	Worse Case = 15

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Type of Mixer: Drum Mix

PTE (ton/yr)

Process	NO_X	CO	VOC	PM	PM_{10}	$PM_{2.5}$	SO_2
Dryer/Mixer	11.4	56.9	14.0	14.5	10.1	1.27	1.49
Load-out/Silo Filling	-	1.15	7.53	0.73	0.73	0.73	-
Conveying	-	-	-	13.14	4.82	4.82	-
Screening	-	-	-	0.96	0.32	0.02	-
Storage Piles	-	-	-	3.17	1.50	0.23	-
Lime Silo Loading	-	-	-	4.82	4.82	4.82	-
Auxiliary Heater	0.43	0.36	0.02	0.01	0.03	0.03	0.0
Engine/Generator	0.0	0.0	0.00	0.00	0.00	0.00	0.00
Total PTE	**11.82**	**58.45**	**21.57**	**37.28**	**22.29**	**11.92**	**1.49**

Note: Dryer/Mixer PTE reflect the 73,000 ton/month (876,000 ton/yr) production limit in the Hot Mix Asphalt General Permit 20.23

Maximum Fuel Usage		
Operation Description	gal/year	gal/month
Diesel Engine	0	0

Process	**NOx (tpy)**	**CO (tpy)**	**PM (tpy)**	**PM10 (tpy)**	**PM2.5 (tpy)**	**SO2 (tpy)**	**VOC (tpy)**
Dryer/Drum Mixer	11.39	56.94	14.45	10.07	1.27	1.49	14.02
Load-out/Silo Filling	-	1.15	0.73	0.73	0.73	-	7.53
Conveying	-	-	13.14	4.82	4.82	-	-
Screening	-	-	0.96	0.32	0.02	-	-
Storage Piles	-	-	3.17	1.50	0.23	-	-
Lime Silo Loading	-	-	4.82	4.82	4.82	-	-
Auxiliary Heater	0.43	0.36	0.01	0.03	0.03	0.00	0.02
Total	**11.82**	**58.45**	**37.28**	**22.29**	**11.92**	**1.49**	**21.57**
Minor NSR Permitting Thresho	10	10	10	5	3	10	5

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Emissions from Drum Mix Hot Mix Asphalt Production - Criteria Pollutants

Facility Capacity: 200 ton/hr

Purple values are pulled from other workshe
Blue values are results

Worst Case Totals

Pollutant	PTE (lb/hr)	PTE (ton/yr)
PM	6.60	28.91
PM_{10}	8.25	20.15
$PM_{2.5}$	0.58	2.54
SO_2	0.68	2.98
NO_X	5.20	22.78
CO	26.00	113.88
VOC	6.40	28.03

PTE of PM/PM_{10}

Pollutant	Emission Factor (lb/ton)	Emissions (lb/hr)	Emissions (ton/yr)	tons/yr
PM	0.033	6.60	28.91	14.454
PM_{10}	0.023	8.25	20.15	10.074

Note: These are the emission factors for the dryers controlled by dry filters.

PTE of $PM_{2.5}$

Pollutant	Emission Factor (lb/ton)	Emissions (lb/hr)	Emissions (ton/yr)	tons/yr
$PM_{2.5}$	0.0029	0.58	2.54	1.2702

Note: This is the emission factor for the dryers controlled by dry filters.

$SO_2/NO_X/CO$

Natural Gas Pollutant	Natural Gas Emission Factor (lb/ton)	Natural Gas Emissions (lb/hr)	Natural Gas Emissions (ton/yr)	Liquid Fuel Pollutant	Liquid Fuel Emission Factor (lb/ton)	Liquid Fuel Emissions (lb/hr)	Liquid Fuel Emissions (ton/yr)	Natural Gas tons/yr
SO_2	0.0034	0.68	2.98	SO_2	0.011	0.00		1.49
NO_X	0.026	5.20	22.78	NO_X	0.038	0.00		11.39
CO	0.13	26.00	113.88	CO	0.13	0.00		56.94

VOC

Pollutant	Emission Factor (lb/ton)	Emissions (lb/hr)	Emissions (ton/yr)	
VOC	0.032	6.40	28.03	14.016

Note:

1. Emission factors are from AP-42, Chapter 11.1, Tables 11.1-3, 11.1-4, 11.1-7, and 11.1-8 for Hot Mix Asphalt Plants (updated 03/2004), except for NOx -see Note 2.
2. NOx emission factor for liquid fuel based on Technical Support Document for Asphalt Plants by Washington's Department of Ecology (updated 01/2011). Value based on 20 sets of performance test data - 75th percentile plus 10%.

Methodology

PTE (lb/hr) = Facility Capacity (ton/hr) x EF (lb/ton)
PTE (ton/yr) = PTE (lbs/hr) x 8760 hr/yr x 1 ton/2000 lb

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Emissions from Load-Out and Silo Filling Operations - Criteria Pollutants

200 Facility Capacity (ton/hr)
300 Temp (used to calculate EF)
-0.5 Volatility (used to calculate EF)

Purple values are pulled from other worksheet
Blue values are results

Totals

Pollutant	PTE (lb/hr)	PTE (ton/yr)
PM	0.1661	0.73
PM_{10}	0.1661	0.73
$PM_{2.5}$	0.1661	0.73
VOC	1.7188	7.53
CO	0.2625	1.15

Load-Out	Pollutant	Emission Factor [1] (lb/ton)	PTE (lb/hr)	PTE (ton/yr)
	Total PM	0.000363	0.0726	0.32
	PM_{10} [2]	0.000363	0.0726	0.32
	$PM_{2.5}$ [2]	0.000363	0.0726	0.32
	VOC [3]	0.002087	0.4175	1.83
	CO	0.000720	0.1441	0.63

Silo Filling	Pollutant	Emission Factor [1] (lb/ton)	PTE (lb/hr)	PTE (ton/yr)
	Total PM	0.000468	0.0935	0.41
	PM_{10} [2]	0.000468	0.0935	0.41
	$PM_{2.5}$ [2]	0.000468	0.0935	0.41
	VOC [3]	0.006507	1.3014	5.70
	CO	0.000592	0.1184	0.52

Note:

1. Emission factors are from AP-42, Chapter 11.1, Tables 11.1-14 and 11.1-16 for Hot Mix Asphalt Plants (Updated 03/04).
2. Assume PM_{10} and $PM_{2.5}$ emissions are equal to PM emissions.
3. According to AP-42, Table 11.1-16, 94% of the TOC emissions from load-out operations are VOC. 100% of the TOC emissions from silo filling operations ar

Methodology

PTE (lb/hr) = Facility Capacity (ton/hr) x EF (lb/ton)
PTE (ton/hr) = PTE (lbs/hr) x 8760 hr/yr x 1 ton/2000 lb

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Emissions from Aggregate Handling Operations

200	Facility Capacity (tons/hr)
10%	Max. RAP Used (%)
4	# of Virgin Agg. Conveyors (#)
1	# of Virgin Agg. Screens (#)
1	# of RAP Conveyors (#)
0	# of RAP Screens (#)

Purple values are pulled from other worksheet
Blue values are results

	Pollutant	PTE (tons/yr)
Conveying Total	PM	13.14
	PM_{10}	4.82
	$PM_{2.5}$	4.82
Screening Total	PM	0.96
	PM_{10}	0.32
	$PM_{2.5}$	0.02

Conveying				Controlled								
				PM			PM_{10}			$PM_{2.5}$ [2]		
Table 11.19.2-2 (8/04)	Source	Number of Units	Max. Capacity (ton/hr/unit)	Emission Factor[1] (lbs/ton)	PTE (lbs/hr/unit)	PTE (tons/yr)	Emission Factor[1] (lbs/ton)	PTE (lbs/hr/unit)	PTE (tons/yr)	Emission Factor[1] (lbs/ton)	PTE (lbs/hr/unit)	PTE (tons/yr)
	Virgin Agg. Conveyors	4	180	0.0030	0.540	10.51	0.0011	0.198	3.85	0.0011	0.198	3.85
	RAP Conveyors	1	20	0.0030	0.060	2.63	0.0011	0.022	0.96	0.0011	0.022	0.96

Screening				Controlled								
				PM			PM_{10}			$PM_{2.5}$		
Table 11.19.2-2 (8/04)	Source	Number of Units	Max. Capacity (ton/hr/unit)	Emission Factor[1] (lbs/ton)	Limited PTE (lbs/hr/unit)	Limited PTE (tons/yr)	Emission Factor[1] (lbs/ton)	Limited PTE (lbs/hr/unit)	Limited PTE (tons/yr)	Emission Factor[1] (lbs/ton)	Limited PTE (lbs/hr/unit)	Limited PTE (tons/yr)
	Virgin Agg. Screens	1	180	0.0011	0.198	0.96	0.00037	0.067	0.32	0.000025	0.005	0.02
	RAP Screens	0	20	0.0011	0.022	0.00	0.00037	0.007	0.00	0.000025	0.001	0.00

Note:

1. Emission factors are from AP-42, Chapter 11.19, Table 11.19.2-2 for Crushed Stone Processing and Pulverized Mineral Processing (Updated 08/04).
   The emission factors selected are the ones with controlled since this facility is subject to NSPS, Subpart I.
2. Assume $PM_{2.5}$ emissions are equal to PM_{10} emissions.

Methodology

PTE (lb/hr/unit) = Max. Capacity (ton/hr/unit) x EF (lb/ton)
PTE (ton/yr) = PTE (lbs/hr/unit) x 8760 (hr/yr) x 1 ton/2000 lb x Number of Units

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Emissions from Storage Piles

200	Facility Capacity (tons/hr)
1,752,000	Max. Annual Production (ton/yr), based on the operation of 8760 hr/yr.
2.5	Agg. Moisture (%)
15	Mean Wind Speed (MPH)

Purple values are pulled from other worksheet

Blue values are results

According to AP42, Chapter 13.2.4 - Aggregate Handling and Storage Piles (updated 11/06), the particulate emission factors for storage piles can be estimated from the following equation:

$$Ef = \frac{k \times 0.0032 \times (U/5)^{1.3}}{(M/2)^{1.4}}$$

where:

Ef = Emission Factor (lbs/ton)

k = Particle size multipliers = 0.74 for PM, 0.35 for PM_{10}, and 0.053 for $PM_{2.5}$

U = Mean wind speed (MPH) = 15 MPH (provided by the facility)

M = Moisture content (%) = 2.5 % (provided by the facility)

Pollutant	Emission Factor (lb/ton)	Control Efficiency[1] (%)	PTE (tons/yr)
PM	0.00723	50%	3.17
PM_{10}	0.00342	50%	1.50
$PM_{2.5}$	0.00052	50%	0.23

Note:

1. Since this facility is subject to NSPS, Subpart I, the particulate emissions control efficiency for storage piles is assumed to be 50%.

Methodology

PTE (ton/yr) = Max. Annual Production (ton/yr) x EF (lb/ton) x 1 ton/2000 lb x (1-Control Efficiency)

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Lime Silo Loading

25 Max. Hourly Load (ton/hr)

98% Bin Vent Control Efficiency (%)

Purple values are pulled from o

Blue values are results

Lime Silo Loading	Controlled (8,760 hr/yr)				
	Pollutant	Emission Factor	Control Eff.	PTE	
		(lb/ton)	%	(lb/hr)	(ton/yr)
	PM	2.2	98%	1.100	4.82
	PM_{10} [2]	2.2	98%	1.100	4.82
	$PM_{2.5}$ [2]	2.2	98%	1.100	4.82

Note:

1. Emission factors are from AP-42, Chapter 11.17, Table 11.17-4 for Lime Manufacturing (Updated 02/98)(SCC 3-05-016-15).
2. Assume PM_{10} and $PM_{2.5}$ emissions are equal to PM emissions.

Methodology

PTE (lb/hr) = Max. Hourly Load (ton/hr) x EF (lb/ton) x (1-Control Eff.)

PTE (ton/hr) = PTE (lb/hr) x 8760 hr/yr x 1 ton/2000 lbs

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Emissions from Auxiliary Heaters - Criteria Pollutants

1 Heat Input (MMBtu/hr)

Purple values are pulled from other workshe
Blue values are results

Worst Case PTE (ton/yr)

PM	PM_{10}	$PM_{2.5}$	SO_2	NO_X	CO	VOC
0.01	**0.03**	**0.03**	**0.00**	**0.43**	**0.36**	**0.02**

Fuel Type: **Natural Gas** Used: Y

	Pollutant						
	PM	PM_{10}[2]	$PM_{2.5}$[3]	SO_2	NO_X	CO	VOC
Emission Factor[1] (lb/MMSCF)	1.9	7.6	7.6	0.6	100	84	5.5
PTE (ton/yr)	**0.01**	**0.03**	**0.03**	**0.00**	**0.43**	**0.36**	**0.02**

Note:

1. Emission factors are from AP-42, Chapter 1.4, Tables 1.4-1 and 1.4-2 (updated 07/98).
2. PM_{10} emission factor is condensable and filterable PM combined. PM emission factor is for filterable PM only.
3. Assume $PM_{2.5}$ emissions are equal to PM_{10} emissions.

Methodology

PTE (ton/yr) = Heat Input (MMBtu/hr) x 1 MMSCF/1,020 MMBtu x EF (lb/MMSCF) x 8760 hr/yr x 1 ton/2000 lb

Fuel Type: **Propane** Used: N Sulfur Content: 0.00 %

	Pollutant						
	PM	PM_{10}[2]	$PM_{2.5}$[3]	SO_2	NO_X	CO	VOC
Emission Factor[1] (lbs/kgal)	0.2	0.7	0.7	0	13	7.5	1.0
PTE (ton/yr)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Note:

1. Emission factors are from AP-42, Chapter 1.5, Tables 1.5 (updated 07/08).
2. PM_{10} emission factor is condensable and filterable PM combined. PM emission factor is for filterable PM only.
3. Assume $PM_{2.5}$ emissions are equal to PM_{10} emissions.

Methodology

PTE (ton/yr) = Heat Input (MMBtu/hr) x 1 kgal/91.5 MMBtu x EF (lb/kgal) x 8760 hr/yr x 1 ton/2000 lb

Fuel Type: **Liquid Fuel** Used: N Sulfur Content: 0.002 %

	Pollutant						
	PM	PM_{10}[2]	$PM_{2.5}$	SO_2	NO_X	CO	VOC
Emission Factor[1] (lb/kgal)	2.0	3.3	2.55	0.213	20	5.0	0.34
PTE (ton/yr)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Note:

1. Emission factors are from AP-42, Chapter 1.3, Tables 1.3-1, 1.3-2, and 1.3-3 for Fuel Oil Combustion (updated 05/10).
2. PM_{10} emission factor is condensable and filterable PM combined. PM emission factor is for filterable PM only.

Methodology

PTE (ton/yr) = Heat Input (MMBtu/hr) x 1 kgal/140 MMBtu x EF (lb/kgal) x 8760 hr/yr x 1 ton/2000 lb

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Emissions from Generator/Engine - Criteria Pollutants

Engine Size: 0 hp

Purple values are pulled from other worksheet
Blue values are results

Diesel Used: Y

Worst Case PTE (ton/yr)

PM	PM_{10}	$PM_{2.5}$	SO_2	NO_X	CO	VOC
0.00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Engine Type: **Diesel Engine (<= 600 hp)** Used: Y

	Pollutant						
	PM[2]	PM_{10}	$PM_{2.5}$[2]	SO_2	NO_X	CO	VOC[3]
Emission Factor[1] (lbs/hp-hr)	2.20E-03	2.20E-03	2.20E-03	2.05E-03	3.10E-02	6.68E-03	2.47E-03
PTE (ton/yr)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Note:

1. Emission factors are from Chapter 3.3, Table 3.3-1 (updated 10/96).
2. Assume PM and $PM_{2.5}$ emissions are equal to PM_{10} emissions.
3. Assume TOC (total organic compounds) emissions equal to VOC emissions.

Methodology

PTE (ton/yr) = Engine Capacity (hp) x EF (lb/hp-hr) x 8760 hr x 1 ton/2000 lb

Engine Type: **Diesel (> 600 hp)** Used: N Sulfur Content: 0.00 %

	Pollutant						
	PM	PM_{10}	$PM_{2.5}$[2]	SO_2	NO_X	CO	VOC[3]
Emission Factor[1] (lbs/hp-hr)	0.0007	0.0007	0.0007	1.21E-05	0.024	5.50E-03	7.05E-04
Limited PTE (ton/yr)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Note:

1. Emission factors are from Chapter 3.4, Tables 3.4-1 and 3.4-2 for Large Stationary Diesel and Dual Fuel Engines (updated 10/96).
2. Assume $PM_{2.5}$ emissions are equal to PM_{10} emissions.
3. Assume TOC (total organic compounds) emissions equal to VOC emissions.

Methodology

PTE (ton/yr) = Engine Capacity (hp) x EF (lb/hp-hr) x 8760 hr x 1 ton/2000 lb

Fuel Usage (gal/yr)	**0**

Methodology:

Fuel Usage (gal/yr) = Total Engine Horsepower (hp) x 8,760 hr/yr x 7,000 Btu/hp-hr x 1 lb fuel/19,300 Btu x 1 gal/7.1 lb