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Project Summary

Asphaltic Concrete Industry—Source Category Report

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The objective of this study was to develop particulate emission factors based on cutoff size for inhalable particles for the asphaltic concrete industry. After review of available information characterizing particulate emissions from asphalt concrete plants, the data were summarized and rated in terms of reliability. Size specific emission factors were developed from these data for each of the three processes used in the manufacture of asphalt concrete. A detailed process description is presented, with emphasis on factors affecting the generation of emissions. A replacement for Section 8.1 (Asphalt Concrete Plants) of AP-42 was prepared, containing the size specific emission factors developed by the program.

This Project Summary was developed by EPA's Air and Energy Engineering Research Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

The purpose of this program was to summarize the best available information on emissions of inhalable particulate matter in the asphalt concrete industry. The main objective of the program was to develop reliable size specific emission factors for each of the three basic processes used to produce asphalt concrete. Both uncontrolled and controlled emission factors are presented in the report. The uncontrolled factors represent emissions that would result if the particulate control device (baghouse, scrubber, etc.) were bypassed: the controlled factors represent emissions emanating from a particular type of control system. The size-specific emission factors are generally based on the results of simultaneous sampling conducted at the inlet and outlet of the control device(s), utilizing a variety of particle sizing techniques. Other objectives of this program were to present current information on the asphalt concrete industry as well as prepare a replacement for Section 8.1 in AP-42, "A Compilation of Air Pollutant Emission Factors."

The above objectives were met by a thorough literature search which included the following sources:

- Data from inhalable particulate characterization program,
- Fine Particle Emissions Inventory System (FPEIS),
- AP-42 background file at EPA's Office of Air Quality Planning and Standards (OAQPS),
- MRI files, and
- Various industry sources (e.g., National Asphalt Pavement Association.

The emission data contained in 27 reference documents were reviewed, analyzed, summarized, and ranked according to the criteria established by OAQPS as published in the report, "Technical Procedures for Developing AP-42 Emission Factors and Preparing AP-42 Sections," April 1980. After ranking the data, emission factors were calculated using the highest quality data available. The quality of the data used to develop each emission factor is indicated by the emission factor rating.

Process and control system operating data as well as general industry infor-

mation were also obtained and summarized as general background information. It was not part of this program to provide detailed engineering analyses, product specifications, or detailed evaluations of trends in the industry.

Results

Particulate emissions are generated from various activities at an asphalt concrete plant including raw material handling, aggregate drying, mixing, and product handling. The dryer (or drum mixer) potentially represents the largest single contribution to process-related particulate emissions in an asphalt concrete plant. Fugitive dust emissions from open sources (e.g., unpaved roads), also a major contributor, are not specifically treated in this report.

The size-specific emission factors in Tables 1 and 2 represent controlled and uncontrolled emissions from conventional (batch or continuous mix) asphalt concrete plants based on the type of control device used. The emission factors in Tables 3 and 4 represent controlled and uncontrolled emissions from drum mix asphalt plants. The emission factors in Table 4 were developed from tests at a single split-feed recycle plant equipped with a baghouse collector. Size-specific emission factors for other types of recycle processes are not included in the report because of insufficient data.

Traditionally, ducted and process fugitive emissions from asphalt concrete plants have been controlled by a cyclone followed by a baghouse. Such control systems may not be general practice at present since the percentage of drum-mix facilities, which generally have no primary collector, has increased significantly since 1975. Wet dust suppression is the most common technique used to control open dust sources in asphalt concrete plants.

Table 1. *Emission Factors for Total Particulate from Conventional Asphalt Concrete Plants*[a]

(Emission Factor Rating: B)

	Emission Factor	
Type of Control	*kg/Mg*	*lb/ton*
Uncontrolled[b]	*22.5*	*45.0*
Precleaner	*7.5*	*15.0*
High efficiency cyclone	*0.85*	*1.7*
Spray tower	*0.20*	*0.4*
Baffle spray tower	*0.15*	*0.3*
Multiple centrifugal scrubber[c]	*0.035*	*0.07*
Orifice scrubber	*0.02*	*0.04*
Venturi scrubber[d]	*0.02*	*0.04*
Baghouse[e]	*0.01*	*0.02*

[a] *Expressed in terms of emissions per unit weight of asphalt concrete produced. Includes both batch mix and continuous mix processes.*

[b] *Almost all plants have at least a precleaner following the rotary drier.*

[c] *Average from a properly designed, installed, operated, and maintained scrubber, based on a study to develop New Source Performance Standards. Range of values = 0.004-0.0690 kg/Mg.*

[d] *Range of values = 0.013-0.0690 kg/Mg.*

[e] *Emissions from a properly designed, installed, operated, and maintained baghouse, based on a study to develop New Source Performance Standards. Range of values = 0.004-0.018 kg/Mg.*

Table 2. *Summary of Size-Specific Factors for Conventional Asphalt Plants*[a]

(Emission Factor Rating: D)

Particle Size (μmA)[b]	Cumulative Mass Equal to or Less Than Stated Size (%)					Cumulative Particulate Emission Factor Equal to or Less Than Stated Size[c]									
	Uncontrolled	Cyclone Collectors	Multiple Centrifugal Scrubbers	Gravity Spray Towers	Baghouse Collector	Uncontrolled		Cyclone Collectors		Multiple Centrifugal Scrubbers		Gravity Spray Towers		Baghouse Collector[b]	
						kg/Mg	lb/ton	kg/Mg	lb/ton	kg/Mg	lb/ton	kg/Mg	lb/ton	kg/Mg	lb/ton
2.5	0.83	5.0	67	21	33	0.19	0.37	0.048	0.096	0.023	0.046	0.041	0.082	0.003	0.006
5.0	3.5	11	74	27	36	0.78	1.6	0.13	0.26	0.026	0.052	0.053	0.11	0.004	0.008
10.0	14	21	80	37	40	3.1	6.1	0.18	0.36	0.028	0.056	0.073	0.15	0.004	0.008
15.0	23	29	83	39	47	5.3	11	0.25	0.50	0.029	0.058	0.078	0.16	0.005	0.01
20.0	30	36	84	41	54	6.8	14	0.30	0.60	0.030	0.060	0.081	0.16	0.005	0.01
Total mass emission factor						23	45	0.85	1.7	0.035	0.070	0.20	0.40	0.01	0.02

[a]*Rounded to two significant figures.*
[b]*Aerodynamic diameter.*
[c]*Based on emission factors for total particulate shown in Table 1. Expressed in terms of emissions per unit weight of asphalt concrete produced. Mg 3 × 10^6 g; ton = 2,000 lb.*
[d]*Rounded to one significant figure.*

Table 3. *Total Particulate Emission Factors for Drum Mix Asphalt Concrete Plants*[a]

(Emission Factor Rating: B)

Type of Control	Emission Factor	
	kg/Mg	lb/ton
Uncontrolled	2.45	4.9
Cyclone or multiclone	0.34	0.67
Low energy wet scrubbing[b]	0.04	0.07
Venturi scrubber	0.02	0.04

[a]*Expressed in terms of emissions per unit weight of asphalt concrete produced. These factors differ from those for conventional asphalt concrete plants because the aggregate contacts and is coated with asphalt early in the drum mix process.*
[b]*Two types: (1) water droplets are sprayed into the stack exit, or (2) water droplets are sprayed onto the fan (dynamic scrubber).*

Table 4. *Particle Size Distribution and Size-Specific Emission Factors for Drum Mix Asphalt Plants Controlled by a Baghouse Collector*[a]

(Emission Factor Rating: D)

Particle Size (μmA)[b]	Cumulative Mass Equal to or Less Than Stated Size (Percent)		Cumulative Particulate Emission Factors Equal to or Less Than Stated Size[f]			
	Uncontrolled	Controlled[c]	Uncontrolled[d]		Controlled[e]	
			kg/Mg	lb/ton	10^{-3} kg/Mg	10^{-3} lb/ton
2.5	5.5	11	0.14	0.27	0.53	1.1
10.0	23	32	0.57	1.1	1.6	3.2
15.0	27	35	0.65	1.3	1.7	3.5
Total mass Emission Factor			2.5	4.9	4.9	9.8
Condensible Organics[g]					3.9	7.7

[a]*Rounded to two significant figures.*
[b]*Aerodynamic diameter.*
[c]*Includes data from two tests out of eight where ~ 30% recycled asphalt paving was processed utilizing a split feed, direct flame process.*
[d]*Based on an uncontrolled emission factor of 2.45 kg/Mg (see Table 3).*
[e]*Calculated using an overall collection efficiency of 99.8% for a baghouse applied to an uncontrolled emission factor of 2.45 kg/Mg.*
[f]*Expressed in terms of emissions per unit weight of asphalt concrete produced. Not generally applicable to recycle processes. Mg = 10^6 g; ton = 2000 lb.*
[g]*Determined at outlet of a baghouse collector while plant was operating with ~ 30% recycled asphalt paving. Factors are applicable only to a direct flame heating process using a split feed.*

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The complete report, entitled "Asphaltic Concrete Industry Particulate Emissions: Source Category Report," (Order No. PB 87-119 574/AS; Cost: $30.95, subject to change) will be available only from:
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