AP42 Section: 11.1

Reference Number: 10

Title: **Comprehensive Economic Study Of Air Pollution Control Costs For Selected Industries And Selected Regions,**

M. E. Fogel, et al.,

R-OU-455, U. S. Environmental Protection Agency, Research Triangle Park, NC, February 1970.

ASPHALT CONCRETE PLANTS
AP-42 Section 8.1
Reference Number 10

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Sub-Report I-7

Asphalt Batching
(SIC Code: 2951)

COMPREHENSIVE ECONOMIC COST STUDY OF AIR POLLUTION CONTROL COSTS FOR SELECTED INDUSTRIES AND SELECTED REGIONS

Prepared for
The National Air Pollution Control Administration
United States Public Health Service
Department of Health, Education, and Welfare

DO NOT USE DATA for THIS REPORT - OR THE FINAL FOR ASPHALT BATCHING. FIGURES IN ERROR PER John O'Connor (Economic studies). NEW study IN PROCESS.
Ken Dunkel

See final report also.

RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709

Sub-Report I-7

Asphalt Batching

(SIC Code: 2951)

Asphalt batching is the production of a paving mixture and is generally done in a central mixing plant or factory some distance from the road construction area. Available data on the sale of asphalt (References 1 and 2) indicates that average annual production rate in the years 1963-1967 was 209 million tons. The paving mixture is made by intimately mixing hot asphalt and heated crushed stone aggregate. The basic process is simple; stone is dried, preheated, screened and then conveyed to a mixing mill into which hot asphalt is added. Mixing and loading the paving mixture in transport trucks are the last steps.

The pollution problem is primarily caused by the emission of fine dust from the aggregate during drying and heating. The uncontrolled emission rate is about 5 pounds per ton of asphalt. Almost all plants have primary collection devices which are usually cyclone or multi-cyclone. Few plants, however, have secondary systems including wet scrubbers and fabric filters. It is estimated that the industry as a whole controls approximately 80 percent of the emission.

For the purpose of developing data for regional cost estimates, the numbers and sizes of asphalt batching plants must be determined. The number of plants will be obtained from County Business Patterns and the size (frequency) distribution will be constructed using data from several state highway departments and other sources. The relation of capacity to production, during periods plants are operational, will be obtained from state asphalt associations. A sampling plan will be used to generate data for national and regional projections. Cost estimates will be made on the bases of the addition of wet scrubbers and fabric filters to provide the level of control required. These calculations will be performed for each batching plant size category. Unit cost of control systems have been compiled from available literature. These will be verified, if possible, by comparison to actual installations reported.

Sub-Report I-7

Asphalt Batching

(SIC Code: 2951)

I. INDUSTRY

A. Annual Capacity of Plants

Nation:

Adverse weather conditions in many states make monthly or daily capacity more meaningful. Information as to number of days that operations are possible and average relationships of production to capacity for those days will be obtained from state asphalt associations. To date, data have been received from 16 states. An extrapolation plan will be used to generate data for national projections if data are not obtained from all states.

Region:

See Attachment A

B. Annual Production, 1963-67 Average

Nation:

209,000,000 tons of total mix

10,450,000 tons of asphalt

This figure was calculated as follows:

1. Estimated hot mix production for 1966 and 1967 was taken from Reference 1.
2. Total sales for years 1963-65 (Reference 2) were converted to tons of hot-mix asphalt using the assumption that 90 percent of all asphalt cement is used in hot mix asphalt materials and that these contain an average asphalt content of 5 percent (Reference 1).

Source: References 1 and 2

Region:

See Attachment A

C. Annual Value of Shipments, 1963-67 Average

Nation:

$460,000,000

Source: References 3, 4, 5, and 6

Region:

See Attachment A

D. Annual Value Added, 1963-67 Average

Nation:

$178,000,000

Source: References 3, 4, 5, and 6

Region:

See Attachment A

E. Number of Plants and Size Distribution

1. Number of plants: to be obtained from County Business Patterns and possibly from Dunn and Bradstreet data.
2. Size (frequency) distribution: to be constructed using data from Section I.A.

F. Estimate of Industry Emissions

Nation:

522,500 tons of particulate

Source: Reference 7

Region:

See Attachment A

G. Attached List of Plants by Regions

A list of plants by regions will be developed from data obtained from several state highway departments and other sources as described in Section I.E.

H. Regional Analysis

See Attachment B

II. PROCESSES

A. Process Types

Continuous or batch production of asphalt:

1. Conveying aggregate
2. Drying and heating aggregate (source of major emissions)
3. Heating asphalt
4. Mixing aggregate and asphalt

B. Annual Capacity of Process

Nation:

See Section I.A.

Region:

See Attachment A

C. Annual Production of Process

Nation:

See Section I.B.

Region:

See Attachment A

D. Type Emission:

Fine dusts of aggregate

E. Presently Controlled Production

Nation:

Almost all plants have primary collection devices such as cyclones or multicyclones (70-85 percent efficiency); a few have secondary systems such as wet scrubbers (96-98.4 percent efficiency) and fabric filters (99.5 percent efficiency).

Source: Reference 8

Region:

See Attachment A

III. DATA TO BE USED IN COST ANALYSIS

A. Type Process

1. Conveying aggregate
2. Drying and heating aggregate
3. Heating asphalt
4. Mixing aggregate and asphalt

B. Process Size (Production Rate):

40 to 200 tons per hour

Source: Reference 9

C. Annual Output

See Section I.B.

D. Gas Volume:

12,000 scfm per 100 tons per hour from the dryer

Source: Reference 10

E. Gas Stream Temperature

300 degrees Fahrenheit

Source: Reference 11

F. Emission Type:

Fine dusts of aggregate

G. Special Emission Characteristics:

Particle Size Distribution	
Particle Size (microns)	Percent by Weight
<5	35
5-10	25
10-20	17
20-44	20
>44	3

H. Process Uncontrolled Emission Rate:

Five pounds of dust per ton of asphalt

Source: Reference 8

I. Process Uncontrolled Emission:

104,500 tons per year, assuming 80 percent effective mechanical device present for entire industry

Source: Reference 8

J. Required Removal Efficiency

Process Size (tons/hour)	Percent Efficiency Required
40	79
100	91
150	93
200	95

K. Annual Hours of Operation

1400 hours

Source: Reference 9

L. Control Systems

1. System Type

a. Basic equipment to be added to existing cyclones

1) Wet scrubber

2) Fabric filter

Source: Reference 8

b. Gas conditioning equipment

There is no need to condition gas.

c. Particulate disposal method

1) Wet: ponded

2) Dry: return to process

Source: Reference 10

2. System size

   See Section III-D

3. System efficiency

   System efficiency of wet scrubbers and fabric filters added to existing mechanical collectors will provide control well above the required efficiencies.

4. Systems costs

   1- Dry collector

   2- Wet scrubber

   3- Fabric filter

1- Dry collector - 15,000 - 60,000 scfm
21,950 - 87,500 acfm

Purchase cost -	$5,800 -	$21,000
Installation -	8,700 -	31,500 (150% of purchase)
Operation -	149 -	595
Maintenance -	330 -	1,310
Total	$14,979 -	$54,405

2- Wet scrubber - 21,950 - 87,500 acfm

Purchase cost -	$8,100 -	$25,000
Installation -	24,300 -	75,000 (300% of purchase)
Operation -	20 -	80
Maintenance -	875	3,500
Total	$32,295 -	$103,580

3- Fabric filter - 21,950 - 87,500 acfm

Purchase cost -	$35,000 -	$78,000
Installation -	61,000 -	136,500 (175% of purchase)
Operation -	149	595
Maintenance -	1,105	4,380
Total	$97,254	$219,475

Source: Reference 12

Attachment A

ESTIMATING PROCEDURE FOR ALL REGIONS COMBINED

A. Capacity of Plants

The capacities for all of the regions will be totaled.

B. Annual Production (1963-67 average)

1. State production will be estimated from shipments of asphalt cement to each state, as was done for the nation.

2. Within each state, the production will be distributed by counties in proportion to total capacities of plants in the counties.

3. For each region, the production for the counties lying therein will be totaled.

C. Annual Value of Shipments (1963-67 average)

Value of shipments will be distributed by regions in proportion to estimated production.

D. Annual Value Added

Same as (C)

E. Number of Plants and Size Distribution

The frequencies and totals for the regions will be totaled.

Attachment B

ESTIMATING PROCEDURE FOR INDIVIDUAL REGIONS

A. Capacity of Plants

1. For each region for which capacity data for plants have been obtained, those data will be totaled.
2. For each region for which no capacity data as such have been obtained, estimates will be made on the basis of numbers of employees in the region and the ratio of capacity to number of employees for the states for which data are available.

Sources: 1) Lists of plants provided by State highway departments and state asphalt associations
2) Dunn & Bradstreet
3) County Business Patterns

B. Number of Plants and Size Distribution

1. For each region for which names and capacities of plants have been obtained, the distribution will be constructed from these data.
2. For regions without such data, estimated distributions will be made on the basis of numbers of employees.

Sources: Same

C. List of Plants

This will be made up by region by assigning the plants included in lists by addresses to the proper counties and then regions, and totaling numbers of counties in regions where complete data are not available.

Sources: Same

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