

Use of

WASTE

MATERIALS

in

HOT-MIX

ASPHALT

H. Fred Waller, editor



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***Use of Waste Materials in
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Foreword

This publication, *Use of Waste Materials in Hot-Mix Asphalt*, contains papers presented at the symposium on A Critical Look at the Use of Waste Materials in Hot-Mix Asphalt, held in Miami, FL on 8 Dec. 1992. The symposium was sponsored by ASTM Committee D-4 on Road and Paving Materials. H. Fred Waller of the Asphalt Institute in Raleigh, NC, presided as symposium chairman and is the editor of the resulting publication.

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Overview

The vast quantity of waste materials accumulating throughout North America is creating costly disposal problems. Some of these materials are by-products of industrial production processing, while others are waste materials from day to day usage by consumers. With governmental agencies becoming more environmentally conscious, it is a difficult and costly task to properly dispose of many of the materials in question, particularly where restrictive provisions prohibit their disposal in sanitary landfills. Some have been classified as hazardous wastes as authorities are concerned about possible contamination of ground water. These concerns lend impetus to exploration of alternate means of disposal; thus, the idea of this symposium was born. Its purpose is to examine the merits, both pro and con, of using several types of waste materials as one of the components in the production of hot-mix asphalt (HMA). The objectives of the symposium are fourfold, namely:

- (1) To determine how waste materials should be processed and handled,
- (2) To determine how various waste materials can be physically added to the asphalt mix,
- (3) To determine the effects on mix properties and performance, and
- (4) To determine the resultant cost increase in the finished product.

For the past several years, there have been limited studies to incorporate some of these waste materials into HMA. Materials involved to date include ground rubber tires, ground glass, asphalt shingles, contaminated sand/soils, incinerator ash, and various kinds of waste polymers. There are perhaps other waste materials that could be included in similar studies in the future. One governing criteria would be the quantity of material available for use. There must be a sufficient amount and a continuous supply in order for a specific material to be considered for use.

There are two primary factors that must be taken into account when the matter of incorporating waste materials into hot-mix asphalt are considered. One consideration is cost; there needs to be a balance between disposal of the waste material in the normal manner as compared to incorporation into the hot-mix asphalt. A second consideration is the effect on quality and performance of the HMA. It would be poor economics indeed to incorporate a waste material that substantially increases the cost of the HMA and at the same time shortens the service life or increases maintenance costs. Considerable additional research needs to be accomplished before we have satisfactory answers to these questions.

With the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) in Dec., 1991, a mandate was issued in Section 1038 that beginning in Jan. of 1994, ground automobile tires will be used in hot-mix asphalt. This act requires that at least 5% of Federal Aid hot-mix projects in 1994 must include some form of rubber tires. The percentage of Federal Aid projects requiring rubber will increase to 10% in 1995, 15% in 1996, and 20% in 1997, and each year thereafter. The ISTEA requirement stipulates that at least 20 lb of ground rubber per ton of asphalt mix shall be used. Each automobile tire produces approximately 12 pounds of available rubber for use in HMA.

Rubber tires, per se, probably offer the greatest potential for incorporation of a waste material. Reports indicate that there are about 3 billion tires currently in scrap heaps with about 240 million tires added each year. No longer can they be thrown into landfills or garbage dumps but must be transported to an approved disposal site. It has become normal

practice for many agencies installing new tires on a vehicle to charge a fee to dispose of the old tires. Hopefully, an economic balance can be developed between using the scrap tires in HMA and the cost of their disposal through other approved means.

There are concerns, however, with respect to the unknown health effects on construction workers who may ingest fumes from asphalt-rubber mixes. Also, it is not known at this time whether pavements containing asphalt-rubber can be recycled to substantially the same degree as conventional HMA pavement; further, there is inadequate engineering data to predict performance of asphalt-rubber mixes. So, while there appears to be much potential for usage, there are many unanswered questions that must be resolved before a full endorsement by government and EPA authorities can be given.

Section 1038 of ISTEA requires the Secretary of the Department of Transportation (DOT) and the Administrator of the Environmental Protection Agency (EPA) to coordinate and conduct, in cooperation with the states, appropriate studies to provide answers to these questions. Such a report is due to Congress no later than 18 June, 1993. In view of these unanswered questions, The National Asphalt Pavement Association and the Asphalt Institute have made a formal request for a three year delay in the implementation of these ISTEA provisions. There may be an element of risk to move forward as planned until the industry concerns as stated have been properly addressed. Approval of this request should allow sufficient time for more comprehensive studies to be made.

Additional research should be initiated to provide indepth studies of the multitude of other available waste materials. We must have assurance that no waste material introduced into HMA will have a negative environmental impact, nor will it put construction workers at risk with respect to possible health effects. Leaders within the hot-mix industry have voiced strong concerns that our roads and pavements not become a dumping ground for waste materials simply to ease the burden of disposal or to comply with an unwarranted federal or state legislative requirement. There must be distinct, identifiable advantage(s) if any waste material is to be effectively used in HMA. We can ill afford to produce only "Trashphalt."

In an attempt to conserve both energy and materials, various kinds of recycling programs have been adopted by many public agencies. It is not uncommon to see collection bins scattered throughout major cities wherein wastes are separated into different categories. Some cities have established comprehensive recycling programs in an attempt to reclaim glass, aluminum cans, newspapers, and the like. New and innovative approaches must be developed from both an energy conservation and materials resources viewpoint. As an example, the New Jersey Department of Transportation (NJDOT) is offering HMA contractors a \$1.00 per ton incentive on state paving jobs to include between 5 and 10% glass in either asphalt base or binder. NJDOT specifications allow up to 50% glass in these mixture types.

One must keep in mind the possibility of potential liability when new, nonstandard materials are used in the asphalt mix production process. Unexpected lawsuits may be a result. Further, the mix properties and specification requirements cannot be compromised to accommodate waste materials. The final answer with respect to mix performance and life cycle cost analysis will require a considerable time period before the economic feasibility and production procedures for using waste materials in HMA can be fully evaluated.

The reports contained in this Special Technical Publication (STP) are a major step in developing an understanding of some of the complexities associated with using waste materials in HMA. More research needs to be undertaken before specifications clearly defining the role of waste materials in the pavements construction industry can be developed. At this point, there appears to be significant economic potential for effective use of many of our waste materials.

NOTE—As a result of the widespread interest shown in this symposium, ASTM is considering the formation of a new Committee entitled “Waste Materials.” Subcommittees would be formed to deal with each individual type of waste material.

H. Fred Waller

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chairman.

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