

# EVALUATING THE USE OF WASTE MATERIALS IN HOT-MIX ASPHALT

## EVERYTHING INCLUDING THE KITCHEN SINK

**W**aste management is becoming an ever-increasing problem in the United States and throughout the world. Few of us really appreciate the magnitude of the overall problem because we see so little nondomestic waste. Recent estimates are that 4.1 billion metric tons (4.5 billion tons) of solid waste are generated every year in our country—approximately 14 metric tons (15.4 tons) for every man, woman, and child.

The hot-mix asphalt industry has been challenged to incorporate a wide variety of waste materials into highway projects—everything from toilets to tires. Industry representatives have voiced concern about increased costs, possible worker risks, and potential environmental impacts, as well as the long-term performance of pavements that contain waste materials. As the direct employers of an estimated 300,000 people in the United States, members of the hot-mix asphalt industry want to ensure performance of their product and the safety of their employees. At the same time, the industry can be a partner in helping to solve society's difficult waste problem.

### TWO DECADES OF ASPHALT RECYCLING

"Asphalt, more than any other single product, sustains the nation's highways and facilitates the flow of commerce and personal mobility. As the nation increasingly focuses on the rehabilitation of roads, dollars spent on asphalt and the importance of this product to the nation's economy and lifestyles increase proportionally."

These words were used in 1984 to begin the effort that became the Strategic Highway Research Program. The hot-mix asphalt industry continues to support this philosophy and strives to build high-performance pavements, based on this guiding principle for materials and processes. The industry is diligent in ensuring that the aggregates and asphalt cement used in its pavement are of the highest quality. Testing for adherence to rigid specifications is performed before and during production of hot-mix asphalt to ensure that the right materials are used to produce the best product.

The industry has supported recycling for a long time, especially the recycling of hot-mix asphalt pavement, and encourages continued research in this area. Large-scale recycling began in the industry in the 1970s and has been growing ever since. The Federal Highway Administration and Environmental Protection Agency recently reported to Congress that 91 million metric tons (100 million tons) of reclaimed asphalt pavement are recovered annually, with 73 million recycled into highway applications. That means 73 million fewer metric tons (80 million tons) of landfill space are used each year. In addition, using reclaimed asphalt pavement reduces the use of asphalt cement and aggregate. Hot-mix asphalt is a 100 percent recyclable product and is designed to be that way.

However, the inclusion of waste materials in hot-mix asphalt pavement affects the entire production process. Proper evaluation of all materials before inclusion in hot-mix asphalt is critical. Certain waste materials in the mix could render the material unrecyclable and present an unwelcome burden to an already overloaded landfill system.

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## 3 AREAS OF CONCERN

The hot-mix asphalt industry has three specific areas of concern regarding the potential use of waste materials in highway projects: engineering, environmental impacts, and economic considerations.

### 1 ENGINEERING

Clear definitions must be developed to describe what a waste material is, when it becomes a waste, and when it ceases to be a waste. Any waste material introduced into hot-mix asphalt replaces a conventional material and could change the properties of the end product. A thorough analysis of both the asphalt and the pavement structure must be performed when the use of waste materials is proposed. Evaluation of waste materials must include sound technical studies and field demonstrations. Appropriate evaluations must be performed before use to determine if any changes will occur and to evaluate the impact of use on performance and maintenance. Five major areas of engineering concern in the reuse of waste materials are storage and handling, processing, mixture requirements, supply, and performance.

### 2 ENVIRONMENTAL IMPACTS

Hot-mix asphalt is produced at temperatures ranging from 121 to 163 degrees Celsius (250 to 325 degrees Fahrenheit) before placement in pavement. Facilities that produce the material operate under strict emission and environmental controls. Waste materials added during production may change the process, producing undesirable results.

Proper handling and processing practices must be developed to assure that no contamination of the site or surrounding neighborhood waterways, land, or air will occur from the use of waste material. Waste materials added to highway projects must not leach out and contaminate storm-water runoff from the roadway, nor pose any health risks to the construction workers or general public using the facility. The four major environmental concerns related to the use of waste in hot-mix asphalt are safety, potential by-products, liability, and public relations.

### 3 ECONOMIC CONSIDERATIONS

Mandated use of waste products may raise the price of construction and decrease the number of miles resurfaced and repaired. Short-term and long-term economic impact studies must be made to determine the impacts on service life and performance. If a pavement including waste materials cannot be recycled in future years, the cost of contaminated-pavement disposal would be staggering. The hot-mix asphalt industry wants to ensure that "linear landfills" are not being built.

The major economic concerns related to the use of waste in hot-mix asphalt are equipment, performance, political issues, and alternative disposal options.

## RESEARCH AND TESTING NEEDED

The National Asphalt Pavement Association, representing the hot-mix asphalt industry, promotes the use of quality products and recognizes that this pavement is under intense scrutiny as a way to dispose of solid wastes. However, NAPA believes several key issues must be addressed relative to the use of waste materials in hot-mix asphalt:

- Use of waste materials in highway construction should not be mandated; they should be used because they provide appropriate engineering performance and are driven by market demand.
- The waste material used in highway construction should not be subsidized by the highway user; it must be cost-effective in its own right or be subsidized by other sources.
- The waste material should perform as well as or better than conventional materials.
- The waste material must be environmentally secure both for present-day construction and future recyclability.
- The use of waste materials in pavement construction should not place any element of the industry at a competitive disadvantage.

Any use of a waste product must be thoroughly researched with respect to worker risk, cost-effectiveness, performance, recyclability, and potential for emissions and fume generation during handling, storage, manufacture, placement, and future recycling operations. Use of waste materials in hot-mix asphalt should be the result of research, field performance, and verification, and should be used only in the best interests of the United States.

In order to fairly and uniformly assess waste materials, a protocol of standards and test methods is needed for the evaluation and testing of waste materials proposed for use in hot-mix asphalt pavements. This protocol should address engineering, environmental, and economic concerns. Such a common-sense protocol would provide an opportunity for any waste material to be fairly evaluated for inclusion in hot-mix asphalt pavements.