U.S. Department of Transportation

Federal Highway Administration

RESEARCH PAYS OFF

Asphalt Pavement Recycling

Editor's note: *Previously, this section of* TRNews *has generally focused on an individual research project and examined the costs and benefits of that single project. Frequently, however, the scale and complexity of the problem is so great that no one research project can be credited with providing the solution. Instead, the solution is the ultimate product of a research program encompassing many projects. Such is the case with this article on recycling. Individual projects were sponsored by state highway agencies; by the National Cooperative Highway Research Program; and by the Federal Highway Administration through Administrative Contract Research, Implementation Studies and Demonstration Projects. The FHWA essentially served as program coordinator.*

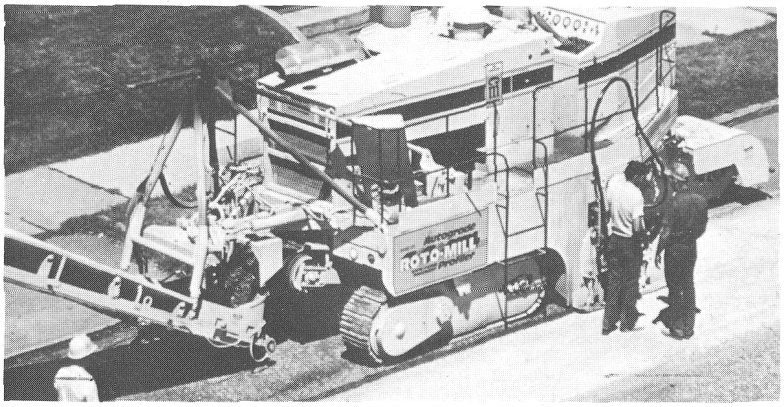
Ever since Henry Ford devised a cost-effective means for the mass production of automobiles, they have become an interwoven part of the national life style. To accommodate the growing automobile population, a vast network of interconnecting hard-surface highways was created. These highway systems now provide us with a means—sometimes the only means—of getting to and from work. They also permit inexpensive transportation of the goods we produce on the job.

Problem Highways are important to the survival of the economy of any nation; however, U.S. paved highways are wearing out faster than they can be repaired or replaced. With normal wear and tear, road surfaces must restored at varying intervals—which costs substantial sums of money. As highway costs continue to increase, highway engineers and administrators face increasing difficulty in stretching available funds to meet current resurfacing and restoration needs. Pavement deterioration under today's increasing traffic weight and volume is occurring at a faster rate than agencies had anticipated. The basic ingredients of blacktop pavement—asphalt and durable, skid-resistant aggregate—are becoming increasingly scarce just when they are needed most.

Solution Historically, pavement resurfacing or replacement has been a major budget item for highway agencies. Beginning with the Surface Transportation Assistance Act of 1982, state and federal highway agencies have dedicated more and more funds to the restoration and rehabilitation of the American highway network. However, it has become apparent that the planning, design, and construction of improvements must emphasize the most efficient and cost-effective processes and materials available. A most promising approach that has evolved in recent years has been that of the roadway recovery concept, better known as "recycling." This approach involves the reuse of existing roadway materials in the reconstruction of a pavement to the structural design required for future traffic needs.

The driving force behind any resource recovery operation is economics. In the past, new materials for highway construction and maintenance operations were generally plentiful and readily available at reasonable prices. Under those circumstances, recycling simply could not be economically justified. During the past decade, however, this situation has changed dramatically.

In those areas where quality paving aggregates have been scarce historically, the ever-increasing energy cost for transport has raised the price of imported or manufac-



Milling units used for recovering asphalt for recycling.

tured aggregate to unacceptable levels. Energy costs at the quarry, modern environmental protection practices, and urbanization of source localities have also contributed to the rising cost of quality paving aggregate. Similarly, the cost of asphalt has climbed astronomically in the last 10 to 12 years.

These factors made asphalt pavement recycling attractive, but before recycling could become a standard procedure for highway agencies, many questions had to be answered through the application of research. These questions included: How can the recycling potential of existing pavement be evaluated? How much virgin aggregate and asphalt should be added to the recycled mix? Are rejuvenating agents required to restore "life" to weathered asphalt and, if so, what types and amounts? What are the relative merits of hot and cold recycling and when is each appropriate? How is construction quality control to be conducted? State, federal, and other highway research agencies undertook an extended sequence of research projects to answer these and other questions. The result was the development of current recycling methods.

Application and Benefits The recycling of asphalt pavements offers tremendous potential for cost savings. In 1981 the state of Michigan documented savings of $7 per ton of mix, and in Wisconsin in 1982 savings exceeding $7.50 per ton were realized.

The cost of research, development, and demonstration of recycling by the Federal Highway Administration (FHWA) and the 41 participating states is estimated at about $5 million. Cost savings of about $2.50 per ton for 5 million tons of asphalt paving mixtures were recorded in a data bank maintained by the FHWA through 1981. Assuming that only half of the recycling jobs of that period were included in the data bank, a yield of $25 million savings, or a 5:1 cost/benefit ratio, for recycling research can be extrapolated. On the basis that recycled mixtures will probably be used in rehabilitating most of the distressed asphalt pavements, and that improved equipment and techniques are now available, the current savings could amount to more than $100 million—by the most conservative estimates.

In addition to stretching the nation's highway dollars, recycling of asphalt pavement offers other benefits. It allows for the conservation of energy and natural resources and, at the same time, preserves the environment and accelerates the pace of highway restoration. Preservation of highway geometrics is another benefit. Highway agencies do not have to adjust curb, sidewalk, or shoulder heights or grades on intersecting roadways to accommodate periodic overlays. The recycling process can accommodate changes in pavement cross section and superelevation and reduces the need for scratch or leveling courses. Because the process creates a tabular surface to accept the overlay, compaction is also enhanced, which results in a more uniform and durable surface.

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