

## **Can You Afford Not To Use RAP? The Case for Using Reclaimed Asphalt Pavement**



**The reclaiming of asphalt pavement begins with the milling of an existing road surface. It is estimated that Ohio contractors reclaim 2.6-million tons of asphalt pavement per year.**

After several successful trial projects in 1980, ODOT specifications have permitted the use of reclaimed asphalt pavement (RAP) in all mixes beginning with the 1981 construction season.

ODOT revisited the issue with an experimental project in 1995 on Interstate 71 in Madison and Pickaway counties (project 214-95), which showed no discernable difference in performance of the mix containing RAP from the all-virgin material control mix. However, despite this nearly 25 years of satisfactory experience, some specifying agencies still restrict the inclusion of RAP, sometimes only in the surface course, sometimes in all courses. Some may believe that using RAP will contribute non-specification size aggregates to the mix, resulting in paving and finish problems. Some may be concerned about non-specification quality materials, either the aggregate quality or the grade of the binder. However, extensive research and experience have shown that RAP-incorporated asphalt concrete mixes can equal or exceed the specifications for hot-mix asphalt (HMA) mixes made with all virgin materials.

We could cite any number of studies that have proven the viability of incorporating RAP into new HMA. We'll mention just a few here:

A quote from Federal Highway Administration, Publication No. FHWA-SA-95-060, reads, "Pavement performance and detailed evaluations indicate that recycled HMA that is designed and controlled during production will perform comparably to conventional HMA and can improve material properties of the existing pavement layer."<sup>1</sup>

Another study, reported in the *Journal of the Association of Asphalt Paving Technologists* concluded, "In general, this study found that recycled pavements containing reclaimed asphalt concrete materials in the range of 20 to 50 percent by weight of the mixture in both binder and wearing course mix performed similarly to conventional pavements selected to be of similar section and mix design, traffic and (if possible) constructed by the same contractor."<sup>2</sup>

A study done at the National Center for Asphalt Technology analyzed the effects of using RAP on the quality of binder in asphalt pavement mixes in Georgia. The conclusion reads, "No statistically significant differences were found between the recovered asphalt properties (penetration and viscosity) of these virgin and recycled pavements in service."<sup>3</sup>

The definitive study on the effects of RAP on binder quality was done under the National Cooperative Highway Research Program, Project 9-12, "Incorporation of Reclaimed Asphalt Pavement in the Superpave System." The final report

# Reclaimed Asphalt Pavement

includes the statement, "Use of RAP has proven to be economical and environmentally sound. In addition, mixtures containing RAP have, for the most part, been found to perform as well as virgin mixtures."<sup>4</sup>

And, a study of RAP quality done in Iowa<sup>5</sup> found that "even though the RAP is from private, commercial and other pavements, the documented uniformity permits use of significant portions in high quality asphalt mixes."

So, although the RAP may require some additional processing, it has been well documented that mixes using RAP can readily meet or exceed the specifications for all asphalt mixes. With that said, however, what is the incentive for using RAP in new asphalt paving mixtures?

Although environmentally speaking it's a worthwhile objective to minimize the amount of material which must be disposed of in landfills, the bottom line has to do with cost. Every customer



*RAP is hauled back to the HMA plant and stockpiled for processing into new HMA.*

is aware that the costs of construction, including asphalt paving, have been heading upward, as increasing fuel costs impact all construction and manufacturing. In a recent customer survey conducted by FPO along with several customer groups, cost was listed most frequently as the major problem facing agencies in improving the quality of their pavements. Well, the use of RAP not only saves the cost and environmental problems associated with disposal, but, it actually reduces the cost of producing new HMA.

How does the use of RAP reduce the cost of manufacturing an asphalt paving mixture? First, because the owner requires the removal of the deteriorated pavement before resurfacing, RAP is most often reclaimed by milling one or more layers from an existing pavement. Thus the RAP is generated as a necessary part of the rehabilitation process. This material must be



*RAP from the stockpile is loaded across a coarse screen into the RAP cold-feed bin.*

**"50 years of safety on the road"**

**TRAFFIC CONTROL AND SAFETY MATERIALS**

OVER 50 LOCATIONS SERVING 20 STATES PROVIDING ROUND-THE-CLOCK SERVICE

- Sign & Sign Stands
- Solar Sign Stand
- Safety Equipment
- Plastic Fencing
- Barricades
- Fitch Inertial Barriers
- Plastic Drums & Cones
- Solar Message Centers
- Solar Advance Warners
- Truck-Mounted Attenuators
- Warning Lights & Batteries
- Temporary Pavement Markings
- Glare Screen
- Delineators
- Reflectors
- Work Area Lighting

**Sales, Rental, and Lease Purchase of  
Work Zone Traffic Control Equipment and Services  
Installation Specialists**

**PROTECTION SERVICES INC.**

John Gannon	Steve Fisher	Chuck Blevins
Cleveland	Columbus	Cincinnati

**"Toll Free" 1-866-489-1234**

Protection Services Inc., a Division of Stabler Companies Inc.  
(717) 236-9307 • 635 Lucknow Road, Harrisburg, PA 17110  
[www.protectionservices.com](http://www.protectionservices.com)



*RAP is then conveyed through a set of secondary, vibratory screens.*



*After processing, the RAP being conveyed to the mixing drum is a very uniform product.*

disposed of or stored for re-use or recycling. If recycled into new HMA, the RAP can replace an equal weight of virgin aggregates and asphalt. Most of the savings comes from reclaiming the relatively expensive asphalt binder contained in the RAP. The range of savings realized by incorporating RAP has been reported to be 14 percent for 20-percent RAP utilization to 28 percent for a 40-percent RAP mix.<sup>6</sup> Clearly, using more RAP is the way to reduce the cost of asphalt paving.

Presently, only more-moderate amounts of RAP are commonly used in producing HMA. Older Types of asphalt plants are incapable of processing more than about 10 percent RAP into new specification material, while the most modern double drum and counter flow drum mixers may be capable of processing up to 40 percent. With such a strong

financial incentive, advances in technology will certainly continue to increase the industry's ability to use greater percentages of RAP in new mixes.

Our path for the future is clear. To keep costs within the public's purchasing power, we must implement the continually improving technology to increase our use of reclaimed materials, while paying careful attention to our quality assurance in order to see that quality is maintained. In this way we can continue to offer the greatest value in pavement to our customers. Conversely, to realize the greatest economy, owner agencies should adopt specifications that allow the use of RAP with appropriate quality control provisions to ensure that quality is not compromised.

*References:*

- 1) U.S. DOT, Federal Highway Administration, Publication No. FHWA-SA-95-060, "Pavement Recycling Executive Summary and Report," March 1996, John Sullivan.
- 2) *Journal of Asphalt Paving Technologists*, Volume 65, "Evaluation of Recycled Projects for Performance," 1996, Harold R. Paul.
- 3) National Center for Asphalt Technology Report, 95-1, parts 1 and 2, "Performance of Recycled Hot Mix Asphalt Mixtures," 1995, Kandhal, Rae, Watson and Young.
- 4) NCHRP Web Document 30 (Project 9-12): Contractor's Final Report, "Recommended Use of Reclaimed Asphalt Pavement in the Superpave Mix Design Method," October 2000, McDaniel, Soleymani, Anderson, Turner and Peterson.
- 5) National Asphalt Pavement Association, *HMAT* magazine, Vol. 2 Issue 2, "The Quality of Random RAP, Separating Fact from Supposition," 1997, Robert M. Nady, PE.
- 6) *Journal of Asphalt Paving Technologists*, Volume 66, "Recycling of Asphalt Pavements-An Overview," 1997, Kandhal.

*Other reference:*

National Asphalt Pavement Association, Information Series 123, "Recycling Hot Mix Asphalt Pavements," 1996, Young.