



RAP can be introduced into the mix via an integrated, in-line feeding system.

Recycling Benefits for HMA Producers

Today's hot mix asphalt (HMA) producers are constantly trying different methods to improve asphalt quality and increase profits while satisfying state specifications. One means of accomplishing this goal is by incorporating reclaimed asphalt pavement (RAP) into the asphalt mix.

RAP is typically produced by milling an existing asphalt pavement or by crushing chunks of an old pavement that has been removed. Through the years, completed

projects containing RAP have been cost effective and long lasting. As a result, most agencies now allow RAP in their highway mixes.

Contractor Perspective

HMA producers can use RAP with relatively inexpensive additions to their mixing plants. For Doug Fog, Plant Operations Manager for Brooks Construction, recycling is a critical component of his operation. "Recycling is extremely important to us. We view it as a tremendous commodity for Brooks. We have eight plants and we use RAP at six of them. So it is a big part of what we are doing," stated Fog.

Like many contractors, Brooks Construction relies on the use of RAP to gain more access to state highway job opportunities. "Our state allows recycling on many of the larger highway jobs and if you want to get those, you better run RAP," said Fog. The key to using RAP successfully, according to Fog, is to be smart about it.

In order to maximize the efficient use of RAP, Brook Construction manages the reclaimed materials. "We separate our RAP stockpiles so that they are ready to use in specific mixes. We have stockpiles

of surface, intermediate and base grades and we try to use them properly. For example, the surface grade has a high AC content. And the RAP has the same top size as the mix's virgin aggregate, which makes it very easy to use," stated Fog.

Methods of Recycling

The most common method of recycling is through heat transfer. RAP is added to superheated aggregates, typically 450-plus °F—depending on atmospheric pressure, moisture content, ambient temperature and type of aggregate. This heat transfer process can be accomplished in either a batch or drum mixing plant.

There are several methods of batch plant recycling. The most commonly used method is to introduce RAP from a separate bin and feed it into a pug mill or weigh hopper via belt conveyor and chute. Up to 40 percent RAP can be recycled using this method. The factors that can affect the production rate include altitude, virgin aggregate type, ambient temperature and dryer efficiencies.

Another, less commonly used, RAP-entry method is through the bucket elevator. When using this method, some contractors remove the screens from the batch tower and feed RAP up the elevator. This method can be successful provided some additional proportioning control is in place. This method enables the contractor to operate his batch plant somewhat like a drum mix plant.

A batch plant modification may be necessary to deal with steam that is generated when the virgin aggregate comes into contact with cold, wet RAP—culminating in a steam explosion. The contractor may have to add exhaust duct work to

vent the steam back to the dryer's exhaust stream and pollution control equipment.

Drum Mix Recycling

Like batch plant recycling, there are various methods used for adding RAP in a continuous mix, or drum, plant. The most common method is the center-entry method. RAP is introduced to the drum downstream and away from the burner flame, and is protected by a dense veil of virgin aggregate that provides a shield from direct exposure to the burner flame. Asphalt is then blended into the final mix by the mixing drum's flighting systems and steel dams. If properly accomplished, this method can accommodate up to 50 percent RAP.

Other methods of recycling with a drum plant include the use of a secondary drum or by using a pugmill. Some contractors have elected to use a plant having a secondary mixing drum after the virgin aggregate

has been heated in a separate dryer. The dried aggregate is discharged from the dryer to a blending drum where the RAP, asphalt binder and fillers are all blended together before discharge into a silo system.

A pugmill can be used in much the same way as a blending drum. Virgin aggregate, RAP and filler are mixed together away from exposure to the burner flame thus eliminating the problems that exist in some continuous mix plants.

Multiple Benefits

In addition to the obvious benefits of reducing production costs and providing an HMA mix that is equal to or better than a virgin mix, recycling asphalt pavements have the added environmental



A secondary mixing drum that is used to blend the RAP and virgin components is shown on the left. The primary dryer is on the right.

benefits of:

- Reusing valuable, and perhaps scarce, aggregates;
- Reducing the amount of virgin asphalt binder needed; and
- Conserving valuable landfill space from unnecessary disposal of old asphalt.

Thus, using RAP provides multiple benefits—cost savings, conservation and long lasting pavements. ▲

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