We know recycling is a topic reaching a fevered pitch for news outlets as of late, but asphalt contractors, producers, and researchers have been targeting the proper re-use of materials for decades. Preserving and then re-using a portion of a pavement system saves resources and energy, but we want a quality result from such efforts. Enter recycling agents, which help restore performance properties to the binder in reclaimed asphalt pavement (RAP).

“In I think we’re going to see more agencies allowing higher RAP quantities,” said Joseph Shacat, NAPA Director of Sustainable Pavements. “The questions of ‘How do we design the mixes?’ and ‘Do we use a recycling agent?’ – that’s a hot topic. That’s an area that needs continued work. Performance testing with a balanced mix design approach may give us the ability to innovate and explore areas like high RAP designs and still give agencies confidence.”

Minnesota Department of Transportation (MnDOT) Asphalt Research has bolstered its confidence by adding rejuvenators as a new tool to help achieve pavement preservation.

In August 2019, MnDOT sent to construction a project using high RAP percentages and dosing with a liquid rejuvenator to restore the recycled asphalt binder. Paul Nolan, Project Supervisor for MnDOT materials and road research, shared that the agency has become proactive with the use of rejuvenators. “Minnesota Highway 95 is the latest location the MnDOT research group has placed a test section to monitor their performance,” Nolan explained. Just southeast of St. Paul in Washington County, Hwy. 95 is a two-lane dividing line between the city of Cottage Grove and Denmark Township and has an average daily

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By Sandy Lender
RAP in Minnesota

Traffic of 4,600 to 6,000, according to Nolan, “with a fair amount of construction vehicles.”

Reconstruction of Hwy. 95 has been a multi-year project, with a 4-mile section reconstructed in 2018 just north of the 2019 test section discussed herein. All the data collected will be submitted and will better aid in MnDOT’s product evaluation process. “It will be interesting to compare the first winter cracking to each of the newly reconstructed segments,” said Nolan. The four new segments include two constructed in 2019: a control section with MnDOT’s standard SPWEB340C Superpave mix with a 58-34 binder package and a test section with a 48 percent RAP mix dosed with 2.6 pounds of Collaborative Aggregates’ Delta S rejuvenator per ton of finished asphalt mix. While primarily a recycling agent, Delta S also functions as a warm mix additive, allowing reduced mix production temperatures. The National Center for Asphalt Technology (NCAT), which coordinated with Commercial Asphalt to perform lab work, recommended the mix design dosing.

Commercial Asphalt-Empire Plant used its 600 tph counterflow drum plant with an Ultra II burner to produce the mixes. “An additive inlet port on the plant’s binder feed line was already in place. 270-gallon totes of Delta S were hooked into the feeder line and calibrated with a small feeder pump,” Nolan explained. “This process was temporary, but very easily could be made into a permanent part of the plant relatively inexpensively.”

Commercial Asphalt produced a 100-ton test run on July 23 and stored it overnight in the silo. Park Construction paved it July 24 – approximately 26 hours after its production. This first run of high dosed RAP mix was placed as a base course, and the mix laydown temperatures ranged from 310 to 280 degrees.
Fahrenheit. Park Construction used its rubber tire roller as the breakdown, followed by a vibratory steel roller.

The balance of the paving, performed on Aug. 20, 2019, was the wear course. Park Construction used a rubber tracked paver to place approximately 1,400 tons of 48 percent RAP mix dosed with Delta S asphalt rejuvenator on southbound Hwy. 95. Park then placed 1,400 tons of conventional Superpave mix on the northbound lanes. Breakdown rolling was performed with three passes of a pneumatic tired roller, intermediate with two passes of a vibratory steel drum roller, and finish rolling with a steel drum roller. “Having the highest dosed RAP mix and the conventional Superpave mix side by side done in the first years will work out fine,” Nolan said. “We will just have to wait to see how the mid-ranged RAP products perform another year.”

It’s not surprising that agencies like MnDOT seek solutions for making use of RAP stockpiles. “Our RAP piles are nothing like they have in, say, California. They’re big, but manageable,” Nolan shared. Shacat pointed out that an agency’s urgency to specify the use of RAP necessarily depends on available materials. “When you look at the RAP stockpiles, it varies by region. Urban areas tend to do more milling and filling than just overlaying because they have curb and gutter to match,” he explained. “This translates to more stockpiled millings. Cities tend to be driving the effort to allow higher RAP percentages, but some state agencies such as MnDOT are also considering higher RAP contents.”

Motivated to re-use and recycle the valuable ingredients of RAP piles, agencies are looking at how to restore and rejuvenate the best properties of the ingredients. Nolan pointed out that adding an asphalt rejuvenator isn’t the only part of the equation, listing several factors contractors can control to ensure success, such as maintaining your equipment, training workers, and performing due diligence in producing a quality job mix formula.

“You need to put effort forward in each of these areas,” he said. “Once that is achieved, adding the rejuvenator will also assist with elements that are out of your control [such as traffic conditions slowing haul truck delivery] and you will get the benefit of having a product that is able to absorb a wider range of placement temperatures.”

Sandy Lender is the editor of AsphaltPro Magazine and part of the trailblazing team that originated the how-to information concept in asphalt industry publishing.