

# DIXIE CONTRACTOR



**Growing RAP Stockpiles  
Prompt Georgia Road Experiment**



A Caterpillar rubber tired roller performs intermediate compaction on trial surface course pavement.



All asphalt mixes for the experiment were produced at C.W. Matthews' Forest Park, Georgia facility, an Astec drum mix plant capable of delivering up to 500 tons per hour.



Clayton Plemons, left, Quality Control - General Superintendent (Central Region), and Andrew Brooks, General Manager, discuss experimental mix designs.



A ROADTEC RX 600E Cold Planer mills off 1-1/2 inches of existing pavement of Georgia State Route 42 Spur in preparation for trial wearing surface installation.

# INDUSTRY-WIDE IMPACT

*C.W. Matthews Tries Uncommonly High Recycled Asphalt Surface Paving in a Demonstration That Could Advance Efforts to Reduce National RAP Stockpiles*

By Paul Fournier



**T**he performance of trial highway pavement installed by a Georgia contractor seeking to reduce its stockpiles of recycled asphalt pavement (RAP) may have important ramifications for industry-wide efforts to slash growing national inventories.

C.W. Matthews replaced standard hot mix asphalt (HMA) planned for portions of Georgia State Route 42 Spur with experimental wearing surfaces. The trial mixes contained up to 50 percent RAP content and various percentages of liquid asphalt binder with, and without, an asphalt rejuvenator. A rejuvenator is included as part of the experiment to monitor its effectiveness in offsetting the lower crack resistance of aged embedded asphalt that makes these pavements crack prematurely.

The test sections are located near Metro-Atlanta on the two-lane highway and experience an average daily traffic count of less than 10,000. These sections had already been scheduled for 1-1/2 inch pavement mill-and-fill as part of a standing contract

with the Georgia Department of Transportation. The switch in mix design was allowed under a contract supplemental agreement.

### Accumulating RAP

C.W. Matthews hopes to develop a mix design that uses high-RAP content but doesn't cause the premature cracking associated with such mixes. The contractor has an enormous inventory of RAP they would like to draw down, according to Clayton Plemons, Quality Control – General Superintendent (Central Region).

“We have about 200,000 tons of RAP stockpiled here, and approximately 3 million tons of RAP spread internally across 25 of our plants in Metro-Atlanta,” said Plemons, speaking from the company's highest capacity asphalt plant, located in Forest Park. He added that Matthews processes all of its stockpiled RAP.

C.W. Matthews' growing RAP piles are indicative of what's happening nationwide. According to the National Asphalt Pavement Association (NAPA) 2018 Annual Asphalt Pavement Industry Survey, more RAP was used than was

received during years 2012 through 2015, indicating that producers were drawing upon RAP stockpiles for pavement construction.

However, in 2016 the trend changed and more RAP was being stockpiled by producers than was being used. The amount of RAP stockpiled nationwide increased from about 94 million tons at the end of the 2016 construction season to approximately 102 million tons at the end of the 2017 construction season. Furthermore, RAP inventories are still growing. Nationwide, producers are incorporating about 21 percent RAP in HMA applications, but apparently this isn't enough to draw down inventories. The industry as a whole is now focusing on ways to increase the use of RAP in HMA pavement.

### Federal, State, NCAT Support

FHWA fully supports using recycled materials such as RAP and RAS (recycled asphalt shingles) in asphalt pavements because the practice conserves raw materials and reduces overall asphalt mixture

costs, as well as reduces the stream of material going into landfills.

Plemons said the company sees the potentially high-value of RAP for contributing liquid asphalt binder in the production of asphalt mix. But they also realize that asphalt in post-consumer RAP is highly oxidized, so they need to find a way to offset the brittleness.

The Georgia DOT is similarly interested in helping industry use more RAP effectively. The Agency agreed to work with the contractor in setting up the trial field demonstration. Help was also provided by the National Center for Asphalt Technology (NCAT), which agreed to support the demonstration by designing the trial asphalt mixes. Raymond “Buzz” Powell, PhD, P.E., Assistant NCAT Director, has overseen similar experiments on high-RAP-content HMA pavements, both with and without asphalt rejuvenator.



CWM crew monitors addition of Delta S asphalt rejuvenator directly through the top access dome cover of a tank truck containing PG 64-22 liquid asphalt.

### Preventing Premature Cracking

The Matthews experiment involved two 12-foot westbound lanes and one eastbound 12-foot lane. The HMA design was a 1/2-inch SUPERPAVE for 1-1/2-inch thick surface course inlay. This is a dense-graded mix with a nominal maximum aggregate size of 1/2 inch, and about 7 percent fines (passing #200 sieve). Each section used PG 64-22 liquid asphalt binder. Tonnages of inlaid mix are provided instead of section lengths to quantify comparisons.

The asphalt rejuvenator selected for use in this field demonstration was Delta S, a non-toxic, organic plant based, liquid chemistry designed to help prevent premature cracking of pavement containing high percentages of RAP and RAS. Marketed and supplied by Collaborative Aggregates LLC, an affiliate of Wilmington, Massachusetts-based Warner Babcock Institute for Green Chemistry (WBI), Delta S was invented by WBI researchers. In this application, the dose rate for the Delta S rejuvenator was 2.8 pounds per ton of HMA.

As part of this experiment, researchers hope to be able to measure performance advantage that an asphalt rejuvenator can provide to asphalt mix designs, allowing higher RAP content for pavement preservation purposes.

### Trial Mix Designs

C.W. Matthews had previously produced a 35 percent RAP SUPERPAVE design Georgia DOT approved, so the contractor already had a design it could use as a control for comparisons in the field demonstration experiment.

Other elements of the designs were as follows (combined asphalt binder percentages include virgin asphalt and asphalt contributed by RAP):

#### Section 1:

- Control Section 35 percent RAP HMA
- Combined liquid asphalt binder 5.5 percent

- 611 tons placed on westbound lane

#### Section 2:

- 50 percent RAP HMA with Delta S asphalt rejuvenator
- Combined liquid asphalt binder 5.7 percent
- 613 tons placed on eastbound lane

#### Section 3:

- 50 percent RAP HMA with elevated liquid asphalt binder content
- Combined liquid asphalt binder 6.1 percent
- 672 tons placed on westbound lane

### High-Capacity Double-Shift Production

All asphalt mixes for the experiment were produced at C.W. Matthews' Forest Park facility, an Astec drum mix plant capable of delivering up to 500 tons per hour but usually operated at 250 tons per hour. The plant has four, 300-ton Astec asphalt mix storage silos operated in pairs, and each pair has a weigh scale and discharge mechanism for loading trucks.

There are three, 30,000-gallon vertical, heated liquid asphalt tanks, all equipped with mechanized agitators. Bright Star Energy Inc., a terminal operation in Rockmart, Georgia, supplies liquid asphalt. The Georgia DOT standard liquid asphalt binder for roads experiencing less than 25,000 ADT (average daily traffic) is PG 64-22. For roads experiencing more than 25,000 ADT, PG 76-22, a more durable, polymer-modified liquid asphalt binder, is used.

Process equipment includes six, 30-ton cold feed aggregate bins, and two 20-ton RAP feed bins. All virgin aggregate is granite manufactured by Vulcan Materials. Another company located in Forest Park is contracted to haul HMA. Matthews operates two work shifts at the Forest Park facility: 6 a.m. to 6 p.m., and 6 p.m. to 6 a.m., including production and quality control personnel.

There is no blending mechanism at the plant for feeding additives to liquid asphalt. For the field demonstration, a plant production crew pumped the Delta S asphalt rejuvenator directly through the top access dome cover of a tank truck containing PG 64-22 liquid asphalt.

### Installing the Surface Courses

Asphalt mixes were manufactured at temperatures ranging between 290 degrees and 310 degrees Fahrenheit at the Forest Park plant and were hauled approximately 9.5 miles to the job site. Previously, a ROADTEC RX 600E Cold Planer had milled off 1-1/2 inches of existing wearing course. Dump trucks deposited HMA into a Weiler Materials Transfer Vehicle, which in turn conveyed the material to a ROADTEC RP-190E Paving Machine.

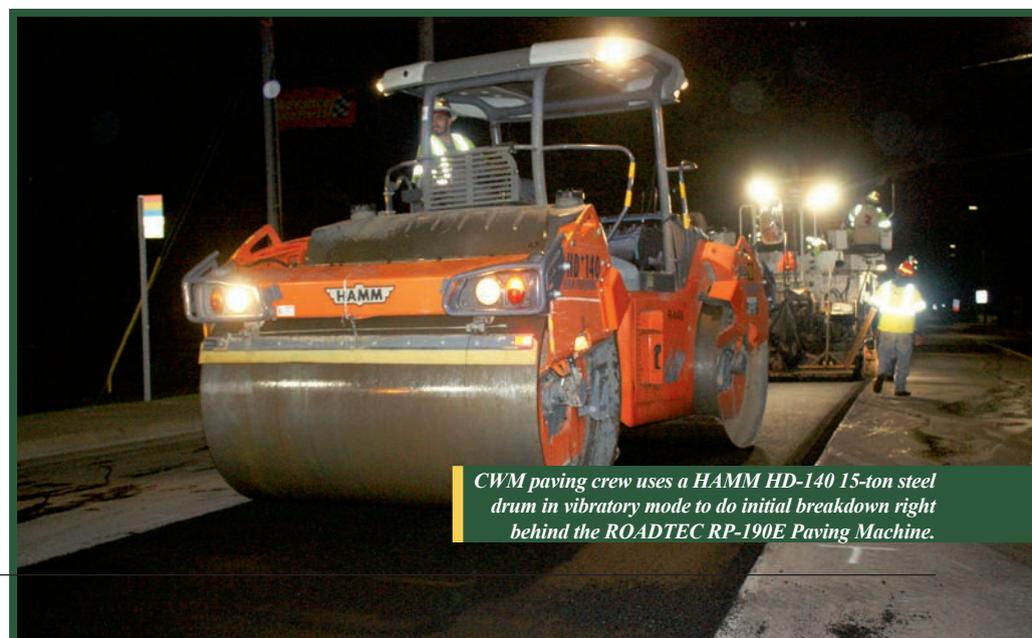
Compaction was performed by three rollers: a HAMM HD-140 15-ton steel drum in vibratory mode did initial breakdown; a Caterpillar RT rubber tired roller accomplished intermediate compaction; and a HAMM HD-90 10-ton steel drum roller in static mode performed finish compaction.

Work crews saw little difference in workability among the three mixes, said Plemons, with the exception that they noticed clumps and conglomerates of fines becoming evident in the mix at the second part of the operation of 50 percent RAP content mixes. This did not occur in the 35 percent RAP mix.

### Brighter Outlook for Stockpile Reductions

Plemons pointed out that Georgia DOT is expected to develop their own plan for monitoring the performance of the test sections. Meanwhile, NCAT will be generating data from the plant-produced mixtures to see if it aligns with the initial mix design data.

While Plemons hopes the field demonstration will help the company find a way to reduce their own RAP inventories, he feels the results may actually help the industry at large, by contributing to the development of high-RAP-content HMA designs with optimal percentages of RAP and liquid asphalt binder. This could minimize pavement cracking at optimum cost and help relieve burgeoning national RAP inventories.



CWM paving crew uses a HAMM HD-140 15-ton steel drum in vibratory mode to do initial breakdown right behind the ROADTEC RP-190E Paving Machine.