Alabama Tests Rejuvenator To Prevent Asphalt Pavement Cracking

By Paul Fournier

Alabama’s Department of Transportation is collaborating on an experiment with the National Center for Asphalt Technology (NCAT) and contractor Midsouth Paving to see if an advanced asphalt rejuvenator can prevent cracking of highway resurfacing mix containing large amounts of recycled asphalt pavement (RAP).

The applied research project involves resurfacing a 0.7-mile section of slow-lane in the northbound roadway of US Route 431 using a high-RAP mix dosed with Delta S, a newly commercialized, non-toxic asphalt rejuvenator.

ALDOT officials decided to try Delta S as a possible solution to early cracking occurring in the Department’s standard maintenance resurfacing pavement, which contains 20% RAP.

While rejuvenators in general can restore the original properties of asphalt binder to offset the lower crack resistance of aged embedded asphalt, they may contain derivatives of benzene, a toxic substance.

Delta S remedies this problem, since its chemistry is derived from organic plants and is harmless to humans and the environment, according to Collaborative Aggregates LLC. An affiliate of Warner Babcock Institute for Green Chemistry (WBI), Collaborative Aggregates manufactures, markets and sells engineered construction products developed by WBI labs. One of these is Delta S, designed to help prevent premature cracking of high-RAP content asphalt pavement.

Christopher Huner, P.E., Troy Area Materials Engineer for ALDOT’s Southeast Region, discussed the cracking issue with Raymond “Buzz” Powell, PhD, P.E., assistant NCAT director and manager for the Center’s 1.7-mile accelerated pavement test track in Opelika, Alabama.

Dr. Powell had experience with Delta S being used in test sections at the track and with lab analyses of the rejuvenator, and he suggested ALDOT try including it as part of one of their regularly scheduled maintenance resurfacing projects. This suggestion was
adopted by ALDOT and resulted in the rejuvenator trial taking place on a segment of US Route 431 in southeast Alabama that was part of a resurfacing contract with Midsouth Paving. It was further agreed that Dr. Powell would manage the design, production and paving for the project.

According to Alexander Murphree, Midsouth Paving’s quality control manager, the company produced liquid asphalt binder for the trial by adding 83 gallons of Delta S directly to 6200 gallons of PG 67-22 liquid asphalt, resulting in a 1.37% rejuvenator/binder blend. In the contractor’s 200-ton-per-hour drum mix plant this modified binder was combined with sufficient RAP and virgin aggregate to yield 450 tons of 20% RAP content, dense-graded, asphalt mix with a maximum size aggregate of ¾-inch and temperatures averaging 320°F.

Haul trucks arrived with mixes averaging 300°F at the test site, where 1-1/2 inches of existing pavement had been milled off and a tack coat of CSS-1h (cationic slow set) emulsion had been applied. The paving crew used a ROADTEC SB-2500D material transfer vehicle to convey asphalt mix from the trucks to the company’s ROADTEC RP 190E paver. A HAMM HD+120i roller operating in vibratory mode performed initial breakdown compaction right behind the paver, while a Volvo HD118HF roller in static mode provided finish compaction.

Midsouth Paving’s crew noticed that the Delta S-dosed RAP mix was more workable than the regular RAP mix. Furthermore, cores taken of the installed pavement indicated that while regular RAP pavement averaged 93.2 density, the cores of the Delta S RAP mix averaged 94.5 density. Lab tests also confirmed that the Delta S mix was more compact, with a bulk specific gravity greater than that of regular mix, indicating it had fewer voids.

Test paving was concluded in December 2017. Dr. Powell and NCAT personnel under his supervision are monitoring the performance of the Delta S modified RAP pavement, and will provide data gathered on the experimental mix to all stakeholders every six months for two years. The data will focus primarily on pavement ride quality, and any occurrence of cracking.