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Happy Holidays
ACP team

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FAILED TEST TRACK SECTION REPAIRED

A failed section of the National Center for Asphalt Technology Pavement Test Track in Alabama is rebuilt using Highly Modified Asphalt

By Paul Fournier

A failed section of the Pavement Test Track at the National Center for Asphalt Technology (NCAT) in Opelika, Alabama was recently repaired using Highly Modified Asphalt (HiMA) binder.

East Alabama Paving of Opelika recently repaired a section of the 1.7-mile test track, an Auburn University facility known for its asphalt pavement research and development, to correct severe pavement rutting and cracking. The paving contractor/asphalt mix producer has a contract with NCAT to construct, and repair if necessary, the 200-ft. sections of experimental pavements under the current 2009-2012 research cycle.

East Alabama Paving's ROADTEC Shuttle Buggy feeds hot mix asphalt containing HiMA binder to Blaw Knox paver during NCAT Test Track repair.

Forty-six sections are available to such sponsors as state transportation departments and private industry to install experimental sections for testing during each three-year cycle. NCAT personnel operate and manage the research track under assistant director/track manager Dr. Raymond (Buzz) Powell, P.E.

Section N8, sponsored by the Oklahoma Department of Transportation, failed early in the current 2009 research cycle. And this was not the first time the section had failed.

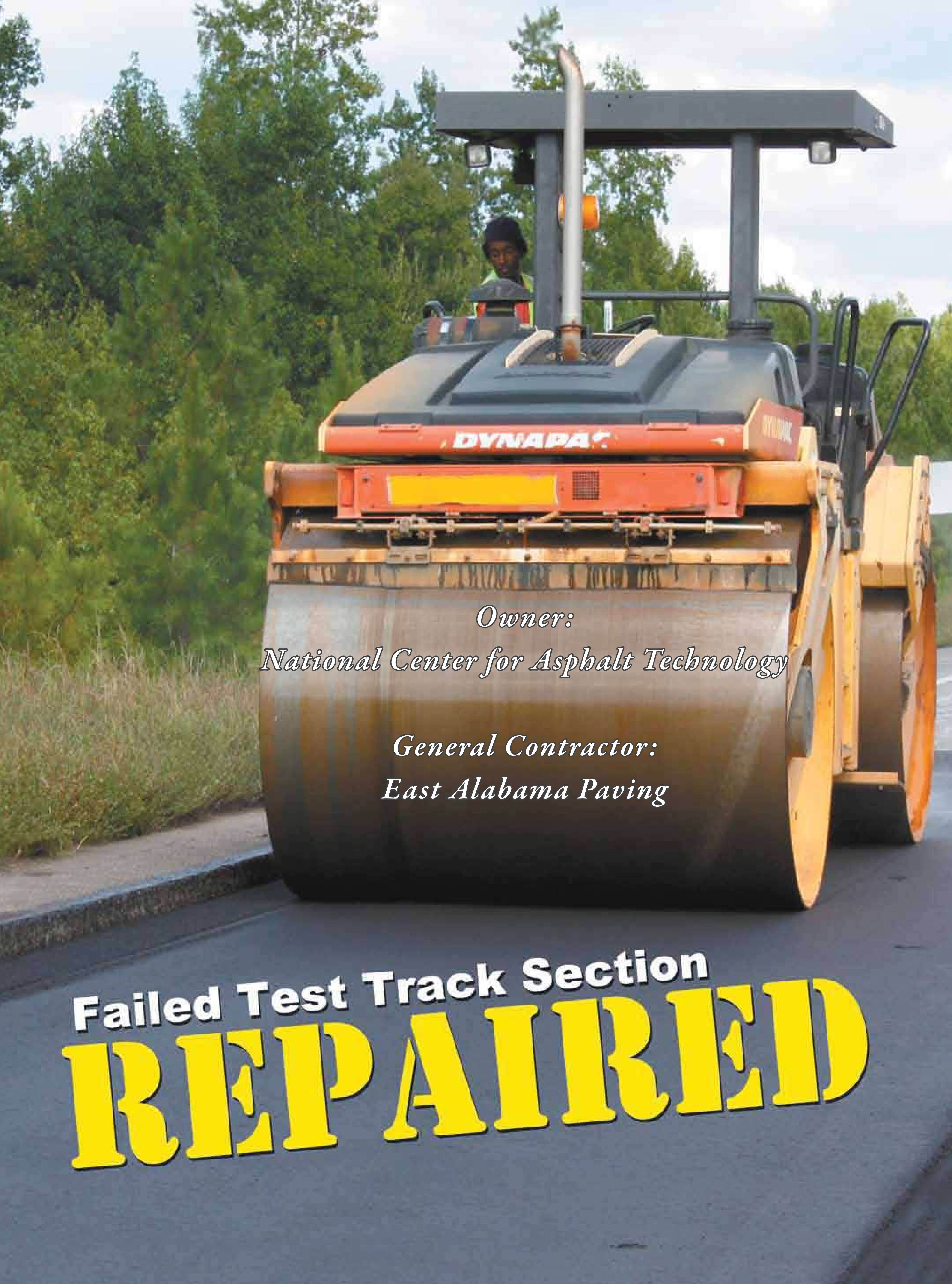
"That Oklahoma test section had also failed previously near the end of the 2006 – 2009 cycle," said Powell. He explained that Oklahoma was trying to develop a perpetual pavement for placement on poor load-bearing native soil. "They asked us to rehabilitate the failed section using the same pavement mix design, so we milled out the top five inches and filled with the same mix designs," he said.

Unfortunately, the sponsored section failed again, in just eight months into the 2009-2012 test cycle.

I'll Huff and I'll Puff…

And blow your house down… and so he (the GOP, Tea Party, Angry America, etc.) did in the mid-term elections. This immediately brings to mind an "old saw," "Be careful of what you ask for. You may get it."

It has been a rough year on top of a rough year and it looks like another rough year ahead. The country is angry, upset, disenchanted, disillusioned, insulted, humiliated, embarrassed and anything and everything else you can think of or say.



Owner:
National Center for Asphalt Technology

General Contractor:
East Alabama Paving

Failed Test Track Section REPAIRED

Eight-axle, 155,000-lb. tractor-trailers operate 16 hours a day for two years on 1.7-mile NCAT Test Track in Opelika.

Page 3: DYNAPAC roller compacts hot mix asphalt modified with Kraton D0243 SBS copolymer used to replace failed Section N8 pavement.

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Ten Million ESALs

Sponsors such as Oklahoma pay for the construction and repair of test sections. One of the main thrusts of data-gathering at the test track is to measure and analyze changes to pavement cross-sections caused by wheel loads in order to help transportation officials design sustainable, eco-efficient pavements. Loading is measured in equivalent single axle loads (ESALs) of 18,000 lbs. each. NCAT uses a life-time truck traffic design of 10 million ESALs over a two-year trucking cycle. Two shifts of drivers operate eight-axle, 155,000-lb. tractor-trailers continuously between 5 a.m. and 11 p.m. each day. They travel in the outside lane of the two-lane track, with the inside lane reserved for safety and as a service lane for construction and repair vehicles. Each of five test trucks travels about 680 miles a day.

According to NCAT, the effect on pavements from this accelerated performance testing schedule is equivalent to experiencing between 10 and 15 years of actual highway truck damage.

Pavement changes brought about by these axle loads are measured and recorded by many instruments. Some instruments are embedded in the pavement structures, e.g., temperature sensors, strain and pressure sensors, while other, non-embedded, instruments, are periodically used to measure pavement smoothness, rutting and cracking among other characteristics. A solar-powered transmission tower collects data from the instruments and sends it wirelessly to the facility's research laboratory for analyses.

At the end of each three-year testing cycle, major construction takes place at the track.

"We rebuild about half of the track each cycle for new sponsors," said Powell. "For the other half, some of the sponsors want to extend their test into the new cycle, and some sections are unfunded. However, sometimes unfunded sections are providing NCAT with information of interest, and since continuous performance data from select tests is still being recorded anyway, we keep utilizing the data."

Ingersoll Rand roller passes solar-powered tower that collects information from instruments embedded in pavement and transmits data to research lab.

Truck containing binder from Ergon Asphalt & Emulsions hooks up directly to East Alabama's Astec hot mix plant.

Searching For Perpetual Pavement

Oklahoma originally had NCAT build two adjacent sections, N8 and N9, for the 2006-2009 test cycle. The DOT had NCAT bring in soil known for its poor load-bearing capacity, comparable to native Oklahoma soil, to the test track to serve as subgrade for the pavement. Oklahoma officials wanted to develop a perpetual pavement – one defined by the National Asphalt Pavement Association as a pavement capable of lasting 50 years. They also wanted it to be as thin as possible to contain costs and minimize energy and resource consumption.

With more than four ft. of poor quality soil serving as subgrade, the paving contractor had originally installed 10-inches of pavement on Section N8, and 14 inches of pavement on Section N9. Unfortunately, by April 2010 Section N8 pavement had already failed twice, with severe rutting preventing truck traffic. However, the 14-inch-deep Section N9 had not failed and is still performing well as of this writing. Since the N8 failure occurred well into the 2009-2012 cycle, NCAT wished to come up with a replacement design that would prevent rutting and preclude disruption to truck traffic. This would ensure continuation of testing for all sponsored sections for the remainder of the ongoing test cycle.

"We wanted to try something else so Oklahoma could get some value from this, but time was of the essence," Powell said. "Test trucks had to detour around the failed section so we needed to repair it and get traffic back on it as soon as possible." NCAT did not want to hinder the testing of the other sponsored pavement sections undergoing testing.

A solution presented itself in the adjacent test section, N7, which had been sponsored by Kraton Polymers LLC.

East Alabama Paving's Astec plant is controlled by operators Rome Pritching and Jody McDonald.

Expeditious Solution

"Right next to the Oklahoma section was the Kraton Polymers test section N7 which was constructed with the HiMA binder, and it was performing very well," said Powell. "We proposed to duplicate the N7 design for the N8 mill and inlay to see if HiMA would work well over the failed Oklahoma pavement and weak subgrade soil."

The 5-3/4-inch-thick Section N7 pavement consisted of three lifts of hot mix asphalt employing (HiMA) binder. This binder contains Kraton's D0243 modified styrene-butadiene-styrene (SBS) copolymer. The 2-1/4-inch base lift and 2-1/4-inch intermediate lift each contained 7.5-percent polymer and 19 mm (3/4-inch) stone, but the wearing course was 1-1/4-inches thick and incorporated 9.5 mm (3/8-inch) stone (see accompanying sidebar).

Oklahoma officials supported using the Kraton design but proposed changing the size of stone in the base course to 9.5 mm, in effect duplicating the wearing course composition but retaining the 2-1/4-inch lift thickness. A consensus on this design change was reached among NCAT's Dr. Powell, Kraton chemist Robert Kluttz and the Oklahoma DOT.

The aggregate change was not a right or wrong choice, Kluttz pointed out.

"There were two severe distresses in the pavement, subgrade rutting and deep bound layer cracking. Larger aggregate would do a better job of passivating subgrade and bound layer rutting, but would worsen resistance to reflective cracking from the remaining bound layer. Vice versa for the smaller aggregate. It's a balancing act. This will be very much a learning experience for Kraton, NCAT and Oklahoma," said Kluttz.

Installing HiMA Binder Mix

At the track, work crews removed the top 5-3/4 inches of the existing Oklahoma section. This left about 4-1/4 inches of underlying, but failed, pavement in place. Paving began August 17, with the HiMA hot mix asphalt being produced at East Alabama's Astec Double-Barrel plant just 11 miles from the track. This same model plant produced the hot mix asphalt when the test track was originally built in 2000 when APAC-Couch was the prime contractor.

Ergon Asphalt & Emulsions' Memphis, Tenn. facility supplied the HiMA, with the delivery truck feeding the binder directly to the plant as required. The liquid asphalt binder, formulated with 7.5-percent modified SBS polymer, was added to the heated aggregate at the rate of 6.1-percent for the base mix, 4.8-percent for the binder mix and 5.9-percent for the surface mix.

At the test track, haul trucks discharged their loads into a ROADTEC SB2500B material transfer vehicle. This machine provided a steady supply of hot mix asphalt to the hopper of the contractor's Blaw Knox PF3200 paver.

East Alabama Paving used three rollers to compact the material: a DYNAPAC CC522 vibratory compactor served as breakdown roller; an Ingersoll Rand pneumatic roller provided intermediate compaction and a Galion 712 static steel drum performed finish rolling.

Trucks Roll Again On Section N8

With the completion of the pavement installation, test trucks once again rolled over the repaired Section N8. NCAT instruments resumed collecting data on the experimental section – data that could help bring about a successful conclusion to Oklahoma's search for a perpetual pavement compatible with its native soil.

Aiming For Thinner Pavements With Increased Durability

Kraton Polymers developed Highly Modified Asphalt (HiMA) binder to improve pavement durability and resistance to rutting, shoving and cracking while reducing the required thickness of pavement. To further field-test its product the company engaged the National Center for Asphalt Technology to build a pavement made with HiMA in Section N7 of the Pavement Test Track in Opelika, Ala.

Section N7 pavement was designed to be 20-percent thinner than a standard seven-inch-thick control design to which it was being compared. The HiMA binder used in the pavement contains 7.5-percent modified styrene-butadiene-styrene (SBS) polymers – more than twice the amount ordinarily used in binder to achieve the desired benefits of polymer modification. These benefits include improved resistance to asphalt stripping and stone raveling, and expanded temperature range over which asphalt binders perform effectively.

Usually, raising polymer content in asphalt binder to more than three-percent increases viscosity to such an extent it is difficult to manufacture and increasingly unworkable to place in the field. But Kraton developed a method to modify the percentage of SBS polymer content to 7.5, gaining the benefits of added polymer content without increasing viscosity.

According to Kluttz, the repair of the failed Oklahoma section at the test track was an opportunity for all concerned. "This was a chance for Kraton to test the performance of HiMA in pavement in adjacent sections – one with a good standard subgrade soil, and one with a failed pavement and a weak subgrade soil.

"For Oklahoma, it was an opportunity to see if a relatively thin, successful perpetual pavement can be built over its native soil.

"For NCAT, it was a speedy solution to a pavement rutting problem that threatened the continuation of test traffic on the track."

Kraton Polymers' Section N7 performance prompted NCAT to use the HiMA mix design in replacing the failed Section N8 pavement.