

**TEXAS DOT
AND THE LANE CONSTRUCTION
CORPORATION DEMONSTRATE WARM MIX
TECHNOLOGY RESULTING IN
AWARD WINNING ASPHALT PROJECT**

***Warm Mix Asphalt with MWV EVOTHERM™
BU-287—Tarrant County, Texas***

**John I. Duval, P.E.
Technical Marketing Manager
MWV Asphalt Innovations**

March 2009



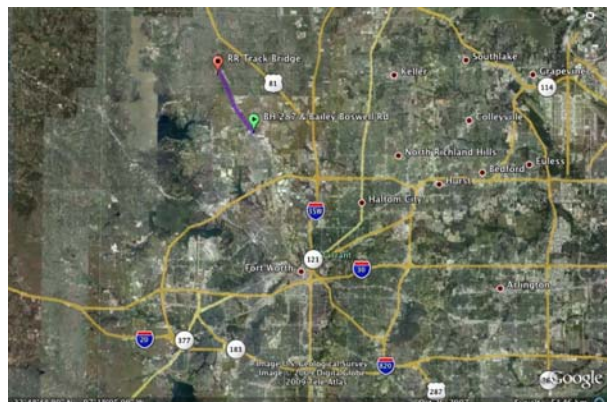
TEXAS DOT AND THE LANE CONSTRUCTION CORPORATION DEMONSTRATE WARM MIX TECHNOLOGY RESULTING IN AWARD WINNING ASPHALT PROJECT

Warm Mix Asphalt with MWV EVOTHERM™ BU-287—Tarrant County, Texas John I. Duval, P.E.¹

In April 2008, the Texas Department of Transportation (TxDOT) and The LANE Construction Corporation began construction on one of the largest warm-mix asphalt (WMA) projects to date. The WMA selected for use was MWV Evotherm™ (Evotherm) Warm Mix Technology, an additive from MeadWestvaco Asphalt Innovations. The project involved placing approximately 55,000 tons of WMA on a busy four-lane section of Business 287 (US-287) north of Saginaw, Texas, in the Fort Worth District. The project has been recognized as a success by both TxDOT and The LANE Construction Corporation for demonstrating the capability of Evotherm technology to produce high-quality low-temperature asphalt mix. Additionally, the National Asphalt Pavement Association awarded the project a Quality in Construction Award in 2008.

Project Location and Information

This project is located in Tarrant County, Texas, and was administered by the Fort Worth District of TxDOT. BU-287 is a four-lane divided highway that connects the community of Saginaw to the southeast and runs to the northwest to connect with US 81.



Project Location—US 287: Bailey Boswell Rd to UP RR Bridge

¹ John I. Duval, P.E., is a Technical Marketing Manager for MeadWestvaco Specialty Chemicals Asphalt Innovations business.

The project ran approximately five (5) centerline miles along BU-287 from Bailey Boswell Road at the southeast terminus to the Union Pacific (UP) railroad bridge near the Hicks Anondale Road at the northwest terminus. From the SE to the NW along the project, the highway begins as a four-lane divided highway with wide shoulders and a vegetated median for about four miles before reducing down to a two-lane undivided highway for the last mile.

2007 traffic count on BU-287 showed a traffic volume of 24,100 vehicles per day in the vicinity of Bailey Boswell Rd². Truck volume is estimated to be 20 percent.

Existing Pavement Conditions

The existing pavement section consisted of an oxidized, distressed hot-mix asphalt (HMA) pavement layer over decades-old jointed concrete pavement. Due to movement of the underlying concrete slabs, the HMA pavement on BU-287 suffered from years of reflective cracking running transversely across the pavement. TxDOT maintenance crews had wisely invested in a crack sealing program with the result being that the existing HMA contained a significant amount of crack sealant.

Previous project experience in the Fort Worth District had demonstrated that newly constructed HMA overlays placed over cracked-sealed pavements of this type were susceptible to heaving and further cracking. The problem occurred due to high mix temperatures that approached as much as 340°F with certain modified binder grades. When the superheated HMA was placed over the old crack sealant, the sealant melted, expanded, and ruptured the new overlay during the compaction process, resulting in a weakened pavement area with new cracks and a rougher ride.



Sealed Transverse Cracks on Existing Pavement

Considering Options

The Fort Worth District Materials and Pavement Engineers considered three alternative solutions in planning the rehabilitation of US-287. Their primary focus was to find a way to create a smooth and durable wearing surface that minimized the heaves and cracks due to the old crack sealant expansion. The solution must be cost effective for the motoring public, both today and for years to come.

The first alternative considered was to mill off the old hot mix asphalt surface layer and place a new concrete overlay over the old concrete slabs underneath. This alternative was quickly put aside as too costly both in initial cost and life-cycle terms.

The second alternative considered was to build a sacrificial HMA layer, approximately two (2) inches thick, which would act to absorb the stresses from the underlying concrete slabs and the reheated crack sealant at the interface with the existing cracked pavement. This interlayer would then be topped off with a second overlay that would act as the final wearing surface. Again, once the numbers were crunched, this alternative was considered to be too expensive.

As Fort Worth District Materials Engineer Richard Williammee, P.E., was doing research on this problem he suggested TxDOT consider WMA. Ralph Browne, P.E., the North Tarrant Area Engineer

² Traffic data provided by TxDOT Fort Worth District.

performed a literature search and found that the Missouri Department of Transportation (MoDOT) had successfully used WMA to reduce or eliminate the presence of heaving and rupturing due to underlying crack sealant. Fort Worth District Engineer Maribel Chavez, P.E., allowed a change to WMA with the requirement that a plant stack test should be run to determine whether pollution reductions could be accomplished.

The Fort Worth District selected a final plan that called for an overlay of five (5) inches of WMA in two lifts. The base lift was to be three (3) inches of TxDOT Specification Item 341 Type B mix (PG 64-22) with a two (2) inch lift of TxDOT Specification Item 341 Type D mix (PG 76-22) as a wearing surface. The nearly five (5) miles of highway would demand approximately 55,000 tons of WMA. In early 2008, armed with a solid plan, the Fort Worth District moved confidently toward the largest WMA project in the country to date.

Mix Design and WMA Technology Selection

The LANE Construction Corporation was awarded the contract to build the BU-287 overlay. They were awarded the TxDOT contract even though it involved a 50-mile one-way haul from their plant to the project site.

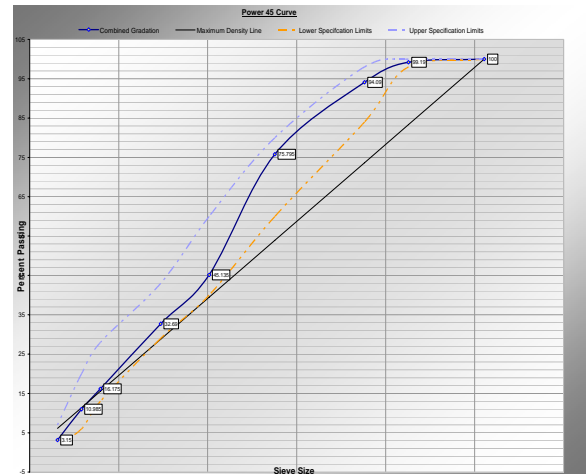
The LANE Construction Corporation selected the Evotherm additive because of its ability to significantly lower temperatures by as much as 85°F to 100°F. The company developed mix designs for the project using TxDOT standard procedures for developing HMA mix designs.

A fine-graded Type B mix was developed that contained 20 percent reclaimed asphalt pavement (RAP) for the base course using crushed limestone aggregates produced by Hanson Aggregates and natural sand from TXI. The TxDOT gyratory mix design called for 4.3 percent of PG 64-22 asphalt binder supplied by SemMaterials.

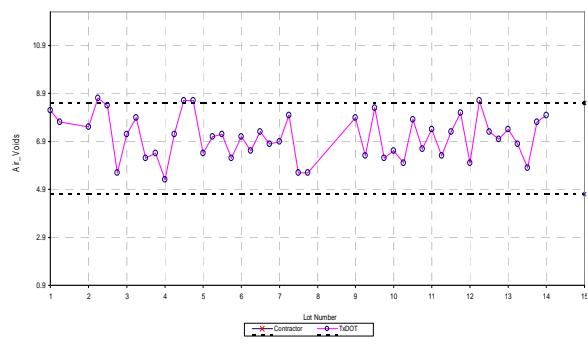
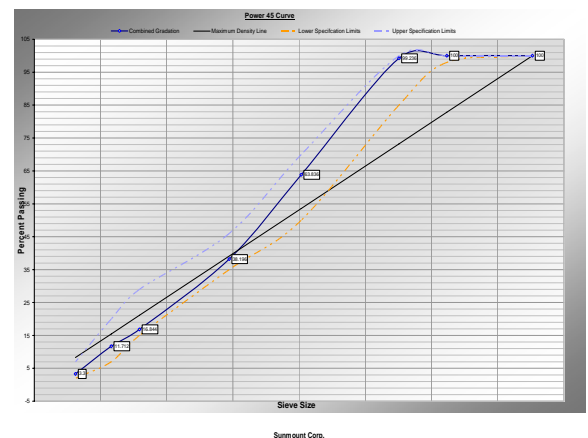
The Type D surface course mix was designed on the fine side of the maximum density line using 100 percent virgin aggregates with crushed limestone aggregates from Hanson and the TXI natural sand (no RAP). The TxDOT gyratory design called for 5.0 percent of SemMaterials' PG 76-22 asphalt binder. Both mixes were evaluated for moisture susceptibility and utilized a liquid anti-strip agent.

Mix Production

The LANE Construction Corporation contracted with Ergon Asphalt & Emulsions to produce and deliver the Evotherm additive solution to the Bridgeport plant. Ergon, a MeadWestvaco development partner, is experienced in producing the dispersed asphalt technology (DAT) concentrate that combines Evotherm chemical additive and water. Ergon produced and delivered the Evotherm DAT concentrate to the plant, installed and calibrated the Evotherm DAT pump and



TxDOT Type B PG 64-22



DAT Adjustment Improved Consistency of Mix Air Voids from Lot 5 to Lot 14

meter system, and provided onsite support throughout the duration of the project.

The Evotherm DAT concentrate was initially produced at a concentration of 15 percent active Evotherm chemical and 85 percent water. After four lots of WMA were produced, Ergon optimized the Evotherm DAT concentration to 10 percent active Evotherm chemical and 90 percent water while at the same time increasing the flow of Evotherm DAT introduced to the asphalt line at the plant. This resulted in the same amount of Evotherm additive per ton of asphalt binder (0.5 percent by weight) while providing improved workability of the mix and more consistency in the production mix air voids.

During trials and test runs at the plant, Asphalt Superintendent, Johnny Rauer and Quality Control Manager, Scott Huber (both of The LANE Construction Corporation), established production temperatures at 240°F for the Type B and 275°F for the Type D mixes. These temperatures were determined to allow plant operators to achieve the mixing and coating characteristics required to produce high quality mix at temperatures that would significantly lower stack emissions and fuel consumption.



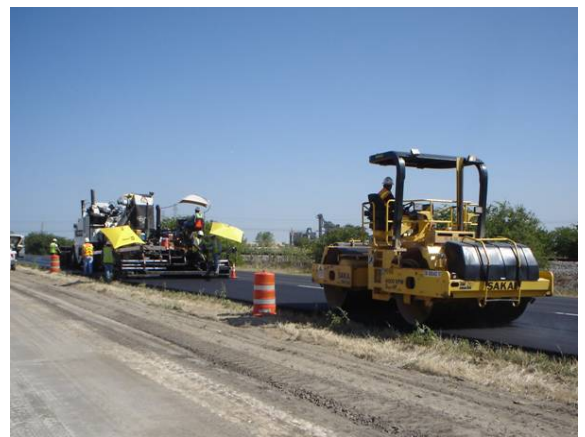
Mixing Temps as much as 95° lower than HMA

During production, plant operators explored lowering the mix temperature and became comfortable with producing the Type B mix as low as 220°F and the Type D mix as low as 235°F. Normal mix temperature for a Type D PG 76-22 HMA mix is 325°F; thus, the Evotherm system resulted in a temperature reduction of as much as 90°F. Stack emissions were measured at the Bridgeport plant during production resulting in a 20 percent reduction in volatile organic compounds (VOCs) compared to normal HMA used in the region.

Laydown and Compaction

This project crew faced challenges including a long haul, cool spring mornings, and a sticky PG 76-22 binder for the Type D mix. These challenges made this anything but “business as usual.”

Laydown and compaction was accomplished using traditional pavers and rollers. The mat flowed smoothly through the paver and under the screed like ordinary HMA except that the placement temperature was significantly lower.



Laydown and Compaction was "so easy"

Ordinarily, a pneumatic roller would have been used on this kind of project to obtain target density; however, according to Huber, the crew was able to change out the pneumatic roller for a vibratory steel wheel roller to ease mat compaction. Four passes of the double-drum vibratory steel wheel rollers allowed Lane to achieve the TxDOT air void requirements for in-place densities.

“We were hauling 50 miles one-way on chilly days and the compaction was so easy,” reflected Huber.

Conclusions

The BU-287 project completed by TxDOT and The LANE Construction Corporation was, by all accounts, a successful project. From the perspective of TxDOT engineers, construction managers and frontline personnel, all agree Evotherm WMA made success possible on this project.

TxDOT's Ralph Browne stated there are three key things about Evotherm that made this project successful.

1. *Low temperatures prevent crack sealant from rupturing the new overlay.* "What we like about Evotherm is that it can allow us to produce mix at very low temperatures," stated Browne. The low temperature WMA dramatically reduces the expansion and surface rupturing experienced with HMA over these crack-sealed highways.

2. *Low temperatures reduce the aging of the binder.* According to Browne, "since our temperatures were so low and the volatiles were not coming off, the mat is staying black much longer." Keeping mix temperatures low reduces the harmful effects of binder aging in the plant.

3. *Low temperatures improve the working conditions on the grade.* "Evotherm allowed much lower temperatures, which resulted in a dramatic improvement of the working conditions behind the paver," said Browne.

Scott Huber also found a lot to like about Evotherm. Huber explains, "our average production pay factor for the Type B PG 64-22 was 1.037 and for the Type D PG 76-22 was 1.039, resulting in significant bonuses for the project." In addition, Huber continues, we had "better consistency of the in-place densities with Evotherm." Based on the consistent in-place densities, Lane believes that Evotherm would also increase pay factors for percent-within-limits projects. Furthermore, the project smoothness was improved significantly as measured by a pre-construction average international roughness index (IRI) of 121.4 in/mi compared to a post-construction average IRI of 60.8 in/mi.

Working together, TxDOT and The LANE Construction Corporation demonstrated that Evotherm can be used to produce low-temperature warm-mix asphalt that results in improved pavement quality, improved conditions for paving crews, and better air quality from reduced plant emissions.

As demonstrated by the BU-287 project, Evotherm WMA opens the door to new possibilities in improved pavement performance and reduced environmental impact—for our benefit and the benefit of generations to come. ♦

MeadWestvaco Corporation
Asphalt Innovations
5255 Virginia Avenue
N. Charleston, SC 29406
Tel: +1 843 740 2236 or +1 800 458 4034
Fax: +1 843 740 2147
evotherm@mwv.com
www.evotherm.com



Evotherm is a trademark of MeadWestvaco Corporation. Copyright 2009.