

**I. RESEARCH PROJECT TITLE**

Kansas Pavement Preservation Initiative: Rehabilitation of Ultrathin Bonded Bituminous Surface

**II. RESEARCH PROBLEM STATEMENT**

The KDOT pavement preservation program actions for asphalt-surfaced pavements include route and crack seal, chip seal, 1- to 4-inch overlay, 1- to 4-inch inlay, heater scarification, cold in-place recycle (4-inch), ultra-thin bonded bituminous surface (Nova chip), modified slurry seal, and cold milling. The ultra-thin bonded bituminous surface (UBBS or Nova chip) is a thin gap-graded hot mix which is bonded to the existing surface with a modified emulsion membrane. This surface has been found to reduce noise, minimize back spray and increase visibility. Since its introduction in the United States in 1998, more than 50 million sq. yds. have been constructed. KDOT has been using UBBS since 2001. From 2002 to 2006, more than 150 miles of UBBS have been placed on the Kansas state highway system, and its use is increasing. Most of the mileage is on full design bituminous pavements, pavements with higher truck traffic as shown in Figure 1. Thus far, the performance of this thin surface treatment strategy has been good. KDOT is currently extending its use from the treatment of existing surface to in conjunction with some sort of surface preparation such as, surface recycling. As some of the UBBS sections approaching rehabilitation, the question now is how to rehabilitate the sections with UBBS. Since the layer is gap or open graded, conventional overlay might result in moisture trapping in the layer causing stripping of the underlying layers. Despite the claim of the marketer of this technology that the UBBS layer will be clogged by the time of rehabilitation, there are no data to support this. They also heavily promote rehabilitation of the UBBS pavements with another UBBS layer. However, this may not be possible when strengthening is required or investigation needs to be done whether structural strengthening is possible with double UBBS layer just like double seal coat.

**III. RESEARCH PROPOSED**

The objective of this project is to evaluate existing UBBS layer for functional and structural behavior so that a rehabilitation alternative can be developed for the pavements with UBBS. It is proposed that cores be taken from pavements with the UBBS layer and tested for permeability. The cores will also be tested in the Hamburg wheel tester for stripping and rutting performance. Finally, some cores will be tested for permeability and rutting and stripping with pores artificially clogged by a cement-fly ash slurry and/or a sand seal. Also, Falling Weight Deflectometer (FWD) tests will be done on pavements scheduled for UBBS treatment in order to assess whether any significant structural improvement happens due to this layer. Some test sections will also be constructed with double treatment of this layer. Finally, the performance of the layer will be compared with 1.5" and 2" overlays.

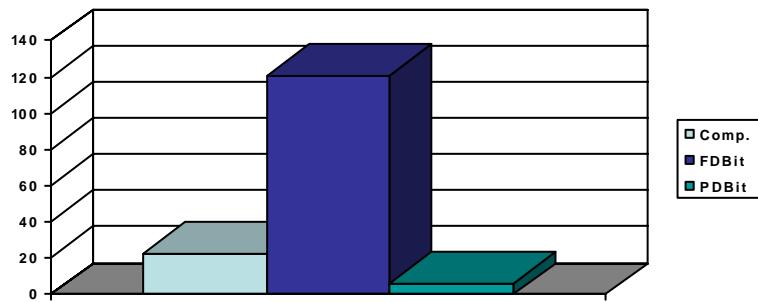


Figure 1 UBBS Mileage on the KDOT System (2002-2006)

#### **IV. ESTIMATE OF FUNDING AND RESEARCH PERIOD**

***Project duration:*** 24 months (07/01/08-06/30/10)

***Budget:*** \$67,862

#### **V. URGENCY AND PAYOFF POTENTIAL**

The research should have a high priority. All highway agencies are currently trying to stretch the maintenance dollars through cost-effective pavement preservation strategies. This project has the potential to make a proven pavement preservation strategy more successful and save millions of dollars in alternative maintenance treatments. This would result in a big return in exchange for the small investment in this research project.

#### **VI. IMPLEMENTATION STRATEGY**

Implementation of this study is expected to be carried out by the Bureau of Materials & Research.

#### **VII. PROJECT PERSONNEL**

This project will be carried out under the direction of Mustaque Hossain, Principal Investigator in close cooperation with KDOT. Mr. Dean Testa of DMT Enterprise, Inc. in Topeka will be a consultant in this project. One graduate students and one undergraduate student in civil engineering will also work on this project. Mustaque Hossain is a professor of Civil Engineering at Kansas State University. His areas of expertise are pavement materials, pavement design, performance, management and non-destructive evaluation using Falling Weight Deflectometer (FWD).