UT Austin Develops Polymer-based Materials for Unpaved Roadway Maintenance

The University of Texas at Austin has recently developed polymer-based sealant materials intended for use on unpaved roadways. These materials, a dust control agent as well as a base stabilizer and sealant, have been evaluated and exhibit high-performance as an option for unpaved roadway maintenance. Figure 1 is taken last year in Texas at a oil drilling operation at the Permian Basin. This picture shows how serious the dust problem for safety at these oil drilling operations.

Fig 1. Construction Project on an FM Road with no Dust Control or Soil Stabilization

When using the polymer-based dust control agent on an unpaved roadway, no washing out is observed. This will result in maintenance that is less expensive and labor intensive than water based dust control. The initial application and occasional maintenance applications are expected to provide a continuous and permanent accumulation of the polymer into the soil. Eventually, the dust particles will be overwhelmed by the presence of the control agent and the frequency between maintenance applications, and the cost of controlling dust pollution, is expected to be dramatically reduced.

For a more hearty treatment, UT has also developed an unpaved roadway base stabilizer and sealant. This polymer-based sealant is a liquid soil stabilizer and additive that binds and transforms the base into a solid, yet flexible mass that resists fracturing and moisture. It's performance indicates that it should be expected to prevent base failure, dust pollution and soil erosion, as well as increasing soil strength and reducing permeability, therefore preventing water damage. Lab-testing the University of Texas has revealed that this polymer sealant's strength is comparable to that of cement stabilization. Other tests have shown that its resistance to moisture significantly exceeds Environmental Protection Agency standards. The polymer-based emulsion is suspended in water. As such, it is non-petroleum and eco-friendly, evaporating only water during the curing process and emitting no volatile organic compounds. In laboratory use, it was observed to be easily applied, requiring the same equipment and handling procedures as other sealant materials.

The strength and permeability properties of these polymer materials which make them ideal for unpaved roadway maintenance also make them ideal candidates for sealant materials used for road bases underneath porous pavements in areas subject to heavy water damage, such as roadways in the flood plain or coastal roads. Road bases have a dramatic impact on roadway maintenance. The quality

and properties of the sealant material directly correlates to the extent of damage the road suffers. It is the road base that supports the entire pavement structure. Because of this, the material used on the unpaved roads needs to be of a high enough quality that it will be able to resist water damage, especially in regions expecting heavy water damage to roadways. In heavy rainfall or flooding situations, if the road materials fail to resist erosion, it is almost guaranteed that the rest of the road structure will also fail. The research study conducted at TPPC showed that 1% polymer, developed at UT Austin, can prevent erosion significantly. Figure 2 shows with 1% polymer treatment only 0.88% of the road shows erosion where untreated roadway structure shows 100% erosion.

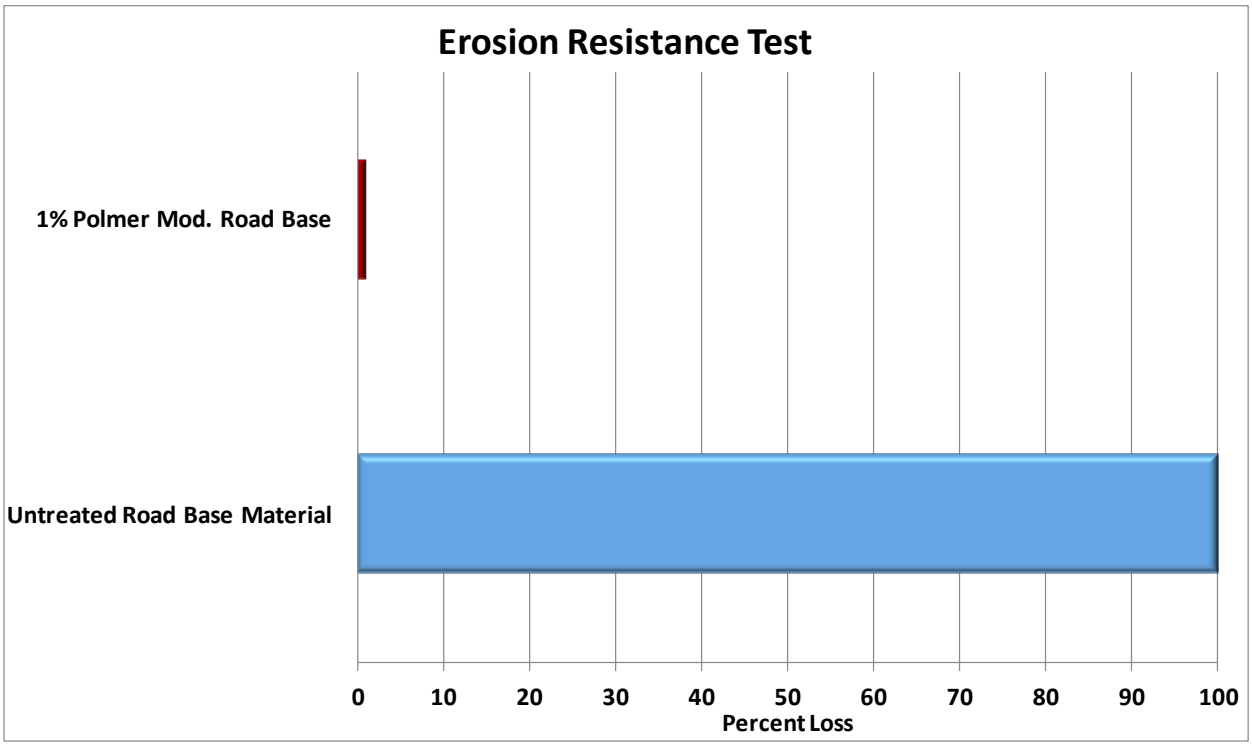

Figure 2. Erosion resistance test results

Further investigating the benefits of polymer-based materials in unpaved roadway maintenance, the TPPC has further proposed to evaluate the feasibility of using polymer materials on unpaved roadways in a recent research proposal for the Texas Department of Transportation which will confront the financial implications of converting low volume surfaced roadways to un-surfaced roadways. Whether planned or unplanned, such conversions are typically required before, during or after resource management operations in rural areas, such as wind farm construction.

The study will examine the benefits and costs to TxDOT and the State of Texas of such temporary conversions during resource management operations. Currently, the purposed conversions happen as a reactionary process after the roadway has already been severely damaged by heavy traffic. This project will provide methods, cost analysis and guidance in pre-planning conversion operations on low-volume

roadways which are scheduled to receive heavy trafficking due to resource management operations such as natural gas extraction and wind farm construction.

With proper planning, the unexpected costs associated with low-volume roadway deterioration during resource management operations has the potential to be mitigated by preemptive conversions of low-volume roadways to unsurfaced roads, before the expected damages occur. What's more, polymer-based materials, such as those recently developed at UT, provide an attractive method for sealing such roadways prior to resource management operations. Results of this study will assist TxDOT in dealing with these issues with the most efficient and cost-effective methods.