TEXAS TECH UNIVERSITY
Multidisciplinary Research in Transportation

PROJECT SUMMARY

Texas Department of Transportation

0-6793: Snow and Ice Chemicals for Texas Roads

Background

Texas is fortunate to have fewer months of harsh winter weather than many northern states. Nevertheless, extreme winter storms—such as the 2011 Groundhog Day Blizzard that impacted the entire northern half of the state—reveal the importance of adequate preparation before snow and ice strike. The citizens of Texas expect TxDOT maintenance personnel to keep roadways safe and open for movement of people and commerce in all seasons The findings of this study on selection, procurement, application, and management of snow and ice control materials support TxDOT's goal of achieving an effective maintenance response, statewide, to winter storms.

What the Researchers Did

This four-year research study explored the application and effectiveness of snow and ice control materials for winter weather roadway maintenance in Texas. The work was performed in two main areas. Effort first focused on a literature and best practices review of snow and ice control material usage both nationally and statewide, addressing material application and effectiveness, the availability and usability of Texas brines, infrastructure durability impacts (corrosion), environmental impacts and regulations, and a detailed cost analysis of TxDOT's historic usage of snow and ice control materials. The second concentration of effort was on field trials with supplementary laboratory testing to obtain a side-by-side comparison of the performance of selected snow and ice control chemicals on the roadway.

What They Found

- The effectiveness of TxDOT's maintenance response to winter weather is a direct function of TxDOT having a clearly-articulated strategy for responding to winter weather, both for typical climate and extreme winter storm events for all regions of the state.
- Geologic brines for snow and ice control include natural brine, manufactured brine, and produced brine related to oilfield operations, and all three must be tested and approved to be considered for widespread use.
- TxDOT's current snow and ice control chemicals include granular road salt, salt brine, MeltDown 20®, and MeltDown Apex™, all of which are chlorides, and, notwithstanding TxDOT's comparatively low application rates and application frequencies, may potentially cause long-term infrastructure durability impacts.
- Environmental regulations and literature suggest minimal added risk to the environment associated with TxDOT's current usage of snow and ice control chemicals.
- Under typical Texas winter weather and road conditions, at TxDOT-recommended application rates, granular road salt for de-icing treatment performed comparably to or better than MeltDown 20®. Similarly, salt brine performed comparably to MeltDown Apex™ for anti-icing applications. At temperatures below 15°F, MeltDown Apex™ was substantially more effective than salt brine at ice melting, but Apex™-treated sections could be noticeably slicker than pavement treated with salt brine.
- Cost savings associated with TxDOT's snow and ice operations can be achieved through standardized selection of materials, improved

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operational efficiency, better risk management practices, and use of performance-based models for snow and ice control.

What This Means

The research findings support several recommendations relative to TxDOT's snow and ice control material policy, procurement, and practice. First, because weather directly influences winter roadway maintenance, TxDOT should tailor its winter weather operational strategies for snow and ice control, including material selection, to the different weather zones in the State. Planning should address both climate normals and extreme weather events.

Second, some Districts are considering alternative brines, especially when customary brine products are either unavailable or prohibitively expensive. Geologic brines, such as natural brine (unrelated to oil or gas plays), manufactured brine (created by circulating fresher water in naturally-occurring below-ground salt deposits), and oilfield brine (produced water related to oilfield operations for oil and gas production), have been identified for potential use. Analytical results suggest that concentrations of trace metals and other constituents could be highly variable among different brine sources; therefore, any geologic brine should be tested and approved prior to widespread application.

Third, TxDOT has historically used both inhibited chlorides (MeltDown Apex™, MeltDown 20®) and uninhibited chlorides (road salt, salt brine). The use of inhibited chlorides provides some added protection against atmospheric corrosion. TxDOT should proceed with caution when using non-inhibited chemicals, and the usage of any snow and ice control chemical—inhibited or non-inhibited—should be done within the context of maintenance practices that minimize corrosion impacts.

Fourth, TxDOT winter roadway maintenance should continue to employ best practices for snow and ice control operations with a view to minimizing environmental impacts.

Fifth, the field trials performed for this study suggest that, when applied at TxDOT-recommended application rates, granular road salt and salt brine are equally or more effective at clearing snow from an asphalt pavement surface compared to the corresponding granular and liquid MeltDown® products. Given that MeltDown® products perform similarly but are purchased at unit costs roughly 5 to 10 times more than their road salt counterparts, the continued usage of MeltDown® products solely on the basis of snow-clearing cost effectiveness is not supported. TxDOT Districts that historically have used MeltDown® products for snow and ice control will likely be able to replicate the snow clearing experience using road salt products applied at the manufacturer's recommended rates. A migration to road salt products is encouraged with the provision that Districts considering a change from MeltDown® products (inhibited) to road salt products (non-inhibited) should evaluate their equipment and infrastructure for susceptibility to potential corrosion impacts.

Sixth and finally, the cost analyses for this study explored opportunities to improve efficiency and outcomes for snow and ice control materials. Strategies include standardizing the selection of snow and ice control materials, improving the efficiency of snow and ice control activities, and transitioning to performance-based models for snow and ice control operations.

For More Information

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