

RESULTS SUMMARY

After reviewing available information, conducting surveys and compiling case studies, researchers identified a list of preliminary recommendations to help agencies get the most benefit out of pre-wetting materials and practices.

PROJECT DETAILS

Project Title: Pre-wet Methods and Procedures

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Project Co-Champions:

James Morin

Washington State Department of Transportation
morinj@wsdot.wa.gov

Patti Caswell

Oregon Department of Transportation
patti.caswell@odot.state.or.us

Principal Investigator:

Xianming Shi

Washington State University
xianming.shi@wsu.edu

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IDENTIFYING SALT PRE-WETTING BEST PRACTICES AND OPPORTUNITIES

Maintaining winter roads is a priority for Clear Roads members. As agencies work to keep roadways clear of ice and snow, a range of established products and methods are available including pre-wetting: the addition of a liquid—typically brine—to solid material like salt prior to applying on the road. Pre-wetting keeps salt on the road's surface, resulting in lower costs and improved road conditions. Identifying the most effective materials and equipment, as well as clear and practical guidance on pre-wetting practices, would be a big help to practitioners.

Need for Research

While pre-wetting practices are used by many agencies, the most effective and efficient materials, equipment and procedures have not been extensively studied. Recent advances in chemical products and equipment and an increase in public expectations further the need for a comprehensive look at pre-wetting.

The effectiveness of pre-wetting can vary based on weather and road conditions, and few agencies have conducted testing or rigorous field trials to compare the effectiveness of different materials, methods, equipment and application rates. Even within a single agency, pre-wetting procedures can vary across districts or regions. Citing safety, costs and environmental concerns, Clear Roads agencies wanted an overview of the most effective pre-wetting methods, materials and practices.

Objectives and Methodology

The goal of this project was to evaluate the available information and the state of practice of pre-wetting equipment, techniques and methods. First, researchers conducted a review of the available literature on current and innovative pre-wetting techniques, as well as materials, equipment and application rates. They then surveyed practitioners in the United States and Canada about their pre-wetting experiences. From the survey respondents, the research team conducted additional interviews to produce nine case studies highlighting transporta-



A screw conveyor mounted inside a truck pre-wets dry salt before it's applied to the road. (Photo courtesy of North Dakota DOT.)

tion agencies that have successfully practiced pre-wetting techniques for 10 years or more. Finally, the researchers contacted six equipment manufacturers and distributors to collect equipment specifications, operational instructions and research or testing results.

From these efforts, researchers identified the current state of pre-wetting knowledge and practice for:

- **Equipment**, including both retrofitted and integrated systems, spreader configurations and controllers.
- **Materials**, both wet and dry, for application under various circumstances.
- **Methods**, such as where wet and dry materials are mixed before application.
- **Application rates**, dependent upon various weather and road conditions.

Results

Through this project, researchers identified the benefits of pre-wetting processes for removing and inhibiting ice. Additionally, the research team compiled preliminary recommendations for best practices and identified knowledge gaps where quantitative data could help agencies maximize their pre-wetting results. All nine agencies included in the case studies reported positive results from pre-wetting practices, such as less material used and improved performance.

Studies and limited field tests showed improved performance when applying pre-wetted materials. For example, less salt is needed when it has been pre-wetted as compared with using dry salt. Pre-wetted material also stays on the

surface longer, has less “bounce-and-scatter” when released from the spreader and remains in place better than dry salt. While salt brine is the most common wetting liquid used, magnesium and calcium chlorides may be good alternatives in cold temperatures. Beet juice can increase salt brine’s performance as well.

Researchers also compiled their findings related to pre-wetting equipment and methods. For instance, while agencies use a variety of spreader configurations, on-board liquid application systems (comprised of a liquid tank, pump system, spray bar and controller) are the most widely used. Additionally, the majority of the agencies reported a preference for hydraulic pumps over electric pumps, but the use of a gravity feed system can make a pump unnecessary.

Benefits and Further Research

Over the last decade, the popularity of pre-wetting as a strategy for deicing has increased among transportation agencies as equipment and technology have improved. With further evaluation, even greater results with lower financial and environmental costs may be possible.

The information compiled in this project—based on research, user experience and vendor data—can inform agencies deciding to use or improve existing pre-wetting practices. Understanding the benefits of pre-wetting procedures, the variety of options available and how agencies are currently implementing them will allow winter maintenance managers to make more effective and efficient decisions regarding the use of pre-wetting practices.

This research also identified opportunities for further study, including how quantifiable evidence on the optimal ratio of liquid to solid material and application methods and rates for different road and weather scenarios, could help agencies get more from their pre-wetting practices.

“Many agencies already know how well pre-wetting works. A major benefit of this project was in identifying where future research could improve pre-wet methods.”

Project Co-Champion James Morin
Washington State DOT
morinj@wsdot.wa.gov