

RESULTS SUMMARY

Through surveys and interviews with practitioners, researchers created a compendium of alternative deicing methods and technologies, ranging from low-investment process changes to larger mechanical improvements.

PROJECT DETAILS

Project Title: Alternative Methods for Deicing

Project Number: CR18-05

Project Cost: \$77,529

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INNOVATIVE METHODS AND TECHNOLOGIES HELP FIGHT SNOW AND ICE

Keeping roads clear in winter is essential for safety and mobility, but what constitutes “clear” has evolved over time. What was once considered satisfactory is no longer acceptable today, as drivers expect “black and wet” roads even in extreme winter conditions. The solution of the past—to increase the use of deicing chemicals—is becoming untenable as costs rise, budgets shrink, and environmental concerns continue to grow. To find a new solution, maintenance managers are going back to basics to learn what they can do, emphasizing methods over materials, to improve efficiency and make existing technologies work better.

Need for Research

When it comes to deicing methods, there are numerous well-known and established practices already in use. What isn’t as well documented, however, is how effective these practices are. Clear Roads members wanted to hear from other winter maintenance managers about which methods work and which need further investigation.

Objectives and Methodology

The goal of this project was to help winter maintenance managers better understand their options when it comes to leveraging existing equipment and budgets.

After reviewing published literature on deicing practices, researchers conducted surveys and follow-up interviews with 91 transportation agencies in six different countries to find out what strategies they use and whether these efforts are effective in the fight against snow and ice. To help maintenance managers make decisions about their own programs, researchers asked respondents to share details like costs, ease of use, and other considerations whenever possible.

Results

The researchers’ efforts culminated in a compendium of alternative deicing methods, showcasing a variety of snow- and ice-fighting solutions that range from



A plow blade with a squeegee blade mounted behind the carbide cutting edge is among many alternative winter maintenance technologies and techniques for transportation agencies to consider. (Photo courtesy of South Dakota DOT)

low-investment ideas to larger, more ambitious mechanical improvements. These practices and technologies include:

- Automatic vehicle location (AVL).
- Blended liquid deicing products.
- Optimized timing and rates for deicer application.
- Direct liquid application (DLA) routes.
- Pre-wet and slurry technology.
- Various mechanical snow removal methods, such as rubber or squeegee plow blades, multisegment plow blades, and brooms and sweepers.
- Methods to reduce chloride use and salt alternatives.
- Route and fleet optimization.
- Using data and reporting tools—including severity indices, decision support systems, and dashboards—to make more informed decisions.

For each practice, the compendium provides an overview and objective description, as well as recommendations for how to implement the approach.

To provide agencies with additional insight, researchers compiled in-depth case studies for most of these methods and technologies. The case studies identify the agency that uses the method, the background and reasoning behind the choice to implement it, and the agency's assessment of its effectiveness, including any challenges that have been encountered. Accompanied by photos and other visual aids, the case studies offer practical guidance sourced from knowledgeable peers.

The best management practices researchers identified may be of the most immediate benefit to agencies responsible for maintenance. These strategies offer modest changes that agencies can make to maximize existing resources, with little risk and without purchasing additional equipment or materials. These approaches include calibrating equipment, applying deicers at different rates and times based on current conditions and forecasts, and incorporating more data in programming decisions. The research report describes these methods in detail and lists the pros and cons of each.

Noting that minor practice changes have limited impact, the researchers acknowledge that more intensive measures may be desirable at some point. Whether an agency is considering purchasing new equipment, technology or materials, researchers suggest conducting a cost-benefit analysis prior to making a larger investment.

Benefits and Further Research

The volume of information compiled in this project provides agencies with a powerful decision-making tool. With so many options and variations presented, there are deicing methods that agencies of any size—and with any budget—can implement. From minor, incremental changes to large-scale investments, winter maintenance managers can make better-informed choices based on their individual needs.

This research also revealed opportunities for further exploration. For instance, more work could be done to compare the costs and benefits of common mechanical and technological upgrades. Additionally, researchers identified several topics that could benefit from instructional documentation, such as how to create a private- and public-facing winter maintenance dashboard or how to work effectively with staff and contractors to ensure widespread adoption of program changes.

"If you're involved in winter maintenance and you don't come away with something useful from this project, I would be surprised."

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