



# Local Operational Research Assistance (OPERA) Program

## Winter Road Sand Treatment

The Cook County Highway Department has been on a mission to combat chloride pollution infiltrating Minnesota's pristine wilderness. To that end, the department has set a goal for chloride-free winter maintenance, starting from annual road salt use that averages 300 tons. Staff experimented with potassium acetate (KAc)-treated sand to reduce the use of granular sodium chloride (road salt) while maintaining road safety.

The department received a \$20,000 grant through the Local OPERA Program to evaluate the usability of the treated sand, particularly its adherence to roads and melt capacity. Though the KAc-treated sand initially exhibited better adhesion and melt capacity than conventional salt/sand mix on pavement, it melted excessively on gravel roads, affecting traction. Over time, the sand's effectiveness diminished due to leaching and freezing issues, decreasing its usability.

### Effects of cold, wet winter add challenges to the mix

The team used CF-7, a potassium acetate deicer produced by Cryotech. It treated the sand at 10 gallons per ton using a hydroseeder and mixing equipment on hand. However, challenges related to the sand's inability to adequately retain the liquid deicer emerged during the application process, which proved labor-intensive and slower than anticipated. In addition, significant leaching occurred in the stockpile of treated sand, which resulted in about 5% of the pile becoming frozen and unusable. Severe temperatures below zero also caused the sand to clump and freeze in the trucks, hindering effective application.

Despite its environmental benefits, the KAc-treated sand incurred a 22% higher cost than conventional salt/sand mix. The project also highlighted the need for drier sand or alternative deicer forms, such as calcium magnesium acetate (CMA) in granular form, for better suspension and retention.

#### Project Leader

Josh Dix

#### Agency

Cook County Highway  
Department  
609 4th Avenue East  
Grand Marais, MN 55604

#### Phone

218-387-3014

#### OPERA Funding

\$20,000



Clumps of frozen sand treated with potassium acetate formed when temperatures fell below zero.



Centerline treated with salt/sand mix.

Centerline treated with potassium acetate/sand mix.

**Cook County reduced total road salt use by 12.5% in an experiment that substituted potassium acetate-treated sand on one plow route for its regular salt/sand mix.**

### **Mixed results provide insights and encouragement**

This eight-month trial showcased the benefits and limitations of liquid-treated sand. Despite the increased cost, potassium acetate proved to be a viable non-chloride alternative for winter road maintenance, particularly on paved roads prior to the onset of severe low temps and leaching. Most important, the project produced a 12.5% reduction in the total road salt use of Cook County by changing just one plow route. The impact of going salt-free on that one route for all but a handful of events emphasized the environmental benefit of the change.

The project also provides valuable insights for other agencies. It emphasizes the potential for reduced chloride use without significant equipment changes. Cook County will share its findings in a variety of ways with other local agencies to foster knowledge exchange and stimulate further research in winter maintenance strategies.

---

### **About OPERA**

The Local OPERA Program encourages maintenance employees from all cities and counties to get involved in operational, “hands-on” research. OPERA helps to develop innovations in the construction and maintenance operations of local government transportation organizations and share those ideas statewide.

#### **Prepared by:**

Minnesota Local Technical Assistance Program (LTAP)  
Center for Transportation Studies  
University of Minnesota  
440 University Office Plaza  
2221 University Avenue S.E.  
Minneapolis, MN 55414  
mnltp.umn.edu | mnltp@umn.edu | 612-626-1077  
April 2024

Local OPERA Program partners: Minnesota Local Road Research Board (LRRB), Minnesota Department of Transportation (MnDOT), and Minnesota Local Technical Assistance Program (LTAP) at the Center for Transportation Studies, University of Minnesota.

Any product mentioned within should not be considered a product endorsement.

*The University of Minnesota is an equal opportunity educator and employer. This publication is available in alternative formats upon request.*