



**PROJECT TITLE:** POTENTIAL FOR NATURAL BRINE FOR ANTI-ICING AND DE-ICING

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**COMPLETION DATE:** SEPTEMBER, 2012

**SPONSOR:** NEW YORK STATE DEPARTMENT OF TRANSPORTATION

## BACKGROUND

Anti-icing, deicing and pre-wetting methods have become common for winter maintenance of roads. Brine (23% salt solution) is the most common material for anti-icing, deicing and pre-wetting processes. Typically brine is prepared from rock salt. There are very few studies that have investigated the use of naturally occurring brine for anti-icing and deicing. This study focused on the use of naturally occurring brine in the Syracuse, New York area for winter roadway maintenance. Participating agencies included the Village of Fayetteville, Onondaga County and the New York State Department of Transportation (NYSDOT) Onondaga East Residency office.

## RESEARCH OBJECTIVES AND APPROACH

The major objective of this study was to determine the feasibility of the use of natural brine available in the Syracuse, New York area as a potential source for winter maintenance of roads. The study consisted of the following tasks:

- Conduct a thorough literature review of the status of brine use worldwide for winter road maintenance;
- Investigate the feasibility of natural brine use in the Syracuse, New York area;
- Investigate the relationship between material application during winter maintenance of roadways and accidents occurring during the application period in Syracuse, New York;
- Conduct interviews with the winter maintenance personnel from the participating agencies to determine the impact of natural brine use;
- Conduct a cost analyses to determine the cost effectiveness of the use of

natural brine versus commercial brine; and to

- Develop a short brief operator's handbook on anti-icing and deicing techniques.

## FINDINGS

A thorough literature review was conducted on the potential of brine as an anti-icing and pre-wetting agent. The review indicated that brine applications in parts of Europe and other countries are more advanced than in the U.S. Anti-icing and pre-wetting lead to decreased applications of chemicals, reduced use of abrasives, improved road friction, lower costs and lower accident rates.

The chemicals cause less corrosion and environmental impacts to soil, water, and the atmosphere. Natural brine has great potential for use in roadway maintenance as evidenced by the operations of the Junex facility in Quebec, Canada and Syracuse, New York. Oil field brines are effective as conventional deicers. However, their use is limited because of high suspended solids, presence of trace metals and certain organic compounds. Anti-icing and pre-wetting programs are successful when combined with sophisticated weather forecasting technology and quality equipment for application of the chemical agents.

The study also investigated the relationship between material application during winter maintenance of roadways and accidents occurring in Syracuse, New York. Pre-wetted deicer and salt utilized by the Onondaga County DOT were evaluated and compared to study the impact on number of accidents and number of injuries. The conclusion

drawn from the data analyses is that the material used (prewetted deicer versus salt) had more significant effect on the number of injuries than the amount of snowfall. Data analyses from the Village of Fayetteville indicated that the natural brine application data in the Village was highly variable. The data indicated that the frequency of accidents went up immediately after a heavy precipitation with either natural brine or rock salt application. The NYSDOT office data indicated that the number of accidents in the 2010-2011 winter season when brine was applied was less than when rock salt was applied during the 2009-2010 winter season, even though the precipitation was greater in the former case. It appears that brine was more effective in reducing the number of accidents at least on the roadways with similar characteristics such as I-81 and I-481.

Interviews with the winter road maintenance crew from the participating agencies indicated that the use of natural brine for both anti-icing and pre-wetting was beneficial for winter road maintenance. The crew indicated that quality equipment, accurate weather forecasting, good record keeping and overall quality management was needed for proper winter road maintenance.

Cost analyses of the use of natural brine from the NYSDOT groundwater well indicated that the costs for using commercial brine versus pumping natural brine from groundwater are comparable. Benefits of natural brine use include lesser material (salt) need and ease of mixing for preparation of the needed 23% brine for winter maintenance.