Anti-Icing and Deicing with Liquid Chemicals
Successes and Challenges

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2004 Purdue Road School

Expectations
- Experiences
- Anti-Icing tools
- Application rates
- Equipment
- Costs
- Types of chemicals
- Challenges
- Questions

“Whiners”

Winter 2004

It got Deep!
**West Des Moines**
- 510 miles of paved roadways
- 20 miles of gravel
- Intersections with 45,000+ VPD
- High Service Level Expectations
- Anti-Icing 7 years

**Iowa Department of Transportation**
- 3,300 Miles of Interstate
- 8,000 miles of primary highways
- Anti-icing 8 years
- Used 9,000,000 gallons of salt brine during the winter of 2000-2001
- 100 Brine makers
- 265 anti-icing units (30% of fleet)
### Scope of Service
West Des Moines

- Anti-Ice Entire Arterial System
- Keep Arterial System Open at All Times
- Provide High Service Levels
- Pro-Active Approach to Storm Management
- Bare Pavement on Arterial System

### Anti-Icing

- Anti-Icing is a pro-active approach of preventing the formation of bonded snow and ice.

### Why Anti-Ice?

- Pro-active approach to storm management
- Reduced chemical usage
- Buys time at the start of storm
- Less granular waste
- Increased service levels

### Anti-Icing Strategies

- Extremely effective when correctly used and approached realistically
- First in a series of strategies
- Crew training is essential
- Decisions need to be based on total costs, not just purchase price of the products

### Anti-Icing is Proactive

- Application of deicing chemicals before/during a storm event
- Prevents bonding of snow and ice to pavement
- Reduces use of resources

### Deicing is Reactive

- Application of deicing chemical during/after a storm
- Bonding of snow and ice to the pavement
- Increases use of resources
Benefits of Liquid Anti-Icers

- Reduced bonding of snow and ice
- Environmentally friendly
- Less material clean-up
- Cost effective
- Reduced chemical usage
- Allows users to get out ahead of the storm

Results!

Clear Wheelpaths

Melting vs Bond Prevention

Bonding Prevention

Salt Brine Test Area
New winter tailgate - 275 gallons

Carries 3-tanks with 1,800 gallons of liquid or can also carry 1,200 gallons of liquid and 6-tons of dry material

Streamer Nozzles

Latest nozzle design

Infrared Thermometers
(mobile platform)
Types of liquids used by West Des Moines

- Sodium Chloride
- Calcium Chloride
- Magnesium Chloride
- GeoMelt
- LCS

Application rates and guides for Salt Brine

- Frost treatment: 40 gal per ln/ml
- Anti-icing: Minimum - 50 gal per ln/ml
- Pavement temperature 15 degrees and rising
- Winds less than 15 mph when loose snow is present
- Weather forecast is the trigger for application

Application rates and guides for “Chlorides”

- Frost Treatment: 15-20 gal per ln/ml
- Anti-icing: 30 gal per ln/ml
- Winds less than 15 mph when loose snow is present
- Weather forecast is trigger for application
**Costs and use**

- Estimated cost for raw materials - $0.04 per gallon
- Cost for final product (includes all costs)-less the $0.05
- IDOT’s 9,000,000 gallons represents only about 8% of total salt use per year.

**IDOT’s annual cost to produce 100,000 gallons of salt brine**
(assume 2,500 gal per hour)

- Labor @ $22/hr- $880
- Building- 866
- Water 750
- Salt 795
- Electricity 750
- Storage tanks 60
- Brine maker 650
- Total annual cost $4,751
- Cost per gallon $0.0475

**Factors Affecting Chemical Effectiveness**

- Initial Concentration
- Precipitation
- Application Rates
- Pavement Temperature

**Cost Comparisons**

<table>
<thead>
<tr>
<th>Mag Chloride</th>
<th>Salt Brine</th>
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</thead>
<tbody>
<tr>
<td>$.65/gallon</td>
<td>$.04/gallon</td>
</tr>
<tr>
<td>30 gal/lane mile</td>
<td>50 gal/lane mile</td>
</tr>
<tr>
<td>$19.50/lane mile</td>
<td>$2.00/lane mile</td>
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<tr>
<td>500 miles = $9750</td>
<td>500 miles = $1000</td>
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</tbody>
</table>

**Weather Forecasting Tools**

- RWIS
- Meridian
- SSI
- Internet
- National Weather Service

**Weather information sources available at the Iowa DOT**

- 50 site Roadway Weather Information System
- Truck-mounted infrared thermometers
- Meteorlogix classic or Weather Sentry systems at all maintenance garages
- Internet access available at all garages
- Contracted pavement forecasts with delivery via e-mail, Meterologix systems and toll free recording
- 3-hour Nowcast
- Weatherview
Post Storm Liquid Usage

Application Rates for Deicing

- Salt Brine: 80 gal/lane mile
- Mag Chloride: 45 gal/lane mile
- Calcium Chloride: 45 gal/lane mile

Pre-Wetting

- Pressurized Systems
- Applied at spinner
- 10-12 gallons per cubic yard of material
- Calcium Chloride
- Salt Brine
- Significantly reduces loss of materials

Prewet Systems

- 140 gallons
- 225 gallons
Why Prewet?

- Extreme cold
- Chemical action prohibited
- Traction required
- Can pre-wet with liquids to “burn” into snow and ice packed material

Do “Nothing” Approach

- Cold pavements
- Dry blowing snow
- Open areas
- Chemicals can create rather than solve problems

Salt and Abrasive use statewide when compared with snowfall

Total Phase 1 & 2 Hours

Average SCBO Readings by Location

Roadway Classifications
- A: Interstates
- B: ADT greater than 5,000
- C: ADT between 2,500-5,000
- D: ADT less than 2,500
Salt Brine 24 Hours After Application

Salt Brine 48 Hours After Application

Salt Brine 72 Hours After Application

Historical Plow and Underbody Blade Use

Snow and Ice Operations Overtime Hours

Challenges

- Corrosion
- Training staff
- Educating the public and getting buy-in from users
- Accurate weather forecasts
Fall Out Issues

Sub-Frame Corrosion

Sealing Problems
Corrosion Prevention
Keeping Systems Clean

Benefits

- Reduced salt use
- Reduced overtime
- Reduced blade use
- Improved service to the public

Keys for a successful anti-icing program

- Develop a plan for anti-icing
- Provide proper training
- Provide access to good weather information and forecasts
- Provide adequate equipment for liquid application
- Have a call-out plan in place
- Training, training and more training

Keys to Success

- Have a Plan
- Good Weather Information
- Proper Material Selection
- Be Proactive
- Keep Good Records
- Get Employees Involved

Anti-Icing Program

Iowa DOT free video

Contact Dennis Burkeheimer @ 515-339-1355

http://www.dot.state.ia.us/maintenance/index.htm
Winter Maintenance Mailing List

snow-ice-request@list.uiowa.edu

In the body of message on a line by itself on that line, type the word subscribe

Aurora

Pooled fund research effort in Roadway Weather Information System technology and other weather items, primarily focused on winter and summer maintenance applications

http://www.aurora-program.org

This pretty much sums it up!

The Future!

THANK YOU

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