Why Now is the Time to Use Organic-Based Performance Enhancers to Treat Winter Roads

2017 Purdue Road School
Presenters:

Diane Watkins
Jay Walerstein
Rod Waltman
Presentation agenda:

Winter Products
Organics In Snow and Ice Control
Agency Results Using Organics
Winter Products
Winter Program Costs

What component of a winter program costs the most?

- Labor
- Fuel
- Materials
Winter Materials
Discussion points:

Chemicals
Advantages
Disadvantages
Selection
Winter Maintenance Materials

Solids

Liquids
Why Use Chemicals?

Chemicals applied to:

› **prevent** bonding of ice and snow to road surface
› **prevent** ice or frost from forming
› **prevent** buildup of snowpack
› melt ice that has formed
How do Chemicals work?

Lower the freeze point of water (less than 32*) to reduce snow and ice to water or slush.
Winter Maintenance Materials

› Salt (Sodium chloride)
› Calcium Chloride
› Magnesium Chloride
› Potassium Chloride
› Brines
› Potassium Acetate
› Calcium Magnesium Acetate
› Urea
› Agricultural/Organics
› Other Proprietary Materials
Rock Salt

Treated Salt
Rock Salt Advantages

Availability

Cost
Rock Salt Disadvantages

Effectiveness drops with temperature
  - Below 25°F

Requires time to go into solution (about 20 minutes)

Corrosive

Environmental concerns
  - Excessive use
  - Improper Storage
  - MS4 concerns
# Rock Salt Facts

<table>
<thead>
<tr>
<th>Pavement temperature (°F)</th>
<th>One Pound of Salt melts (how much ice at this temp?)</th>
<th>Melting Time (at this temp &amp; quantity of ice)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>46.3 lbs. of ice</td>
<td>5 minutes</td>
</tr>
<tr>
<td>25</td>
<td>14.4 lbs. of ice</td>
<td>10 minutes</td>
</tr>
<tr>
<td>20</td>
<td>8.6 lbs. of ice</td>
<td>20 minutes</td>
</tr>
<tr>
<td>15</td>
<td>6.3 lbs. of ice</td>
<td>1 hour</td>
</tr>
<tr>
<td>10</td>
<td>4.9 lbs. of ice</td>
<td>Dry salt becomes ineffective and will most</td>
</tr>
<tr>
<td>5</td>
<td>4.1 lbs. of ice</td>
<td>likely blow away before</td>
</tr>
<tr>
<td>0</td>
<td>3.7 lbs. of ice</td>
<td>it melts anything.</td>
</tr>
<tr>
<td>-6</td>
<td>3.2 lbs. of ice</td>
<td></td>
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</table>

Source: Salt Institute
Calcium/Magnesium Chloride

Advantages
- Salt/brine performance enhancer
- Lower effective temperature
- Quick response – “fast burn”

Disadvantages
- Dilutes quickly
- Hygroscopic
- Infrastructure / Equipment corrosion
Other Chemicals

› Potassium Chloride
› Potassium Acetate
› Urea
Brines

Salt brines, natural brines, well brines, cheese brine, pickle brines, etc.

Salt (23.3%) + water (76.7%)

Advantage:
- Low cost
- Use in all facets of operation: anti-ice, prewetting, deicing
Brines

**Disadvantages or Limitations**

Pavement temperature restrictions

Limited residual on high volume/high speed roads

Apply to dry pavements

Airborne chloride dust over roadways when using straight salt brine
Abrasives
Sand, cinders, ashes, crushed rock, slag
Specifications
Clean up
Environmental Concerns
Abrasives

Friction

Increases material supply when salt supplies/availability becomes an issue

Do not lower freeze point of water on roadways

Research data results indicate that abrasives imbed in snow after about 20 vehicles
PICK THE RIGHT DEICER
Deicer Selection

Level of service

Knowledge of products – properties, advantages/disadvantages

Availability

Cost
Organics in Snow and Ice Control
Discussion Points:

- Organics?
- Progression of Organics as a Winter Product
- How Organics Enhance Performance
Organics?

What products are organics

Com

Com products used with Chlorides

Chloride free Com products

Sugar Beets

Grain Alcohol Extracts
Organics?

100% organic products

Proprietary Blends
- Organics base
- Calcium or Magnesium Chloride base

Blending in House
- Salt Brine or Salt with Organics
- Superblend – blending salt brine + organics + calcium chloride
Progression of Organics

WWII – impact of sugar beets on snow

1980s – Hungarian factories realize retention ponds where alcohol from wheat and grains never freeze

1970-1980s – North America utilizing sodium chloride (rock salt) for winter programs

1980s – Agencies recognizing limitations of rock salt and look for alternatives or performance enhancers
Progression of Organics

1980s - Agencies begin to utilize calcium and magnesium chlorides to enhance rock salt

1996 - Toth patent in North America

1996 - Corn organics introduced to the market

2001 - Sugar beet extract was introduced

2003 - McHenry County, Illinois and IDOT - Agencies began process of salt brine production and blending sugar beet extract with chlorides
How Organics Enhance Performance

- Reduces application rate at the spinner by 30% or more
- Reduces number of applications needed during many storms
- Reduces dead head time to salt domes
- Reduces fuel
- Reduces overall costs
How Organics Enhance Performance

Sugars and anti-icing solids enhance performance

**How will these enhancements improve my winter program results?**

- Lowers the temperature that water will freeze to -15*
- Prevents bonding of ice, hard pack and snow
- Increased residual of products applied on roadways
How Organics Enhance Performance

Restores roadways to safe conditions more quickly; thereby increasing level of service

Assists agencies in meeting Storm Water Act or SM4 standard by reducing chlorides in surface and drinking water
Bonding Prevention

IT TAKES 4 TIMES MORE SALT TO REMOVE ICE THAN PREVENT IT!
SALT BRINE RESIDUAL

24 HOURS

48 HOURS

72 HOURS
The roads were anti-iced on Thursday January 5, before the weekend
Snow event January 12, 2012 the material still worked after 7 days
These are low volume roads
Conditions must be correct for using liquids in deicing. Warm pavement temperatures, low or no additional snowfall rates, short route cycle times, no blowing snow.
Agency Results Using Organics
Agency Results
Utilizing Organics

Mishawaka Street Department

Tippecanoe County Highway Department

Crawfordsville Street Department

St. Joseph County Highway Department
2003 purchased a 2000 gal. tank; pre-wet salt
2004 purchased 250 gal. Anti-Icing Unit
   Pilot: Treat 2 roads 80/20 blend
2008 additional storage to expand anti-icing program
2017 Added 2 Anti-Icing Units, Brine Maker & Storage tanks
Anti-Icing
Mishawaka County
SUCCESS!

Beet juice works!

Agency tried other products; did not achieve desired results

Program progression was supported by knowledgeable vendor representative
Indiana Case study
Unlocking the potential of granular material with older equipment

Ed Ward
Highway Supervisor, Tippecanoe County

Rich Domonkos
Training Specialist, Indiana LTAP

Rod Waltman
Road Solutions Inc.
Tippecanoe County Problem
Eliminate Sand Cleanup

› The mission: Use salt to provide

› **SAFE & DEPENDABLE** Transportation During Winter

But Not One Pound More!
Program Steps

Case Study - Tippecanoe County

Mix of Fixes:
✓ Calibration of all plow equipment. Mechanical Staff
✓ Training of drivers and maintenance staff. LTAP
✓ Training of administrative staff. APWA
✓ Implement good accounting practices to measure results. Office Staff
✓ Meet with vendors and winter materials suppliers for
  • Salt
  • Sand
  • Beet juice
Salt Management Program

Road Salt Management

The Assessment of Current Methods.
- Inventory and Assessment of all deicing equipment.
- Calibration of all deicing equipment.
- Identifying proper application rates.
- Minimizing the “bounce and scatter” effect.
- Accounting of amounts, locations and performance of deicers used.

The Mix of Fixes.
- Calibration of all deicing equipment.
- Calibration of spreading patterns.
- Improving deicing equipment – ground speed controls.
- Adding Liquid anti-icing and Pre-wetting to the toolbox
- Improved deicing chemicals
- Training of management and staff on methods to manage chloride usage.
Comparison Results between Salt and Salt Sand Mix

Tippecanoe County Truck #33
3 Sand: 1 Salt Mix
8 miles @ 1224 lbs per lane mile
= 9,792 lbs salt/sand mix per lane
= 19,584 lbs salt/sand total
= 6,528 lbs salt total
The single axle truck is empty!

Tippecanoe County Truck #33
Salt Only Mix
8 miles @ 300 lbs per lane mile
= 2,400 lbs salt per lane mile
= 4,800 lbs salt total
The single axle truck is 3/4 full

**treated salt**
Crawfordsville Street Department

2010 Winter program assessment
2013 500 gallon tank system added for brine production
1300 gallon holding tank; two 250 gallon Anti-Icing tanks
Trained staff on winter liquid applications
Program Progression

2013 / 2014 winter season – addition of liquids (brine) produced immediate; decision made to evaluate adding organics

2014/2015 winter season - purchased (2)2500 gallon storage tanks for storage of beet juice and blended product

Equipment calibration
Crawfordsville SUCCESS

Utilized knowledgeable vendor, vendor provided smaller quantity of product for pilot

Utilized a vendor that product that supported our program progressions

Staff trained on product application
Agency Evolution

- Truck equipped with two 250-gallon tractor saddle tanks, now used as our secondary road sprayer.

- 1,300-gallon holding tank allows us to make brine on site.
Program Progression

1,000-gallon tank on ambulance chassis, concrete pad and 2,500-gallon storage tanks, used for primary roads
St. Joseph County Highway Pilot Study-New Carlisle Garage

Set up Winter Standard Operating Procedures
2014 - Management evaluated the Tippecanoe Co. Study
2014-2015 Updated County Level of Service Policy
Eliminated sand from winter material selection
Equipment Calibration
Employee Training
Results Reduced wasted salt; Increased Level of Service
2015-2016 Winter Pilot Study Utilizing “Organics”

Chose New Carlisle Garage, Snow Capital of Indiana

Pile treated bulk salt

Blended his brine with 20% “Organics”

Utilized Company proved “Salt Management Training Program”, to reduce wasted salt, fuel and labor
New Carlisle Pilot Study Results

- Garage Average Salt Usage Per Event Per Season:

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<th>Year</th>
<th>New Carlisle</th>
<th>Central</th>
<th>Riverside</th>
<th>Granger</th>
<th>Ash Road</th>
<th>Woodland</th>
<th>North Liberty</th>
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**39.06%**

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St. Joe County Pilot Results 2015-2016

1. Higher level of service

2. Faster melting

3. 39% reduction in salt usage (500 lbs. down to 300 Lbs, center lane

4. 46 snow events
Next Steps
2017-2018 Winter Season

Purchase storage tanks for product at the other 4 garages
Purchase 4 additional Anti-Icing Units
Treat pre-treat all salt at all locations
Repeat training this fall with all staff and operators
Look to improve data collection
QUESTIONS?

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