



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

2017 Purdue Road School

Presenters:

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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

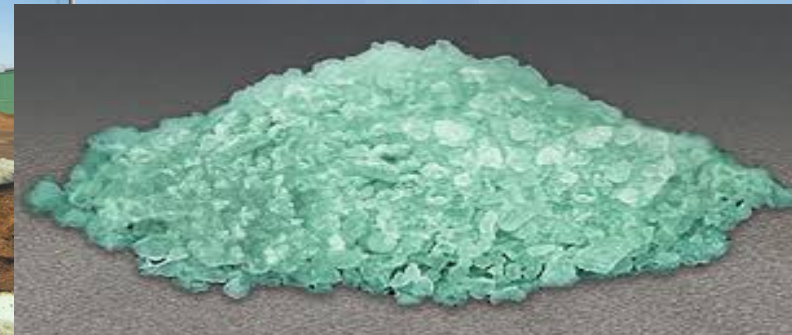
- › Salt (Sodium chloride)
- › Calcium Chloride
- › Magnesium Chloride
- › Potassium Chloride
- › Brines
- › Potassium Acetate
- › Calcium Magnesium Acetate
- › Urea
- › Agricultural/Organics
- › Other Proprietary Materials

Rock Salt

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

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

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

Corn

Corn products used with Chlorides

Chloride free Corn 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

WW11 – 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



Frost event January 9, 2012

Snow event January 12, 2012 the material still worked after
7 days

These are low volume roads



USING LIQUIDS FOR DE-ICING



**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

Mishawaka Street Department Tim Ryan, Street Commissioner Program Progression

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



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Tippecanoe County Problem Eliminate Sand Cleanup

- › The mission: Use salt to provide
- › SAFE & DEPENDABLE Transportation During Winter



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.

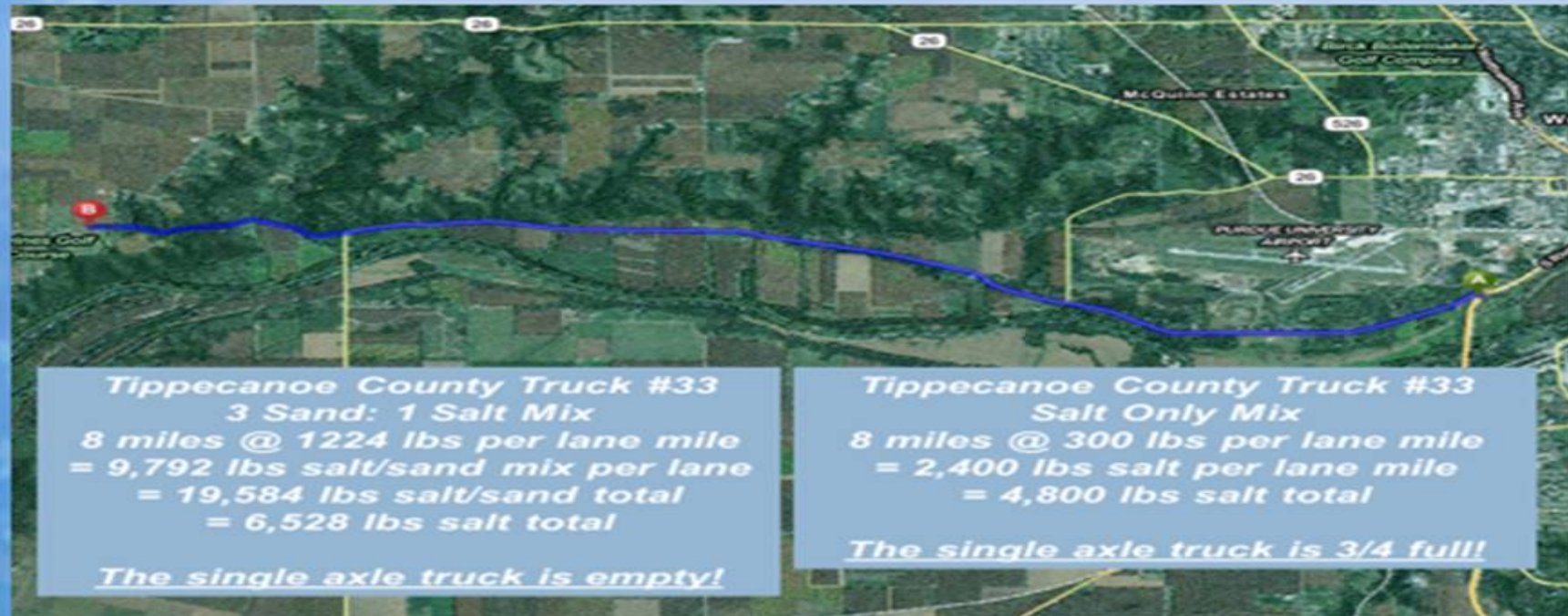
Adding Liquid anti-icing and Pre-wetting to the toolbox

Improved deicing chemicals

Training of management and staff on methods to manage chloride usage.



Comparison Results between Salt and Salt Sand Mix



**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:

› Year	New Carlisle	Central	Riverside	Granger	Ash Road	Woodland	North Liberty	Average:
› 2009/10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
› 2010/11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
› 2011/12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
› 2012/13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
› 2013/14	27.35	5.10	27.35	27.35	5.10	27.35	27.35	146.94
› 2014/15	53.90	23.81	53.90	53.90	23.81	53.90	53.90	317.14
› 2015/16	32.85	23.91	42.34	54.03	10.87	35.74	27.25	226.99
›								
›								
›								
›	39.06%							
›	32.85	14.51	32.85	32.85	14.51	32.85	32.85	193.28
›	1521.02	671.83	1521.02	1521.02	671.83	1521.02	1521.02	8948.730129
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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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