Winter Operations
Working efficiently
Doing more with less!

• Changes in Operations has caused many challenges for large or small agencies:
  – Less Personnel
  – Less Supervision
• This is not an excuse to go back to the old winter operations techniques!
• Better to work smarter not harder.
Change is Good!

- Mandatory Tools
Three Essentials

• Get out Early
• Calibrate Equipment
• Pre-Wet Material
  – Especially the first load
Tools Available now!

- Anti-Icing Strategy
- Pre-Wetting
- Pre-Treating  
  - (solid or liquid)
- Salt Brine
- Weather Forecasting Services
What is an “Anti-icing Strategy”? 

The application of chemicals at the start of a precipitation event in an attempt to prevent or weaken the bond of ice to the pavement by reducing the freezing point of water.
Anti-icing

- Anti-icing is **proactive**
  - Apply chemicals before and/or during the early stages of a storm.
- This creates a brine layer on pavement surface.
- Prevents ice and snow from bonding to the pavement.
Anti-icing Benefits

- Provides safer roads sooner than deicing
  - Produces black pavement right after storm
  - Less labor and fuel cost
- Uses less chemicals
  - Saves money
  - Less affect on environment
- Reduces wear on equipment, easier to remove snow and ice when not frozen to road surface.
What Are You Doing?

• Preventing the bond of the ice to the pavement
• Plowing, not melting, removes 90% of the snow and ice
• Spread patterns are critical
• Must calibrate to ensure you’re spreading what you want to spread
Anti-Icing

• Applications will need to be more frequent at lower temperatures and higher snowfall rates.

• Dilution drives the application rate.

• More moisture:
  – More pounds per lane mile
  – More frequent applications
2015 – 2016 Recap
Winter Severity Index

The 2016 winter was a relatively mild winter and the effects of the anti-icing and other efficiency measures were not as evident or dramatic as in previous years with the exception of District 1, which still showed considerably lower salt use than that predicted.
De-icing

• A reactive approach
  – Chemicals are applied after the snow has accumulated on the road surface.
  – Sand and salt are spread on the top of packed snow and ice that has bonded to the road surface.

Cost up to 6X to melt snow and ice from the top down vs. from the bottom up. (CRRL)
Policy Decisions

• Levels of Service (LOS)
  – During storm
  – After storm
• Which chemicals to use
• What amounts to use for various storms and conditions
• When to apply them for best results
Treatment Factors

- Pavement temperature
- Road condition
- Weather
  - Precipitation type
  - Storm length and intensity
- Traffic volume and timing
- Resources available
Why Pavement Temperature?

• What’s the difference between Pavement Temperature and Air Temperature?
• Often times a LOT!
• Think pavement temperature for
  – Chemical choice
  – Chemical form -- dry or prewet
  – Application rate
Anti-icing Application Rates

• Pavement temperature -- range & trend
• Precipitation type and intensity
  – Light snow, rain, freezing rain, or sleet
  – Moderate snow, rain, freezing rain, or sleet
  – Heavy snow, wet snow, rain, freezing rain, or sleet
• Wheel path -- bare pavement, frost, thin ice, black ice, slush, loose snow, thick ice, packed snow
Melting Rates

Melting Rates-NaCl

Temperature in Degrees F

Pounds of Ice Melted Per Pound of Salt
Mandatory Pre-wetting Benefits

• Higher levels of service
  – Starts melting faster
  – Melt 10-25% more ice with less material
• Less bounce and scatter
• More environmentally responsible
• More cost effective
Mandatory Pre-wetting

• Comparison of bounce and scatter, dry and prewetted salt

Percent remaining on the road after traffic

<table>
<thead>
<tr>
<th></th>
<th>Dry Salt</th>
<th>Wetted Salt</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 vehicles at 38 mph</td>
<td>30%</td>
<td>93%</td>
</tr>
<tr>
<td>100 vehicles at 38 mph</td>
<td>15%</td>
<td>80%</td>
</tr>
</tbody>
</table>

Source: Michigan DOT
Anti-Icing on Bare Pavement

- Chemical depresses the freeze point of water.
- If spread as solid, needs to dissolve
- Spread before event, forms film on road
- If film maintained, last plowing leaves a cleaner road
Have to Know how Much!
Dry Versus Prewet Salt

Salt retained to melt snow and ice, 180 lbs spread/LM

<table>
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<tr>
<th>Traffic</th>
<th>Dry Salt</th>
<th>Prewet Salt</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 cars @ 38 mph</td>
<td>30 lbs</td>
<td>130 lbs</td>
</tr>
<tr>
<td>100 cars@ 38 mph</td>
<td>10.5 lbs</td>
<td>112 lbs</td>
</tr>
</tbody>
</table>
What’s Happening?

1. Salt is spread on the ice or snow packed surface
2. Salt melts through the snow or ice forming a brine
3. Remaining snow or ice floats on the brine, breaking its bond with the road surface
4. Vehicular traffic breaks through the surface, reducing the snow/ice to plowable slush and moving it to the road side
RWIS

• Roadway Weather Information System
• Mass-Highway has 29 sites
• What does that mean for you?
  – Shared information
  – Interstate sharing of Data
  – Better decisions
Pavement Temperature
Pavement Moisture
Frost & Ice Detection
Chemical Concentration
Freeze Point Temperature
Moisture Depth
RWIS Mounting Structures
Corrosion Issues
Equipment Issues

• There may not be new equipment
  – Your responsibility is to keep it running
• Wash equipment after a storm
  – When weather permits
    • (32° Degrees and above)
• Use a Chloride neutralizer
• Do circle checks, regularly!
The 3 T’s

• **Timing** is everything!
  – Be prepared

• **Trust Technology**
  – New Gadgets do work

• **Training** is essential at all levels
  – Train operators as well as consumers

• And be open to new ideas
It Will Snow!