Winter Operations Update

Iowa Freight Advisory Council

December, 2017
Topics

• Winter Travel Resources
• Winter Operations Overview
• Research Projects
Winter Travel Resources

• There are websites that can assist during winter weather
  • 511
  • Track-a-plow
  • Weatherview

• Each features real-time data, camera imagery, and more
Iowa 511
http://hb.511ia.org

Winter Road Condition Reports
Roadside Cameras
Traffic Speeds
Road Closures
Towing Bans
WAZE reports
--- Citizen Update --- I-80 westbound: Major accident.

Between Exit 141: US 65 and I-235; I-35 (near Altoona). A Waze user reported a major accident.

Reported by Waze App Today at 2:00 PM
511 Traffic Speed

• We use traffic speed to estimate the impact of weather on drivers

• Drivers tend to slow down:
  • In bad visibility
  • When they think the road feels slick
  • After seeing other cars in the ditch
Track-A-Plow

See where plows are – and what we see from the windshield

Color-coded road condition reports

Radar overlay

Expect to be up to 600 plow cams by winter (was ~450)

http://trackaplow.iowadot.gov
Weatherview

Roadside weather, forecasts, and camera views

For 2018 – Total site overhaul but similar functionality

http://weatherview.iowadot.gov
http://weatherview.iowadot.gov

Camera images now available on mobile devices
Select the Forecast tab to see hourly road weather predictions.

<table>
<thead>
<tr>
<th>Date Time</th>
<th>Road Temp</th>
<th>Road Frost Prob (%)</th>
<th>Bridge Temp</th>
<th>Bridge Frost</th>
<th>Air Temp</th>
<th>Dew Point</th>
<th>Wind</th>
<th>Wind Speed (mph)</th>
<th>Wind Gust (mph)</th>
<th>Precip Type</th>
<th>Precip Prop (%)</th>
<th>Precip Rate (in/hr)</th>
<th>Sky</th>
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</thead>
<tbody>
<tr>
<td>October 12, 2017</td>
<td>72°F</td>
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<td>72°F</td>
<td>No</td>
<td>60°F</td>
<td>51°F</td>
<td>SSE</td>
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<td>SSE</td>
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<td>51°F</td>
<td>SSE</td>
<td>7</td>
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<td>Partly Cloudy</td>
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<td>55°F</td>
<td>No</td>
<td>56°F</td>
<td>51°F</td>
<td>SSE</td>
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<tr>
<td>October 12, 2017</td>
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<td>55°F</td>
<td>No</td>
<td>56°F</td>
<td>51°F</td>
<td>SSE</td>
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<td>0</td>
<td>Partly Cloudy</td>
</tr>
</tbody>
</table>
A Bit About Iowa DOT Winter Operations

- 102 garages
- ~900 snow plows
- 1,000 winter staff
- 9,480 centerline miles
- 24,200 lane miles
- 121,000 tons of salt/year
- 21,800,000 gal. brine
- 40,000 gal. calcium chloride
- 227,000 ton salt storage capacity
- 20,000 tons sand/year
- 70 roadside weather stations
Deicing Chemicals Used or Tested by Iowa DOT

- Sodium Chloride
- Sodium Chloride brine
- Calcium Chloride (liquid & dry)
  - Calcium Magnesium Acetate (CMA)
  - Potassium Acetate
  - Ice Ban (experimental) with salt brine
- Geomelt with salt brine
- Ice Slicer
- Liquid Corn Salt (LCS)
- Activar
- Geomelt 55
- Mineral Melt
- First Down
- Clear Lane
- All Clear
- Caliber
- AG 100
- Fusion
Chemical Application Rates

• Each chemical has different melting properties at different pavement temperatures

• For salt:

<table>
<thead>
<tr>
<th>Pavement temperature (F)</th>
<th>One pound of salt can melt:</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>46.3 lbs.</td>
</tr>
<tr>
<td>25</td>
<td>14.4 lbs.</td>
</tr>
<tr>
<td>20</td>
<td>8.6 lbs.</td>
</tr>
<tr>
<td>15</td>
<td>6.3 lbs.</td>
</tr>
<tr>
<td>10</td>
<td>4.9 lbs.</td>
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</table>

Below 0, salt has little melting capacity

Half as effective in only 5° drop
Determining Application Rate

- Rate charts help select appropriate amount for the condition
- Depends on storm characteristics and pavement temperature range

<table>
<thead>
<tr>
<th>Pounds of Salt*</th>
<th>Surface Temperature (F):</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>33-30 F</td>
</tr>
<tr>
<td></td>
<td>29-27 F</td>
</tr>
<tr>
<td></td>
<td>26-24 F</td>
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<td></td>
<td>23-21 F</td>
</tr>
<tr>
<td></td>
<td>20-18 F</td>
</tr>
<tr>
<td></td>
<td>17-15 F</td>
</tr>
</tbody>
</table>

- Heavy Frost, Light Snow
  - Hours: 2
  - Level: standard
  - 33-30 F: 50
  - 29-27 F: 75
  - 26-24 F: 95
  - 23-21 F: 120
  - 20-18 F: 140
  - 17-15 F: 170

- Medium snow (1/2 inch per hour)
  - Hours: 2
  - Level: standard
  - 33-30 F: 75
  - 29-27 F: 100
  - 26-24 F: 120
  - 23-21 F: 145
  - 20-18 F: 165
  - 17-15 F: 200

- Heavy Snow (one inch per hour)
  - Hours: 2
  - Level: standard
  - 33-30 F: 100
  - 29-27 F: 140
  - 26-24 F: 185
  - 23-21 F: 250
  - 20-18 F: 300
  - 17-15 F: 350***

- Freezing rain, drizzle, sleet
  - Hours: 2
  - Level: standard
  - 33-30 F: 140
  - 29-27 F: 185
  - 26-24 F: 250
  - 23-21 F: 300
  - 20-18 F: 350***
  - 17-15 F: 400***

Rates scaled up or down based on service level and cycle time.
Pavement vs. Air Temperature

- Pavement temperature drives:
  - Freezing/melting of road surfaces
  - Thermal energy needed for chemicals to work
- Road, bridge, and air temperature are often quite different!
Pavement vs. Air Temperature
Truck-mounted pavement temperature sensor
New Deicer Testing

• “AMP” low temperature brine add-in
• Supposed to work in colder temperatures without hygroscopic characteristics of calcium chloride
• Can also be used as a corrosion inhibitor
• Sioux City, Mason City, Decorah
• ~1,500 gallons at each location
Salt/labor management dashboard

**What**
- Produces ‘expected’ salt/labor use for each area for each day
- Compares ‘expected’ vs. ‘use’

**Why**
- Shows how well we adhere to our use guidelines for each unique storm and location

**How**
- Uses detailed observed weather data
- Uses each garages’ responsibility info. – lane miles and service level
- Computes expected use according to guidelines
What Does This Mean For people?

• Targets provide a benchmark
• Visual way to compare
  • Across time or location
  • Outliers become obvious
    • Simple reporting errors
    • Unusual use
• New data daily
  • Catch potential problems early
How We Have Changed

Salt Applied/Salt Estimated (%)

2007-2011 (pre dashboard) value of tons over estimated:
$1.6 M per year

2012-2017 (after dashboard) value of tons under estimated:
$1.9 M per year
Work Underway with ISU/InTrans

• Winter ops custom heat mapping program
  • Visualize data online with themed maps
  • Where are we putting resources? Are there gaps or unusually high areas?

• Winter ops dashboard
  • Link GPS operations data to traffic speed, crashes, and road condition reports
  • Study how our actions relate to safety and mobility and (hopefully) find patterns to lead us forward

• Plow blade wear evaluation
  • Find the best blade type for the road type

• Plow route optimization
  • Re route plows and assignments based on current garage locations
  • Try some non-traditional routing assignments
Thanks for Listening!

- Tina Greenfield -- Iowa DOT Road Weather Information Systems Coordinator