The Connector

February 24, 2016

Message from WisDOT Secretary Mark Gottlieb

Next year will mark the 100-year anniversary of a highly-successful state and county partnership for maintaining Wisconsin's 11,800-mile State Highway System. In 1917, a Maintenance Division was created within the State Highway Commission, establishing a model that remains in place today. The Wisconsin Department of Transportation (WisDOT) contracts with 72 county highway departments across the state to plow snow and complete other routine maintenance year-round along state, federal and Interstate highways.

WisDOT is extremely grateful for this partnership that has served the department, Wisconsin travelers and taxpayers well for almost a century. As winter winds down, it's a good time to review winter maintenance activities in Wisconsin, including innovative strategies the department and counties are implementing to save time and resources while keeping our highways open for business throughout the winter season.

Winter road maintenance in Wisconsin - a combination of snow, ice and innovation

Modern technologies and a nearly century-old state/county partnership keeps people and commerce moving throughout the winter season

When a winter storm grips Wisconsin, a fleet of about 770 county snowplows stand ready to remove snow and ice along the State Highway System. But preparations for a winter storm event start much sooner. Each plow and driver is backed by an inter-connected network of equipment, technology and policies that guide their response.

One important tool is WisDOT's Maintenance Decision Support System (MDSS) that became fully operational in 2011. MDSS combines modern weather forecasting techniques and WisDOT policy guidelines to encourage uniformity in winter maintenance activities. Data streaming into MDSS comes from several sources including 60 specialized weather reporting stations WisDOT oversees around the state. Typically located on or near bridges, the stations monitor air and pavement temperatures, relative humidity, wind speed and direction, precipitation amounts and salt concentrations on roadways. This real-time information helps develop weather forecasts for individual snowplow routes and assists county highway superintendents in planning their overall response to a winter storm.

Plowing - the oldest snow removal technique - remains the "work horse" of winter maintenance. The measured application of salt serves to lower the freezing point of snow and ice, but its primary purpose is to keep snow "workable" so it can be more easily plowed away. When pavement temperatures drop below 15 degrees, salt becomes less effective, and may be mixed with calcium chloride or magnesium chloride to help lower the freezing point even further. A mixture of salt and sand is sometimes used during lower temperatures, but abrasives like sand have limited value. Sand has no ice melting properties and is easily blown or carried off roadways by moving traffic.

Despite its public safety benefits, salt also has drawbacks, impacting vehicles, bridges, roadways and the environment. The cost of road salt continues to creep upward. To hold down costs, many counties and municipalities participate in the state salt bid. In an average winter season, salt use on the State Highway System is about 522,000 tons. For this winter season, the average price per ton was about $71.

Innovative strategies minimize salt usage, environmental impacts and overall costs:

- **Pre-wetting** road salt with a salt brine or similar solution just before it falls onto a roadway helps salt stick to the pavement, minimizes waste and can reduce salt use up to 30 percent. In Wisconsin, nearly all counties have at least some - or in some cases - all of their snowplows outfitted with pre-wetting equipment.
- **Anti-icing** involves spraying bridge decks, curves, hills and other known trouble spots with a salt solution prior to a storm. The solution dries and helps prevent snow or ice from bonding to the pavement. This minimizes or eliminates the need for additional salting, enhances the effectiveness of plowing and improves overall motorist safety. Last winter season, 63 counties made at least one anti-icing application.
- **Ground speed controllers** adjust the amount of salt being applied based on truck speed. Newer "closed-loop" systems provide feedback to truck operators comparing the amount of salt dropping

onto roadways with previously calibrated settings. This data can be used in real-time - in conjunction with MDSS - to help ensure the amount of salt being applied corresponds to anticipated weather and road conditions.

- Many county snowplows are now equipped with **Automatic Vehicle Locators** that use global positioning technology to help highway superintendents know where plows are located, what routes have been covered, and how much de-icing materials should be applied to roadways.
- The most recent innovation holds perhaps the greatest potential to further minimize both salt use and overall equipment needs. **Route optimization** utilizes specialized computer software and GPS technology to plot the most efficient plowing routes. Currently, WisDOT is working with Dane, Green and Brown county highway departments to pilot route optimization efforts.

As any long-time Wisconsinite knows, the length and severity of a winter season varies greatly. Overall winter snowfall in the Badger state can range from 40 inches in the south, to 160 inches along the Lake Superior shoreline. Each snowstorm is unique as well - with variables including snow amount and moisture content, air and pavement temperatures, wind and humidity - all of which impact how maintenance crews approach snow and ice removal. But thanks to a time-tested state and local partnership, along with increasingly sophisticated equipment and technologies, people and commerce continue to move efficiently throughout Wisconsin's winter season.

"Frost tubes" signal appropriate time to haul heavier loads

Each winter, when state highways become sufficiently frozen, WisDOT implements the state's Frozen Road Law (see map of Frozen Road Zones). The law allows heavier loads for trucks carrying certain forest products, and salt and sand for winter maintenance along state highways once ground under highway pavement is frozen to a depth of at least 18-inches. To begin or end a Frozen Road declaration, WisDOT utilizes data gathered from the 60 weather stations, a computer-based "frost model" - and about 75 liquid-filled devices beneath pavement known as "frost tubes." The frost tubes provide a visual reference to know how deep frost has penetrated. When warmer temperatures return and frost begins leaving the ground, WisDOT implements temporary Spring Thaw and Class II road restrictions to protect pavements during this vulnerable period.

Who's who at WisDOT

Peter Wisniewski, Bureau of Highway Maintenance

For WisDOT's Peter Wisniewski, public service includes preventing snow from blowing across highways and motorists from sliding - if you catch his drift.

A Fox Valley native, Wisniewski uses his engineering know-how to develop effective, low-cost solutions to manage drifting snow. Wisniewski says natural solutions are the preferred option, such as planting shrubs

or trees within highway right-of-way to block the path of drifting snow or working with farmers to leave rows of standing corn along known trouble spots. In some cases, permanent, aesthetically-designed snow fences do the trick. Whichever option is chosen, Wisniewski says the outcome is typically dramatic: a significant reduction in drifting snow, and a 50 - 75 percent drop in slide-off crashes.

Following high school in Appleton, Wisniewski spent two years in the Army, worked in carpentry, later as a warehouse manager, then went to college - earning a degree in Civil and Environmental Engineering from UW-Madison in 2010. Today, Wisniewski is the "point person" within WisDOT's Bureau of Highway Maintenance on the latest winter maintenance innovation - route optimization. Now being piloted in three counties, analysis of this new technological tool is ongoing, but optimizing snowplow routes holds the potential for significant savings.

When he's not battling snow drifts or optimizing snow plow routes, Wisniewski writes as a freelance author, and enjoys spending time with his wife, four-year-old son and three-year-old daughter.

Improving how we measure incident response

Traffic incidents happen on the Interstate and state highway system every day, from minor property damage incidents to serious traffic crashes. Restoring the roadway to full operation as quickly as possible reduces secondary incidents, minimizes delays for people and freight and decreases the associated economic impact of backups. The department recently improved its Incident Response performance measure to track how well incidents are cleared in relation to their severity. This change in methodology will bring WisDOT more in line with how other states and the Federal Highway Administration measure response to intermediate and major traffic incidents. Performance for both types are exceeding their targets and trending in a favorable direction with the statewide average clearance time at its lowest level in last five years. For more information, please visit the MAPSS Performance Improvement homepage.

Research Annual Report available

A report summarizing WisDOT's research activities during Federal Fiscal Year 2015 is now available electronically on the department's new and improved Research and Library homepage. In 2015, the department's $3.8 million research program completed eight projects through the Wisconsin Highway Research and Policy Research programs. The department led/participated in 46 pooled fund projects to support important research topics of joint interest to multiple transportation agencies. We collaborated with educational institutions, organizations and state and federal agencies to conduct and share research finding of broad interest through staff participation in national studies and panels. Research staff completed five synthesis reports and 27 literature searches, handled 670 customer inquiries, circulated over 1,615 items and added 2,301 records to the WisDOT library. The activities of the program are aligned with and support the department's MAPSS Performance Improvement program and culture of data-driven decision-making.

The Wisconsin Department of Transportation's MAPSS Performance Improvement Program reviews performance measures for five key goal areas that guide us in achieving our mission - mobility, accountability, preservation, safety and service. To check out the latest online reports, simply click on the MAPSS logo.

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