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**Research Applications
Laboratory**

Winter Road Maintenance

Prediction & Guidance for Safety & Efficiency

Controlling snow and ice buildup on roadways and runways during winter weather events presents several challenges for winter road-maintenance personnel.

Among these challenges is the need to make effective winter maintenance decisions (treatment types, timing, rates, and locations), as these decisions have a considerable impact on roadway safety and efficiency. Additionally, poor decisions can have adverse economic and environmental consequences.

In an effort to mitigate the challenges associated with winter maintenance decisions, the Federal Highway Administration (FHWA) Office of Transportation Operations (HOTO) initiated a program in 2001 aimed at developing a winter road Maintenance Decision Support System (MDSS).

Optimize Maintenance Operations

The winter MDSS is a tool designed to support and inform pavement snow and ice control operations for both roadways and airport runways. The MDSS is based on leading diagnostic and prognostic weather research capabilities, road-condition algorithms, and rules of practice for anti-icing, which have been developed by national research centers. Private-sector weather service providers are using prototype MDSS technologies to develop operational versions of the system for departments of transportation (DOTs) to use.

Benefits & Impacts

- Cutting-edge weather & road forecasting to predict pavement conditions
- Detailed weather forecasts
- Snow & ice control maintenance guidance
- Saves state DOTs & airports millions of dollars annually
- Capitalizes on existing road & weather data sources

Contact Us!

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MDSS Display: Phone & tablet compatible

MDSS INTEGRATED TECHNOLOGIES

- Precision Weather Forecasts (snow rates, snow amounts, etc.)
- Pavement Weather Forecast System
- Pavement Chemical-Concentration Algorithms
- Pavement-Temperature Model
- Anti-icing Rules-of-Practice Module
- Winter Maintenance Display Application

The development of the MDSS began in 2001 and system refinements are ongoing. The system has been field tested in Minnesota, Iowa, and Colorado. The City and County of Denver is currently supporting a version of MDSS used by Denver International Airport to support runway maintenance activities. It's also used by the Minneapolis St. Paul International Airport to inform runway friction prediction. It's also being tested over large urban areas with diverse climates across the United States.

Results that Matter

The MDSS project has developed an operational capability that:

- Capitalizes on existing pavement and weather data sources;
- Fuses data to present an open, integrated, and understandable presentation of current environmental and pavement conditions (or runway conditions);
- Generates diagnostic and prognostic maps of weather and pavement conditions emphasizing the 1- to 72-hour horizon;

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- Offers recommendations on winter maintenance courses of action along with anticipated consequences of action or inaction;
- Delivers all of the above on a single platform, with simple and intuitive operating requirements, and does so in a readily comprehensible display;
- Resides in an open-source framework to support shared enhancements; and
- Uses a new mobile-compatible display which is easy to view on phones, tablets, and desktops

MDSS capitalizes on existing road & weather data sources.

The MDSS was designed to be flexible and extensible so that it could be reconfigured to support a broad range of decision makers involved in snow- and ice-control operations. Although the system was initially developed for state and local winter-maintenance practitioners, it has also been applied in support of airport surface-snow and ice-control operations.

MDSS PRODUCTS PREDICTIONS:

- Pavement Temperature,
- Pavement Condition (snow and ice deposition),
- Weather Impacts: temperature, wind, humidity, precipitation (type, intensity, amount), precipitation-type resolution with probability of precipitation for each type, snow rates, off- and on-pavement snow-totals,
- Pavement-Frost Potential,
- Blowing-Snow Potential,
- Cross-Wind Potential, and
- Treatment Recommendations: type of chemical and amount, to plow or not to plow, location, and timing.

Technology Transfer

The MDSS technologies are made available to parties interested in snow- and ice-maintenance decision-support systems by contacting NCAR. Technical information on the MDSS and instructions for obtaining MDSS software and documentation can be found at: ral.ucar.edu/projects/rdwx_mdss



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