

A new season for winter road maintenance:

## 6 trends and technologies that matter most today



### 1 Moving from reactive to proactive operations

#### Why?

- New technologies allow agencies to anticipate treatments
- Proactiveness improves safety and minimizes traffic disruption
- Environmental concerns require new efficiencies

#### The times are changing

	THEN	NOW
Plow/de-icing deployment	Deployed during/after snow event	Remediation starts before the weather
Forecasting	Only atmospheric conditions	Atmospheric and pavement conditions from many data sources
Road condition data	Broad and nonspecific	Granular and detailed
Timescales	Long; data frequently outdated	Short, often real-time
Sensing and observation	Unsophisticated, manual, and prone to error	Automated, objective, and instant
Material waste	Excessive and costly	Minimal and continually optimized

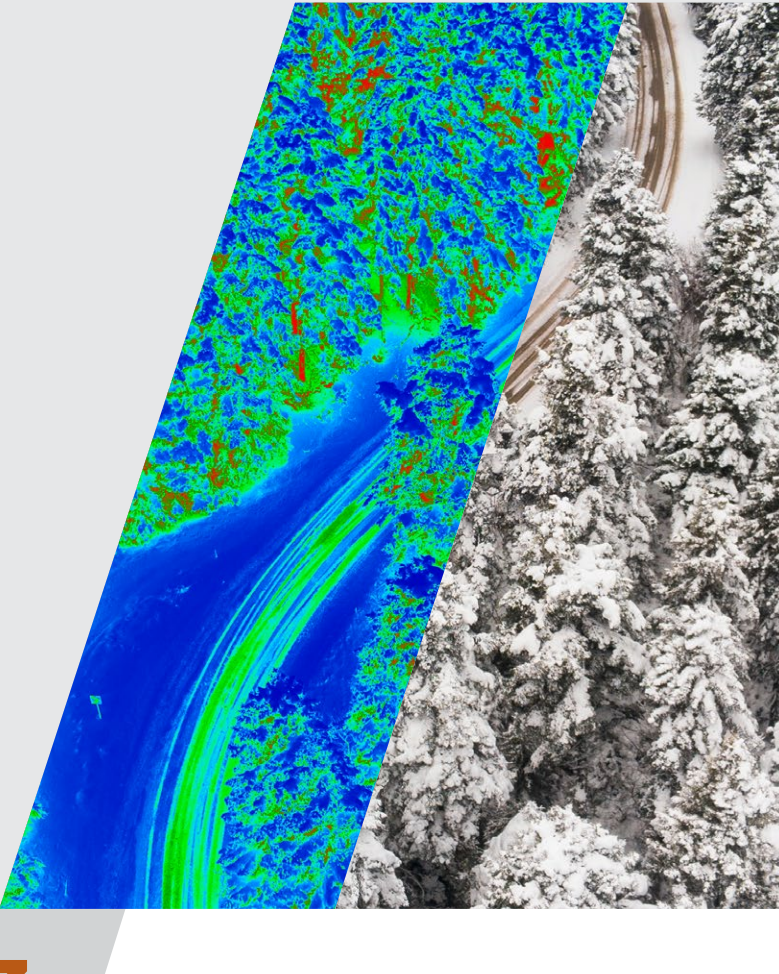
#### What more proactive operations do for agencies:

- Help control costs
- Allow for better, more extensive mitigations
- Create new efficiencies and better decision-making



### 2 The rise of thermal mapping

2



#### Why?

- Thermal mapping has been available for some time and usage in the U.S. has recently been increasing
- Identifies warm and cold areas of roadway
- Data can be merged with crash reports to mitigate dangerous stretches of road

#### What thermal mapping does for agencies:

- Predicts which areas will be affected by a freezing event and which will not
- Provides granular data on short stretches of road where temperature varies as much as 15°F
- Allows for prioritization and appropriate treatment amounts ahead of a freeze

### 3 Liquids, liquids, liquids

#### Why?

- Available, fast to apply, and effective in a more timely manner
- Increasingly prevalent, so materials and practices are well-understood
- Environmental impacts can be managed

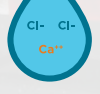
#### Typical liquids



Salt brine



Magnesium chloride



Calcium chloride

#### What liquids do for agencies:

- Provide flexibility — they work instantaneously and have good working temperature ranges
- Expand the useful window of treatment time because they work before, during, or after a weather event
- Improve performance while reducing the amount of chemical needed as a best practice



### 4 Higher-performance equipment

4

#### Typical equipment types



Plow blades



Ground-speed computerized dispensing systems



Remote sensors

#### Improvements in longevity



Traditional mild steel plow blades:  
A few **hours** of use



Today's blades with rubber-encased carbide or ceramic:  
A few **years** of use

#### What higher-performance equipment does for agencies:

- Controls replacement costs over time
- Keep trucks online and out of the shop
- Performs better in the field than legacy equipment



### 5 Mobile sensors

#### Why?

- A single sensor can provide a detailed understanding of road state, both before and after the plow blade pass
- Creates real-time insights for drivers and agency
- Small, rugged sensors can withstand severe weather and be installed on almost any vehicle

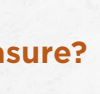
#### What would you like to measure?



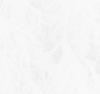
Surface temperature



Dew point



Humidity



Air temperature



Pavement friction



Roadway state



Precipitation thickness

#### What mobile sensors do for agencies:

- Enhance objectivity and allow data to be shared instantly
- Create significant savings in money and materials
- Provide drastic improvements to situational awareness and efficiency

### 6 Incorporating Big Data

6

#### Why?

- Data collection is becoming easier and more automated
- With the right analysis, situational awareness and efficiency can improve greatly
- Funding and efficiency pressures demand more intelligent decision-making

#### Just what is Big Data?

- **Big in quantity:** combines many data points from many devices
- **Big in scope:** measures many weather and performance factors
- **Big in power:** Assimilates data for powerful insights, better decision-making

#### What Big Data does for agencies:

- Helps improve an agency's resiliency and efficiency
- Applies road condition data to other processes and problems
- Allows systems to work together for better insights and decisions

#### It's about the Big Picture

Advanced algorithms can fuse data from multiple sources to deliver a more comprehensive view of:

- Road segment forecasts
- Roadway assessments
- Current conditions/plow location visualizations

