

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| Timescales               | Long; data frequently outdated              | Short, often real-time                                     |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                          |

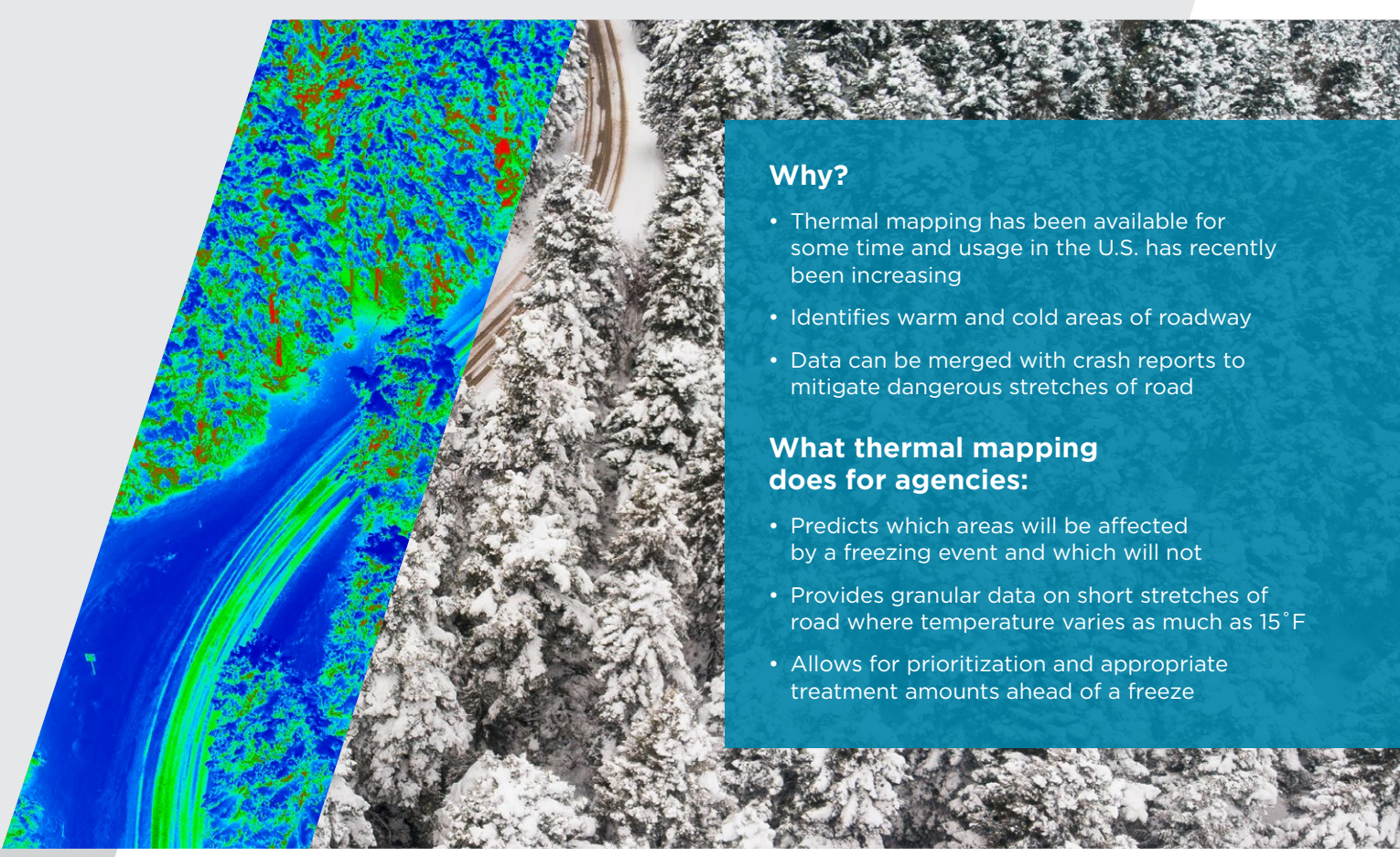
### What more proactive operations do for agencies:

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



## The rise of thermal mapping

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### 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:

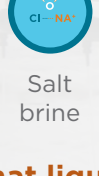
- Predicts which areas will be affected by a freezing event and which will not
- Provides granular data on short stretches of road where temperature varies as much as 15°F
- Allows for prioritization and appropriate treatment amounts ahead of a freeze

## Liquids, liquids, liquids

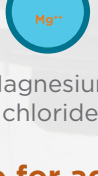
### Why?

- 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

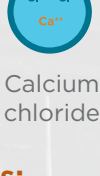
### Typical liquids



Salt brine



Magnesium chloride



Calcium chloride

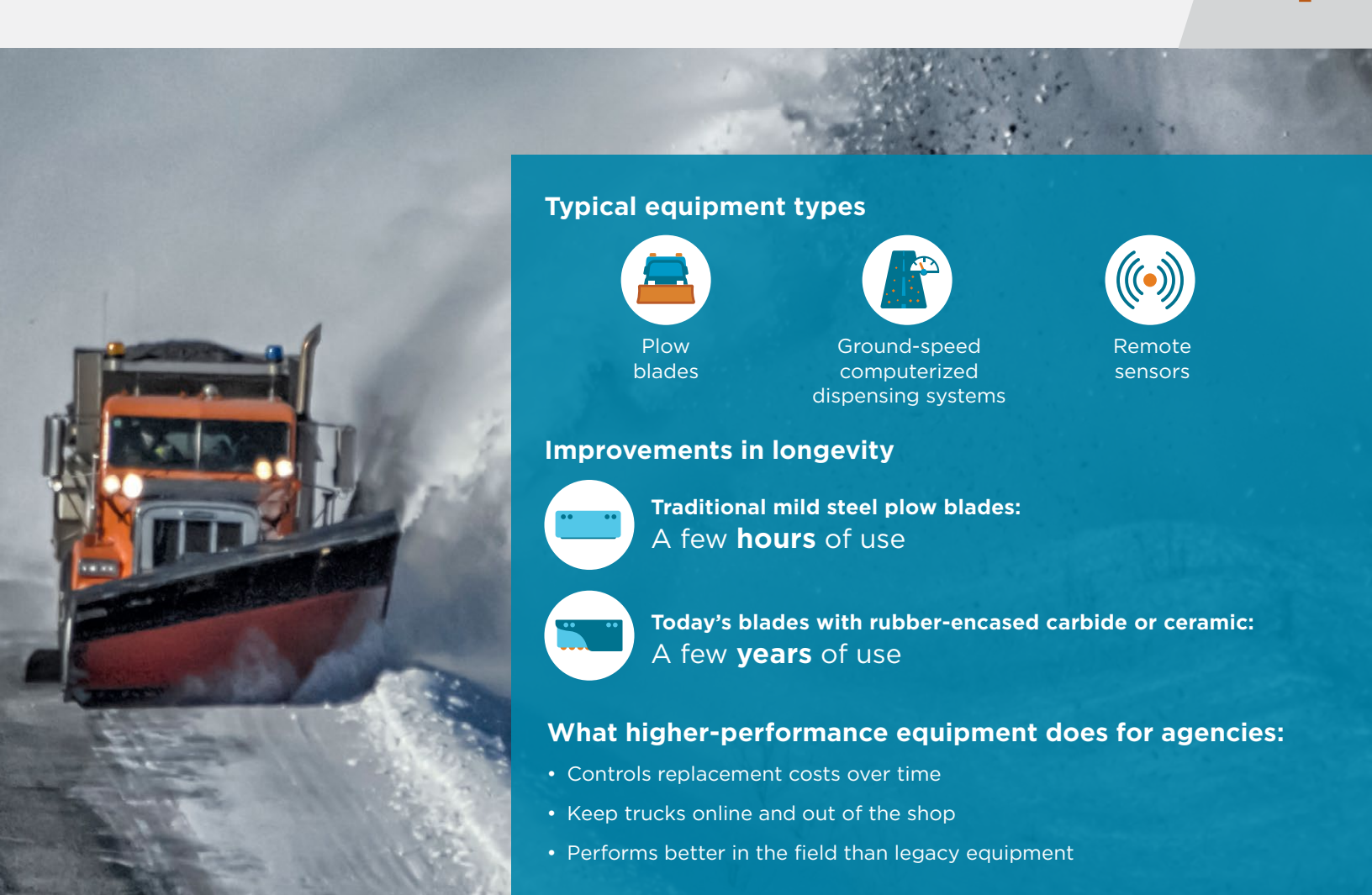
### What liquids do for agencies:

- 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

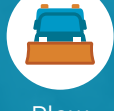


## Higher-performance equipment

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### 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

## 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

## Incorporating Big Data

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### 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 improves 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