Best Practices for Winter Road Maintenance

Laura Fay
ADC60 Summer Workshop
“Sustainability in a Time of Resource Scarcity”
June 8, 2015
Overview of WM Operations
WM practices - Plowing

The physical removal of snow from the road using a snowplow.
Sanding

The application of sand, cinders, ash, etc. to improve friction on the road way.
Anti-icing

The practice of preventing the formation or development of bonded snow and ice by timely applications of a chemical freezing-point depressant.
Deicing

The practice of breaking the bond between snow and ice and the pavement surface through applications of a chemical freezing-point depressant.
Pre-wetting

Application of liquid to solid material prior to placement on the road surface.

Examples
Salt brine ➔ sand
Salt brine ➔ rock salt
Winter Maintenance Products

- Sand
- Treated sand (sand + 10% salt (s,l))
- Chlorides – NaCl, MgCl₂, CaCl₂ (s,l)
- Ag-based – beet, corn (l)
- Acetates & formates (s,l), glycols (l) & glycerin (l)
Product Application Rates

- **Sand** – 100 to 1000 lbs/l-m (32°F and colder)
- **Salt/sand** – 400 to 1000 lbs/l-m (32 to 0°F)
- **NaCl** (32 to 15°F)
  - solid – 100 to 800 lbs/l-m
  - liquid – 10 to 40 gal/l-m
  - pre-wet – 8 to 20 gal/l-m
- **MgCl₂ (32 to -5°F) and CaCl₂ (32 to -15°F)**
  - solid – 100 to 500 lbs/l-m
  - liquid – 10 to 40 gal/l-m
  - pre-wet – 8 to 20 gal/l-m
“the snow and ice control practice of prevent the formation or development of bonded snow and ice by timely applications of a chemical freezing-point depressant”

- ↑ LOS, ↓ product, abrasives & plowing
- 10 – 40 gal/l-m
- Cost savings, ↑ mobility & safety
- Side benefit of reducing impacts to the environment, infrastructure, and vehicles.

- Limitations:
  - Cold temps, rain/sleet, blowing snow, air temp above freezing and rising, high humidity
Pre-Wetting Solid Material

- Adding liquid to products or abrasives at stockpile or at the spreader
- Benefits
  - Eases product management and distribution
  - Accelerates breakup of snow/ice and enhances melting
  - Minimizes bounce and scatter, improves performance
  - Increases longevity on road = less frequent applications
Impacts of Salt and Chloride Based Deicers

Photo courtesy of M. Mills

www.witnessservices.net
www.modot.org
www.clf.org
www.syracuse.com
www.miissoulanews.bigskypress.com

www.ci.bellevue.wa.us

Western Transportation Institute

Montana State University College of Engineering
Impacts of Sand and Abrasives
Salt Management Plans

– A statement of policies and objectives
– Identifies:
  • Road use, salt vulnerable areas, storage sites, snow disposal sites, training, etc.
– Documentation
– Proposed approaches
– Training and Management Review
Iowa DOT Salt Model

- Allocates salt to garages based on weather conditions and policy usage requirements.
- Creates a salt budget for each garage

Garage Salt Use Summary Through 4/15/2012 Payperiod 13 & 14

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Annette Dunn, Iowa DOT
Monitoring and Keeping Records

• Determine your baseline
• Use collected data to find trends
• Consider tracking:
  – Total length of road
  – Winter severity rating
  – Number of events
  – Material used
  – Calibration dates
  – Treatment effectiveness
Training for Salt Management and Winter Maintenance Operations

- Assess the needs of your staff
- Consider who is being trained and how to best convey that information
- Design training based on learning goals
- Training methods:
  - Classroom, field, post-storm debriefing, simulator, etc.
Training Continued…

• Have experienced staff conduct the training
• Evaluate your training program
• Assess how much information was learned
• Common training methods:
  – Annual operator training, Snow University, Snow & Ice Rodeo, Computer Based Training (CBT)
Calibration

• Is a must
• Why: to realize savings gained from investment in new technology
• Train how to calibrate & keep records
• When to calibrate:
  – When first acquired, points throughout a season, whenever a new material is used, after repairs, if there appears to be discrepancy in material usage
Material Storage

- All products should be stored in a manner to minimize any loss of product.
- Cover and store snow and ice control materials on an impermeable surfaces
- Secondary containment for liquids.
Reactive Strategies

So there are deicing chemicals and sand out on the road and in the environment, what do we do now?

- Clean it up
- Capture it
- Dispose of it
Summary of Environmental BMPs for Snow and Ice Control

• Cover and store snow and ice control materials on an impermeable surface, secondary containment for liquids.
• Regulate the application of snow and ice control materials to prevent over application.
• Use specialized equipment to apply the right amount, in the right place, at the right time.
Summary of Environmental BMPs for Snow and Ice Control

- Use the appropriate snow and ice control materials for the given conditions.
- Calibrate equipment.
- Train operators in proper application, calibration, and cleaning procedures.
- “Good housekeeping” – clean, organized and well maintained.
Conclusions

Deliver the right type & amount of materials in the right location at the right time

- Effectiveness & efficiency of winter operations
- Material usage, $$$, environmental footprint

Balancing LOS vs. sustainability: best practice in technology & management domains
Resources
NCHRP Synthesis 449 Strategies to Mitigate the Impacts of Roadway Deicers on the Natural Environment (http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_449.pdf)
NCHRP 25-25(04) Revised Chapter 8 Winter Operations and Salt, Sand and Chemical Management (http://environment.transportation.org/environmental_issues/construct_maint_prac/compendium/manual/8_0.aspx)
NCHRP Toxicity of Chloride Based Deicers on the Natural Environment (http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP25-25%2886%29_FR.pdf)
Thank you for your time.

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