Equipment & Materials
Effective snow and ice control is a critical aspect of highway winter maintenance. Snow removal equipment, especially, is a key element that is affected by harsh conditions. This session is relevant for fleet management and maintenance and operations personnel who have winter maintenance responsibility.
Equipment and Materials

- Accuracy of data collected from equipment/vehicles (scales and plow sensors)
- New equipment (plow lighting, plug and play communication protocol) and cost benefits (plow blades, tow plow)
- Mitigating corrosion
Equipment and Materials

- Effective use of winter maintenance materials
- Optimizing computer-based plow routes to minimize completion time, balance work load, reduce wasteful deadheading
- Snow Plow Operators
INNOVATIONS

• Staff Swap with Forestry
• Underbody Slush or Pack Cutting Blades
• Hot Water Sander- Cold Surfaces
• Load Cell On-board Weighing
• Spreader Calibration during the Season to Account for Salt Density Changes
• Laser Light Guide for Wing and Tow Plows
Gaps

• Cost Benefit of Corrosion Inhibitors/Quantifying Corrosion Costs/On-board Corrosion Sensing
• Recycling Truck Wash Water- Turn into Brine vs. Disposal Cost Effectiveness
• Update Warning Light Guidance- Consideration of New Technology
• Need for a National Standard or Guidance for Reflective Sheeting
• What do Winter Liquids do to Electric Vehicles?
• Winter Maintenance of Pedestrian Areas, Bicycle Routes and ADA Compliance
• Addressing Freezing Rain
Breakout Session Notes

Equipment and Materials

- Non-Chloride Materials: CMA to -40°C corrosion pretreat with grit "salt x 10" salt radian.
- Oregon Salt Ban: MDOT: 20-20 grit and gritted sand.
- Tow Plows: Chain, combo spreading, how to avoid plow plugging.
- Sodium Propionate: Powder corrosion, $10,000 per tonne.

INNOVATIONS
- Staffing swap with Forestry.
- Underbody Slash Blade.
- Cinder volcanic products application:
- Load cell on board.

Accuracy of Salt Spreading
- Spreader cell ± 20%.
- Salt density & pH: Steam-corporative accurate placement across pavement.

Variable Salt Rates
- Many Factors: more salt on the pavement.

GAPPS
- $ benefit of corrosion inhibitors.
- Magnitude of improvements in maintenance vehicles - simple.
- Best Practices: common understanding.
- Clear road report.
- Recycling truck wastewater.
- Visibility: lights, sheathing - FEMA.

Residual Salt Application
- Visible: visibility cladding reduction - optimum rate.

MDSS
- Road state forecast: recommend role material. Hybrid Shift Policies.
- Automatic Plow Control.
- Sweep up sand?
- Patrolling Frequency: 24/7 vs. 24/5? Who? Full patrol? Palm Island?
- Plum or Pick-Up: Operations with possible track, 100% breed: implementation.

What do similar liquids do to electric vehicles?
- Standard Test Protocols for Ultra-fast charging applications:
- Maintenance of production.
- Bicycle routes.

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Breakout Session Notes

- Na Propionate, Chloride free materials
- Load Cells
- Emerg. Mgt + Winter Operation
- Innovative Practices + Technologies
- Corrosion - measure to manage
- Tow Plow performance hills
- Equipment needs
- Patrol routes + frequency
- Materials

Non-Chloride Materials
- CMA - to -10°C corrosion pretreat with grit
- Salt * 10 50 t 800 km.
- Oregon Salt Ban, MgCl₂ 20-30 g/l mi
- pretreat sand
- S Steel truck bodies?
Breakout Session Notes

Sodium Propionate
lower corrosion
$10,000 per tonne

Tow Plows
hills - chains
combo spreading
how to avoid plowing salt?
adual wing plows
trailer with underbody slush plow
implementation?
Joma flexible blade
Akron U. cost-benefit
MDSS
road state forecast
recommended rate & material
Hybrid Staff Positions

Automatic Plow Control

Sweeping up Sand?

Patrolling Frequency
24/7 8?16?12? flexible?
Full patrol? RWIS eyes?

Plow or Pick-up?
Operations Center calls patrol
track RWIS forecast
snowplow RockPlow
trackers/public crowdsourcing
E-car
Breakout Session Notes

**INNOVATIONS**
- Staffing swap with Forestry
- Underbody Slush Blade
- Hot Water Sander - cold surface! 8 KAAD
- Cinders: volcanic
- Brooms - attachment
- Load cell on board

**Accuracy of salt spreading**
- Spreader cal ± 20-30%
- Salt density Δ thru season - compensated
- Accurate placement across pavement

**Variable Salt Rates**
- Many factors move salt on the pavement
Breakout Session Notes

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**GAPS**

- $ benefit of corrosion inhibitors
- magnitude of corrosion (rate) on maintenance vehicles → sensor
- Best Practices corrosion mitigation: Clear Roads report
- Recycling truck washwater
- Visibility
- Lighting: Sheeting - FEMA
- Need for national standard
  - snow packs on airfoils LED

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**GAPS**

- Early implementation
  - laser guide for wing plow
  - DOT visual guidance system
- Residual Salt - Aurora
  - Operator visibility clothing - reflective
  - optimum color?
Breakout Session Notes

What do winter liquids do to electric vehicles?

Standard Test Protocols
- plow blades
- anti-icing application rate
- maintenance of pedestrian and bicycle routes
- freezing rain