More Liquid- Less Salt!

Chris Cheney
MnDOT Maintenance Operations
District 1
Winter camp on Savanna Portage

Savanna Portage separates the Lake Superior and Mississippi drainage basins
Alexander Mackenzie called it "the most perfect piece of water in North America"
Mississippi River

The Mississippi near Grand Rapids
While nearly 70 percent of the world is covered by water, only 2.5 percent of it is fresh. The rest is saline and ocean-based. Even then, just 1 percent of our freshwater is easily accessible.
Organization

- 6 Sub-areas
- 19 Truck Stations
- 22 Reload Sites
- 3800 lane miles
- 565 Bridges
- 99 routes
Road Salt Use

• MnDOT District 1 - annual average 32,500 tons salt
• MnDOT District 1 2019-20 season – 31,749 tons salt
• MnDOT District 1 2019-20 brine – 418,089 gallons
• MnDOT Statewide – 2019-20 - 246,505 tons salt
• MnDOT Statewide – 2019-20 - 4,571,401 gallons brine
Winter Maintenance
Resource Deployment - Staffing

• Criteria outlined in Statewide & District Snow & Ice Plans

• ‘Normal’ Shifts: 7am – 3:30pm (8 hours)

• Split Shift: A &/or B
  • Adjusted work periods for increased coverage based on forecast or storm severity
  • 40+% chance snow; 30+% freezing precip; severe conditions; high priority post-storm cleanup
  • ‘A’ may start as early as 12am, ‘B’ may start 12:00pm
  • Provides ability for 24 hour coverage if needed

• Dawn & Afternoon Patrol: 11pm-7:30am; 3pm-11:30pm
  • Provides coverage & communications for after-hours conditions
Resource Deployment - Staffing

- Operator Assignments and Deployment based on truck locations and ‘2 per plow’ concept
- 168 Priority 1 operators (159 Operations; 9 from PD or temps), 30 Priority 2 operators, 14 45-day emergency temps
- 6 TOS2 (Subarea Supervisors), 3 TOS1, TPS, Superintendent
• **Road & Weather Information System (RWIS)**

  • Automated system that collects and reports current and forecasted weather data and pavement surface sensor data

  • Planned for expansion (22 to 31) over next 2 years to fill in existing gaps
Resource Deployment - Equipment

- 84 Route or ‘Line’ Trucks (91 w/ 9 spares)
  - 31 Class 33 & 60 Class 35
    - Front Plow
    - Wing Plow
    - Underbody Plow
    - Salt/Sand Box
    - Pre-wetting Tanks
    - High Vis Lighting
    - Road Temperature Sensors
    - Communications
    - AVL (Automated Vehicle Location)/MDSS (Maintenance Decision Support System)
Resource Deployment - Equipment

MDSS – real time radar, forecasts, material application recommendations
Resource Deployment - Equipment

- 20 Front End Loaders
- 13 Industrial Blowers
- 6 Motor Graders (own 3)
- 5 Anti-icing units
- 2 Trackless Machines
Resource Deployment - Equipment

- 5 Tow Plows
  - 24’ width at 30° angle
  - Increased Efficiency
  - Less passes, not less trucks
  - Not effective for all conditions
Tow Plow Tank Conversions

Tow plow hopper box to liquid tanks conversion, approximate cost $18,000 plus labor
Truck In-box Tank Conversions

1050 gallons of liquid capacity plus room for 8 tons of granular material – approximate conversion cost -- $15,000.
In-box Tank

Enough capacity for up to 400 lbs./mile and 25 gallons per mile for a 40 mile route
Auger spray bar and rear spray bar

Pump can apply liquid at rates from 20 to 60 gallons per lane mile
Electronic valve controls – Sight gauge for in-box tank
MnDOT District 1 Liquid Expansion

- Adding 22 6500 gallon liquid storage tanks across the district at truck stations and outlying reload locations
- Adding and/or upgrading brine generators across the district to meet brine capacity needs.
- Adding in-box distribution tanks in plow trucks and converting tow plows to liquid distribution

Need 2 inch waterline supplying the makers or have fresh water surge tanks
Chemicals

• Plowing is most cost-effective; lower LOS

• Rock Salt (NaCl) is still the standard
  • $75/ton.........32.5K tons/yr (average)
  • 1# salt melts 46# ice at 30°........only 6# at 15°
  • Corrosive; environmental impact (1 tsp NaCl contaminates 5 gal H2O)

• Pre-wetting w/salt brine (23% conc); speeds reaction, holds material to surface

• Enhancers: Geomelt, Beet Heet, other organics (30%/70%)

• Alternatives: CaCl$_2$, KAc

• Winter Mix (sand) when temps fall below salt working temps
District 1 2019-20 winter season

- Salt - 31,749 tons
- Winter sand - 12557 tons
- Brine – 418,089 gallons
- Potassium acetate – 75,743 gallons
- Salt brine additive (Beet Heet, other) 42,628 gallons
- Miles on plow-trucks – 805,560.69 miles
District 1 2019-20 Winter

• The totals according to MDSS Maintenance reports:
  • 136.62 inches of snow up north of the Shore
  • Over 115 inches in the Duluth area
  • Across District 1 the average snowfall was 92.42 inches
  • The average annual snowfall for D-1 is 76.5 inches
  • 39 snow & ice events
  • 104 plow event days
MDSS usage vs Recommendations

8/6/2020

MDSS seasonal usage vs recommendations - District 1 over 145 %
Bare Lane regains
District 4  2019-20 snow & ice season

• 25.6 snow & ice events
• 68.4 inches of snowfall
• 1,265,987 gallons of brine
• 13,153 tons of salt
• 592,971 plow truck miles
• More Liquid- Less salt!!
District 4 averaged 61% of MDSS recommendations
District 4 Bare Lane regain times
Thank you!

MOST PLACES WOULD CALL THIS A Crippling SNOWSTORM

IN MINNESOTA WE CALL IT THURSDAY