

Alaska Department of Transportation & Public Facilities

National Peer Exchange 2013



Winter Maintenance Best Practices and Sustainability



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Alaska DOT&PF

Alaska Compared to the Continental U.S.A.



Maintenance and Operations

- Over 1150 M&O Employees Statewide
- 80 Maintenance Stations
- 3944 Pieces of Equipment
- \$155M Operating Budget
- \$55M Snow and Ice Control
- 18,000 Tons of Salt Annually
- \$50M FHWA PM Program
- \$5-10M FAA Surface Maintenance
- \$3-20M Deferred Maintenance







Winter Maintenance Challenges

- Extreme Temperatures: -80F to +100F
- Extreme Snowfall: 1.5' to 80'
- Extreme Geography: Maritime to Arctic
- Extreme Cost:
 - Bulk Salt \$145/ton
 - Bagged Salt \$350/ton
 - Organic Additive \$2.40/gal
 - Mag Chloride \$1.40+/gal
 - Diesel \$9-\$10/gal in Villages
- Changing Climate
- Changing Regulatory Climate
- Budget



Winter Maintenance Technologies

- 51 RWIS Installations
- Expanding Highway Anti-icing Program
 - Magnesium Chloride
 - 8 new Enhanced Salt Brine Units
- Five Tow Plows
- Automated Bridge Deicing System (E36)
- Alaska Specific MDSS
- Mobile Weather Detection System



Alaska's Smart Vehicle System

- High Accuracy Differential Global Positioning System (HA-DGPS) which gives the operator a virtual view of the highway
- Head-up-display provides a virtual view of the highway
- The System's ability to provide visual, heuristic, and audible indicators to aid the operator with lane assistance during reduced or zero visibility conditions due to snow, blowing snow, ice fog or smoke
- Advanced radar which is integrated into the system displays the position of other vehicles and aircraft on the head-up-display providing position, distance and closure rate













Thompson Pass average of 46 feet of snowfall since 1951





the road to Valdez in summer...

view of the road in winter...

Lane Guidance Systems for Highway Maintenance: "Seeing" the Road



Smart Vehicle Benefits

 By equipping our snowplows, snow blowers and a Fire Truck we are able to reduce operator stress, reduce guardrail/equipment damage, conduct safer and more efficient snow & ice control and rescue operations



Smart Technology Overview

- Technology that adapts to humans
 - Human centered design
 - Enhancing visibility; Lane keeping assistance
 - Enhancing situation awareness
- Accuracy and DGPS
- Lane Level Digital 'Maps':
- Driving in narrow lanes: ... bus-only shoulders
- Other applications: Reducing lane departure fatalities



University of Minnesota Intelligent Vehicles Laboratory

- 2 Snowplows and 2 Snow Blowers in use at Thompson Pass
- Smart Fire Rescue Vehicle and a Smart Snow Plow in use at Deadhorse Airport
- Snowplow at in use at Valdez

Smart Vehicle Technology

- High Accuracy Differential Global Positing System (HA-DGPS) which through the signal processor and display technology gives the operator a virtual view of the highway
- Head-up-display provides a virtual view of the highway
- The System's ability to provide visual, heuristic, and audible indicators to aid the operator with lane assistance during reduced or zero visibility conditions due to snow, blowing snow, ice fog or smoke
- Advanced radar which is integrated into the system displays the position of other vehicles and aircraft on the head-up-display providing position, distance and closure rate

Smart Vehicle Operations

- The System provides a virtual moving map of the highway:
 - centerline
 - fog lines (which go from white to red when crossed)
 - intersections
 - dividers
 - turn lanes
 - rumble strips
 - guardrail
 - radar image (which gets larger and flashes if closure rate is high)

Divide Repeater Site

VHF Antenna for DGPS Correction

GPS Antenna For High Accuracy DGPS Station Accuracy 3 – 5 cm

Projector •

Storm guard

Head-updisplay Image Combiner

Housing for computers, radar, VHF radio, and GPS receivers

Smart Vehicle Project Cost

- Cost
- Phase I -\$244,800.00
- Equip 2 trucks
- Differential GPS Station
- Electronic Map Highway

- Cost
- Phase II \$550,478.00
- Equip 3 trucks
- Antenna Tower Foundation and 120' Tower
- Differential GPS Station, Integration of vehicles and stations
- Electronic Map Highway