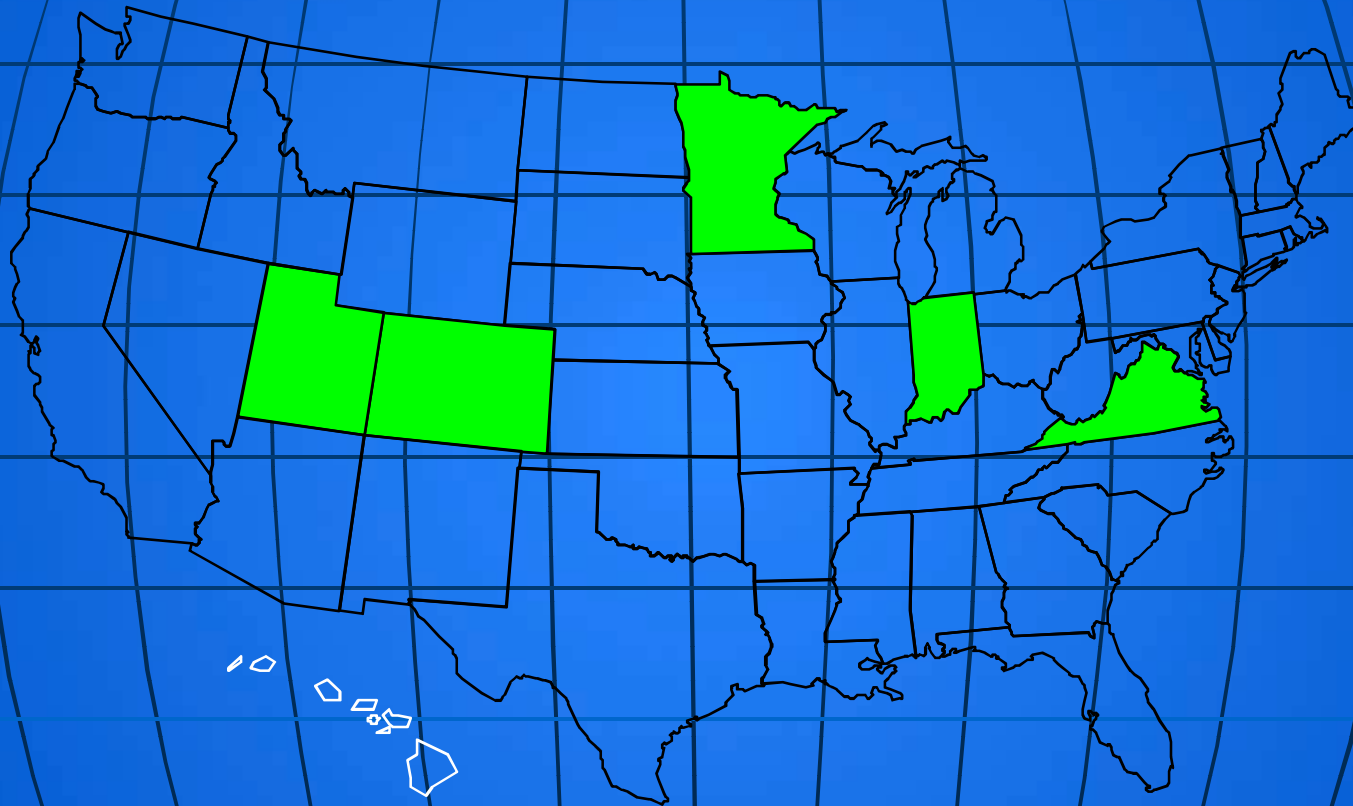


2009 Domestic Scan

Best Practices in Winter Maintenance



Bill Hoffman – Nevada DOT

Indiana Department of Transportation

2009 Snow & Ice Conference

Places Visited

STATES

- Minnesota DOT
- Colorado DOT
- Utah DOT
- Indiana DOT
- Virginia DOT

CITIES

- Denver, CO
- Ft. Collins, CO
- Grand Junction, CO

■ *plus*

I - 470 Toll Road in Denver, CO

Eisenhower Tunnel, CDOT

Holland Tunnel, CDOT

Winter Scan in the Snow?



SCAN TEAM MEMBERSHIP



Ben McKeever
FHWA
Co-Chair



Dave Ray
ODOT



Bill Hoffman
Nevada DOT
Co-Chair



Steve Lund
MnDOT



Terry Nye
PennDOT



Mike Schwartz
VDOT

ARORA STAFF



Rod Pletan
Subject Matter Expert
Retired MnDOT



Armando Perez
American Trade Initiatives (ATI)
Logistics Coordinator

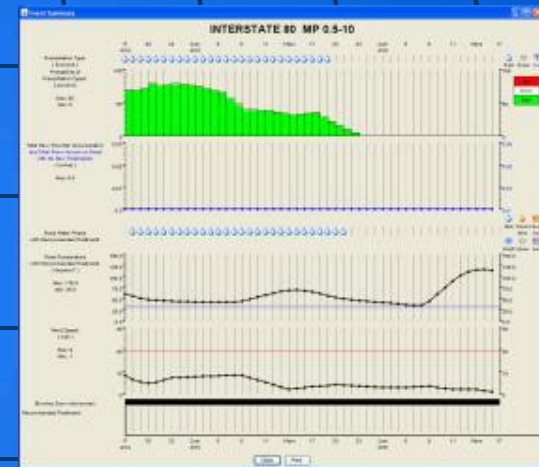
Focus Areas

- Maintenance Decision Support Systems (MDSS)
- Automatic Vehicle Location Systems (AVL)
- Equipment Technologies
- Training and Development
- Management Issues
- Integration of Weather, Traffic and Maintenance Operations

Initial Findings

MDSS

- Data Transmission capability, real time with truck
- Wide variety of Data Elements
- Year around applications
- Cost-Benefits becoming identifiable
- Marketing strategies vary from top down to bottom up
- Positive impact for both employee and management



MDSS

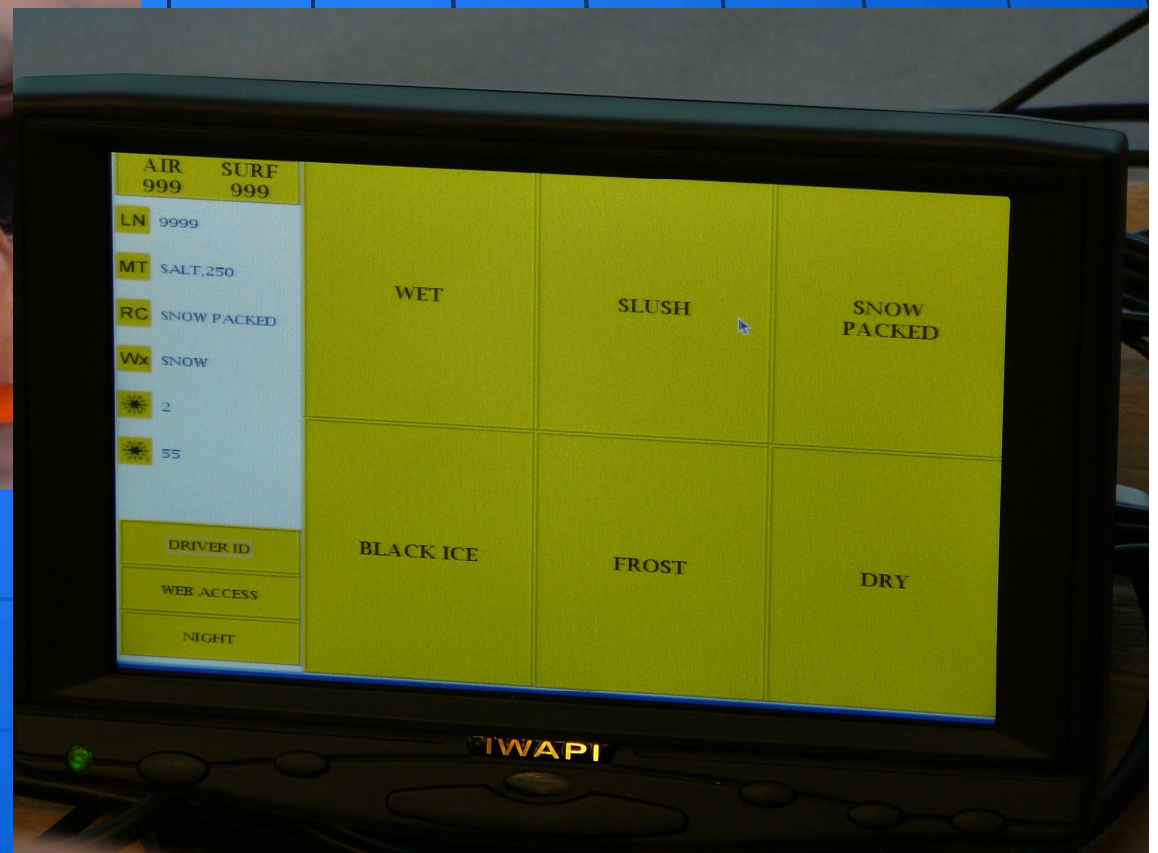
In-Cab Displays @ CDOT



CDOT



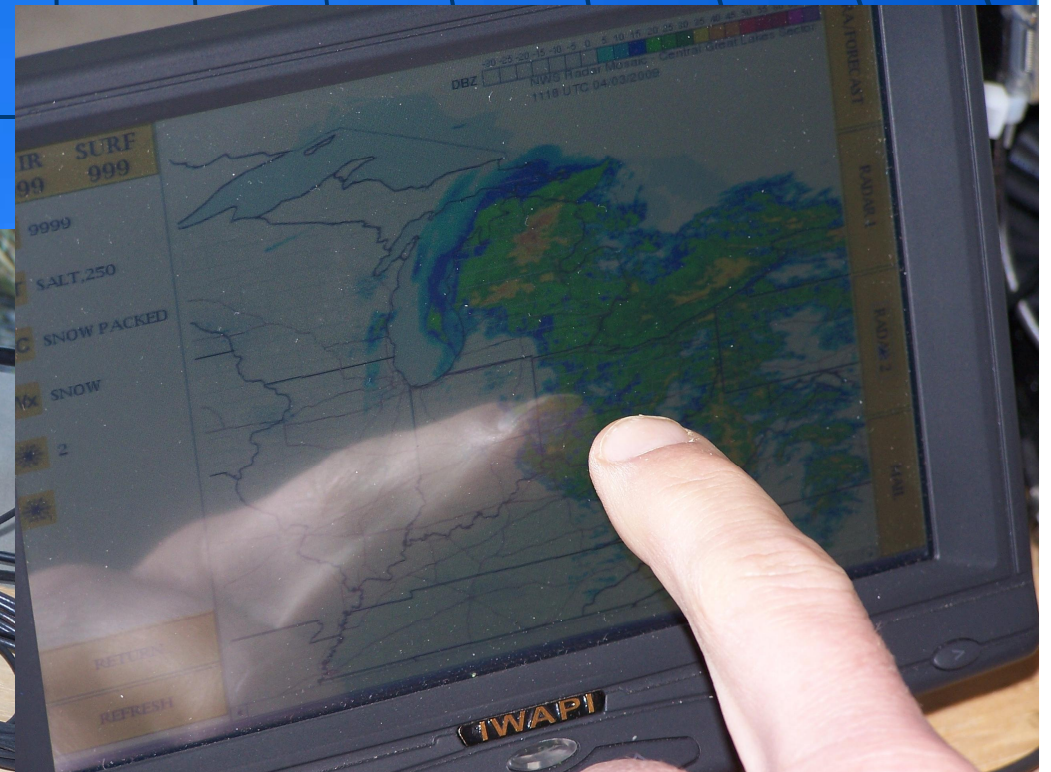
MDSS Touch-Screen Input @ CDOT



Indiana MDSS Training



Indiana MDSS Training



MDSS In-Cab Displays



Minnesota



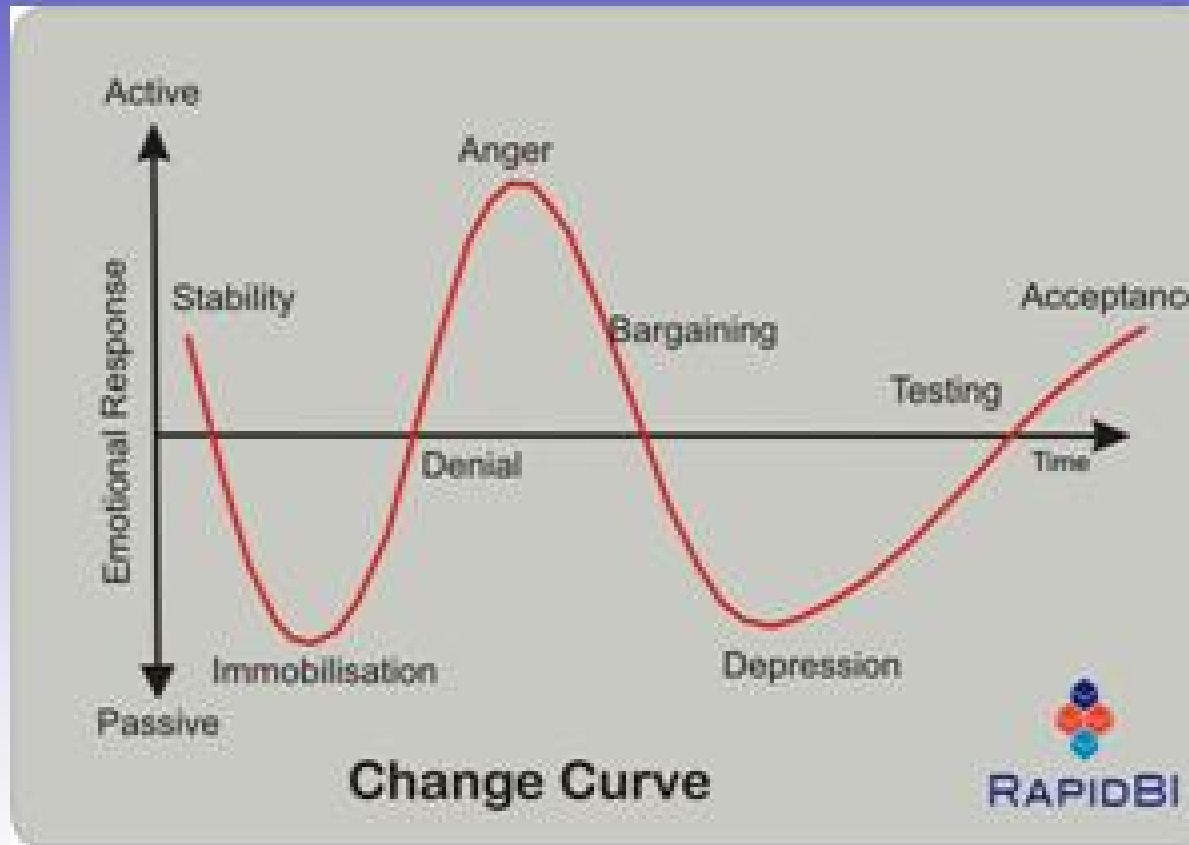
Indiana

MDSS Camera in Cab

CDOT



How do we respond to change emotionally?



Tony McClellan - INDOT



INDIANA DEPARTMENT OF TRANSPORTATION
Driving Indiana's Economic Growth

**MDSS Implementation
Team**

Recommendations

MDSS

- Publish Successes in Winter Operations
- Continue Use for Year-Round Maintenance Activities
- Continue Marketing and Implementation strategies
- Continue Efforts to Develop Automated 511 & MMS Data Uploads
- Continue to Develop Level of Effort Index

Chemical Storage Buildings

Solid Chemical



UDOT



Mn/DOT - Maplewood



City/County of Denver, CO



CODOT - Deer Trail



City of Ft. Collins, CO



Salt Storage – Fort Collins



Chemical Dispensing System – F.C.



Indiana Storage Building Combination Liquid/Solid



Indiana DOT - Greensberg



All brine making, storage of both solids and liquids...plus loading...all isolated inside covered building



IN Drive Thru Loading Area



Brine Making



Early Brine Making shop made using PVC piping



VDOT



Mn/DOT - Maplewood



Virginia Brine Water Source



Brine Making

Housed in same building as solid chemical

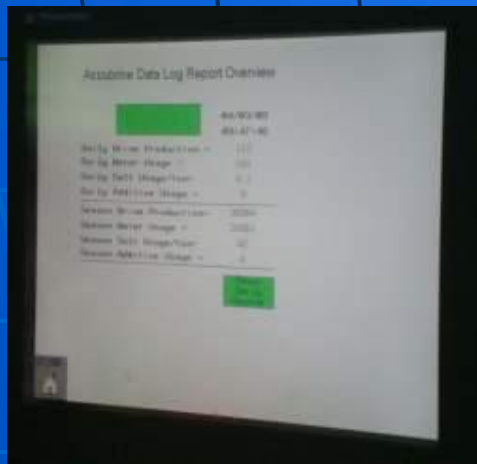
Indiana DOT - Greensberg



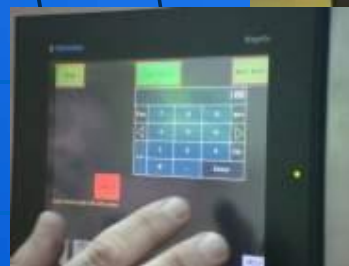
Control Room



All automatically controlled, touch screen actuated, with printouts of production

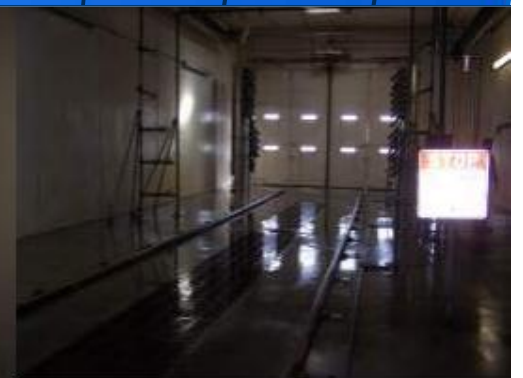


Accubrine Data Log Printout

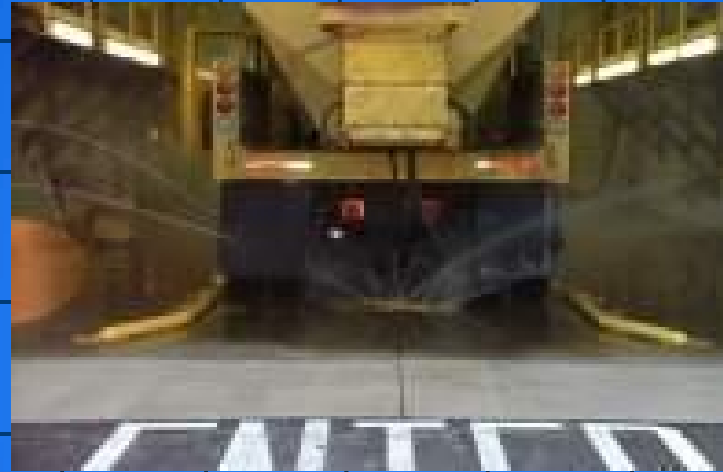


Truck Wash Bay

Minnesota DOT



Truck Washing Bay Indiana



Platoon Plowing



Grand Junction CO



Indiana DOT



Minnesota DOT



Utah DOT

INDOT Tow Plow



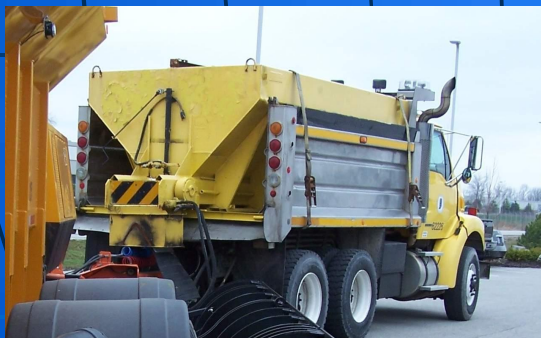
Easily able to cover one-extra lane (truck plow not mounted)



Solid Chemical Box



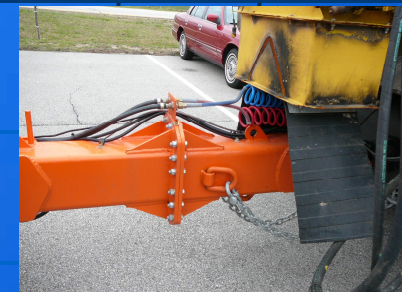
Self-Contained Power Unit For Hydraulics



Tow Truck w/V-Box Spreader



Spreader



Simplified Hook-up

Mn/DOT's Tow Plow



Towing position, plow up



Plowing position, plow down



Easy to cover shoulder



Blue & amber LED warning lights



Rear-facing Camera



Rear Camera Display in Cab
to see Tow Plow



w/Liquid Chemical Tank

Laser

Plow Guidance for wing or tow
plow is extended out onto the
shoulder



Wing Plows



UDOT Double Wing



UDOT



CDOT



Mn/DOT Wing
as extension of underbody plow

Broom Plow

Utah DOT



Plow Blades

Indiana's Three-Blade Plow



Front Steel Blade



Center Serrated Blade



Trailing Rubber Squeegee Blade

Misc Plow Blades

Mn Two-Blade Plow



CDOT Gutter Guard



CDOT Joma Blade



Joma Blade

Granular Chemical Spreaders

Slide-in V-Box



CODOT



City of Grand Junction, CO



VDOT



City/County of Denver , CO



UtDOT



Granular Chemical Spreaders

V-Box



City of Ft. Collins, CO

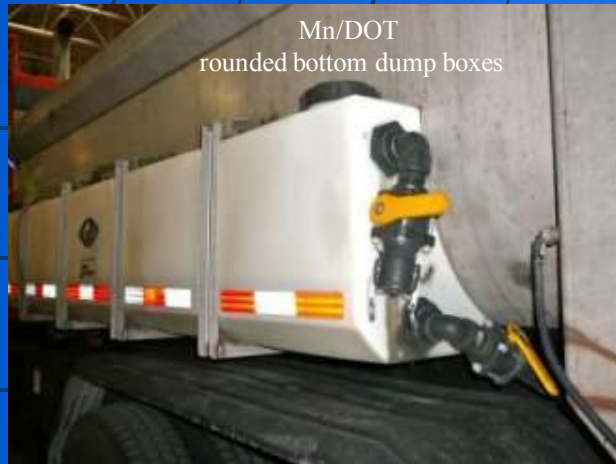


InDOT



Side Saddle Tanks

rounded-bottom dump boxes



Zero-Velocity Spreaders



Tailgate Sander Spinner Modification



Mn Spinner without Chute



Mn Spinner Chute c



Mn Spinner Chute a



Mn Salt Spreader Skirt



Mn Spinner Chute b

Sander Calibration Box



Mn Salt Calibration Box

Liquid Chemical Spreaders

Slide In & Truck Mounted Tanks



CODOT



City of Ft. Collins, CO



Mn/DOT



City/County Denver, CO



VDOT Rental Trucks
Available off season

Spreader Pups



Mn/DOT



VDOT



UDOT

UDOT's Pup Liquid Spreader w/Broom Plow



Chemical Spreaders Tanker Trailers



CODOT Trailer Liquid Spreader



VDOT



VDOT



UtDOT



MnDOT

Outsourcing Auxiliary Equipment

Virginia DOT

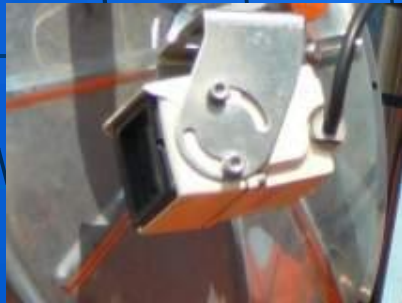


Fog Busters

Utah DOT Technology



Rear View Camera as assist for truck operator



Mn/DOT Tow Plow Truck

Camera Assist Technology

Indiana DOT



Accessories



Mn Air Vizion mirror cleaner



MnDOT Vibrating Windshield Wiper

Initial Findings

Training & Development

- Flexible Workforce
- Cross-training
- Simulators
- Off-Site Training Academies



Plow Simulators





Specialized Training Programs

Two Core Winter Maintenance Courses

Plus one course in collaboration with the Virginia Transportation Research Council:

- 1. Snow Operations for Supervisors**
- 2. Snow Removal Training for Operators**
- 3. Anti-Icing: Pretreatment**

Training Facilities



Virginia

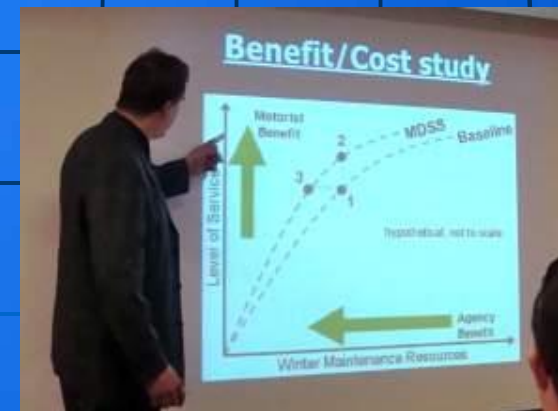


Minnesota

Initial Findings

Management & Culture

- Maintenance Office Research Funding
- Management and Culture of the Organization
- Outsourcing vs. In-House
- Winter Performance Measures
- Consistencies in Level of Service
- Internal and External Communications



Initial Findings

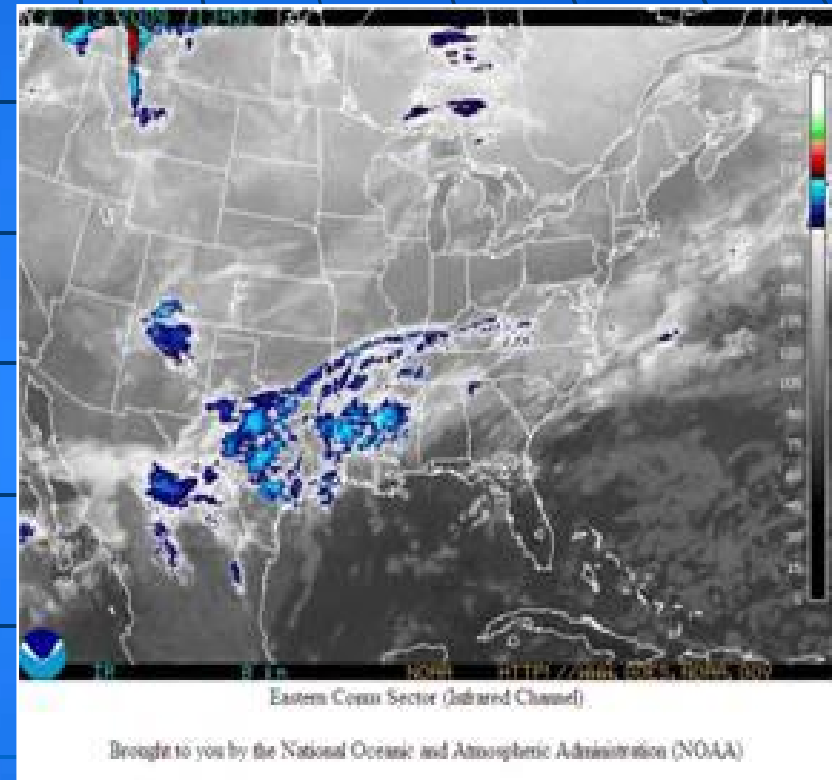
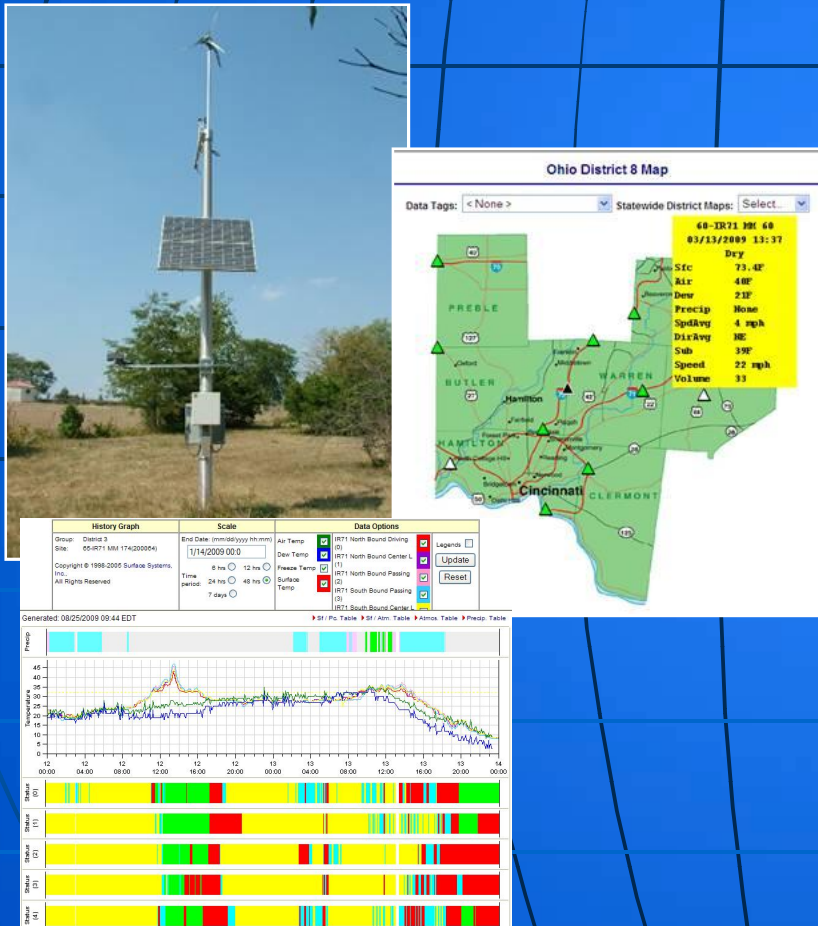
Integration of Weather, Traffic and Maintenance Operations

- Variety of Disciplines locating together in TOC (besides typical traffic operations personnel)
 - Maintenance Operations Dispatcher
 - Meteorologist
 - Snow & Ice/MDSS Coordinator
 - Highway Patrol Dispatcher
 - Motorist Assistance Dispatcher
 - 511 Coordinator
 - Traffic Signal Control Coordinator
 - Private and Public Media Announcers
- Some are Full-time; some just during events



Forecasting and Technology

RWIS, Scan Web, and
Pavement Forecast



Statewide Weather Forecasting and
Annual Weather Training

Major Impressions

- States Belonging to National Pooled Funds
- Agility of Local Agencies to try new things
- Existing Culture - focus on Winter Maintenance
- Maintenance Office Winter Research Program
- Off-Site Maintenance Training Academies
- Separate “New Technology” Budgets
- Performance Measures and Levels of Service
- Indiana’s Approach to Implementing MDSS

Lead or Get Out of the Way

- What does a State-of-the-Art Winter Maintenance Program Look Like?
- Who is your Winter Maintenance / Technology Champion?
- What “Event” Will Force You Down the Inevitable Path of Practicing the State-of-the-Art?
- Once a Lead State, How Do You Maintain Your Position? (Training, Funding, Expertise, etc)

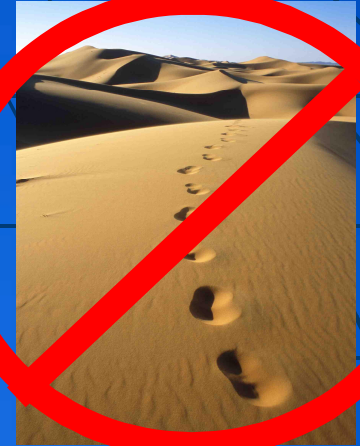
Staying Ahead of the Rest

- Need to Know What Innovation is Out There
- State-of-the-Art VS. State-of-the-Practice
- What Areas Could You Improve Right Now?
- How Much Is It Going to Cost? Pilot and Statewide
- Develop a Detailed Plan. Scope, Schedule, Budget (Marketing Strategy is Extremely Important !!)
 - How Much Will It Save the Department?

Innovation Process



NO SAND PLEASE !!



- Environmental Concerns
 - Sediment Loads in Lakes & Streams
 - Water Clarity /Sediment Dispersion (Tahoe)
 - Air Quality / Vehicle Grinding & Distribution
- Ineffectiveness
- Availability of Solid Melting Material (7:1)
- Additional Costs of Sweeping & Cleaning Drains
- Safety Issues if Sand is not swept (drainage)

Lake Tahoe Clarity



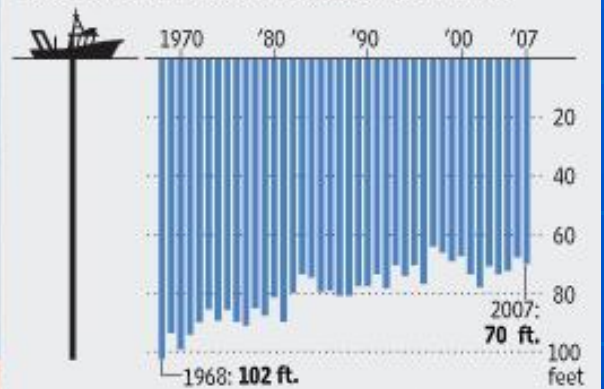
Lake Tahoe



Keeping it Crystal Clear

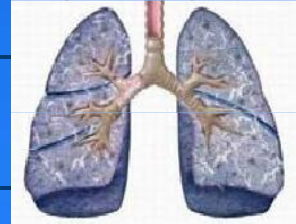
To measure the clarity of Lake Tahoe, researchers at the University of California at Davis lower a Secchi disk (left) until it is no longer visible to the naked eye.

Lake Tahoe's Annual Average Secchi Depth



Source: Tahoe Environmental Research Center/UC Davis

Air Quality



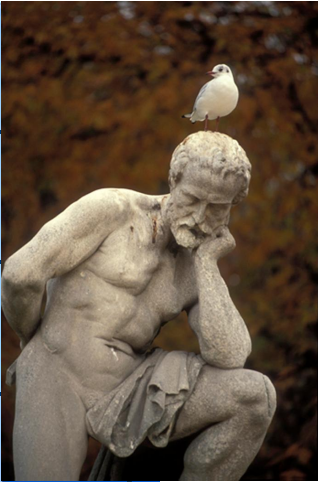
12:11:18 15-FEB-2001





Additional Costs





Ineffectiveness

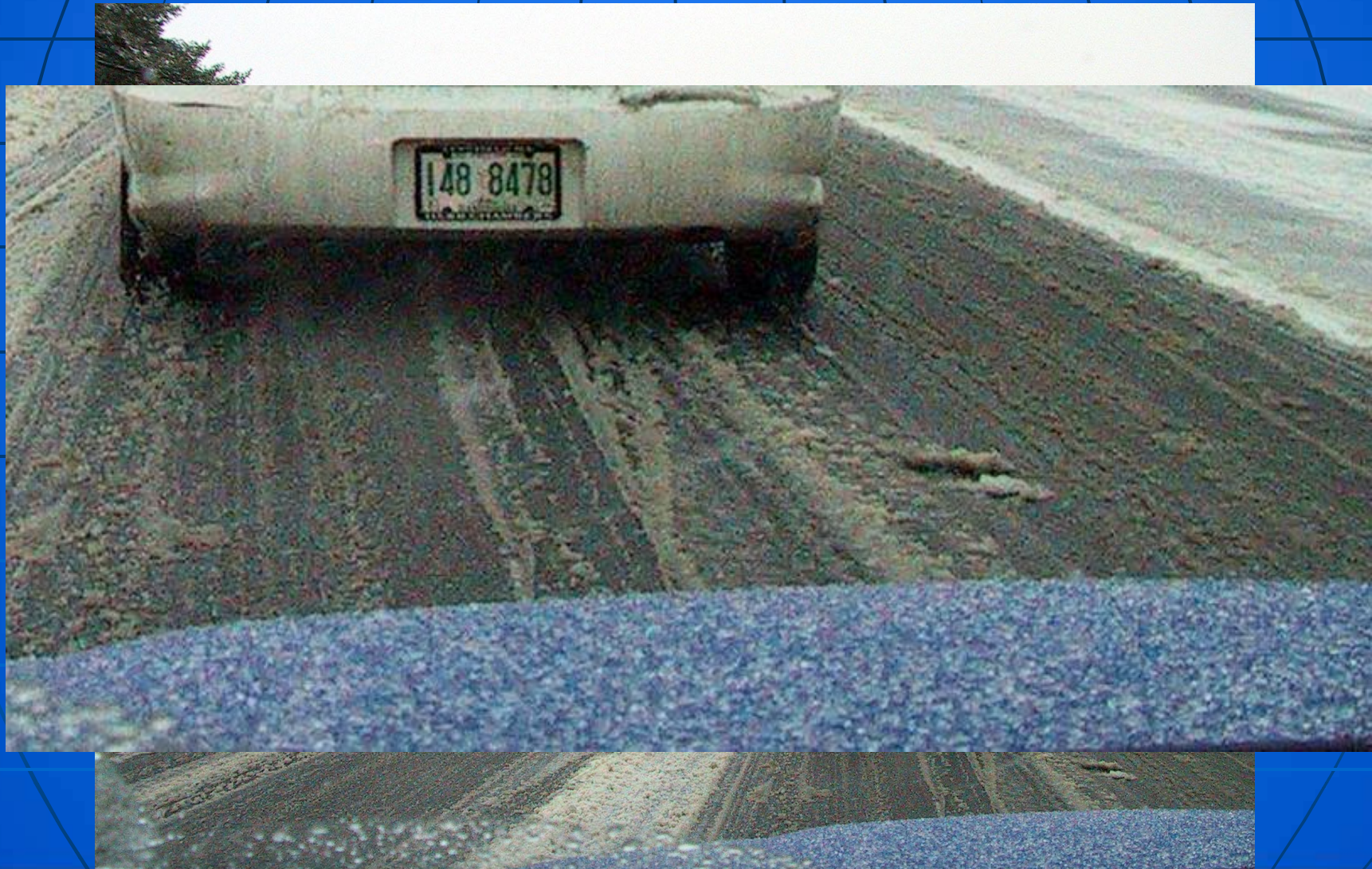
Temporary Friction Improvement

18 cars and the
effectiveness of
abrasives is gone



Courtesy of Dewey Amsler

Limited Melting Capacity



Safety



Sand

Snowmelt

5.1.2003

Suggested Strategies (Sand or No Sand!)

- Snow Plan (LOS Guidelines and Goals)
- Statewide Media Campaign (Ice & Snow...)
- Pre-wetting salt
- Calibrating equipment
- Anti-icing pavements
- Storm monitoring and management
- Education of workforce
- Anti-idling in dump trucks
- Weather and pavement temperatures
- Proper use of materials
- Customer Surveys / Market Research

ABRASIVES USE

Table 2: Recommended Abrasives Application Practices

| Road Type | Use of Dry Abrasives |
|------------------------|--|
| Freeways | Inappropriate |
| Rural Roads, Paved | Inappropriate |
| Rural Roads, Gravel | Only on low speed sections (perhaps hills and curves) |
| Rural Intersections | Only on low speed approach length of gravel roads |
| High Speed Urban Roads | Inappropriate |
| Low Speed Urban Roads | Only in certain locations, and when snow pack will persist |
| Urban Intersections | Only when snow pack will persist |



Questions?



I-35W Bridge

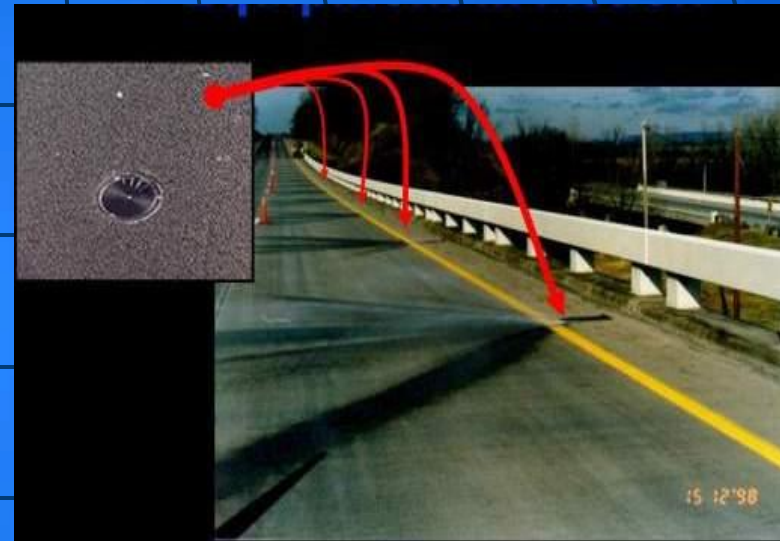


FAST Systems

(Fixed Automatic Spray Technologies)



MN FAST on 35W from driving lane



MN FAST system Mn 1998
Sprayed from shoulder