# Anti-Icing and Deicing with Liquid Chemicals

## Successes and Challenges

Bret Hodne- City of West Des Moines

2004 Purdue Road School

## Expectations

- Experiences
- Anti-Icing tools
- Application rates
- Equipment
- Costs
- Types of chemicals
- Challenges
- Questions

## "Whiners"

## Winter 2004

## It got Deep!

## West Des Moines

- 510 miles of paved roadways
- 20 miles of gravel
- Intersections with 45,000+ VPD
- High Service Level Expectations
- Anti-Icing 7 years

## Iowa Department of Transportation

- 3,300 Miles of Interstate
- 8,000 miles of primary highways
- Anti-icing 8 years
- Used 9,000,000 gallons of salt brine during the winter of 2000-2001
- 100 Brine makers
- 265 anti-icing units (30% of fleet)

## Scope of Service
## West Des Moines

- Anti-Ice Entire Arterial System
- Keep Arterial System Open at All Times
- Provide High Service Levels
- Pro-Active Approach to Storm Management
- Bare Pavement on Arterial System

## Anti-Icing

- Anti-Icing is a pro-active approach of preventing the formation of bonded snow and ice.

## Why Anti-Ice?

- Pro-active approach to storm management
- Reduced chemical usage
- Buys time at the start of storm
- Less granular waste
- Increased service levels

## Anti-Icing Strategies

- Extremely effective when correctly used and approached realistically
- First in a series of strategies
- Crew training is essential
- Decisions need to be based on total costs, not just purchase price of the products

## Anti-Icing is Proactive

- Application of deicing chemicals before/during a storm event
- Prevents bonding of snow and ice to pavement
- Reduces use of resources

## Deicing is Reactive

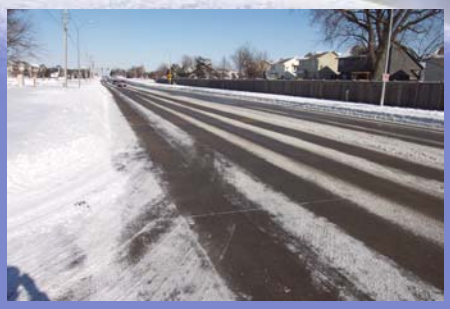
- Application of deicing chemical during/after a storm
- Bonding of snow and ice to the pavement
- Increases use of resources

## Benefits of Liquid Anti-Icers

- Reduced bonding of snow and ice
- Environmentally friendly
- Less material clean-up
- Cost effective
- Reduced chemical usage
- Allows users to get out ahead of the storm

## Results!

## Clear Wheelpaths



## Melting vs Bond Prevention

## Bonding Prevention

## Salt Brine Test Area

## M1000 Test Area

## FreezGard Test Area

## FreezGard Test Area

## Equipment

## Tandem Anti-Icing Unit

## Trailer Mounted Unit

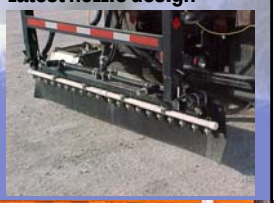


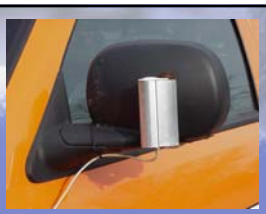

## New winter tailgate- 275 gallons

Carries 3-tanks with 1,800 gallons of liquid or can also carry 1,200 gallons of liquid and 6-tons of dry material

## Streamer Nozzles

Latest nozzle design




**Infrared Thermometers**

**(mobile platform)**

## Brine Storage Tanks

## Traditional brine facility


## New brine building design

## Brine makers

## WDM Brine Production Unit

## Anti-Icing Hills

## Plowing While Anti-Icing

## Types of liquids used by West Des Moines

- Sodium Chloride
- Calcium Chloride
- Magnesium Chloride
- GeoMelt
- LCS

## Application rates and guides for Salt Brine

- Frost treatment- 40 gal per ln/ml
- Anti-icing- Minimum - 50 gal per ln/ml
- Pavement temperature 15 degrees and rising
- Winds less than 15 mph when loose snow is present
- Weather forecast is the trigger for application

## Application rates and guides for "Chlorides"

- Frost Treatment – 15-20 gal per ln/ml
- Anti-Icing – 30 gal per ln/ml
- Winds less than 15 mph when loose snow is present
- Weather forecast is trigger for application

## Costs and use

- Estimated cost for raw materials- $0.04 per gallon
- Cost for final product (includes all costs)-less the $0.05
- IDOT's 9,000,000 gallons represents only about 8% of total salt use per year.

## IDOT's annual cost to produce 100,000 gallons of salt brine

(assume 2,500 gal per hour)

| | |
|---|---|
| Labor @ $22/hr- | $880 |
| Building- | 866 |
| Water | 750 |
| Salt | 795 |
| Electricity | 750 |
| Storage tanks | 60 |
| Brine maker | 650 |
| Total annual cost | $4,751 |
| Cost per gallon | $0.0475 |

## Factors Affecting Chemical Effectiveness

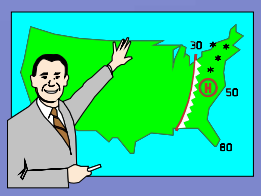
- Initial Concentration
- Precipitation
- Application Rates
- Pavement Temperature

## Cost Comparisons

| Mag Chloride | Salt Brine |
|---|---|
| $.65/gallon | $.04/gallon |
| 30 gal/lane mile | 50 gal/lane mile |
| $19.50 /lane mile | $2.00/lane mile |
| 500 miles = $9750 | 500 miles = $1000 |

## Weather Forecasting Tools

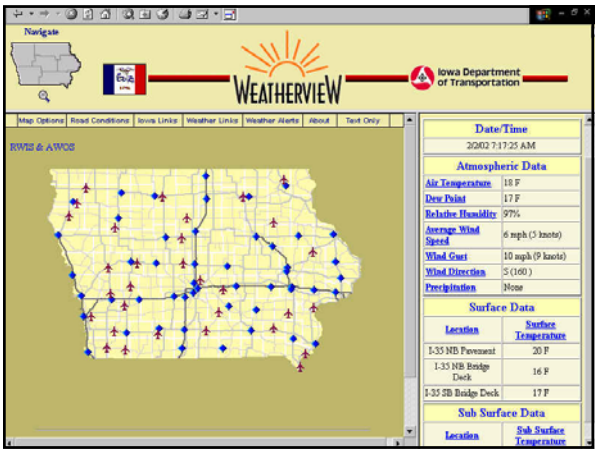
- RWIS
- Meridian
- SSI
- Internet
- National Weather Service




## Weather information sources available at the Iowa DOT

- 50 site Roadway Weather Information System
- Truck-mounted infrared thermometers
- Meteorlogix classic or Weather Sentry systems at all maintenance garages
- Internet access available at all garages
- Contracted pavement forecasts with delivery via e-mail, Meterologix systems and toll free recording
- 3-hour Nowcast
- Weatherview

## Iowa Roadway Weather Information System




## Post Storm Liquid Usage

## Application Rates for Deicing

| | |
|---|---|
| Salt Brine | 80 gal/lane mile |
| Mag Chloride | 45 gal/lane mile |
| Calcium Chloride | 45 gal/lane mile |

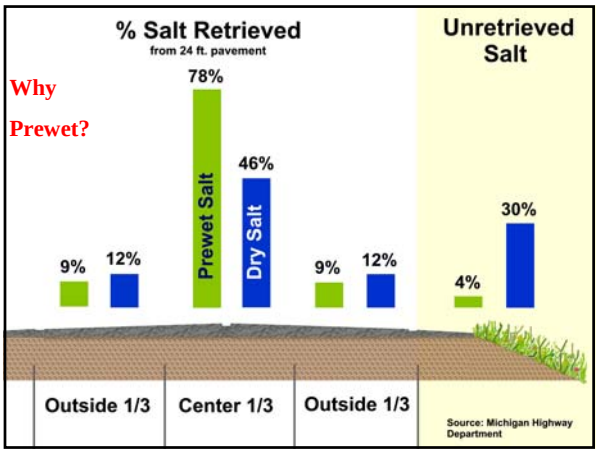
## Pre-Wetting

- Pressurized Systems
- Applied at spinner
- 10-12 gallons per cubic yard of material
- Calcium Chloride
- Salt Brine
- Significantly reduces loss of materials

## Prewet Systems

225 gallons

140 gallon



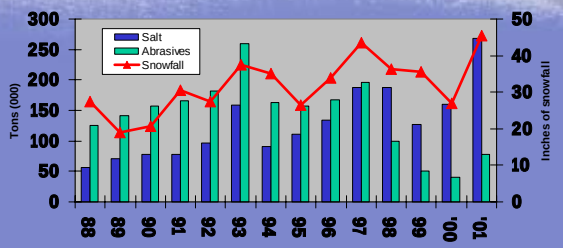

## Abrasives

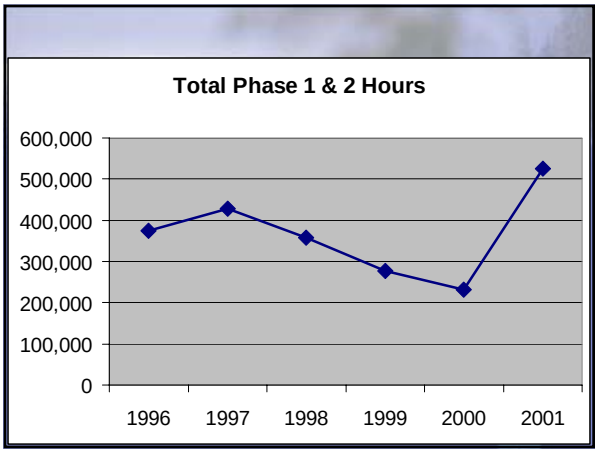
- Extreme cold
- Chemical action prohibited
- Traction required
- Can pre-wet with liquids to “burn” into snow and ice packed material

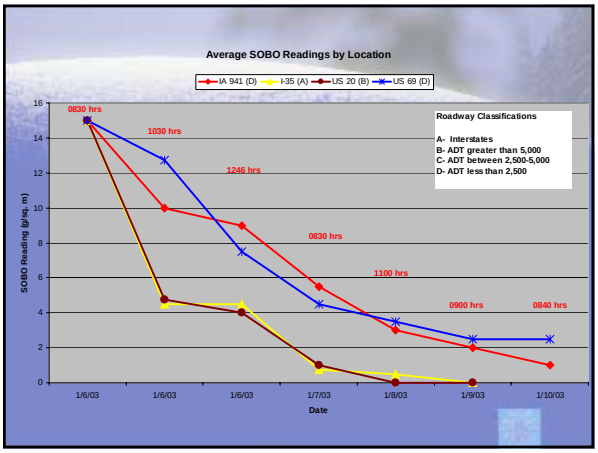
## Do “Nothing” Approach

- Cold pavements
- Dry blowing snow
- Open areas
- Chemicals can create rather than solve problems

## Salt and Abrasive use statewide when compared with snowfall



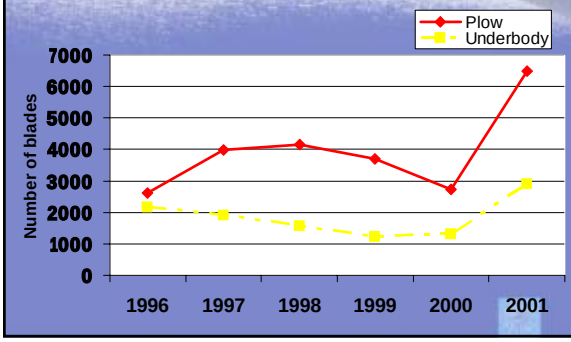



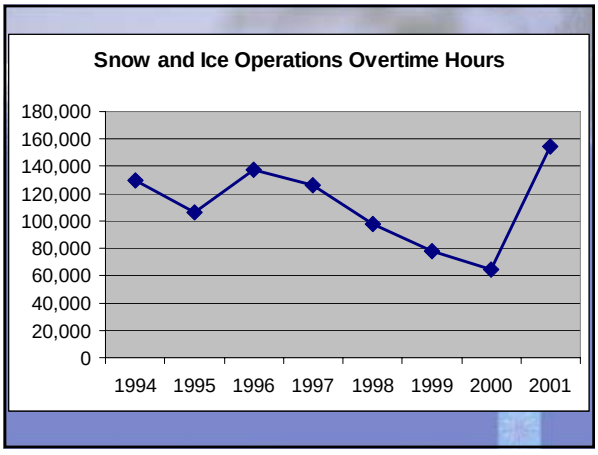



## Salt Brine 24 Hours After Application

## Salt Brine 48 Hours After Application

## Salt Brine 72 Hours After Application



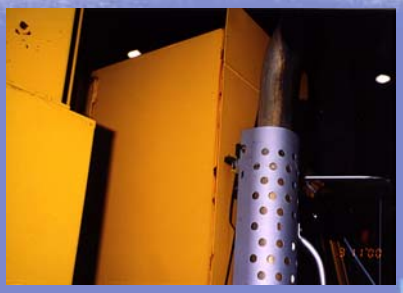

## Challenges

- Corrosion
- Training staff
- Educating the public and getting buy-in from users
- Accurate weather forecasts

## Fall Out Issues

## Sub-Frame Corrosion

## Sealing Problems



## Corrosion Prevention


## Keeping Systems Clean

## Benefits

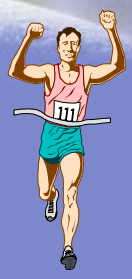
- Reduced salt use
- Reduced overtime
- Reduced blade use
- Improved service to the public

## Keys for a successful anti-icing program

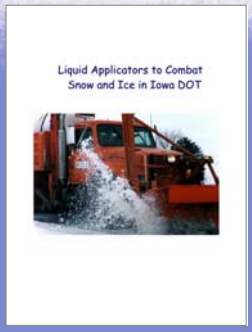
- Develop a plan for anti-icing
- Provide proper training
- Provide access to good weather information and forecasts
- Provide adequate equipment for liquid application
- Have a call-out plan in place
- Training, training and more training

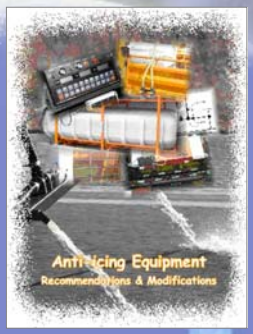
## Keys to Success

- Have a Plan
- Good Weather Information
- Proper Material Selection
- Be Proactive
- Keep Good Records
- Get Employees Involved

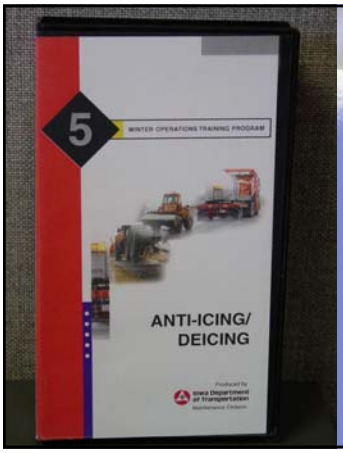


## Anti-Icing Program




http://www.dot.state.ia.us/maintenance/index.htm




## Iowa DOT free video

Contact Dennis Burkeheimer @ 515-339-1355

## Winter Maintenance Mailing List

**snow-ice-request@list.uiowa.edu**

**In the body of message on a line by itself on that line, type the word subscribe**

## Aurora

Pooled fund research effort in Roadway Weather Information System technology and other weather items, primarily focused on winter and summer maintenance applications

http://www.aurora-program.org

## This pretty much sums it up!


## The Future!

## THANK YOU

**Bret Hodne**
**West Des Moines**
**(515) 222-3480**
**bret.hodne@wdm-ia.com**