Alternatives for Reducing Chloride Loading from De-Icing

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Reducing Chloride Loading

Why?
Purpose?
Goal?

Reducing Chloride Loading

- Plant Issues
- Water Issues
- Corrosion Issues
- Concrete Issues

MISSION STATEMENT

Establish and promote Best Management Practices for de-icing that minimize deterioration to buildings, infrastructure and the environment without compromising safety.


2008/09/10

Generic De-Icers

- Aluminum Chloride
- Ammonium Sulfate
- Calcium Acetate
- Calcium Chloride
- Calcium Magnesium Acetate
- Ethyl Alcohol
- Ethylene Glycol
- Fertilizers
- Formamide (1:1:1)
- Isopropal Alcohol
- Liquid Calcium Chloride
- Lithium Chloride
- Magnesium Acetate

Generic De-Icers

Magnesium Chloride
Methanol (Methyl Alcohol)
Potassium Acetate
Potassium Carbonate
Potassium Bicarbonate
Potassium Chloride
Potassium Phosphate
Propyl Alcohol
Sodium Chloride
Sodium Formate
Sodium Nitrate
Sodium Sulfate
Tetrapotassium Pyrophosphate
Trisodium Phosphate
Urea

Typical De-Icers

Chloride De-Icers

Sodium Chloride	Granular or Liquid
Magnesium Chloride	Granular or Liquid
Calcium Chloride	Granular or Liquid
Potassium Chloride	Granular

Non-Chloride De-Icers

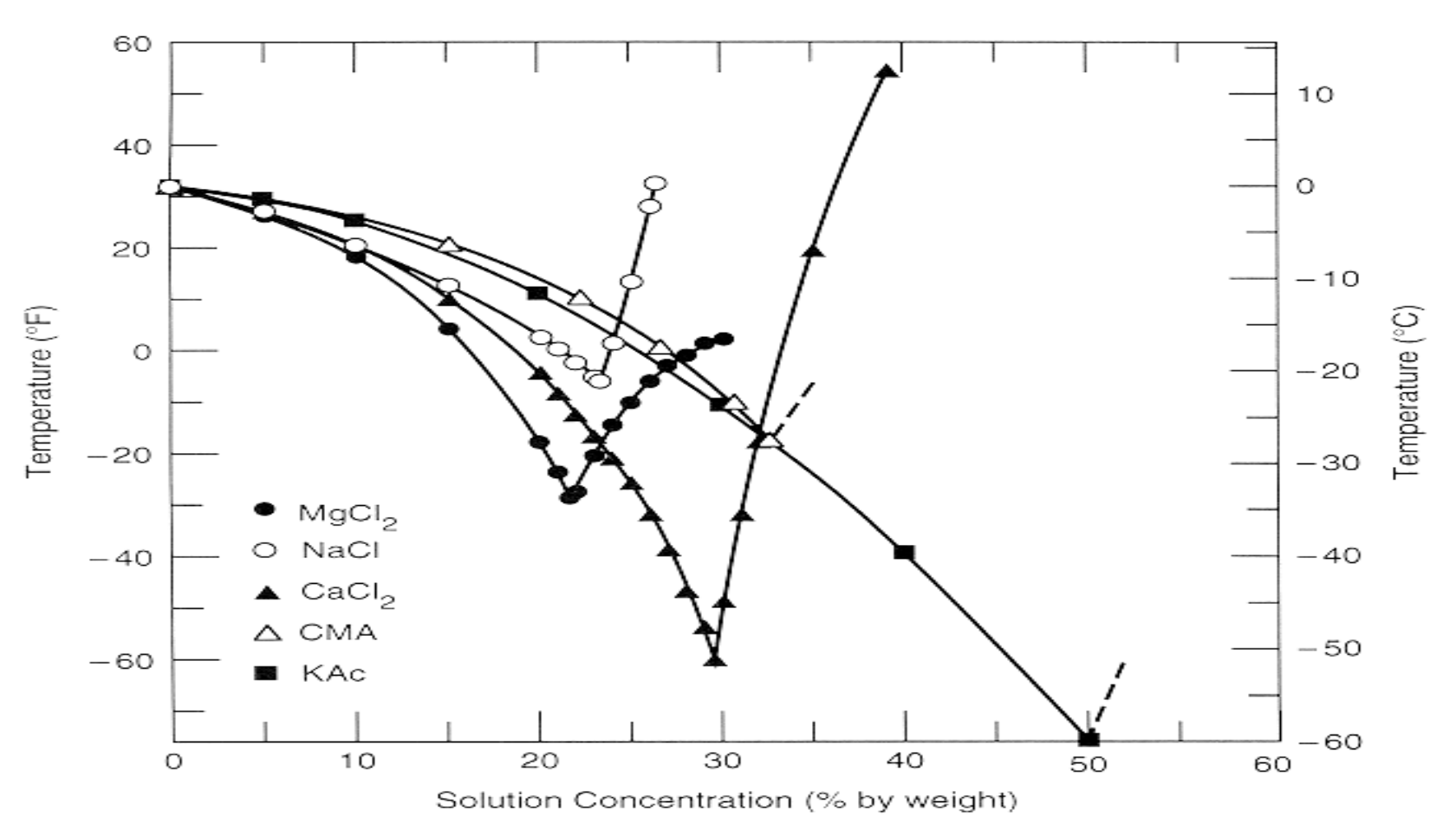
Calcium Magnesium Acetate	Granular or Liquid
Potassium Acetate	Liquid
Urea	Granular

Frequent Additive: Carbohydrates
Manufactured
By Product

Evaluating Alternative De-Icers

- Corrosion & Environmental Impact
- Application Rates
- Ease of Handling
- Odor
- Cost
- Availability
- Technical support from vendor

Phase Diagram for Typical De-Icers



BOD & COD

- BOD - Biochemical Oxygen Demand. A measure of how much dissolved oxygen is being consumed as microbes break down organic matter. A 5-day test giving indication of rate of oxygen take-up.

- COD - Chemical Oxygen Demand. COD is the amount of oxygen required to degrade all the organic compounds in a water solution. A 20-day test.

BOD is much more important than COD.

Phosphorus and Nitrogen

Why are phosphorus and nitrogen important?

Eutrophication - Water pollution caused by excessive plant nutrients. Excessive amounts of plant nutrients (primarily phosphorus and nitrogen) cause excessive growth, or "blooms", of algae. Algae is aerobic, and consumes all the oxygen in a water ecosystem and can kill all other organisms in the water including fish.

Is one more important than the other? NO!!

Despite the fact than many agencies are only putting specification limits on phosphorus, the fact is that there must be a certain amount of nitrogen present as well. A lake with excessive amounts of phosphorus and no nitrogen will not undergo eutrophication.

Reducing Chloride Loading

What is the ‘Big Picture’ ?

Reducing Chloride Loading

Low Hanging Fruit

Storage 5%

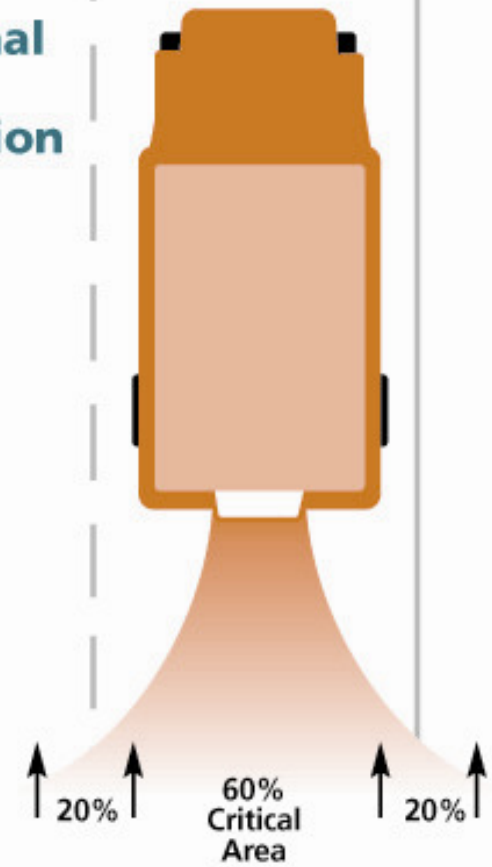
Pre-Wet 30%

Anti-Icing 4%

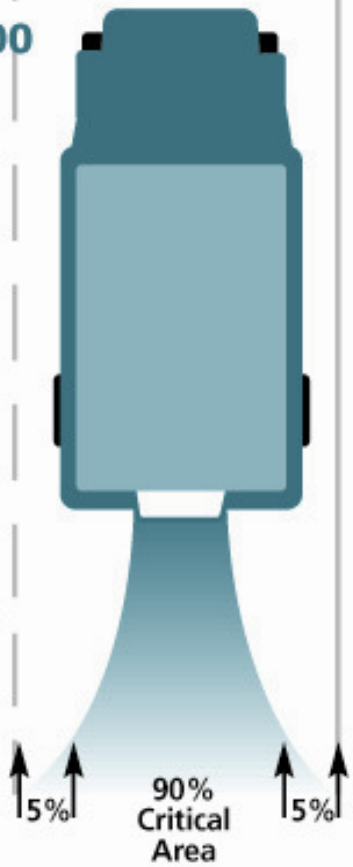
Application Training 20%

Compare the costs with Caliber M2000 treated salt.

Traditional Dry Salt Application



Caliber M2000 Treated Salt Application



300 lbs. per lane mile	Application Rate	200 lbs. per lane mile
60%	Critical Coverage	90%
180 lbs.	Critical Application Rate	180 lbs.
	Material Costs	
$25/ton	Salt	$25/ton
$0	Caliber M2000	$10
$25/ton	Total Material Costs	$35/ton
	1 Ton of Finished Product	
6.667 miles	Covers xx miles??	10 miles
$3.75 per lane mile	Cost per lane mile	$3.50 per lane mile

Now factor in fuel costs, labor, maintenance, overtime, etc., and see how more cost effective pre-wetting is than traditional methods!!

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Resources

Center for Transportation Research and Education	www.ctre.iastate.edu
Federal Highway Administration	www.fhwa.dot.gov
American Association of State Highway and Transportation Officials AASHTO	www.aashto.org
Transportation Research Board	www.nationalacademies.org/trb
Civil Engineering Research Foundation (CERF) (Highway Innovative Technology Evaluation Center. HITECH)	www.cerf.org/hitec/index.htm
U.S. Roads	www.Usroads.com/
Canadian Strategic Highway Research Program (C-SHRP)	www.cshrp.org/english/
Salt Institute	www.saltinstitute.org/2.html
Better Roads	www.betterroads.com/
American Public Works Association (APWA)	www.apwa.net/
Pacific Northwest Snowfighters	www.wsdot.wa.gov/fossc/maint/pns/
Ice and Snow Technologies	www.iceandsnowtechnologies.com
Glacial Technologies	www.anti-icers.com
Winter Maintenance email list service Very Good!	Email: snow-ice-request@list.uiowa.edu

www.coverall.net

www.shelterlogic.com

www.dome-corp-na.com

www.asicoverbuildings.com

www.bulkstorageinc.com

www.waltersbuildings.com

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CALIBRATION CHART (US)

Agency: Acres Group

Location:

Truck No: Spreader No:

Date: 28-Oct-04 By: Mark

Gate Opening 2" (inches) (Hopper Type Spreaders)				DISCHARGE RATE (pounds discharged per mile)								
	A	B	C	TRAVEL SPEED AND COMPUTATION MULTIPLIER ( )								
Control Setting	Shaft RPM (Loaded)	Discharge per Revolution (pounds)	Discharge per Minute (lb) (A x B)	3 mph (x 20.00)	7 mph (x 8.57)	10mph (x 6.00)	13 mph (x 4.61)	15 mph (x 4.00)	20 mph (x 3.00)			
1			-	-	-	-	-	-	-			
2			166.70	1,667	715	500	385	333	250			
3			-	-	-	-	-	-	-			
4			333.30	3,333	1,430	1,000	770	667	500			
5			-	-	-	-	-	-	-			
6			666.70	6,667	2,860	2,000	1,540	1,333	1,000			
7			-	-	-	-	-	-	-			
8			(1,000.00)	(10,000)	(4,290)	(3,000)	(2,310)	(2,000)	(1,500)			
9			-	-	-	-	-	-	-			
10			(1,333.30)	(13,333)	(5,720)	(4,000)	(3,080)	(2,667)	(2,000)			
11			-	-	-	-	-	-	-			

THE ACTUAL APPLICATION RATE (POUNDS PER LANE MILE) **ON THE HIGHWAY IS THE DISCHARGE RATE DIVIDED BY THE NUMBER OF LANES BEING TREATED**