Steven Clark PhD

Chemistry 101 / Winter Maintenance

Steven Clark PhD

Field Application Scientist

What's That Mean?

I-80 near Cle Elum

Why Use Products ?

Bacon Slider

Why Use Products ?

Some of us just cope well . . . . .

. . . because we just have skills.

Why Use Products ?

But the real reason we use products …

… it's just plain scary if we don't.

History of Snow Removal

Before 1862, people didn't use snow plows, they used snow rollers.

Horses, shovels, and carts were the norm for Departments of Street Cleaning.

History of Snow Removal

In 1862, Milwaukee became the first major city to adopt a snow plow.

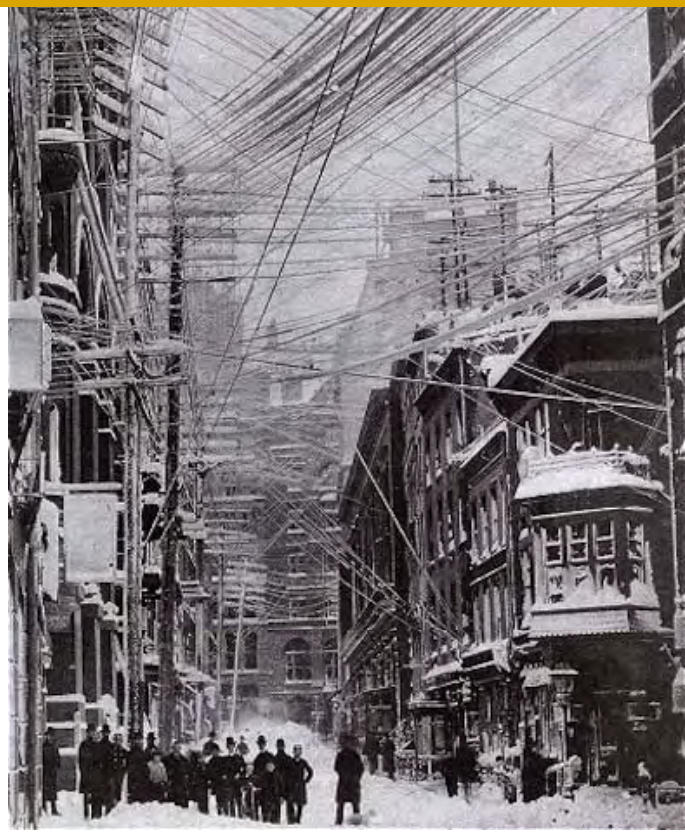
It was a hit!

History of Snow Removal

The Blizzard of 1888

New York City experienced 4 feet of snow with 20 foot drifts leaving 400 people dead in two days.

Cities recognized the need for a proactive method to remove snow during the event and not waiting until the storm passed



History of Snow Removal

By 1925 – 17 million Cars

The American public depended and the automobile and demanded safer roads.

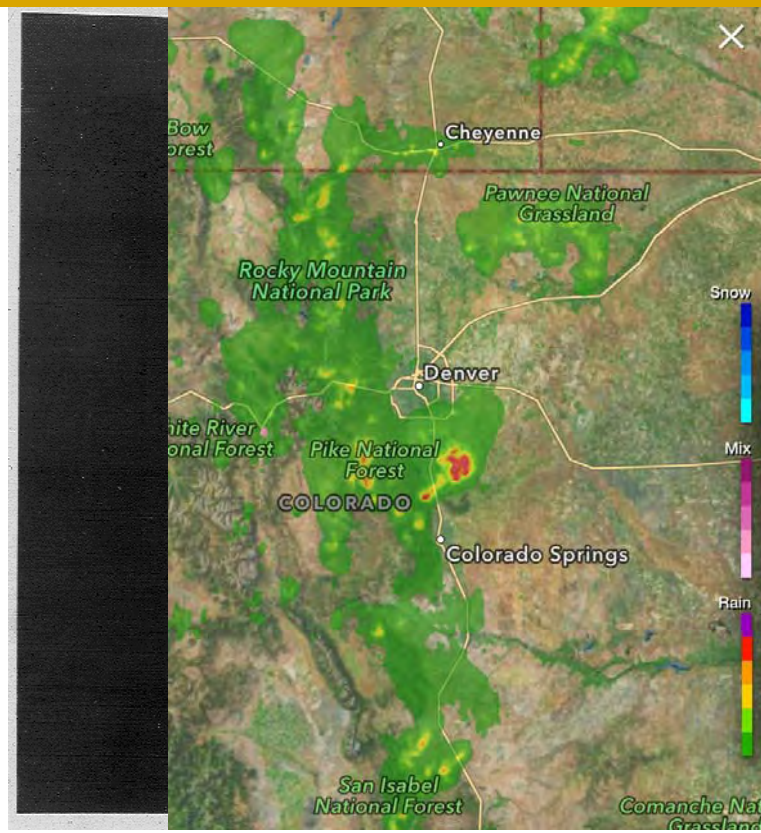
City public works used salt by the tons and experimented with cinders and sand.

History of Snow Removal

1959 – Space Technology

The first satellite images were available for weather forecasting.

Now, we can get radar on our phones.



Finding Appropriate Level of Success

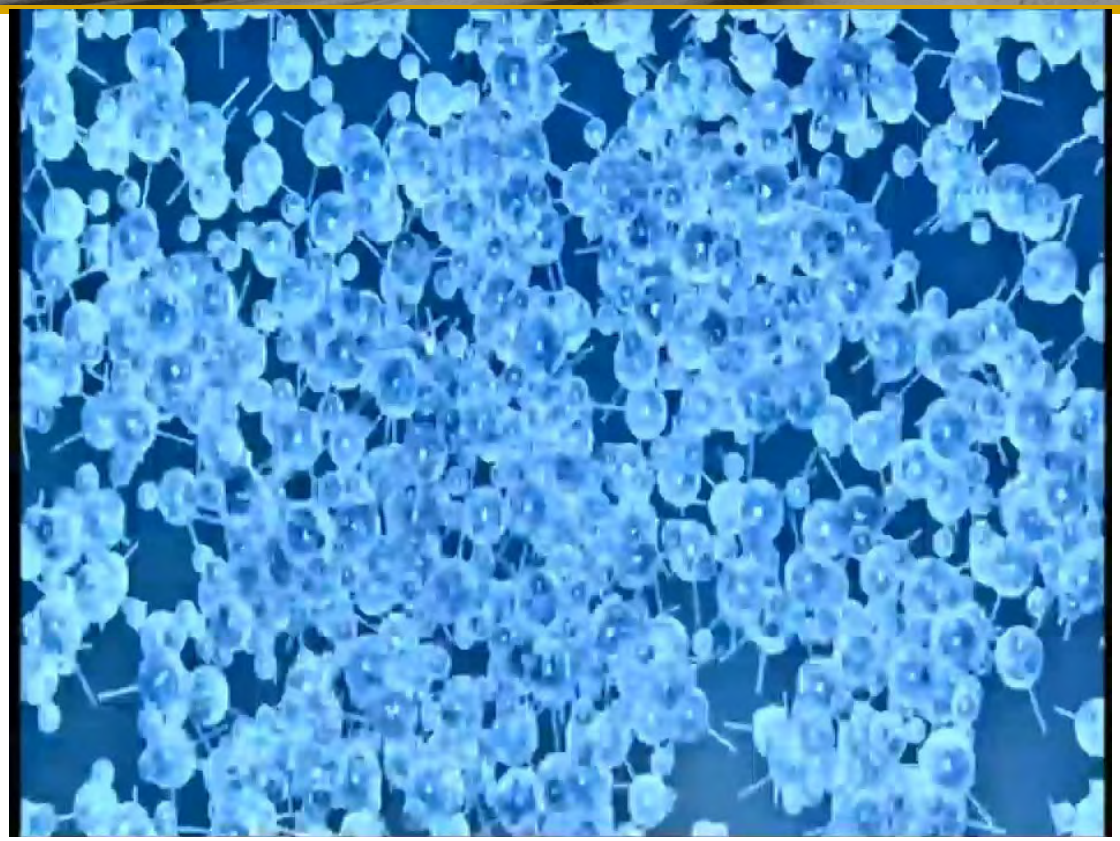
A Quick Video on Success


SERVE
PASSION
WORK
WHAT LEADS TO SUCCESS?
PUSH
FOCUS
GOOD
IDEAS
PERSIST

Present Snow Removal

Current Techniques and Equipment

How Water forms *ICE*.



How does Salt Melt *ICE?*

It’s your responsibility to keep your surfaces safe and clear.

Stop snow and ice from bonding to your surfaces while accelerating melting.

- **BULK GRANULAR DEICING PRODUCTS**
- **SALT & SAND TREATMENT PRODUCTS**
- **ENHANCED LIQUID DEICING PRODUCTS**

A supreme, medium-grade granular deicer engineered to cut through ice much faster than any other product of its kind.

Let's do a quick demonstration!

Exothermic reactions, all salts are not created equal……

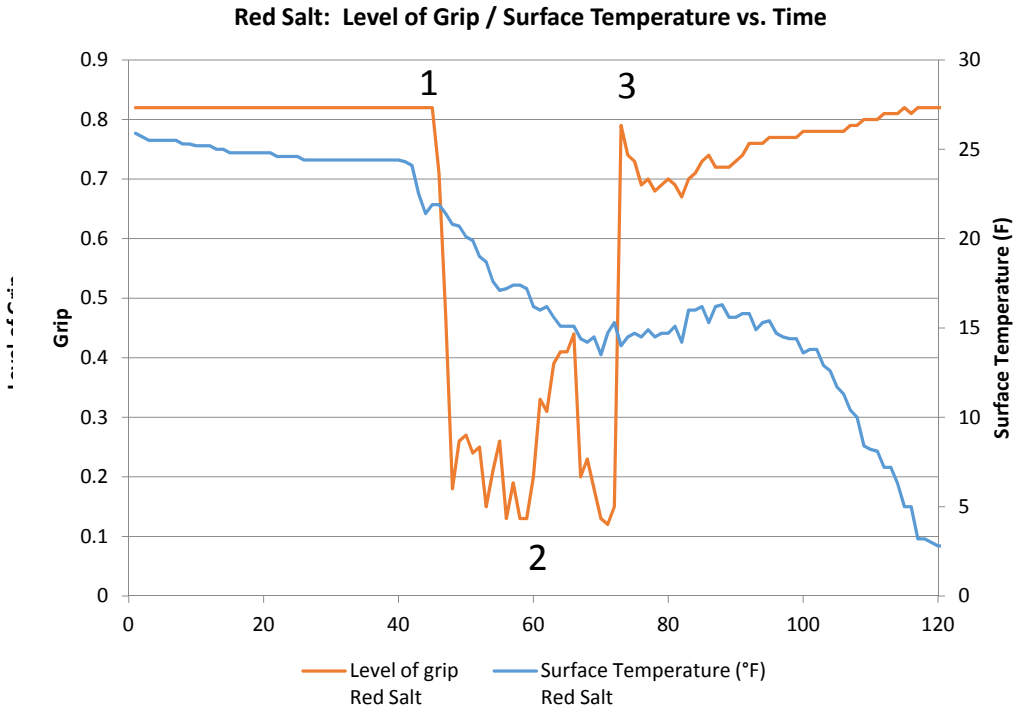
$CaCl_2$

Red Salt vs White Salt Blend

January 3, 2015 **Fargo, ND**

Conditions

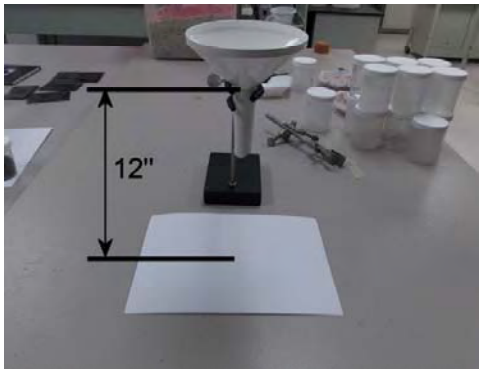
Salt		*300 lbs. per lane mile*
PreWet at Spinner		*Brine at 10 gal/ton*
Temp:	*7am*	*9F*
	12pm	*-1F*
	5pm	*-5F*
Wind:	*5 - 15 MPH*	



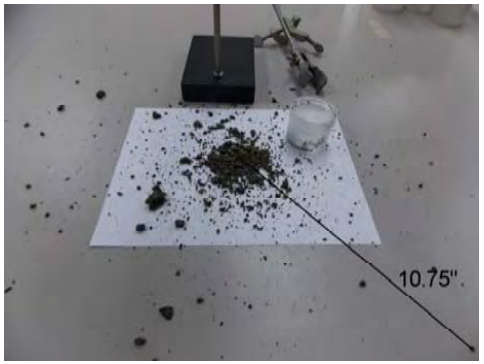
Lab Tested / Customer Endorsed

Liquid Pre-Treatments

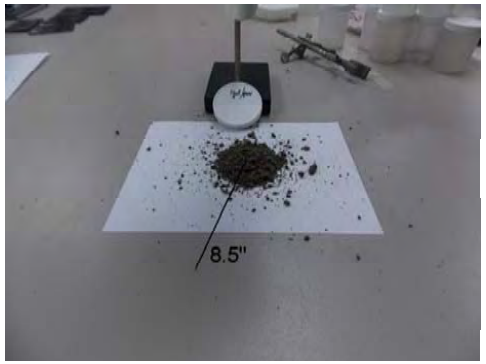
Testing Continued . . . ***Bounce and Scatter***



Apparatus



Treatment 0 gal/ton



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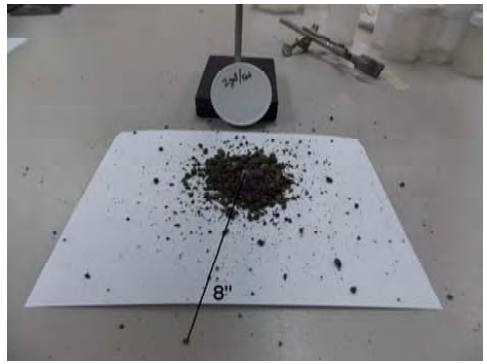
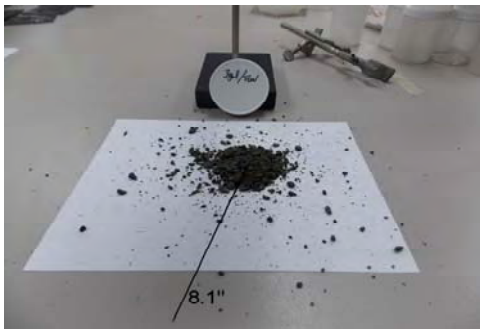
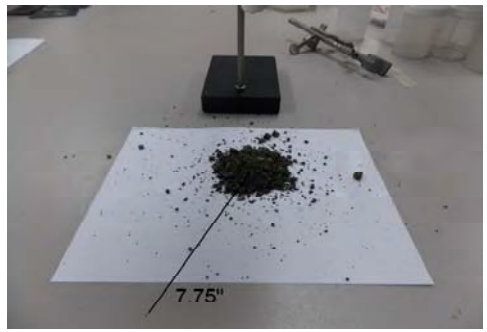


Treatment 2 gal/ton



Treatment 3 gal/ton



Treatment 4 gal/ton

The images depict the bounce and scatter patterns of 50 g of aggregate dropped through a funnel from a height of one foot. The untreated aggregate has the largest particles scattering the furthest from the center of the pile with 4 gal/ton performing the best.

Lab Tested / Customer Endorsed

Liquid Pre-Treatments

Recommendation to WSDOT:

For a minimum application, 2 gallons/ton provides good coverage of the aggregate and greatly improves performance.

WSDOT chose 3 gallons/ton treatment

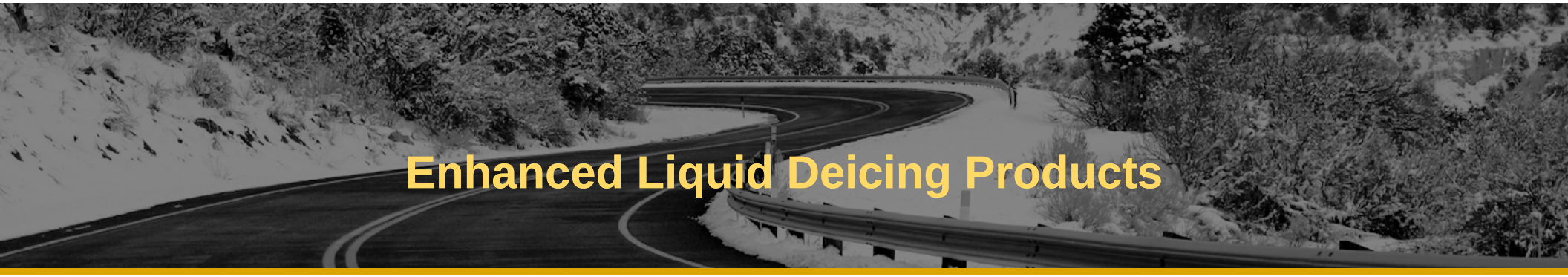
Liquid Stock Pile Treatments

Chloride based liquid pre-treatment

Treating a stock pile with ($MgCl_2$ based) or ($CaCl_2$ based) liquid onto granular material powerfully enhances the melting performance of the stock pile, particularly at colder temperatures. These products can be applied to a stock pile in advance or as it is being delivered. Treating the entire stock pile prior to application to the roadway eliminates the need for pre-wetting saddle tanks.

Features	Application Rate
One Ton Salt Stock Pile	6-10 gallons SOS
One Ton Sand Stock Pile	4-6 gallons SOS

* Michigan DOT Bounce and Scatter study



Deicing & Anti-Icing

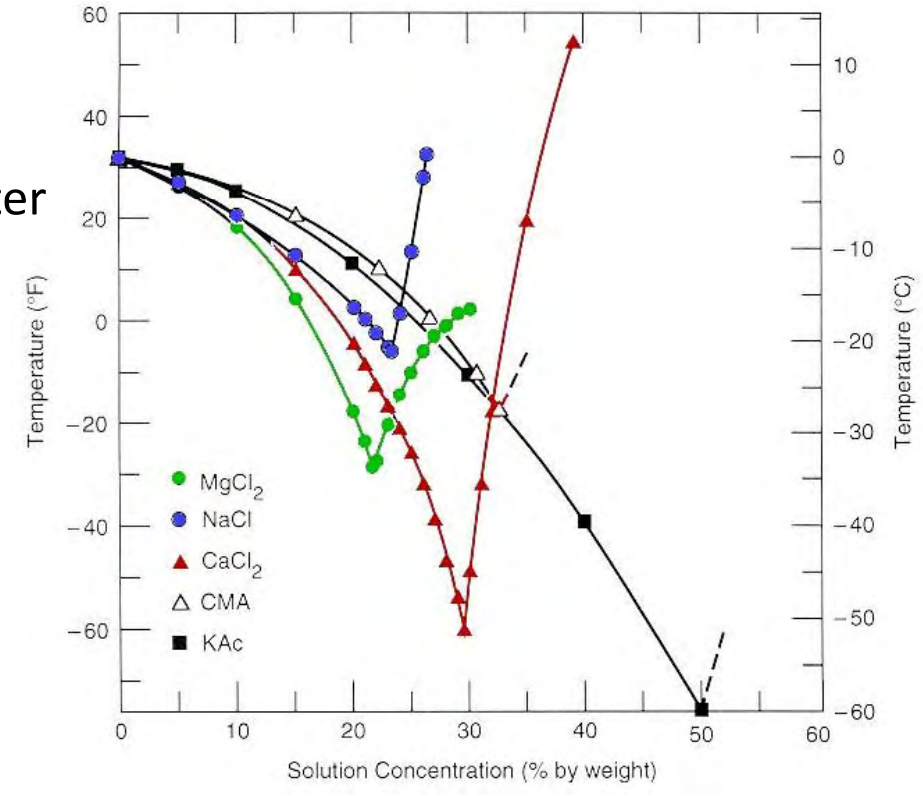
We know it’s your responsibility to keep your surfaces safe and clear so take pride in delivering peace of mind. High-performing solutions assist in your deicing and anti-icing problems; letting you focus in other areas of need.

Enhanced Liquid Deicing Products

Enhanced Liquid Product Tests

Effective Freeze Points 1:1 with Water

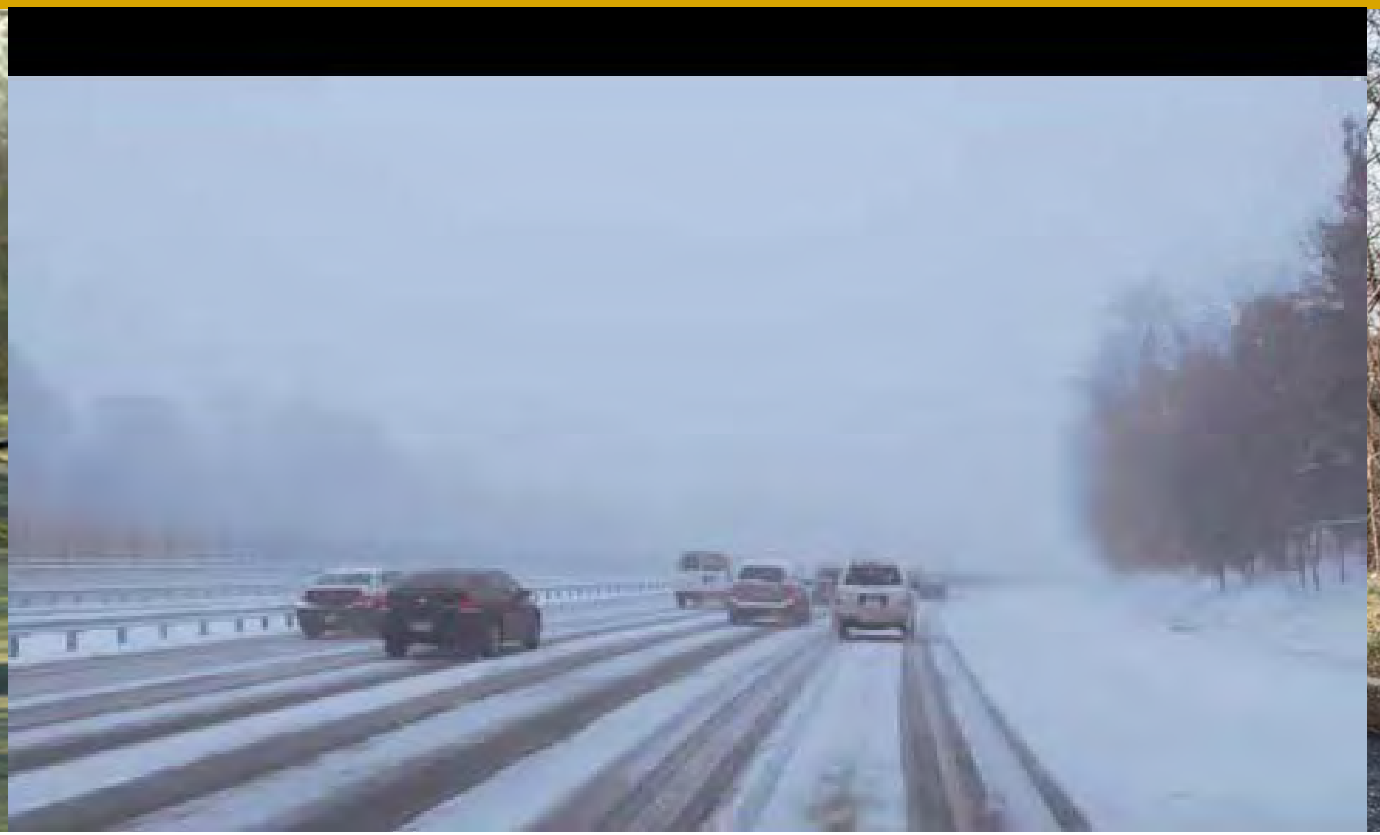
$CaCl_2$	8 ºF
$CaCl_2$ (Enhanced)	-2 ºF
$MgCl_2$	4 ºF
$MgCl_2$ (Enhanced)	-6 ºF
NaCl	16 ºF
NaCl (Enhanced)	11 ºF

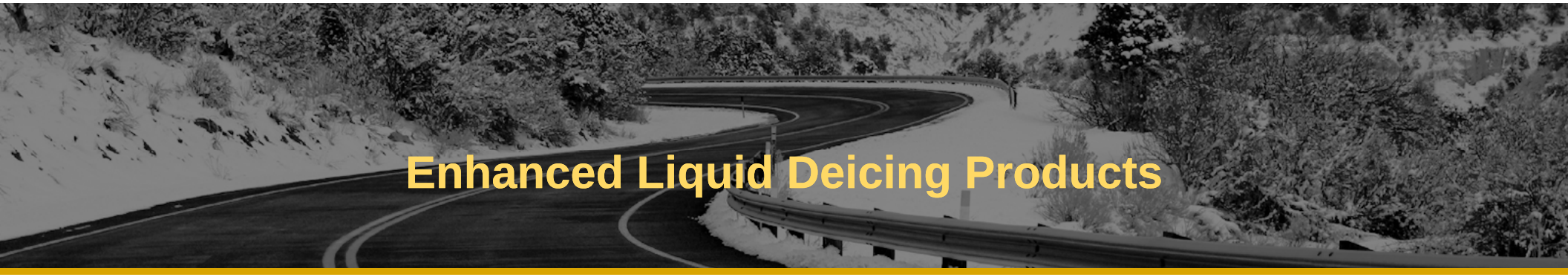


Enhanced Liquid Deicing Products

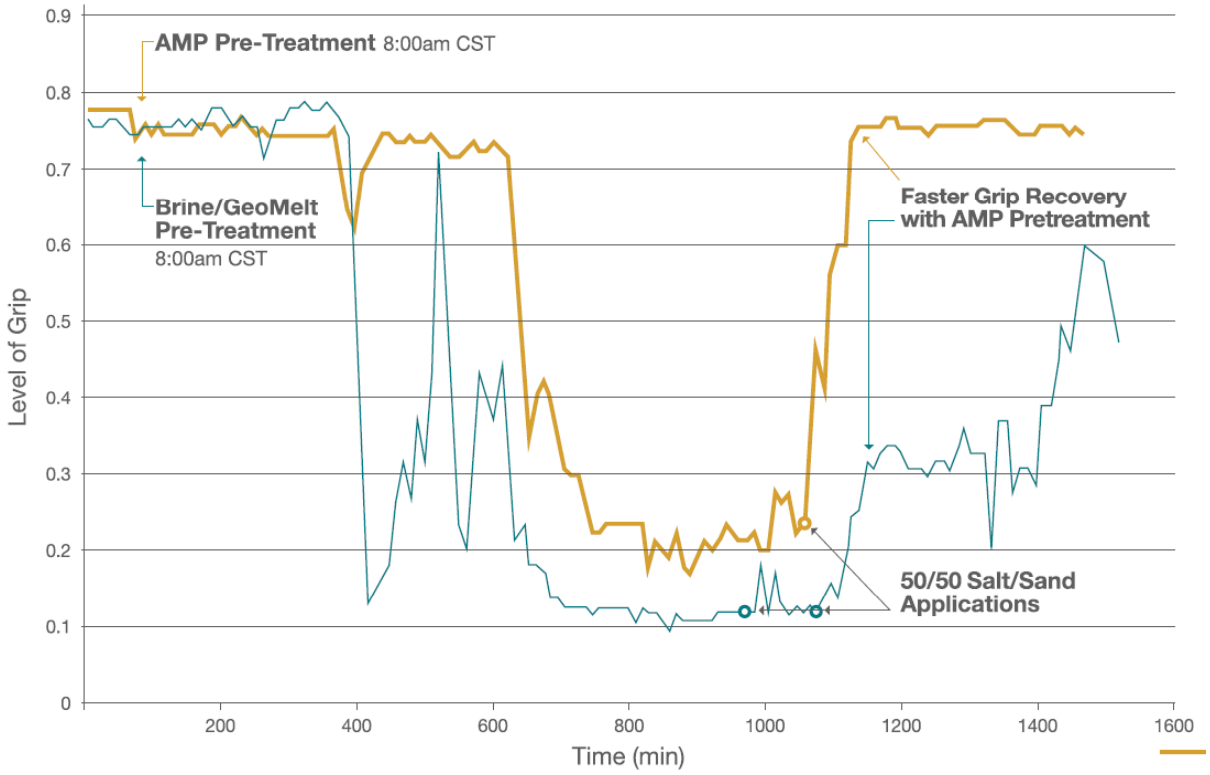
Anti-Icing

A liquid anti-ici
event – *hard ice*





Enhanced Liquid Deicing Products



Compared to traditional salt brine enhancers, AMP solution maintains friction **4 hours longer** at the beginning of a storm. Tests also show that for anti-icing, AMP recovered friction **5.5 hours sooner** than conventional enhancers.*

*Test completed in Fargo, North Dakota.

Level of grip
Surface site 1 AMP

Level of grip
Surface site 2 Brine/GeoMelt

Infrastructure & Storage

Is your supply of deicing product available when needed?

Infrastructure exists to make snow removal, easier and more efficient.

When the winter get
storage?

Winter products getting low, can you get what you need when you need it, where you need it?

ConnDOT Salt vs. Sand Mix

(2008)

Salt Cost	Factors	Abrasives
$56.00	A Purchase Cost/ton	$ 60.00
---	B Cost of added salt/ton (14%)	$ 8.40
---	C Mixing cost	$1.00
$56.00	D Total Cost (per ton)	$ 69.40
300	E Pounds per lane mile	750
$9.00	**Cost / lane mile**	**$26.00**

Cost to treat one lane–mile Salt vs. Sand (approximately)

Does not include spring clean up

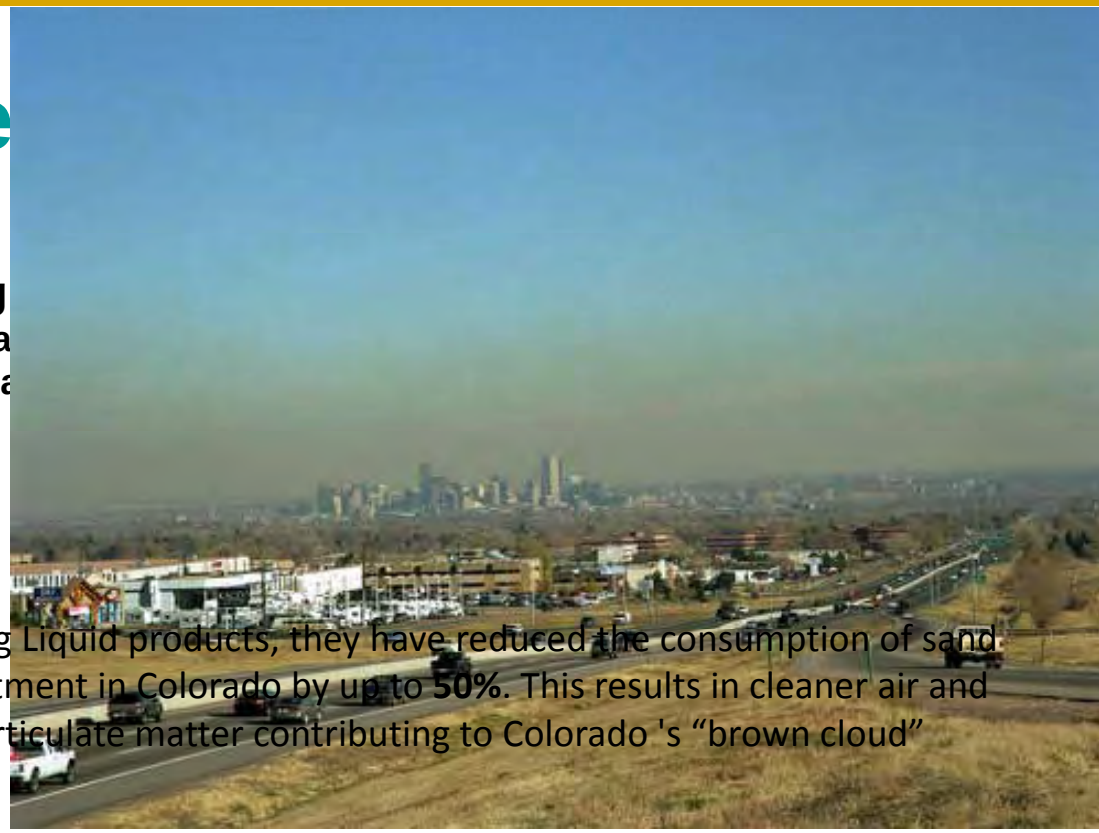
Environmental Impacts

- **Reduce Chloride impact on roadside foliage**
- **Lessons Learned about Smog and Sand**
- **Post winter aggregate clean up**

Environmental Impacts

- **Reduce Chloride impact on roadside foliage**
  - **Know your weather forecast**
    - **Warm weather coming – can you lower your app rate?**
  - **Leave salt on road longer prior to plowing – more dilution**
    - ***Solution to Pollution is Dilution***
  - **Use enhanced product – *Less is More!***

Environme



- **Lessons Learned about Smog**
  - **Reduction of sand on Denver roa**
  - **The City of Denver has a chemica**

1. Since CDOT began using Liquid products, they have reduced the consumption of sand used for winter road treatment in Colorado by up to **50%**. This results in cleaner air and ***vastly reduced PM10*** (particulate matter contributing to Colorado 's “brown cloud” effect).

Environmental Impacts

- **Post winter aggregate clean up**
  - **Black Gore Creek – Vail, CO**

Approximately 2,400 truckloads of sediment were removed from the area. Project personnel began noting fish activity soon after water flows were restored.

The removed sediment was then used by CDOT and the Town of Vail to construct a berm to protect area neighbors from noise and light associated with an adjacent commercial vehicle chainup station.

"This was really extraordinary of CDOT, and so important for our rivers." - Jon Stavney, Eagle County Commissioner

Snow Removal - Scenarios

Scenario 1

Ambient Temp = 0 F
Surface Temp = 5 F
4” of snow on ground and still snowing.
- the snow is dry, roads are snow packed, no sun at 3:30 pm.

$MgCl_2$ or Enhanced $CaCl_2$ at your recommended app rate followed by plowing when liquid undercuts the pack (typically within ~30 mins to minimize refreeze).

Snow Removal - Scenarios

Scenario 2

Ambient Temp = 28 F
Surface Temp = 25 F
Snow event 3 hours old and still snowing and is averaging 1”/hour.
Due to high water content, traffic is compacting snow fall to hard pack / ice.

Option 1
Plow and use solid salt for deicing. Standard application rates that work in your location.

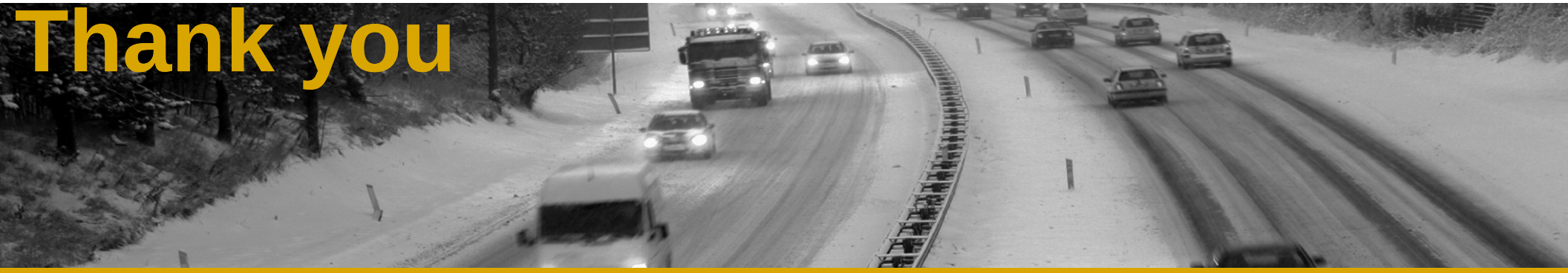
Option 2
Liquid deicer (Na, Mg, or Ca) in the trouble spots to quickly break hard pack, followed by standard solid salt application.

Snow Removal - Scenarios

Depending on Product availability:

Liquid deicers for cold dry snow and solid deicers for warm wet snow.

Thank you



Steven R Clark PhD
Field Application Scientist
sclark@envirotechservices.com
970.396.4956