

MICHIGAN **Winter** Operations Conference 

LIQUIDS IN MICHIGAN



MDOT's Historical Liquid Use



We have tried this \$&%# and it Does Not Work!

Wait - What Did You Say?

- If you use Liquid's, you will save \$\$\$ and faster results
- If you use Liquid's you use less salt, you will do less damage to the infrastructure
- If you use Liquid's & less salt, you will do less damage to your equipment
- Use less salt with Liquid's & it is better for the environment



CALIBRATION

- Calibration will result in consistent applications of materials
- Training of Team members, everyone on the same page – visual applications
- “Buy-In” is essential for accurate training / tests / learning
- Accurate data for comparing materials



Liquids



Calibrate for consistent application




Manual vs Auto




Nozzle Type / Size





Uses of LIQUIDS




ANTI-ICING/pro-active



Direct Liquid Application / re-active



PRE-WETTING/Solids



Costs \$\$

Staff/Labor

Equipment

Materials/Deliveries

Storage



Pre-Wetting Solids



Salt Bounce and Scatter Studies

Maintenance Advisory

MA 2013-01
August 27, 2013

From Mark Geib, Engineer of Operations Field Services Division

MDOT
Operations Field
Services Division
6333 Lansing Road
Lansing, MI 48917

Questions regarding
this advisory should
be directed to:

Tim Croze
Engineer Manager
Region Support
Phone:517-322-3394
[Email:Tim.Croze@mdot.gov](mailto:Tim.Croze@mdot.gov)

Justin Droste
Roadway Operations
Engineer
Phone:517-636-0518
[Email:Justin.Droste@mdot.gov](mailto:Justin.Droste@mdot.gov)

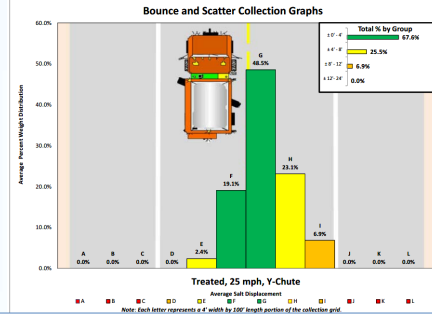


Best Practices for Applying Deicing Materials

Due to increasing costs and growing environmental concerns regarding the use of deicing materials for winter maintenance operations, it is critical we do everything possible to reduce the use of these materials, while still providing adequate levels of service. A major component of reducing the amount of deicing material required is conducting operations in ways that limit the amount of material that bounces and scatters off the roadway during application. The 2012 MDOT Salt Bounce and Scatter Study concluded that using pre-wet salt and applying deicing materials at slower speeds significantly increases the amount of material that stays on the roadway. Incorporating these practices into MDOT's winter operations program will ensure that as much deicing material as possible remains on the roadway and within the target area (4' on either side of the centerline), where it is most effective.

In order to keep the most deicing material on the roadway during the application process, the following guidelines should be followed (for all MDOT maintenance facilities 2013/2014 season):

1. The truck's speed should operate bet applying deicing material. Every effort sh as slow a speed as possible while applyin Justified exceptions to this practice may in
 - Peak hours on high-speed roads
 - Trucks equipped with technology tha as zero-velocity spreaders, slurry ge results from the 2013 MDOT Salt Bc these advanced systems should not mph
 - Other circumstances approved by the
2. All salt applied to a roadway should be pre-wet with a liquid chloride product. Rates of pre-wetting should be between 7 to 10 gallons per ton of untreated salt (salt slurry will require more, per manufacturer's recommendations). Salt can be treated at the stockpile, by the truckload, or at the point of application on the truck.



Tandem Axle - 10 TONS of SALT= \$600+



EVERYTIME
YOU LOAD UP !!



SIMPLE



- 800 gal/hr. (12-15 hrs. to recover from anti-icing)
- Fully manual operation & cleanout
- 1 fill point (2,600 gal/hr.)
- Stop operation to clean or truck fill
- Blend in 1- 3,000 gal tank and transfer



Splash Blending





Updated

- > 4,000 gal/hr. +
- > Automated
 - > Tests salinity
 - > Transfers to storage
 - > Pings phones when needs salt



Liquid/Contained Storage



Three Fill Points



Blending on demand



ANTI-ICING



Some may have the wrong impression



ANTI-ICING or DE-BONDING

"It takes 10X more resources to De-Ice than to Anti-Ice"



- Applying liquid chemicals to the road surfaces **pro-actively** before a snow/ice event prevents bonding of ice or hard pack to road
- Best results are achieved with 35 – 50 gallons per lane mile
- Ineffective if storm comes in as heavy rain or extreme cold, **reactive**
- Choose the right liquid/blend for the forecasted conditions



DLA- Direct Liquid Application

- Use on Freezing Fog, light snow events
- Use when pavement temps are 20 deg. and rising
- Completed entire routes with DLA
- Water main breaks, with blends
- Use less granular, liquid already in de-icing mode
- Consider **route** completion and **cycle time**
- **Always pre-wet your granular (Pump Output)**



DLA for a light snow or freezing fog

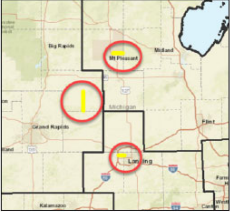


Direct Liquid Application

Liquid Route Pilots

Background and Locations:
 Enrolled Senate Bill 379 of 2020 amended Act 51 and charged MDOT to pilot the use of liquid-only plow routes (also known as direct liquid application (DLA)), including the following provisions:

- Study liquid-only plow routes at three different locations (including one local agency).
- Incorporate and evaluate use of agricultural byproducts (ABP) to promote surface adhesion and reduce freezing point of applied substance.
- Provide final report to House and Senate transportation committees no later than June 30, 2025, reviewing pilot activities, results and potential best practices for statewide use of agricultural additives.





Route	Limits	Lane-Miles	Maintenance Provider
M-66	Ionia County line to city of Stanton	24	Montcalm County Road Commission
M-20	Summerton to Midland County line	30	MDOT Mt. Pleasant garage
M-43	Canal to Rosemary	22	MDOT Grand Ledge garage

Equipment:
 DLA requires plows that carry large liquid tanks with spray bars instead of salt hoppers with solid material spreaders. There are two types of treatment when performing DLA:

- Anti-icing is a proactive treatment that involves applying a liquid prior to the onset of a snow event that prevents snow and ice from bonding to the pavement.
- De-icing is a reactive treatment for melting existing snow and ice formed on a surface either by itself or in conjunction with plowing.


Application rates for DLA can vary between 20 to 100 gallons per lane-mile, based on operation, material and environment.

Direct Liquid Application

Liquid Route Pilots

Facilities:
 Another consideration for DLA are additional liquid storage needs at the facility. For this pilot, contracts for liquid procurement also include a 20,000 gallon frac tank rental to supplement existing liquid storage already at the facility. While not done at the pilot garages, some locations also have brine makers.




Materials and Properties of Liquids and Agricultural Byproducts (ABP):
 Chloride solutions are what melts snow and ice. Rock salt (sodium chloride) must first go into solution with surrounding moisture for it to work as a deicer. With liquid deicers, the chloride is already in solution. Liquids will work faster but will also dilute out sooner. Liquids do not bounce and scatter like applied rock salt, so more chloride stays where it is needed, which should reduce the overall amount of chloride needed.


Na^+
Cl

Ca
Cl Cl


Mg
Cl Cl



Agricultural byproducts (ABP) are carbohydrates (sugars). ABPs on their own will not melt snow and ice, but they can help lower the working temperature of a chloride solution. An ABP also helps the chloride stick to the surface better.






Liquid products used on the liquid pilot routes so far include calcium chloride brine and calcium chloride with ABP from either sugar beets, corn molasses, or sugar cane.




MDOT Direct Liquid Pilots

Route	Limits	Lane-Miles	Maintenance Provider
M-66	Ionia County line to City of Stanton	24	Montcalm County Road Commission
M-20	Summerton to Midland County line	30	MDOT Mt. Pleasant Garage
M-43	Canal to Rosemary	22	MDOT Grand Ledge Garage

- Legislative Mandated Pilot
 - Liquid only plow routes...aka Direct Liquid application (DLA)
 - Evaluate Agricultural Byproduct (ABP) Additives (inc liquid sugar beet ABP)
 - Pilot in at least three (3) test locations
 - Include at least one (1) local road agency
 - MDOT to provide report by June 2025
- Two or Three Winters so far (2 more left).
- Keep same Level of Service at Salt Routes

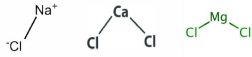






MDOT Direct Liquid Pilots

Liquids Used:

- (FY23: 290K gal; FY22: 282K gal FY21: 69K gal)
- Calcium Chloride Mineral Well Brine (MWB)
- Calcium Chloride with ABP
(ABP: Sugar Beet, Corn, or Sugar Cane based)



Observations to Date:

- Liquids work fast, but not as long
- LOS can be met with DLA
- ABP liquids best for anti-ice and colder temps
- Success with blending MWB with ABP liquid
- Higher rates needed in cold temps and nighttime
- Liquids more expensive than Salt (ABP especially)

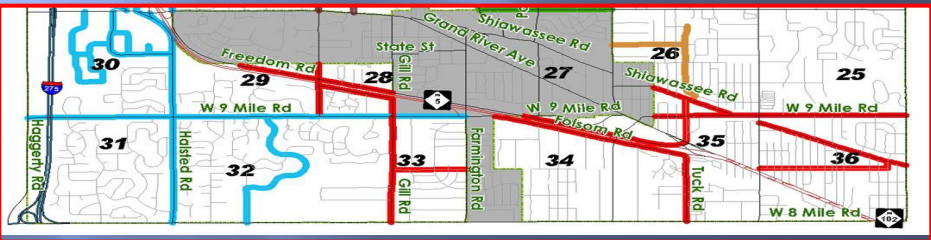


Before Application



25 mins-after application

DLA in 2011



1.5 YD's of salt to produce the Brine vs. 5-7 YD's Granular Salt to do Red route



DLA-Brine Efficiency

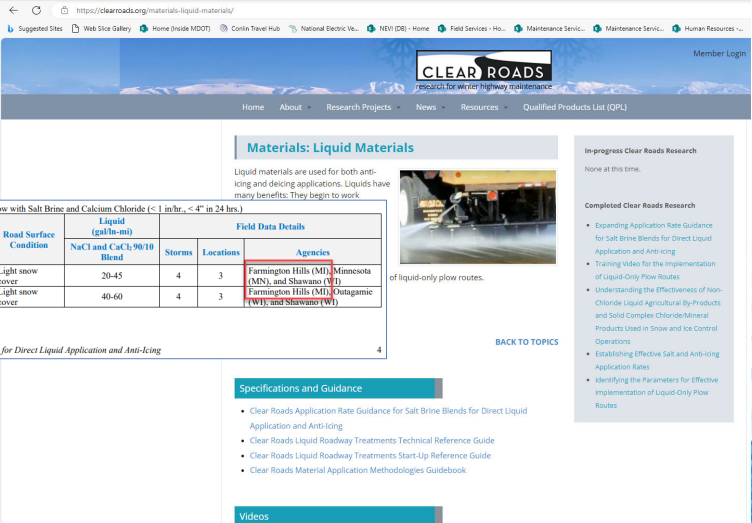


(1) 5 YD cap. Truck = 4k Gal's BRINE




Liquid Use Resources

- [Materials: Liquid Materials - Clear Roads](#)

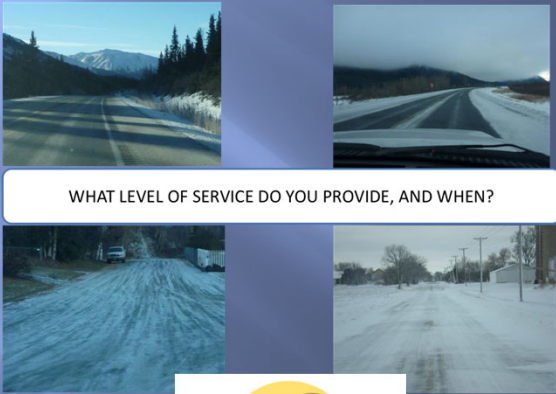


Pavement Temperature	Trend	Road Surface Condition	Liquid (gal/100-sq-ft) NaCl and CaCl ₂ 90/10 Blend	Field Data Details		
				Storms	Locations	Agencies
20-25°F	Remaining in range	Light snow cover	20-45	4	3	Farmington Hills (MI), Minnesota (MN), and Shawano (WI)
15-20°F	Remaining in range	Light snow cover	40-60	4	3	Farmington Hills (MI), Onongame (WI), and Shawano (WI)



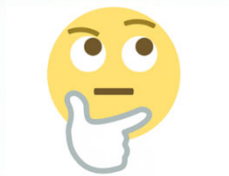
Clear Roads Application Rate Guidance for Direct Liquid Application and Anti-Icing

Expectation's

Level Of Service



WHAT LEVEL OF SERVICE DO YOU PROVIDE, AND WHEN?



TRAINING

26



Vendors



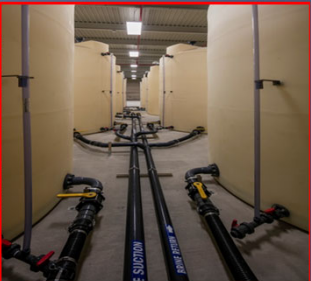
Potlucks



Workshops



BLENDING of BRINE & ORGANICS



Bottom Feed all storage tanks

Below the surface of liquid + use of Anti-Foam



Filter-Strainer-Filter



➤ Additional Filters on Equipment, at Fill Points



MATERIALS Testing / Evaluating/Buy In



Small Quantities
2-3 gallon
Hand Sprayers



Test in Parking
Lots /Lower
Volume Roads



Totes 2-300 gal.



If this \$&%# does not work Then why?



QUESTIONS?

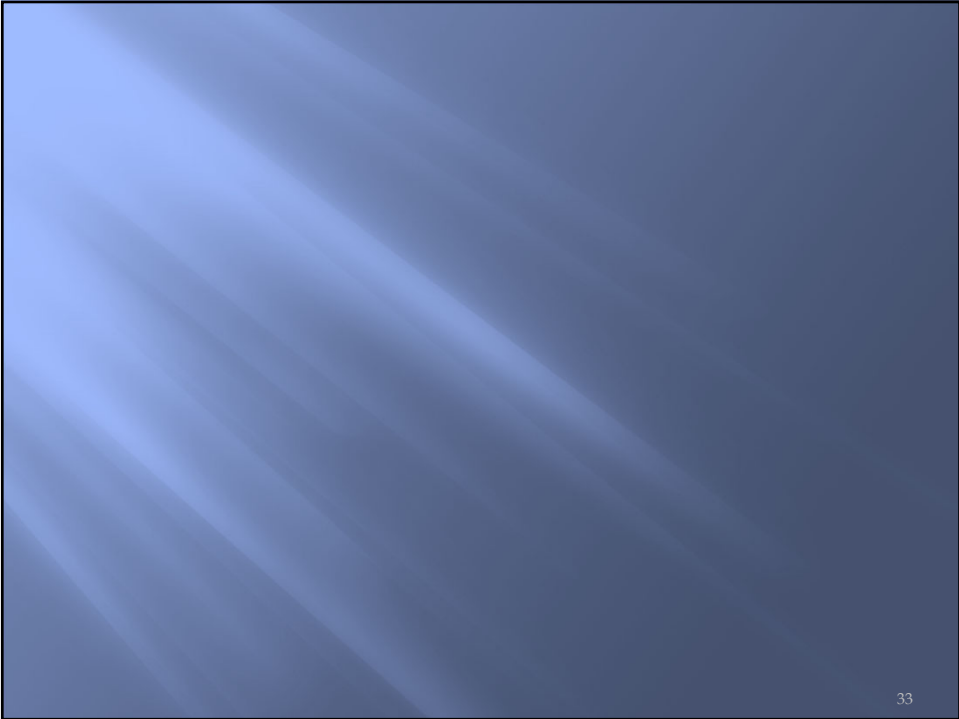




Justin Droste P.E.
Region Support Engineer
MDOT TSMO Division,
Maintenance Services Section
6333 Lansing Road
Lansing, MI 48917
(517) 636-0518
drostej@michigan.gov

•Bryan Pickworth•
Retired Road Maintenance Supervisor
Part Time Projects / Safety Coordinator
CITY OF FARMINGTON HILLS, MI
DIVISION OF PUBLIC WORKS
bpickworth@fhgov.com 248-871-2850





TALKING POINTS IF TIME ALLOWS



Farmington Hills, MI-Lessons Learned

- Walk before you run – Shared Services / Vendors
- Careful of over promising clear roads 24/7 –Expectations
- Staff #1 resource – Train, Train, Train, Empower, Buy In
- Network – don't reinvent the wheel, attend webinars, conf's
- You will fail – Learn from your tests & pilot programs
- Brine is the most forgiving- if starting a program or blending. When used with organics can help environment.
- Brine is a cost-effective way to start with liquids
- Communicate and take the time to tour other municipalities



35



ANTI-ICING RESULTS 12-29-11 8AM @ +27F



- Anti-Iced this area with 40 GPLM – 85% Brine / 15% Beet
- We were able to accomplish other tasks: Grading, Cold Patching, Forestry



36



ANTI-ICING



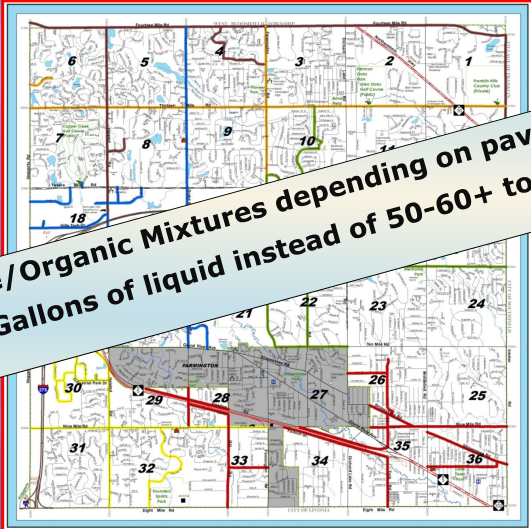
PARKS Division Anti-Iced Day Before w/cars parked, they were able to use there resources at other parking lots



37



DLA for a light snow or freezing fog



Can use Brine/Organic Mixtures depending on pave-temps.
FH used 9k Gallons of liquid instead of 50-60+ tons of salt



38



BRINE/BEET IN OUR PROGRAM

- Reduced annual granular salt use (40% - 50%)
- Prior to 2006 used straight calcium (Wixom,MI)
- High year before liquid = over 9,000 tons/yr.
- 2013 snow-mageddon only 6,400 tons used
- Avg. annual use about 5,000 tons
- Production of 100,000 gallons of brine in 2007 to current up to 200,000 + gallons depending on weather & Shared Services.....
- 2007 Beet \$3.07 a gallon / 2020 average \$1.65
- Keep in mind most Brine 85-80% –Beet mixes 15-20%



39



BLENDING OF BRINE & ORGANICS



40



BLENDING of BRINE/LIQUIDS



- Log of vehicle, user and product or blend
- Blend multiple products, consider trading
- Cost Brine 7cents per gallon – Cost Beet \$1.62 per gallon
- Odor Issues with Organics / Test Neutralizers



Farmington Hills, Michigan Road Network

City Covers 33 sq. miles

- 6 Major Road Snow Routes (approx. 28 Lane Miles each)
- 247 Miles of Local Roads
- 4,500 tons of salt annual avg.
- 200,000 + gallons of annual liquid use on Average
- Residents expects a high level of response and service



TRAINING - TEAMWORK



BLOOMFIELD TOWNSHIP
1827

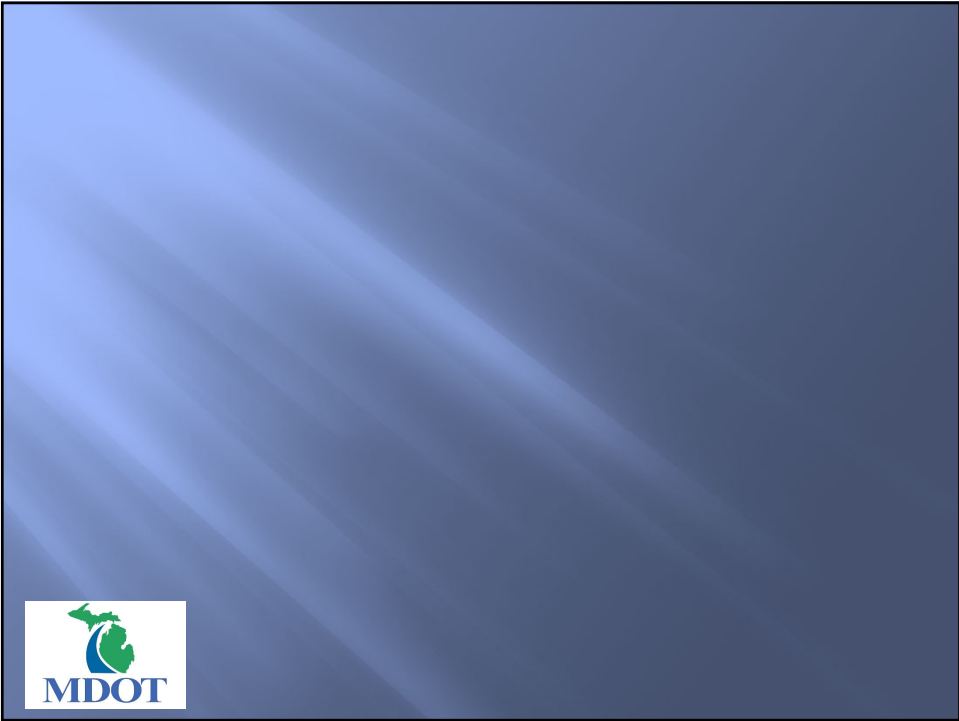
S.E. Michigan Winter Maintenance Team

FARMINGTON HILLS
Michigan

APWA
AMERICAN PUBLIC WORKS ASSOCIATION
Michigan Chapter

SEMCOG

Michigan's Local Technical Assistance Program
Bridging the gap between theory and practice



MDOT