

How to integrate liquids into de-icing

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Integrating liquid into de-icing operations can give us many advantages. This section will describe the two most common ways to use liquids in combination with rock salt.

By adding a liquid to rock salt you have many advantages:

#1: it works faster



Liquid salt works immediately (assuming pavement temperatures are in practical melting range), by integrating liquid salt into granular salt you can speed up the melting process.

#2: It stays on target! Doesn't bounce off of the road as easily



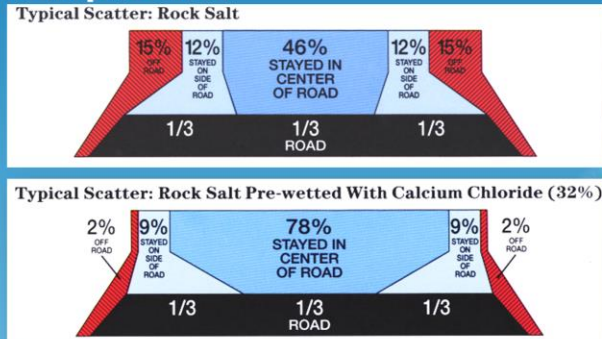
Photo: Fortin Consulting

Moist salt bounces less than dry salt. With less bounce less salt needs to be applied to the roadway to get the same results. This offers great savings in salt, \$ and the environment.

1974 - 1975 MDOT Salt Report

Pre-wetted

- 3 year study on use of pre-wetted salt
- Concluded that 32% more salt stays in target area when pre-wet



graphics: MDOT

For those of you that are not aware of the previous work MDOT has done on bounce and scatter I just wanted to give a brief overview of the work done in the 1970's as MDOT has a long history of being leaders and innovators in using liquids for winter operations. In the early 1970's MDOT performed a 3 year study to determine the amount of bounce and scatter of untreated and treated (or prewet) salt. The study concluded that 32% more treated salt stays in the target area than dry salt.

Because of this study MDOT is widely recognized as a pioneer of using liquids deicers in winter maintenance and the results are still referenced today by researchers across North America.

As I said earlier one of our goals was to expand upon this report by including 2 other variables, application speed and delivery system.

#3: You can turn down the application rate



30% less is needed



We know less salt is needed but we still have to take time to change our application rate charts and execute the lower our rates when we are out on the road. This might feel wrong to veteran plow drivers who are used to seeing a higher application rate so that is another area where education is important. Expect to see less salt leaving the truck and expect to see the same de-icing results.

Two ways to get salt wet

#1: pretreated stockpile

#2: pre-wet on the truck



Two methods of integrating liquids:

Stockpile treatments and onboard liquid. Both have advantages and disadvantages that will be discussed in this section.

Both methods are far superior to using dry salt.



Often the first step into using liquids is by purchasing pre-treated salt. No new equipment is needed, just turn down the application rate!

Stockpile options

Purchase it premixed

Mix it yourself



Good storage is essential with treated stockpiles.
They are more likely to leach than dry salt

The liquid added is hygroscopic which means it draws moisture to the pile. This is good in many ways as far as performance of de-icing. However if you have treated salt over the summer it will draw a lot of moisture to the pile and may cause you leaching problems.

You can manage this by ordering conservatively so you don't have a large over summer pre-treated pile. Or by having excellent storage that doesn't allow liquids to leave the building.

If you buy it premixed:

- It will be mixed properly
- You don't need any liquid tanks or liquid products
- It costs more



By purchasing it pre-mixed you are likely to have a product that is better mixed and properly mixed. You can leave the worry to the vendor and just use the treated stockpile.

Treated salt costs more than dry salt if you compare ton to ton. However if you compare how much you need to use, dry salt is often more expensive.

If you mix your own:



4 – 6 gallons per ton, be accurate, more will leach

Do not use salt brine, talk to your vendors about what they recommend

Mix up small batches, not for the whole year

Those that have liquid on hand are more likely to mix their own treated salt than those that do not. To get a good mix make sure you are starting with dry salt and that you do not exceed the 4 to 6 gallons per ton formula. There is a salt moisture testing section in the training manual that can explain how to test for moisture in rock salt.



This is an example of how moist 4 gallons per ton is. As you can see it isn't very wet. That is one of the most limiting factors with a pretreated stockpile vs. on board pre-wetting systems.

Advantages of onboard Pre-wetting

- Can change your type of liquid
- Can change the amount of liquid



Pre-wetting salt occurs on the truck. There is a tank for liquid de-icer and a box for granular de-icer. They come together before the road although they generally are poorly mixed.

Tips for Pre-wetting

- Many choices for pre-wetting liquids
- Start out programs often 8-14 gallons/ton
- More liquid is better!
- Some use more than 60 gallons/ton
- As you turn up the liquid, turn down the granular!



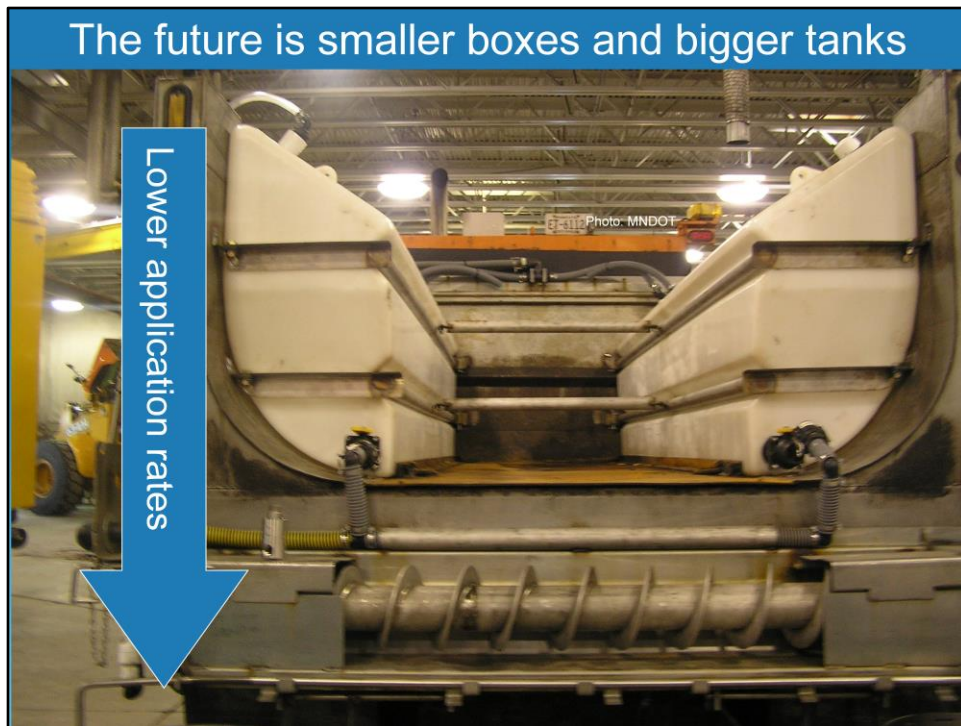
Most organizations apply 8 to 14 gallons per ton. This is because they allocate the liquid to granular so they both run out at the same time. The most effective ratios seem to be higher liquid with lower granular although no one seems to know what the optimal mix is.



Some organizations have discharge liquids into the auger to try to get a better mix that at the spinner.



This is a very common method of pre-wetting. In this example the liquid is discharge at the spinner. It isn't perfect, Its short coming is that it is difficult to get a good blend of liquid and granular. Its advantage is it flows nicely and doesn't cause many problems.



The trend is toward more liquid. Experiment with this and see what works best for your operations. Remember each gallon of brine has 2.34 pounds of salt in it so if we used 60 gallons of liquid that is 140 pounds of salt. If you add granular salt on top of that it only needs to be a very slight amount. Figuring out the optimal mix is a worthwhile endeavor for your agency.

Disadvantage of on-board pre-wetting

You have to
invest in new
equipment

New training



Pre-wetting offers many advantages over dry salt and a few advantages over pre-treated stockpile. There are some disadvantages with pre-wetting, those are mainly the initial investment in equipment, storage and training. Most organizations agree that there is a high return on investment in this area.

Potential Cost Savings



Material	Cost/ton	Amt. needed	Total cost
Dry salt	\$55	10 tons	\$550
Wet salt	\$60	6.6 tons	\$396

Tim Croze from MDOT suggested \$5 extra for wet salt. Not including cost for new equipment. Matt Pratt from MDOT commented that prices vary depending on material used.

Even if you figured \$80 ton for wet salt you would see salt savings. No one is suggesting \$80 per ton cost.

This chart shows savings if you use 1/3 less salt. 1/3 less salt is needed if you use pre-wet salt according to 1974 MDOT study.