Materials

Overview

Different materials will work for different situations. Having multiple options and choosing the correct materials for the situation can greatly increase the efficacy of any treatment.

Top: Salt, Middle: Sand, Bottom: Organic-treated salt

Deicers – *Chlorides and acetates*

- Melt snow and ice
- Available in liquid and granular forms
- Chlorides are the most commonly used deicer.

Abrasives – *Sand*

- Provides traction on top of snow and ice
- Does not melt snow and ice

Organics – *Agricultural byproducts*

- Lowers the freezing point of deicers
- Sticky
- Alters ice crystal formation
- Does not melt snow and ice

Abrasives

Abrasives, such as sand, can be used for temporary traction on top of snow and ice. It does not melt snow and ice once on pavement.

This material works well at cold temperatures when deicers are not effective.

Less than 10 percent salt should be mixed into winter sand to keep it flowing.

Salt-sand mix

If you add more than 10 percent salt to your sand, you are trying to melt with sand, which is ineffiecient. If you are trying to melt, switch to deicers.

If you are using a 50-50 salt-sand mix, you are always half wrong!

Deicers

Deicers melt snow and ice. The purpose of using chemical deicers is to loosen the bond between the snow and/or ice and the pavement so the snow can be physically removed. Chemical deicers are not intended to melt all the snow and/or ice from an event. Using that much deicer is impractical financially, in terms of time, and for the environment.

How Deicers Work

Salt works by lowering the freezing point of water allowing snow and ice to melt at colder temperatures. Deicers work faster at warmer temperatures and slower at colder temperatures.

Dry materials must go into a solution before they can melt. Liquids work faster than dry salt (see Chapter 8).

Ice Melt Capacity and Speed

Ice melt capacity is a measure of how much ice a fixed amount of deicer will melt. Each deicer is different. Pavement temperature will change the speed of melting, but not the total ice melt capacity.

The warmer the temperature, the faster deicers work. When it is too cold, deicers will not melt at all. A large reason why we over use salt is that we think that more salt will speed up melting. If you already have the proper amount of salt down, more salt will not make the snow and ice melt faster.

$ Tip ***Adding more of the same granular deicer to try to speed melting wastes money and salt.***

Speed of Ice Melt Chart

Pavement Temperature ºF	One Pound of Salt (NaCl) Melts	Melt Times
30	46.3 lbs of ice	5 min.
25	14.4 lbs of ice	10 min.
20	8.6 lbs of ice	20 min.
15	6.3 lbs of ice	1 hour
10	4.9 lbs of ice	Dry salt is ineffective and will blow away before it melts anything.
5	4.1 lbs of ice	
0	3.7 lbs of ice	
-6	3.2 lbs of ice	

Figure 4: Speed of melting chart[20]

Chlorides

Chlorides are the most commonly used deicers. They have a variety of practical temperature ranges and are corrosive to infrastructure.

- **Rock Salt, also known as Sodium Chloride**

  Road salt, also known as sodium chloride (NaCl), is the most common and least expensive deicer. NaCl is effective at pavement temperatures 15 °F and warmer.

- **Magnesium and Calcium Chloride**

  Magnesium chloride ($MgCl_2$) and calcium chloride ($CaCl_2$) melt faster at colder temperatures. $MgCl_2$ to -10 °F and $CaCl_2$ to -20 °F.

  $MgCl_2$ and $CaCl_2$ will melt better at colder temperatures than NaCl.

  If over-applied in warm or humid temperatures, $MgCl_2$ and $CaCl_2$ may create a greasy surface. This is because they are hygroscopic, meaning they pull moisture from the air.

- **Potassium Chloride**

  Potassium chloride (KCl) melts at a similar temperature range as sodium chloride, but costs more. Potassium is a nutrient often found in fertilizers that can be utilized by plants.

- **Acetates**

  Acetates are a non-chloride deicer option. The two most commonly used acetates are calcium-magnesium acetate (CMA) and potassium acetate (KAc). Acetates are readily available and are more expensive than salts. Acetates are less corrosive than chlorides.

- **Organics: Agricultural Byproducts (ABP)**

  Agricultural byproducts (beet juice, molasses, distillers' solubles, and corn syrup) are most often a chloride additive. They do not melt snow or ice but may be helpful in reducing the freeze point of brine, interfering with ice crystal formation, reducing corrosion, and improving adherence to pavement. Clear Roads project 13-02 has more information on ABPs.

Chemical Properties of Deicers Chart

The practical melting pavement temperature refers to real-world conditions. The eutectic melting pavement temperature refers to a lab setting.

Deicer	Practical Melting Pavement Temp.	Eutectic Melting Pavement Temp.
Sodium Chloride (NaCl)	15 °F	-6 °F
Magnesium Chloride ($MgCl_2$)	-10 °F	-28 °F
Calcium Chloride ($CaCl_2$)	-20 °F	-60 °F
Calcium Magnesium Acetate (CMA)	20 °F	-18 °F
Potassium Acetate (KAc)	-15 °F	-76 °F
Blends	Talk to supplier	Talk to supplier
Abrasives	Does not melt	Does not melt

Figure 5: Chemical properties of deicers[20]

Bagged Product Labeling

Using bagged blends is like taking on a research project. You must understand which ingredients are in the product and how they work. Generally, the cheaper the bag the more NaCl will be in the blend. Bagged blends generally include a smaller grain size which will allow for easier movement through spreaders.

Because there are no labeling regulations, bagged products often falsely claim to be "environmentally friendly."

> ***When using blends do not rely on the information on the bag. There are no labeling requirements for deicers therefore the information on the bag may be misleading.***

Work with your vendor to understand what is in the blend and what is the practical melting range for that product.

$ Tip ***Some crews use less salt if it is provided to them in smaller bags.***

Credit: https://www.wisaltwise.com/documents/PDFs/Madison-Parking-Lot-Manual-Final-7-19-2019.pdf