**James Brower** *CONSERV FS*

# Breaking the Ice:


## What Facility Managers Need to Know About Ice Melters

*The noise surrounding the sale of ice melters seems to have reached an all-time high with more brands than ever before on the market. Complicating matters, they all claim "safe on vegetation," "less tracking," or "low-temperature effectiveness" if used as directed. Most newer brands are actually only blends involving one of the more common deicers.*

When you understand how ice melters work, a lot of the mystery of what they are unfolds. Granular ice melters work by dissolving in the ice/snow, forming a brine. The salt-brine solution has a freezing point lower than water. This brine solution will penetrate/melt to the surface to break the bond between the surface and the ice layer, making for easier ice/snow removal.

*Each of the individual components of ice-melt products has some benefits depending on what your needs are.*

Basically, five products go into ice-melter production:

1. Sodium Chloride
2. Potassium Chloride
3. Calcium Chloride
4. Magnesium Chloride
5. Urea

Ice-melt products are either straight products listed above or a combination of several of these. This combination can be in either a granular form or a liquid form. Typically, you see a liquid calcium or magnesium chloride sprayed onto a pellet of sodium chloride or onto potassium chloride. The liquid calcium or magnesium will quickly form a brine by pulling moisture from the atmosphere, causing a faster melting action. We call products that pull water from the atmosphere "hygroscopic." Remember that all ice-melt products have to form a brine in order to start the melting process.

Outlined on page 11 are the pros and cons of the various products that are used for ice melters.

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## WHICH ICE MELTER IS THE BEST?

Real confusion usually sets in when trying to determine what ice melters to use. I like to use the following criteria to help people determine what product to use. Ask yourself, what desirable characteristics are most important to you? Consider:

A. Product availability
B. Desired melting temperature
C. Quick or slow melting speed
D. Product longevity on the ground
E. Application ease
F. Environmental friendliness
G. Cost effectiveness

To elaborate a bit on the above: The product of choice should be readily and locally available. When you're out and need to replace it, Mother Nature is not going to wait. Also consider that for most people, storage space is at a premium. Consider the melting temperature of the product; it is important because if it is 5° below zero and your ice melter is not working, YOU are. Melting speed is important because the faster the product works, the faster you can clean the snow up. However, some slower-melting products will stick around and give you grit or traction. Consider product longevity—will the product wash away or will it stick around for the next storm event? Application ease is important; if the product has a lot of fine particles that clog your spreaders, rendering them unusable, what good is the product? Workers also need to see the products (i.e., spread pattern) to speed product application and to reduce waste.

Consider the long-term economic effects of your ice-melt product. Is your primary concern more environmental, such as turf or trees, or is it your concrete walks, brick work or multimillion-dollar parking garage? Do your storm drains empty into irrigation ponds? The next thing to consider is how cost-effective the product is in light of all of the above. Is the bag price of your product your main concern? Remember that the same weight of calcium chloride will melt twice as much ice as sodium chloride will at a lower temperature. Did you know the biggest cost of winter maintenance is actually labor?

Each of the individual components of ice-melt products has some benefits depending on what your needs are. Sodium chloride bears the lowest price tag and is most available. It figures into most blends and works down to 20°F. Remember that when using a blend of ice-melting ingredients, the blend is always diminished by its weakest ingredient. Below 20°F, sodium chloride needs traffic to generate heat to help it on cold mornings. Make sure that if you buy bagged material, it is a Halite brand [heat-treated to dry it] and that it has been screened to remove the small particles from it.

Potassium chloride is a slow-melting particle. It is commonly used in blends but in small quantities due to the cost of most fertilizer products increasing over the last couple of years. This melter works down to 15° and because of its particle size, also gives some grit or traction on icy days.

Calcium chloride works quickly, drawing water from the atmosphere, and creates its own heat. Because of this, it will work below 0°. It is commonly used as a liquid to activate other products, such as sodium chloride and potassium chloride.

Magnesium chloride, like calcium chloride, works quickly, even below 0°, and is also commonly used as an activator on other products. It is user-friendly and frequently appears in pet-friendly blends of ice melt.

Urea is not commonly used as a ice melter except in specialty locations such as airports or parking garages where anything with chloride molecules—which may pit aluminum airplane bodies, turbines or metal rebar—cannot be used. The chloride molecules will penetrate through concrete and attack certain metals.

In conclusion, all products that are used as ice melters bring certain benefits to the table. The most common concern with ice melters is the potential damage to concrete. All concrete, whether old or new, will be damaged if it is not properly poured, mixed or cured. The natural freeze-thaw cycle will damage poorly laid concrete. It will do so even if ice melters are not in use. Anything that increases the freeze-thaw cycle, including water, can induce spalling in concrete.

*Most ice melters are overused and this is where we see damage to turf areas.*

In turfgrass situations, it is common for decision-makers to choose fertilizer products such as urea and potassium chlorides. The thought process is that they will do less damage. Remember, however, that a typical ice-melter application of such products is much higher than a typical fertilizer rate. Damage to turf will occur if applied 12 or 15 times a year to frozen turf areas because the product cannot leach through the frozen soil. The best results that I have seen regarding minimizing turf damage are the use of the calcium-coated ureas, such as with a product called Power Melt, and the use of magnesium chloride.

The best ice-melt programs I have seen are those that realize that all ice melters have potential risk. Train your crews on this. Make sure you follow proper application rates. Most ice melters are overused and this is where we see damage to turf areas. Always remove the slush once the ice/snow has melted. Always remove snow/ice to the curb away from the vegetation. Inquire as to what is in your bag of ice melt. Blends don't list percentages of ingredients. Even MSDS are vague on the exact percentages. Most importantly, minimize risk by following proper application procedures. This includes removing the snow before applying your ice-melt product and removing the slush afterwards.

If you have questions or want to get more specifics on any of your ice-melt programs, please contact specialists in the use of these products.

## Common Ice-Melting Components

Ice melters are commonly available as either single materials or combinations of them. The following overview reviews the dynamics of the basic ice-melting components and how these characteristics determine their overall effectiveness relating to performance and value. References regarding melting temperatures are derived from practical use-rate applications.

**• Sodium Chloride**

Sodium chloride (or "salt") is the traditional "rock salt" and the least expensive ice melter available. Soils and plants can be damaged by high concentrations of sodium chloride. It is also highly corrosive to metals and should not be applied where tarnish or corrosion may damage metal or result in unsafe conditions, such as near aircraft, electrical boxes and other similar locations. Unscreened salt for roads (cheapest) usually contains slate with other foreign and off-sized materials. Sodium chloride melts effectively to approximately 12°F.

**• Potassium Chloride**

Potassium chloride is a common fertilizer nutrient that offers more safety to plants than sodium chloride. Compared to salt, this material is not damaging to the soil structure and will corrode metals to a lesser degree. Potash (KC1) is usually screened and sized for use in granular applications and melts effectively to approximately 20°F.

**• Urea**

Urea is a fertilizer nutrient that can contaminate groundwater and runoff collection ponds with nitrates, a degradation product. Approximately 10% as corrosive as sodium chloride, urea is Federal Aviation Administration (FAA)-approved as an airport runway ice melter (when chloride content is less than 200 ppm). It is also used near equipment that is sensitive to corrosion by chloride salts (electrical boxes, etc.). If using near airports or other sensitive areas, make sure the product meets the chloride specifications. Urea melts effectively to approximately 21°F.

**• Magnesium Chloride**

Magnesium chloride is a very hygroscopic salt. An open bag will leave a pool of water if left open with the remaining material subsequently becoming hard. Often used in blends with other chlorides or as a liquid spray solution on concrete surfaces. Heavy applications can be tracked to indoor surfaces, resulting in slippery flooring or oily carpeting. Magnesium chloride melts effectively to approximately -25°F.

**• Calcium Chloride**

A byproduct of chemical-manufacturing processes, calcium chloride is a traditional ice-melter product. Very hygroscopic, it forms slippery, slimy surfaces on concrete and hard flooring. Some people and pets show dermal sensitivity in the form of rashes and "burns." Handling precautions suggest the use of gloves, goggles and respirators. Calcium chloride melts effectively to approximately -25°F.

**• CMA**

Calcium-magnesium acetate (CMA) is a noncorrosive ice melter. Developed by the Federal Highway Administration and promoted as an environmental alternative, CMA is extremely expensive and has very limited melting capabilities. Its primary advantage is that it prevents ice from bonding to cold surfaces when applied prior to snow and ice accumulation. CMA is commonly used to control ice formation on bridges and overpasses as well as in areas with new concrete or where materials are extremely susceptible to corrosion. CMA is sometimes blended with chloride salts to reduce cost. CMA melts effectively to approximately 15°F.

**• Liquid Potassium Acetate**

Promoted as biodegradable and environmentally friendly, potassium acetate is available only in liquid form. Like CMA, potassium acetate is extremely expensive. Most commonly preapplied to road surfaces before snowfall. Liquid potassium acetate melts effectively to approximately -15°F.

**• MG-104**

A corn byproduct, MG-104 aids in keeping the resulting slush from refreezing. It is expensive to use at rates that provide this utility. MG-104 is blended with other ice-melting agents.

**• Blends**

Blends are mixtures of deicing components that enhance the ice-melting capabilities of each individual ingredient. Combining the attributes of low-temperature performers like calcium and magnesium chloride with the inexpensive qualities of sodium or potassium chloride results in a product that is effective and affordable. Depending on the mixture of ingredients, blends melt effectively from 20°F to -15°F.

**• Liquids**

Liquid deicers are available as several ice melters in varying concentrations. Liquids are most commonly used as pretreatment before snowfall and as a "hot mix" to enhance the performance of sodium-based deicers. The drawback for liquids includes heated winter storage and the added expense for spray equipment. Liquid deicers are effective from 20°F to -25°F depending on the material applied.

– Roger Ogalla
BTSI