



## CHOOSING A LIQUID ANTI/DE-ICING PRODUCT

Today, the highway maintenance professional is faced with a myriad of products and equipment to choose from for winter maintenance operations. This upsurge of new products and equipment is due to the development and advancing of winter maintenance technologies, such as anti-icing and stockpile treatment. Industry vendors have responded by developing products that make these new technologies available.

When considering the use of a liquid anti/de-icing product, we must first take into account how we intend to use it.

**ANTI-ICING:** Anti-icing is the application of a chemical freeze-point suppressant to the road surface prior to, or at the beginning of the actual storm event. The application is made with the intent of eliminating or reducing the bond between the frozen precipitation and the road surface. What real advantages does anti-icing offer?

- Anti-icing is proactive. A commitment is made to improve traffic safety before safety is compromised.
- The Level of Service (LOS) and traffic safety is increased, resulting in fewer accidents. Studies by ICBC (Insurance Corporation of British Columbia) have documented the reduction in accidents (and corresponding savings in dollars) attributed to anti-icing.
- Save on overall winter operations costs. According to the Texas Transportation Institute, last year \$2 billion was spent on winter road maintenance. Add to that another \$5 billion in indirect costs – corrosion, pavement damage, environmental impact, and loss of life – and it is obvious that winter maintenance is a very expensive undertaking. The FHWA document *Planning for Snow and Ice Control* states that the use of anti-icing results in a 50 to 80 percent reduction in chemical application required to achieve the same result. If 40% of the \$2 billion (\$800,000,000) was spent on chemicals, and only a 50% reduction was achieved, the end result would be a national savings of \$200,000,000. If indirect savings are also considered, it would be expected that the actual savings could reach \$1 billion.
- Environmental Considerations: As stated above, anti-icing results in a reduction of chemical application by 50 to 80 percent. Consider that reduction when evaluating impact on surface water (toxicity to fish and other aquatic organisms), ground water (chloride and sodium loading of drinking water), effects on vegetation, and air quality (pm-10 from salt and sand).

How widely used is anti-icing? According to *the 1999-2000 Technology and Usage Survey Results* published by SHRP; Anti-Icing/RWIS Lead States Team, 90% of state highway agencies responding are using anti-icing strategies. Further, 86% plan to start or

expand anti-icing usage. State highway agency anti-icing practices account for approximately 140,300 lane miles or 23.9% of all lane miles treated by state agencies.

**PREWETTING AT SPINNER:** For those agencies not yet equipped for an anti-icing program, there is still a very valuable use for liquid de-icers. The practice of spraying the solid (salt and/or sand) with the liquid de-icer just prior to roadway application has been shown to improve the use of the solid materials. There are two primary benefits. First, the liquid will reduce the bounce and scatter of the solid material on the road surface. Studies have indicated that as much as 60% of the dry application can migrate to unproductive areas of the road surface through the application and normal road traffic. However, if that solid material is treated with a liquid prior to application, that loss of material can be reduced to 10%. If the liquid is applied to salt, the speed at which the salt begins working is dramatically increased. Further, depending upon the liquid used, the melting performance of the salt can also be dramatically increased, especially at colder temperatures. The downside of prewetting at the spinner is that it still requires additional equipment.

**STOCKPILE PRETREATMENT:** With the recent advent of liquid products with enhanced viscosity, it has become possible to treat entire stockpiles (salt and/or sand) with the liquid product. There are a number of benefits to pretreating an entire stockpile:

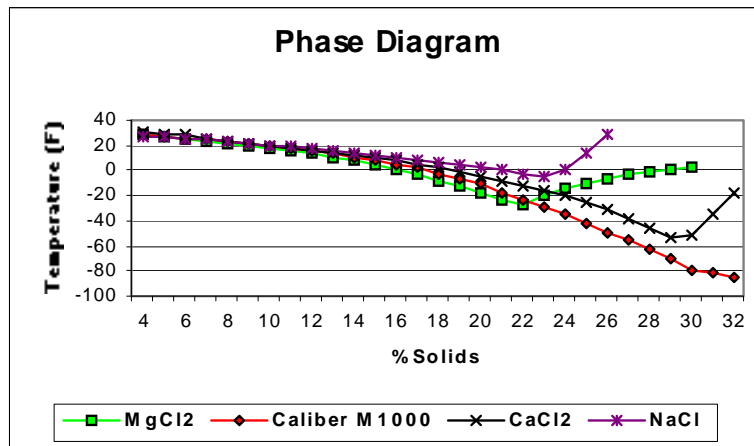
- No additional equipment is required as with prewetting at the spinner. The product is applied in finished form using existing spreading equipment.
- Convenience: The stockpile is either delivered in an already treated form, or it is treated at the customer location at a time that is convenient for the customer. Additionally, operators do not need to concern themselves with filling liquid saddle tanks.
- No frozen or clumping piles. Treated piles will remain free-flowing regardless of temperature. Additionally, the liquid can be applied to already frozen or clumped piles in order to achieve a free-flowing pile.
- Corrosion advantages: Typically, the liquids used to treat stockpiles also have a very low corrosion value. In pretreating a stockpile, each granule of salt is completely encapsulated with the low corrosion liquid. Therefore, the salt is not allowed to contact the spreading equipment. No salt contact – no corrosion.
- Performance advantages: The same advantages seen in prewetting at the spinner will also be seen with stockpile pretreatment, but to a greater degree. Studies have indicated that treating at the spinner results in a 50% or less coverage of each granule. Pretreating the entire stockpile results in a 100% coverage of each granule.

**LIQUID APPLICATION DE-ICING:** Typically, de-icing with a liquid material is a method that is not recommended. However, as the industry vendors have continued to advance their products, it has recently become possible to use certain liquid products as a de-icer in certain applications. Consult your liquid vendor for recommendations.

## CHOOSING THE RIGHT LIQUID PRODUCT

When choosing a liquid anti/de-icing product, it is very important to consider all the factors pertinent to its use:

- 1) Determine the application method: Anti-icing, prewetting, stockpile pretreatment, or de-icing.
- 2) Determine your LOS or Level of Service Goal.
- 3) Evaluate products based upon their performance:
  - a) Determine the effective temperature and the melting capacities of different products. This can best be done by studying a Phase Diagram such as the one below.



The products with the greatest potential to melt snow and ice at colder temperatures will have a higher concentration, a lower eutectic point, and a flatter phase curve. Products with steeper curves are more susceptible to refreeze.

- b) What is the practical temperature range that the product will be used in?
  - c) Consider the possible applications for a product. Is the product only intended for prewetting, or can the product be used for several different applications?
  - d) Consider the recommended application rates for each product given a certain set of circumstances. Does the product have any other intrinsic properties that increase performance?
- 4) Consider the corrosion value for each product. Will this product deteriorate the equipment, infrastructure, etc...
  - 5) Determine the environmental impact of each product. Does it contain heavy metals? Is it toxic to fish, etc... Is the BOD (Biochemical Oxygen Demand) too high?
  - 6) Consider handling and storage issues. If it drops below 5°F, will crystals begin forming in the tank? Does the product require agitation? Will foreign material plug nozzles in the application equipment? Will the material burn skin or damage gloves and boots?

So what about purchase price? Purchase price was not mentioned because purchase price should never be the determining factor in product selection. Surely it should be considered, but only in the context of calculating the overall **cost** of the product's use.

Using the above mentioned criteria (and any others that are important to you), select products that can meet your expectations. Then, use the purchase price of these products to evaluate which is the most cost effective for the benefits offered.

Truly, this process can become complicated and difficult to complete. However, there is an aide available to assist you in your product selection. Dale Keep and the Pacific Northwest Snowfighters have developed the "Pacific Northwest Snowfighters Liquid Chemical Comparison Worksheet". This worksheet is an excel file that simplifies the process greatly. The worksheet asks you to weight the factors of Best Buy, Corrosion, Environment, and Performance. You then enter the lowest temperature that you anticipate using the product. After you have entered in the information that is important to you and your situation specifically, information regarding the specific products are necessary. You are asked which products you wish to compare (the most commonly used products are listed for you, with a space for newly developed products left blank), and specific information such as concentration, cost, specific gravity and corrosion value. After all of the information is completed, the worksheet calculates which product would best serve your needs based upon the weighting factors and temperature that you entered.

The worksheet is not foolproof, as some products will perform better in the field due to other properties such as viscosity, effects of traffic, etc..., that are not accounted for in the worksheet. However, it will provide a strong basis for you to choose a couple of products for your own field-testing and evaluations. If you would like a copy of the worksheet, you can obtain one by contacting Dale Keep and Snow and Ice Technologies, his e-mail address is [dalekeep@innw.net](mailto:dalekeep@innw.net).

As new technologies are developed, and vendors continue to improve products, the highway maintenance professional will continue to have more options available for winter maintenance. These options should be viewed as opportunities to improve efficiencies and provide safer roads for winter travel. Evaluation of the options is the key to success.