

NORTH AMERICAN WINTERS IN EUROPE: FOCUS ON HIGH PERFORMANCE!

It looks like European winters are getting more severe. The past few cold winters could be coincidental but it could very well be the influence of climate change. Strange as it seems, global warming might bring colder winters with significant wintry precipitation to North-West Europe. If the moderating influence of the Gulf Stream decreases, North-West European winters will become like those at similar latitudes on the eastern shores of the Pacific. Does that significantly change the current winter maintenance approach?

By Jos Wieringa

Salt availability

One of the problems that Road Authorities face in strong winters is the availability of salt. Even though salt is one of the most common substances on earth, salt is not readily available everywhere. And with more severe winters, salt consumption will definitely increase.

Road Authorities (and also Cities & Communities!) typically build up higher stock levels early in the year. Commitment to a minimum off take in order to have sufficient product during a severe winter is a good strategy to minimize the risks for all parties involved.

Winter Maintenance Practices

The practice has changed from reactive to proactive. Preventive anti-icing with pre-wetted salt has become common practice. Spreading of pre-wetted salt has been done for many years and it has proven to be a very effective and reliable anti-icing technique. Of course, if severe winters continue, more deicing and snow removal applications will be necessary again. Snow removal is mostly done by plowing in combination with salting. Of course, pre-wetted....!

Anti-icing

The common standard for anti-icing today is the application of pre-wetted salt. Direct application of liquids not very common yet but is also being developed.



The most important advantage of anti-icing with pre-wetted salt is the fact that salt stays on the road while it is wet. It gives the snowfighters time to apply the product up to a few hours before the storm starts.

Pre-wetting enables accurate spreading even at high working speed, nearly no product is being blown away. The total salt usage is reduced significantly compared to using dry salt. In some European countries the use of dry salt as anti-icing is even forbidden because of the spillage!

Another major advantage of anti-icing with pre-wetted salt is that the wetted salt is already partly converted to brine which allows the salt to start working immediately. This will melt away the first precipitation and prevents at the same time the formation of bonds between snow or ice and the road. In case of snowfall the snow removal is less problematic.

The disadvantage of ordinary Salt brine is the fact that it dries on the road. Once the pre-wetted salt has become dry, it will blow away. Magnesium and Calcium Chlorides are hygroscopic salts; they attract moisture from the air. These brines do not dry. They actually make the salt stick to the road thus preventing the pre-wetted salt from being blown off the road. Salt savings of more than 35% are not unusual! Furthermore, the freezing points of Magnesium and Calcium brines are much lower. Pre-wetting with high performance brines provides a higher protection level compared to Salt brine, especially at lower temperatures. These facts are important incentives to use high performance brines when winters get more severe!

De-icing

In many European countries pre-wetted salt is also used for de-icing. Spreading dry salt is more and more seen as an old fashioned and less effective method. Sometimes rock salt with a grain size of 6 mm is applied as it also improves traction on white roads. In areas with significant snowfall, sand and grit is still used to provide traction on white roads, but in declining amounts. In the Nordic countries even sand is sometimes pre-wetted or treated with liquid Magnesium or Calcium. Rock salt coated with a blended carbohydrate by-product was introduced recently and this product is proving to be a good alternative for future cold winters as a traction providing deicer on white roads.



Liquid De-icers

Pre-wetting salt is common practice in Europe. The three most used liquids for pre-wetting are Salt brine, Magnesium Chloride and Calcium Chloride. In the areas with lower temperatures, high performance liquids such as Magnesium or Calcium are preferred.

High Performance Liquids

It is obvious that the demand for these high performance liquids will increase when winters become more severe. The availability of these liquids is plentiful, for example, Magnesium Chloride is mined in huge quantities.



The properties that make application of pre-wetted salt the preferred anti-icing method are also applicable as it concerns curative de-icing:

- * easy to apply even at high working speed
- * very accurate spreading
- * provides high service levels
- * virtually no loss of product

Many recognize the benefits of using high performance liquids instead of Salt brine. These powerful ice melters provide additional benefits like:

- * higher safety levels
- * less salting action required
- * savings on manpower and equipment
- * further reduction of salt usage: savings on salt
- * less salt ends up in the environment



Another important advantage of hygroscopic brines is the fact that they prevent dust formation which helps lowering the overall fine dust (PM10) concentrations.

Application rates

In the table below average application rates in some of the European countries are indicated.

PWS stands for pre-wetted salt, DS for dry salt. The common technique for pre-wetting is on-board pre-wetting in the ratio of 70% salt & 30% liquid. In areas with a mild climate usually 15% Magnesium Chloride, 16% Calcium Chloride or 21% Salt brine is used as the liquid component. In colder climates 30% Magnesium Chloride or 33% Calcium Chloride is used as the liquid component. Of all salting actions about 70% is anti-icing.

Non-Porous road surface (Temp. range 0°C to -6°C)	North East UK	Benelux	Northern Germany	Alp countries	Southern Scandinavia
	(g/m ²)	(g/m ²)	(g/m ²)	(g/m ²)	(g/m ²)
Anti-icing PWS	10-20	7-10	5-15	5-15	6-11
Deicing PWS	10-20	7-10	5-15	5-15	6-11
Deicing DS	15-40	10-15	10-20	8-15	10-15
Anti-icing PWS before Snowfall	20	15-20	15-30	10-30	12-24
Deicing DS during Snowfall	40	15-20	20-40	10-30	20

The application rates for porous road surfaces are generally 1.5 – 2 times higher. This however depends very much on the type of surface and the general road conditions.

Developments

The ongoing developments in Europe basically focus on 3 subjects:

- * Safety: increasing road safety
- * Environment: reduction of salt consumption and of abrasive materials (PM 10 & 2.5)
- * Costs: achieving higher service levels at same or lower costs.

In all countries Road Weather Information Systems are in use. Such technology offers a wide range of ways to obtain accurate, concrete information from the road network in real time. Many of the Road Authorities are examining the possibilities offered by these new tools, which will become even more important in the future.

Salt reduction is still an important issue. Mainly for environmental reasons but also cost driven, new spreading systems and methods are being evaluated (i.e. pre-wetting with ABP modified brines, direct application of liquids, etc.). If climate change results in more severe winters, the increase of salt consumption is probably inevitable. Authorities and the Salt Industry must intensify their efforts on finding new ways of utilizing salt in order to avoid an ongoing consumption increase.

Conclusion

The current winter maintenance approach is still providing adequate service levels; anti-icing and de-icing with pre-wetted salt remains the preferred technique. But, with more severe winter storms in sight, the use of high performance brines for pre-wetting will become necessary to maintain the service levels Europeans are used to.

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