Statens vegvesen

Norwegian Public Roads Administration

Salt SMART

A research and development programme in the Norwegian Public Roads Administration 2007-2011

Salt SMART is intended to contribute towards ensuring that the NPRA initiative to maintain trafficability and traffic safety will not result in unacceptable harm to the environment. This will be achieved through an eco-friendly salting practice.

www.vegvesen.no/saltsmart

Background for the project

- **Heightened focus on the environmental impact of road salting**
- **Our responsibility to avoid harms to the environment as a result of our own activities**
- **The Norwegian Water Regulation sets requirements for us**
- **Trafficability and traffic safety are factors of great social importance**
- **The total use of salt has increased considerably during recent years**

How will Salt SMART contribute to an eco-friendly salting practice?

- Increase knowledge about the environmental effects of salting
- Increase knowledge about the environment's limit of tolerance in terms of the use of chemicals in winter operations
- Increase knowledge about the effect of chemicals on snow and ice
- Propose methods that yield good driving conditions while using low amounts of salt
- Propose how and to what extent salt-reducing measures can be implemented
- Propose how the results from the project can be best incorporated into management documents and training materials

What do we do - and what have we learned?

- **Doctoral studies, post-doctoral research positions and master's theses** that have provided – and will continue to provide – more basic knowledge about how chemicals work in winter operations.

- **Field tests to study whether additives in salt** increase the time that salt remains on the road surface – with a view to being able to salt less frequently. No special effect from the tested substance was shown.

- **Experimentation with various forms of spreading:** salt solution, salt slurry, moistened salt and dry salt. Salt solutions have proved to have the most long-lasting effect on dry or slightly wet road surfaces. During winter 2010/2011 experiments using salt slurry - a type of "porridge" made of fine-grain salt - will be conducted.

- **Experimentation with intensified and alternative forms of snow removal.** The less snow remaining on the road, the less salt we need to use. On E39 at Ålesund, experiments were conducted during winter 2009/2010 using special equipment designed to sweep the snow off the road surface (the same type of equipment used at airports). Calculations show that by using this kind of equipment while at the same time using a salt solution rather than moistened salt, the total amount of salt used can be reduced by approximately 40 percent. Experimentation will continue during winter 2010/2011. Equivalent experiments, but using another type of equipment (the so-called "spatula" rather than broom) will be tested on C-road 3 in Elverum.

- **Review of the literature on alternatives to salt** (natrium chloride) and additives designed to improve the effect of salt. No chemical emerges as a good alternative to salt. Certain substances have the same or a somewhat better effect on road surfaces, but they also have the same or even worse negative effects on materials and the environment. Otherwise, the survey shows that scientific experiments have been conducted using additives to salt, but that knowledge is lacking in the field.

- **Survey of the literature pertaining to environmental consequences from the use of various chemicals.** This summarizes what has been learned, as well as knowledge that is lacking in the area – both nationally and internationally.



- **More initiatives to increase knowledge about the amount of salt that groundwater and lakes can withstand –** among other things, with a view to the biological effects on algae, fish and roe, and the amount of salt that a lake can withstand before the natural exchange of the lake's bottom water is hindered.
  Both laboratory and field experiments have been conducted. The results show, among other things, that in lakes with little natural salt, the addition of only a small amount of salt is all that is necessary to change the composition of the algae community.

- **Surveys, investigations and experiments to find out more about how salt affects vegetation –** and what can be done to reduce harms:
  - A survey of damage along the road network in south-eastern Norway after winter 2009/2010, a particularly cold and dry winter season that resulted in major damage caused by salt.
  - An experiment involving the flushing of a newly planted birch-lined avenue to see if weekly rinsing has a positive effect on trees exposed to salt spray.
  - A greenhouse and outdoor study shows that trees exposed to salt sustain less damage if they are watered before the leaves come out.
  - A study of how salting affects roadside flora yielded no clear answers, but it may appear that salting has no dramatic, negative effect on plants that largely lie dormant in the ground as seeds or roots throughout the winter.

- **Division of the road network into green, yellow and red zones** based on the amount of salt used on given stretches of roadway and the degree to which nature is especially sensitive to salt. This information will be presented by means of a chart. It will eventually be able to provide a better overview and a basis for decision-making. Among other things, it is clear which areas must be especially taken into account when using salt.

- **Development of methods for calculating how much road salt leaches out into the groundwater and lakes –** as well as where it leaches out. This knowledge will be able to be used to assess and follow up the threshold of salt tolerance in watercourses and when this is exceeded.

- **Collection and summary of examples of solutions that reduce or remove environmental harms** caused by salt in particularly sensitive areas (many examples from Sweden and Canada, in addition to Norway). This can entail, for example, containing or draining water from road surfaces away from important watercourses (lakes, groundwater), or draining water away so that it is diluted.

- **Survey of the contractual requirements to operation and incentives for winter operations.**
  The survey indicates that contractors are paid based on the amount of salt they use, and this gives them no grounds to use less. The contracts for operations also do not make any requirements to environmental concerns – only traffic safety and trafficability. Assent stimulates increased use of salt since this is the most resource-efficient for the company.

- The project will be concluded with, among other things, development of a **guide for use by the operational staff**, both work providers and contractors, which will show alternative measures and solutions for stretches of roadway that are particularly sensitive to salt.

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