

HOW TO REDUCE DE-ICING SALTS USING

Luc DURIEZ

CEREMA – Direction territoriale Nord-Picardie - FRANCE

Chargé d'études et spécialiste en viabilité hivernale

Research fellow and expert in winter maintenance

luc.duriez@developpement-durable.gouv.fr

SUMMARY

In France, during winter time 2009-2010 and 2010-2011, the yearly average consumption of de-icing salts and mainly sodium chloride has doubled.

This consumption reached two million tons and led to an important lack of salts, close to shortage, although the rigour of both winters didn't double!

Numerous snowfalls occurred the last two winters after many not much cold and non snowy winters.

It occurred that the habits of removing snow have been forgotten and so the consumption of de-icing salts had increased a lot.

The ministry quickly set up different working groups to study different standards for salts supply, salts storage and for salts reducing.

National instructions were drawn up and sent to different services which manage the national major road and motorway network.

Studies and researches about optimization and decrease in de-icing salts are in progress. It appears that working road services reduce the use of de-icing salts without damage on the efficiency.

1. INTRODUCTION

In France, since the 2000's, winter time has mainly exclusively been mild and not very harsh but mainly with icy patches.

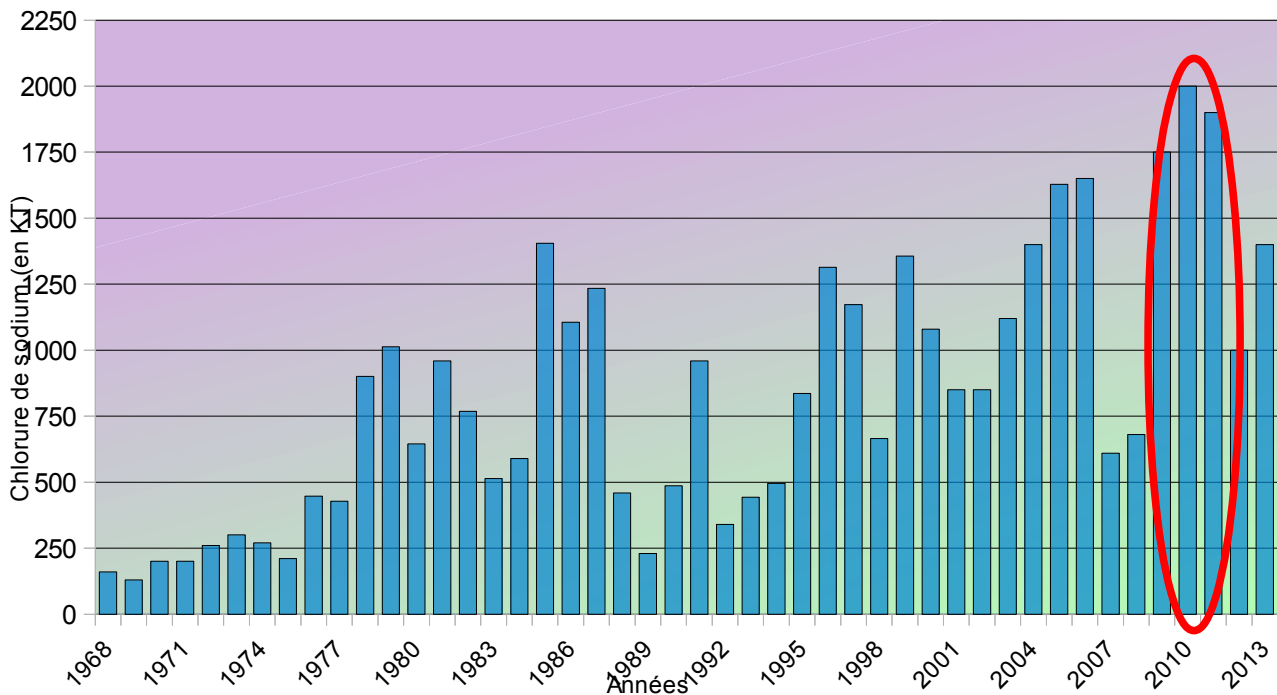
On the other hand, winter time 2009 and 2010 were not harsh winters but with thick snowfall during several days.

Different French maintenance units rediscovered abundant snowfalls and their processing.

It occurred that the staff forgot the snow processing and how to drive a vehicle equipped with a snow blade. Some of them never took down the snow clearing blade in order to manoeuvre easily and others were undecided over lifting up the blade.

At the same time, the use of either solid or liquid de-icing salts (more than 99% of sodium chloride) was excessive. Even though the national average consumption was about one million of tons for all the winter maintenance units, it doubled and reached more than two million of tons during winter time 2009/2010.

Graph1 - De-icing salts french market (data asselvia & rock)



This large consumption led to a shortage of de-icing salts in working road services. mining or harvest and salts supply didn't keep up the full demand during winter time.

Former ministry of ecology, sustainable development, transportation and housing quickly decided to set up several working groups including civil servants and motorway companies which aimed to propose improvement trails in order to avoid or cope with salts shortage so that next winter maintenance will be serenely took up.

The setted goals were based on 3 lines :

- what is a forecast indicator for the winter harshness
- taking more into consideration the stock of salts
- reducing the quantity of salts during de-icing works

During october 2010 a ministerial circular has been sent to all the state services to make them able to take into consideration, as soon as winter time 2010-2011.

This circular asked to each State staff to take some of the rules into consideradion:

1. De-icing salts supplies (sodium chloride)

- the less they stock up on before winter time (initial storage) has to be balanced with the consumption of a mild winter,
- the rules for replenishment were that we order de-icing salts as we go along with them, we gather the orders and centralise the stocks,
- different suggestions in purchase and delivery fields.

2. How to make good use of de-icing salts

- before winter time and after each supply we have to adjust the spreader,

- organizing trainings to alert the working road employees to the use of salts and their environmental impacts, to the use of materials and to the winter serviceability standards,
- use, as less as possible, de-icing salts and better use, according to the classification of snow, the right snow clearing blade and the right wear blade.

3. Public relations

- we have to organise written and oral communication for local and nationwide authorities, media, users and road companies,
- talking about how to face with winter phenomenon, de-icing salts use and its limits.

2. RANGE OF ADVICE

1. On a national scale:

Different studies and researches have been launched to reduce the quantity of spread de-icing salts:

- the research about residual salts on the road surface and the standards drawn up for different de-icing salts,
- the analysis of the spreading of salt equipments by infrared device fixed on the spreader,
- the technical guides about black ice and snow treatments and about salts storage.

2. On a local scale:

Each service provider aim for making their workers kept updated, sensitive to and taught about the right use of de-icing salts and their environmental impact as well as reducing salts consumption.

3. WHICH ARE THE DIFFERENT LEVERS TO REDUCE THE CONSUMPTION OF DE-ICING SALTS ?

On a local scale and on a national one, we can advise how to reduce the consumption of de-icing salts. We just need time, dynamism and financial supports.

All can't be immediatly done or at the same time. winter serviceability operators need time to change their habits. Beyond an action, there are human's habits and practices ; we have to put in order of priority.

Different actions, in order to reduce de-icing salts, can be listed, such as :

- Providing training to each winter serviceability operator. According to different aims, one, two or three years of in-service training may be organized,
- Consistently advise to use pre-wetted salt wich is more efficient,
- Incrising the number of salt shelters to preserve the salts qualities and get a better spreading or a better flow of salts,
- Better distinguishing the levels of service in order to reduce the quantity of salts spread on roads with small traffic volume,
- Setting new standards for spreading regarded to wintry weather,
- Reducing the width of the spreading when it's a preventive use,

- Consistently adjust the spreaders before and during winter time in an electronically or manually way,
- Purchasing and using the on-board equipment for spreader which integrate GPS,
- Regarded to the type of snow, using bi-scraping blade and the right wear blade to have less snow to scrub,
- Using both a scrub-bruss and a blade to quickly reach a comfortable road surface
- Improving the quality of winter maintenance equipments and take advantage of their performances,
- Improving the decision taking thanks to materials and aid to decision devices (weather forecast companies, road weather stations),
- Taking into account the residual salinity before beginning a preventive treatment,
- Buy and use the spreading of salt equipments by infrared device fixed on the spreader,
- Draw up standards about winter treatment materials and about spreader and de-icing vehicles driving training,
- Let the users know more about winter maintenance and about the winter time risks,
- Make the users and the staff sensitive to environmental impact of excessive de-icing.

4. SOME EXAMPLE ABOUT A NATIONAL ACTION

In 2012 the ministry had authorized analysis and studie about infrared sensor fixed on a spreader to assist in spreading.

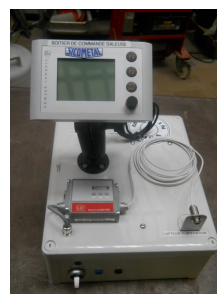
Six companies for winter maintenance materials have been contacted to be part of the assessment and the different tests.

In 2013 has been occuring the first presentation of the material which had been made available for tests.

A test procedure has been drawn up and laboratory tests occured in summer (static and dynamique position assessment, influence of the sensor packaging, functional analysis of the measure, cost and using analysis).

The target was estimating the suitability and the efficiency of the material put aboard winter maintenance vehicles.

It also allows to easily comply with the reducing de-icing aim and a good use advised by the ministry



1- Pictures about infrared sensor devices

5. SOME EXAMPLE ABOUT LOCAL ACTION

The actions of DIR Nord capture our attention and this interest allows to view different sorts of actions which concerned the aim of reducing de-icing salts since winter time 2009-2010. Some actions, just like using geolocalisation linked to spreading is still taking tests. Other DIR also have enter into different actions in order to promote de-icing reducing.

1. Training:

Since winter time 2010-2011, the DIR Nord has been applying a training programm itended to the different winter maintenance providers, i.e.:

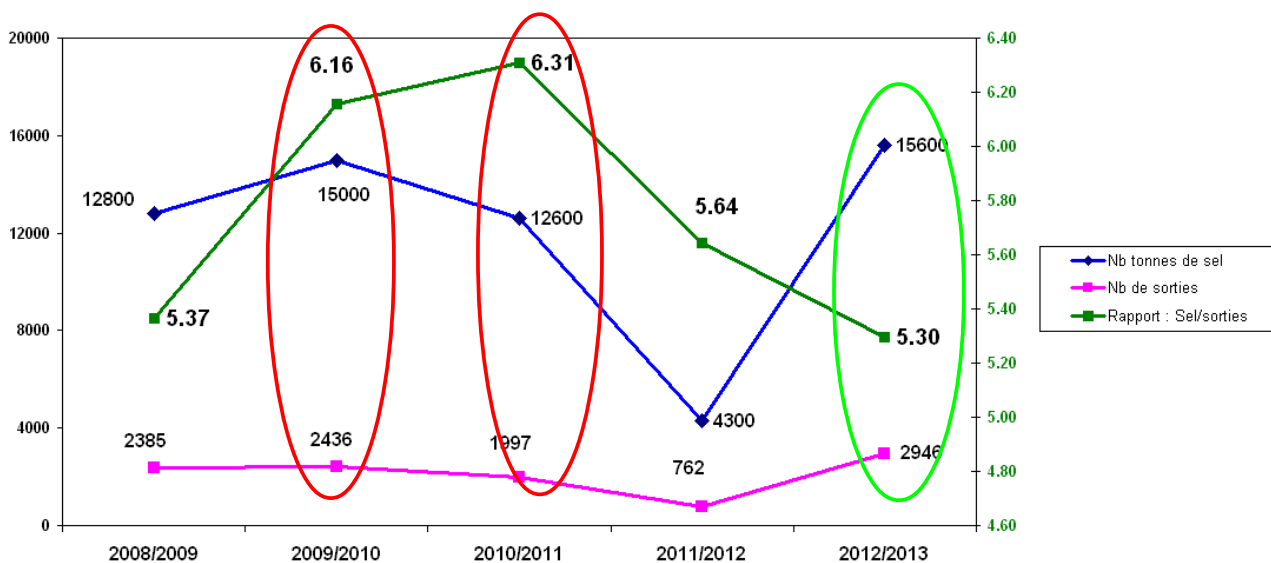
- the new arrivals and the managers who cope for the first time with winter serviceability,
- the road network patrols who measure local meteorological data and driving conditions,
- persons in charge and decision-makers who are careful to winter conditions and set off the interventions,
- spreading drivers for de-icing salts.

So far, these four yearly trainings have formed 53 new arrivals and managers, 85 road network patrolers who have to be trained every other year, 77 people in charge and decision-markers who, each year, have to be trained and to share feedbacks and, 348 drivers who have to be trained every three years.

The first review of winter maintenance, which has been drawn up in april 2013, revealed that during winter time 2012-2013, although it was very snowy with snow drift, the volume of spread salts decreased.

The after-graph shows that there was a tonnage ratio for winter 2009-2010 and 2010-2011 according to the quantity of spread salts and the number of patrols. For winter 2012-2013, the ratio is up to 5.30 tons although the quantity used of salt and the number of patrol increased. We can mainly conclude that trainings and awarness campaigns implemented by the DIR Nord have been getting benefits. Saving 3.000 tons is not a trivial matter!

graph 2 - ratio between tons of salts and number of patrols



2. Pedagogical and technical days:

Since 2010, the DIR Nord has been organising a yearly technical meeting about winter maintenance during which all the intervention centres are represented by one or two patrollers. Put as a sign of exchange, this day allows to gather remarks and proposals for an improvement.

In June 2013, the DIR Nord organised a pedagogical day (winter serviceability olympiad), in order to pre-select two representatives who will be in the national snow plough competition. This aims to appoint two French representatives for the international competition which will take place in Andorra in february 2014. Each maintenance and intervention centre was represented by two people.

Apart from the obstacle and scraping races reserved for the competitors, winter serviceability material and spreader adjustment had been shown.



OLYMPIADES VH

Sélection DIR NORD
le 25 juin à Laon

Sélection Nationale
en septembre 2013 à Blois

Représenter la France
en février 2014 à Andorre



2 candidats (chauffeur ESH) par CEI et EST
Inscrivez-vous avant le 31 mai auprès de votre chef de centre



2. Pictures of the pedagogical and technical day

3. Spreader adjustment:

At the end of 2011, the DIR Nord purchase spreader adjustment computer hardware. This material named ODEMIE (spreader optimisation from computer hardware for respect for the environment) allows a computerised purchase for salts quantity spread depending on the weather in order to check the spreader dosage and its proper functioning.

This material allows to check the quantity of spread brine and salts.

In this way, the DIR Nord is checking its spreaders before winter time and according to winter needs too.



3 - pictures of spreader adjustment computer hardware (Odemie)

6. CONCLUSIONS

Further to the different State actions, developed on local scale, there is a decrease in de-icing spread salts quantity by the most important winter maintenance units as a result of the trainings. All the action levers reducing the consumption of de-icings are not yet taken under consideration by all the winter maintenance teams.

We have to go on and above all to explain and alert them about the salt which is not a magic remedy: we reach such good results decreasing its consumption.

Despite hard snowy winter time 2012-2013 and a de-icing spread salts reducing, the levels of service to road users have not decreased. By comparison with winter 2009-2010 and 2010-2011, the traffic problems during snowfalls periods are not due to spread salts reducing but to the usual lack of user's self-discipline. On the whole, road networks units learnt lessons from previous winter times while they had improved the efficiency of the treatments and had reduced the quantity of spread salt.

Yearly training cycles, the analysis on infrared sensors used to spread, the development of integrate GPS for spreading, the regular adjustment of the spreaders... allow to achieve de-icing salts reducing and proper use, salting better and less, just salting as a specialist.

At present we note that most of the french road maintenance services take into account :

- using de-icing salts and pre-wetted salts,
- putting up salts shelters in order to stock road salts,
- organizing trainings in particular for drivers in order to spread the good quantity of salts and to reduce the environmental impact of de-icing,
- using more efficient bi-scraping blade or scrub-bruss,
- adjusting the spreaders before and during winter time and after each delivery of salts according to their quality and origin.

Actions to be done to winter serviceability companies in order to reduce the quantity of de-icing salts are :

- underlining the managers and workers' responsibility when they implement insuitable or unjustified devices,
- explaining legal framework,
- letting the users know that road salts are not a universal remedy so users have to behave properly during winter time,
- relying on advanced technology to be more efficient, to reduce the consumption of road salts, to reduce environmental impact and in order to improve users' comfort,
- investing in new devices and advanced technology,
- training to drive spreaders and to use blade.

In France, professional hesitate to reduce the use of road salts because of :

- the lack of legal precedents managers loss of confidence about when and what quantity of road salts has to be spread,
- the cost of new devices brake on investment.

Obviously, winter services try more to use new devices and cheaper measures in order to reduce the use of road salts.

But they have to dare leaving old devices behind even if they were reliable and furthering technological innovations.

Apart from practical aspects, winter season 2012-2013, with snowfall and snowdrift till the middle of March, shown that it is necessary to improve access infrastructures, to invest for struggling against snowdrift and better organising winter maintenance (snow fences, snow blowers, taking away stuck vehicles,...).

Harsh winters and financial crisis sped up road authorities' thoughts to reach a better winter maintenance and safe roads for users.
When people have to cope with adversity, people change more often their behaviour.