

The use of ICE & DUST-AWAY to reduce the concentration of particulate matter and for winter road maintenance

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## I. Application areas of ICE & DUST-AWAY

### I.1 ICE & DUST-AWAY to reduce the concentration of particulate matter

- The regular application of ICE & DUST-AWAY to heavy traffic roads leads to a lasting reduction of particulate matter concentrations in the air.

Tests so far have shown following reductions in particulate matter:

Stockholm: average of 35 %  
Klagenfurt: average of 30 %  
(will be continued)

The fine dust is bound and so it is no longer present in the ambient air in the form of respirable dust. The bound fine dust is then equal to normal road dust and rain will wash it, together with the rest of the road dust, into the sewer system.

### I.2 ICE & DUST-AWAY for winter road maintenance

- The use of ICE & DUST-AWAY in winter as a de-icing agent lowers the freezing point of water and thus it melts snow and ice (freezing point depression). When used preventively, ICE & DUST-AWAY avoids the formation of ice layers and firm packed snow covers.
- Use of ICE & DUST-AWAY as humectant for thawing salts containing chloride. Through the formation of a passivation layer, ICE & DUST-AWAY, i.e. the CMA contained therein, acts as a corrosion deceiver (inhibitor) on iron and steel elements. The corrosive effect of de-icing agents containing chloride is reduced by up to 80%.

## II. Application guidelines ICE & DUST-AWAY

### II.1 Application guidelines for ICE & DUST-AWAY to reduce the concentration of particulate matter

For combating particulate matter, ICE & DUST-AWAY is regularly applied to heavy traffic roads every 48 hours on dry days.

**Dosage to reduce fine dust: approx. 10 g /m<sup>2</sup>**

At a dosage of approx. 10 g/m<sup>2</sup>, it is possible to treat with 1.000 kg of CMA a traffic area of approx. 100.000 m<sup>2</sup> in order to reduce the concentration of fine dust.

When ICE & DUST-AWAY is applied to dry lanes, a possible change in the braking response of vehicles should be taken into account, this due to the application of the liquid. Treated tracks should be appropriately signposted and provided with warning signs.

Following points should be borne in mind

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1. Signposting of the test tracks through danger signals "Slippery road" and through the additional plate "Test track fine dust binder" (duty to warn).
2. The maximum quantity of CMA that can be applied amounts to 10 g per square meter. As the "Fine dust glue" reduces road grip ability, it must be used as sparingly as possible.
3. Can not be applied to inclines, in bends, roundabouts, at crossways, street car tracks and large pavement markings such as crosswalks. The paint of the pavement markings itself is already more slippery than asphalt. When CMA is applied to pavement markings, the road surface may become too slippery in this area.
4. If necessary, a speed limit of 30 km/h has to be imposed.
5. Drivers of gritting trucks and maintenance staff have to be precisely instructed, sufficient inspection tours should be arranged and documentation of these tours should be provided (obligation to conduct inspections).

Tests in the city of Halle have shown that the fine dust glue has no impact on driving safety.

## II.2 Application guidelines for ICE & DUST-AWAY concerning winter road maintenance

For preventive de-icing operations, ICE & DUST-AWAY is applied to the roads up to 60 hours prior to the expected snowfall or ice formation. After snow has fallen or ice has formed, clearance can take place over a longer period of time without the snow or ice layer being packed down again by the moving traffic. So, in case snow clearing services are very busy, a so-called snow removal is still possible after a time lag.

Dosage to prevent slippery surfaces

0°C up to – 3°C	– 4°C up to – 7°C	– 8°C up to – 10°C
5 –10 g /m <sup>2</sup>	8 –12 g /m <sup>2</sup>	10 –15 g /m <sup>2</sup>

As several factors have an influence on the necessary dosing quantity, only average values are mentioned here.

When ICE & DUST-AWAY is used as a humectant for de-icing agents containing chloride, ICE & DUST-AWAY is just utilized instead of water for moistening. The subsequent application of the wetted de-icing agent takes place as usual. The corrosive effect of de-icing agents containing chloride is considerably reduced.

## III. Environmental compatibility of ICE & DUST-AWAY

ICE & DUST-AWAY is safe for use in the environment. On March 18, 2004 the ICE & DUST-AWAY products of the company NORDISK Aluminat have been awarded the Nordic Eco-Label, the SWAN Environmental Label. The purpose of this ecolabelling is to ensure the safety of a product through the extensive testing of a large number of environmental impacts and the compliance with tight limit values ([www.ecolabel.dk](http://www.ecolabel.dk)).

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In Annex II the examined values are listed.

ICE & DUST-AWAY is characterised by following environmental properties:

- completely biodegradable (at a temperature of 20°C, more than 70 % is decomposed within 72 hours)
- no environmental pollution caused by chloride
- no environmental pollution caused by heavy metals
- no risk of injury to pets as it is observed, for example, in dogs when chlorides are used (will be continued)

ICE & DUST-AWAY does not adversely affect the operation of wastewater treatment plants. In contrast to products containing chloride, for CMA no environmentally harmful effects on wastewater treatment plants are known. CMA has no toxic effect on the microorganisms of the wastewater treatment plants but rather acts as readily biodegradable nutrient.

## IV. Corrosion properties of ICE & DUST-AWAY

ICE & DUST-AWAY shows no additional corrosive effect on steel, concrete or other building materials.

According to a study of the Minnesota Department of Transportation, dated August 2001, the corrosion caused by CMA lies within the range of the control sample with pure water, i.e. the corrosive effect of CMA corresponds to the effect of pure water.

On the contrary, it appears that ICE & DUST-AWAY causes a reduction of the corrosive effects when ICE & DUST-AWAY is used as humectant for de-icing agents containing chloride.

In 1993, an investigation of the Federal Highway Administration run by Dr. Ugo Bertocci established that CMA has a passivating effect, i.e. it has corrosion-inhibiting properties, on mortar-rebar systems. For this reason, along with chloride-containing products, it reduces the corrosive behaviour of thawing salt by up to 80%.

Rubber seals, etc. in tankers are not damaged. During the long-time and regular utilization of ICE & DUST-AWAY in Stockholm, Gothenburg and Klagenfurt no damage was observed to the vehicles and tankers used for the operations.

A negative effect on the abrasion resistance of tyres on roadways – treated with ICE & DUST-AWAY – has not been detected so far. In this connection too, no damage was observed to tyres e.g. of public transport vehicles or private vehicles during the long-time and regular utilization of ICE & DUST-AWAY in the cities Stockholm, Gothenburg and Klagenfurt.

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## V. Profitability considerations regarding the use of ICE & DUST-AWAY

### Reduction of fine dust:

- Decrease of health risks for the population through a lowering of the fine dust concentration
- Better compliance with legal requirements, which means avoiding restrictive measures
- A reduction or prevention of driving bans (will be continued)

### Winter road maintenance:

- Extension of the time frame for snow clearing services working very close to full capacity
- Prevention of environmental damage caused by de-icing agents containing chloride
- Reduction of corrosion damage caused by de-icing agents containing chloride (will be continued)

## Annex I. Data collection CMA (ICE & DUST-AWAY) Annex I.1 Physical data

Appearance: virtually transparent liquid

		<b>ICE &amp; DUST-AWAY (CMA 25 %)</b>	<b>ICE &amp; DUST-AWAY (CMA 30 %)</b>
Density at	20 °C	1,12 g/cm <sup>3</sup>	1,16 g/cm <sup>3</sup>
Viscosity at	+5 °C	32 cP	42 cP
do.	0 °C	37 cP	48 cP
do.	- 5 °C	44 cP	53 cP
do.	-10 °C	53 cP	58 cP
pH value		8,8 ± 0,5	9,4 ± 0,5
Freezing point		-19 °C	-30 °C
Content of chloride (total)		< 0,01 <sup>w</sup> / <sub>w</sub> %	< 0,01 <sup>w</sup> / <sub>w</sub> %

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## Annex II. The criteria of the SWAN Eco-Label

Parameters	Limit value	ICE & DUST-AWAY
Content of chloride Cl-	1,0 w/w %	0,006 w/w %
Degradability	Min. 70% over the course of 28 days	70% degraded within 3 days
Oxygen consumption	5 g O <sub>2</sub> /m <sup>2</sup>	1,2 g O <sub>2</sub> /m <sup>2</sup>
Ecotoxicity, zebrafish Daphnia Chlorella Vulgaris (algae)	96-hour LC50 > 1mg/l EC50 > 1 mg/l LC50 > 1 mg/l Between 1-100 mg/l the substance shall also be readily degradable or log Pow ≤ 3,0	LD50 > 11,4 g/l EC50 > 1,8 g/l EC50 = 13g/l
Nutrient salts, Tot-N Tot-P	1 w/w % 1 w/w %	0,00008 w/w % 0,002 w/w %
Heavy metals, As Cd Hg Ni Pb Zn Cr Cu	10 mg/kg TS 0,8 mg/kg TS 0,8 mg/kg TS 30 mg/kg TS 40 mg/kg TS 30 mg/kg TS 40 mg/kg TS 40 mg/kg TS	7,5 mg/kg TS 0,1 mg/kg TS 0,6 mg/kg TS 10 mg/kg TS 16 mg/kg TS 9,3 mg/kg TS 9,1 mg/kg TS 8,9 mg/kg TS