

DAICA

DUST AND ICE CONTROL AGENT

Introduction

DAICA which is the shorten form of “**Dust And Ice Control Agent**” is referring to a unique natural material with scientific name of **Tachyhydrite**.

Tachyhydrite is an unstable mineral, a hydrous chloride of calcium and magnesium with formula: **CaMg₂Cl₆·12H₂O** It is a rare component of marine evaporate salt deposits. Upon exposure to moist air it rapidly deliquesces and dissolves. It forms a colorless to yellow trigonal crystal with a vitreous luster. However, DAICA can be in forms of fluid, crystal or powder depends on its different applications.



Our product analysis due to the latest laboratory report is as below:

Insol %	H ₂ O %	CaCl ₂ %	MgCl ₂ %	KCl %	NaCl %
0.18	40.75	21.31	34.81	0.31	1.21

The analysis of the final brine which our product comes out of it is as below:

T °C	D g/cm ³	CaCl ₂ g/l	MgCl ₂ g/l	KCl g/l	NaCl g/l
24.5	1.4285	451.33	146.00	9.01	8.06

This brine is 100% natural and comes from central desert of Iran and does not contain any organic beings. The final product is prepared after several refines and salt deposits. First, we refine NaCl, then KCL, and finally we get DAICA.

Applications

Because of **DAICA** specifications, exclusive of the applications of Magnesium and Calcium chlorides individually, it can be used for both **Dust-Control** (soil-stabilization) and **Ice-Control** (De-/Anti-Icing) without breaking it down. It has many advantages in comparison with regular Salt for De-Icing and Oil Mulch or other Dust-Control agents. In Addition, it can be a great raw material for sourcing $MgCl_2$ and $CaCl_2$ by breaking it down, instead of producing these chlorides chemically.



Anti-icing powder (calcium chloride) for preventing the snow from freezing in NL



Applying liquid de-icer (magnesium chloride) to city streets in Cleveland



Aerial application of liquid dust control agent to stabilize the main tailings



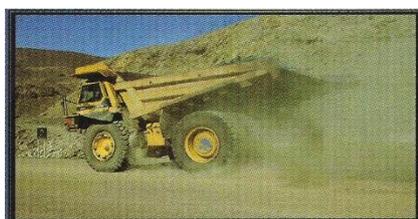
Spattering fluid dust control agent by truck for stabilizing mining tailings

DAICA: The most efficient and environment-friendly DUST-CONTROL Agent

One of the most common uses of DAICA is to control dusts and preventing erosion as a soil stabilization material in dirt roads and deserts. Both CaCl_2 and MgCl_2 are able to absorb humidity. Magnesium chloride starts to absorb water from the air at 32% relative humidity, almost independent of temperature, and is more effective than calcium chloride solutions for increasing surface tension. Calcium chloride is able to absorb humidity up to 17 times of its weight in relative humidity of 95%. This is the basis of these two compositions to control dusts.

It can be used as a fluid by adding 20% or up to 80% proportion of water. To gain the best and longest results, it should be used as a thick fluid. It may be spattered on the surface of the soil for an average of $3\text{L}/\text{m}^2$ which can stabilize a normal traffic road more than a year effectively; or be mixed with the soil after a low depth ploughing and before levelling for $5\text{L}/\text{m}^2$ which can increase the efficiency period by two times.

Pictures below show before and after of utilizing DAICA in one of Iran mining sites:



Before utilizing DAICA



Spattering the DAICA fluid



After utilizing DAICA

DAICA: The most effective and economic ICE-CONTROL Agent

Many researches show that utilizing DAICA instead of Salt for deicing leads to slighter damages to environment as well as decreasing deicing costs. This product can be used in form of fluid or powder for De-Icing or Anti-Icing. It may be applied on the roads both before snow – based on the weather forecasts – to prevent ices to be shaped on the surface of the road, and after snow to deice the shaped ices. It is 100% natural, colorless and odorless and referring to the comparisons of the potential environmental impacts of deicers published by the **National Cooperative Highway Research Program** not only it has lowest damage to environment and living beings, but has positive effects for plants by improving soil structure.

The table below shows the specifications of NaCl , MgCl_2 and CaCl_2 compared with each other, which is the best prove why this product is the most effective De-Icer and Anti-Icer.

Comparing Table	NaCL	MgCl ₂	CaCl ₂
Lowest freezing point	-21 °	-33 °	-50 °
Solution temperature	2.9 Kcal/mol	14.5 Kcal/mol	11.95 Kcal/mol
Melting rate	100%	150%	150%
Duration of stay	1 day	3-4 day	1-2 day
Proper temperature to be used	-1 ° --- -10 °	-1 ° --- -20 °	-1 ° --- -10 °
The effect on groundwater	Noxious for health	Noxious for health	Little influence on health
Corrosion of metals	%100	% 40-60	% 50-70

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DAICA is applicable in following cases:

- Stabilization of dirt roads and construction of temporary roads
- Control dust in industrial environments
- Infrastructure and stabilization the shoulders of road
- Maintenance of motorways and sideways in winter
- Environments of petrochemical plants and refineries and mines
- Parks and sport fields like tennis court
- De-Icing of aircraft fuselages

Some applications of individual chlorides of magnesium and calcium

- Refractories: producing the highest quality bricks for cement kilns or steel kilns with magnesium chloride.
- Pulp bleaching: sustainable and cost effective bleaching technology with magnesium chloride.
- Road Maintenance: winter road maintenance and dust control on and along motorways with both these chlorides.
- Oil & gas exploration: both magnesium and calcium chlorides are applicable in the exploration or exploitation of oil and gas wells.
- Food additives: calcium chloride is being used in the production of cheese and beer
- Pharmaceutical: magnesium chloride is being used in many medicines.
- Fertilizers
- Animal feed
- Cosmetics and wellness



Utilizing for aircraft fuselages



Applying in the form of fluid

Why DAICA?

In the past decade, numerous studies have been conducted separately in North America, Europe and Australia to find out the most effective and the less harmful solutions for Dust-Control and Ice-Control. Some of these researches can be easily found on the internet. Based on the results, all of these researches confirm that chlorides of magnesium and calcium are the most economical and functional, and the less harmful materials for these purposes. For example, according to the Minnesota Department of Transportation Research in 2009, while the average effect of all materials for soil stabilization result in dust reduction as of 50 percent, magnesium and calcium chlorides have achieved the result of 90 percent, and also keep the effect longer than other agents. According to the Dutch Tests in 2005, the less harmful materials for soil and water were the same chlorides. And according to researches of Professor Xianming Shi for Montana University in 2011, the most affordable agents for controlling the soil and snow are calcium and magnesium chlorides.

The interesting point is that not only DAICA is made of these two chlorides, but also it is 100% natural and has not any harmful chemicals even in low amounts.

In general, DAICA advantages compared to other products with similar applications such as oil mulch and salt can be expressed as follows:

- 100 percent natural and harmless to the environment and living organisms
- Improving the structure of soil and useful for plants
- Harmless for and very low influence on water (if entering the groundwater)
- Very low impact on corrosion of road surfaces, structures and metals
- Low cost of storage, transport and utilizing
- Usability in various forms and in all weather conditions with minimal facilities
- No cleanup costs
- Reducing the implementation costs by its long-term effect (1 to 3 years for soil stabilization)
- Functional and effective in very high and very low temperatures
- Accelerate ice melting process by releasing heat when absorbing the moisture
- Long-term effect because of its gelatinous characteristic and adhesion to surfaces
- Very convenient to freight or keep for long distances and times

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