



Leaders in environmental products

















## > OUR MISSION

We are determined to do our best to reduce our environmental footprint by developing and distributing efficient organic products that surpass the chemical-based products that are currently available in the marketplace.

To do so, it is imperative to inform and, above all, provide the proper training to our customers on the use of these new products. New product, new procedure!

In addition to cost savings, the result will be an active participation in the preservation of our environment.



## > OUR OBJECTIVE

Offer an eco-friendly product line that surpasses existing chemical-based products.

## > ACKNOWLEDGEMENT

None of this would be possible without the participation of our different public and private partners. We count on the implication of different governmental organizations such as the Transport Ministry, the Ministry of Environment as well as the road services and public works departments of our cities and municipalities in order to pursue the path of economical ecology.

What more can we ask for? An ecological approach that lowers costs and improves safety.

## > THE MEDIA HAS BEEN TALKING ABOUT US!

The benefits of our products have been highlighted by the media across the country. Eco-friendly de-icing is becoming more and more popular among our cities and municipalities.



#### > ROAD SALT USE IN CANADA

Today more than 7 million tonnes of road salt are used in Canada every year. This is the equivalent of 3 times the volume of the Olympic Stadium in Montreal.

#### > IMPACTS ON THE ENVIRONMENT

#### Impacts on surface and groundwater:

Only 45% of the chloride ion applied as road salt is removed by surface water runoff. The remaining 55% was interpreted to be stored within the groundwater system. (Environment Canada, 2001)

Chloride concentrations up to 82 000 mg/L were also observed in runoff from uncovered blended abrasive/salt piles in a patrol yard. (Environment Canada, 2001). This represents a concentration equivalent to 3 times the chloride level of sea water which translates into numerous environmental repercussions.

30 to 45 % of chlorides found in the Great Lakes are from road salt. (D'Itri, 1992)

The application of one tonne of road salt can contaminate up to 1.5 million litres of water (MPCA, 2008). The environmental management of road salts permits us to reduce, and eventually eliminate, the impact on our drinking water supply.

#### Impacts on flora:

In cold regions where they are used in large quantities, like northern Canada, deicing products affect the environment by salinizing it. The decline and disappearance of local salmon or certain amphibian species are just two examples of the result of increased salinization.

Salt can also affect the trees that absorb it via their roots and accumulate it. Above a certain concentration, the tree dies. Forest fires and combustion of salt-laden wood produces toxic and very stable organochlorides. In British Colombia (and in New Brunswick) we calculated that the combustion of salt-laden wood generated the equivalent of 8.6 grams of airborne toxic material per year which equates to 4.3 % of the overall dioxins and furans emissions of the inventory of releases prepared under the Canadian Environmental Protection Act (CEPA). Conifers have an active metabolism year-round and are therefore more vulnerable to atmospheric salts (salt spray) than broadleaf trees. (Charbonneau, 2006)

At least 15 % of trees situated along roadways are damaged by road salt each year. (Munck, 2010)

In Quebec and Ontario, the application of large amounts of road salt favors the proliferation of invasive plants along the roadways, like the common reed (Phragmites Australis). Demonstrating a tolerance to salt, this plant competes with indigenous species and threatens the biodiversity by modifying the biological components of the ecosystem. This issue is a concern since certain colonies extend beyond the roadside and have been able to reach the wetlands. (Bedard et al., 2008; Jodoin et al., 2008)



## Costs related to damages:

When considering damage caused to the environment, infrastructure and vehicles, the indirect cost of an application of one tonne of road salt is 15 times its purchase cost. (Yunovich et coll., 2002)



#### > OPTIMAL UTILIZATION OF DEICING MATERIALS

It is useless to apply granular salt (NaCl) once the temperature is below -10°C; it is a waste of time and money.

It is not recommended to use a 50/50 mix of salt and sand since the combination of these two products can lead to a reduction of their benefits such that the efficiency of salt as an ice melter and the efficiency of sand as an abrasive are both reduced. (Walker, 2005)

#### > ADVANTAGES OF PRE-WETTING AND ANTI-ICING

Pre-wetting salt promotes rapid melting action. This allows the salt to begin the melting process before it gets plowed away by the next pass of the snowplow. Additionally, pre-wetting reduces the amount of salt that is dispersed by passing vehicles into the environment by 30 to 40%. On-board pre-wetting permits us to reduce the application rates up to 20% without loss of efficiency as well as significantly lowering the effective temperature range.



Anti-icing is a proactive technique of applying a product onto the surface before the arrival of a snow or ice event. This technique prevents the formation of ice and is best used in conjunction with weather and road forecasts and conditions.

Pre-wetting and Anti-icing techniques reduce the amounts of deicing materials thereby lowering the environmental impact while providing considerable cost savings.

#### > ENVIRONMENTAL MANAGEMENT OF ROAD SALTS AND ABRASIVES

The environmental management of road salts and abrasives aims to protect the environment without compromising the safety and flow of people and goods. The environmental management of road salts permits us to reduce, and eventually eliminate, the impact of road salt on infrastructure, drinking water, soil, flora and aquatic and terrestrial fauna. Additionally, it can reduce winter maintenance costs by applying the right amount in the right place at the right time.

The use of large amounts of abrasives helps keep the roads safe, especially at low temperatures when traditional salt cannot melt ice. Unfortunately, this practice is detrimental to our environment since abrasives carry heavy



Photo taken June 1st, 2018

metals and contaminants which must be recuperated, treated, and decontaminated before being reused or returned to nature.

Training and communication are key to the environmental management of road salts. Training of and communication with all parties involved in winter maintenance as well road-users are instrumental to the successful implementation of the environmental management of road salts.

#### > RESPONSIBILITIES OF MUNICIPALITIES

Municipalities are responsible for the maintenance of more than 75 % of the road network. They apply 50 % of the salt used in Quebec and Ontario. As front-line stakeholders, municipalities must take action in the environmental management of road salts in order to protect their environment.



## **HOW DOES IT WORK?**

#### > SCIENTIFIC SYNERGY BETWEEN CHLORIDES AND FUSION DE-ICING LIQUID

There is a scientific synergy between chlorides and FUSION de-icing liquid whereby the two components act to depress the freezing point by two different mechanisms. The salt lowers the freezing point by a colligative mechanism (basic chemistry). This refers to the fact that anything that dissolves in water will lower its freezing point. The amount by which the freezing point is lowered depends on the number of molecules dissolved and not on the identity of the molecules or anything else.

The organic mechanism is completely separate and has to do with the structure of the molecules. Since Fusion liquid contains hydroxide and some sugars which are similar in structure to ice, it works by packing in with the growing ice crystal. This inhibits the growth of ice crystals beyond a very small stage.

The reason there is a synergy is because there are two independent mechanisms at work, one lowering the freezing point by the common colligative effect and the other by inhibiting the growth of ice crystals. If they worked by the same mechanism, the effects would be additive and not synergistic.

Deicing products melt ice and snow by lowering the freezing point of water which then cools the solution and the surface with which it contacts.

You can observe this phenomenon at home by adding salt into a bowl of water and ice. The ice water will be at a temperature of 1°C which is the point at which it starts to change phases to ice. Once salt is applied, the temperature of the solution will drop and could approach -20°C. For a given quantity of ice melter, the amount of ice it can melt decreases as the temperature of the solution decreases. At a certain temperature limit, called the eutectic point, it can no longer stay in solution and melting therefore ceases.

The eutectic concentration is the amount of deicer that is required to lower the freeze temperature down to the eutectic temperature. At this temperature, melting is very slow. If we add too much salt (the salt concentration is superior to the eutectic concentration), salt crystals will precipitate out of solution without lowering the freezing point. The use of too much salt is a waste and reduces the efficiency of the chemical ice melting.

The heat needed to melt ice comes from humidity, air, the surface and the ice itself. Once a deicer is added to ice, it absorbs humidity from the environment which is necessary to produce the heat required to melt ice. This phenomenon results in the lowering of the temperature of the ice and water solution until it equals that of the saline solution. Meanwhile, as the ice is melting, the salt concentration decreases and the equilibrium temperature rises followed by a gradual increase in temperature as the ice continues to melt. As the saline solution becomes more and more diluted by the melting ice, it starts to refreeze.

To better understand we must know the composition of each of the various components. Here is a brief overview of the molecules that comprise the traditional deicers that are widely used today.

Solid water	Liquid water Water vapou	
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As you can see in the table, solid water (ice) is very organized and the molecules are connected to each other forming crystals that can be seen with the naked eye in some cases. Conversely, in liquid state, they are free and disorganized and much closer together while in the gas phase (water vapor), they are completely free and volatile.



When we add calcium chloride, magnesium chloride or even sodium chloride to ice, the resulting chemical reaction disorganizes the molecules and interferes with the molecular bonds of the water.





#### Calcium Chloride (CaCl2) (by weight, 36% calcium, 64% chlorine)

Calcium Chloride Brine (by weight, 30% CaCl2, 70% H2O). Calcium chloride is the second most commonly used road salt in North America and Europe. In Canada, it is also the most popular dust control product. Used on gravel roads to abate dust by reacting with the humidity in the air, it maintains a thin layer of liquid on the road surface which keeps the dust on the road. It is however very toxic to the environment. Calcium chloride has numerous applications. Dissolving it in water is very exothermic and therefore it can be used to melt ice. It can melt ice at very low temperatures. Unfortunately, calcium chloride tends to refreeze quickly and is extremely corrosive, especially to iron and concrete rebar.



#### Magnesium Chloride (MgCl2) (by weight 26% magnesium, 74% chlorine)

Magnesium Chloride Brine (by weight 30% MgCl2, 70% H2O). Magnesium Chloride is also used to melt ice.

In Canada 25,000 to 35,000 tonnes of magnesium chloride are used annually. Like its cousin Calcium Chloride, it tops the list with over 60% chlorine. It is also more toxic to humans and to the environment than sodium chloride.



#### Sodium Chloride (NaCl) (by weight 40% sodium, 60% chlorine) Sodium Chloride Brine (by weight 23.3% NaCl, 76.7% H2O)

Sodium chloride is by far the most commonly used ice melter in Europe and North America. Today more than 7 million tonnes of road salt are used in Canada every year. This is the equivalent of 3 times the volume of the Olympic Stadium in Montreal.



Fusion - Concentrated liquid for stockpile treatment

Fusion 2350 - 50 % NaCl brine and 50 % Fusion (% by weight). Sodium concentration 4.7 %, chloride 7.0 % Fusion 2330 - 70 % NaCl brine and 30 % Fusion (% by weight). Sodium concentration 6.5 %, chloride 9.8 %

#### Liquid Agricultural by-products

The first trials of agricultural by-products used to combat ice date to 1987 in Hungary; it was comprised of waste products from vodka distilleries. Other organic residues have been tested over the years such as residual from the production of flour, corn, wine and cheese however they all have negative characteristics such as bad odor from the fermentation process.

However, one of these stands out above the rest; « beet juice » (Fusion Liquid). Fusion has been used on roads in North America since 2005 and it has been expanding since (in 2009, 2010 and 2011 in Chicago, Toronto, Montreal and Ottawa respectively). Used on its own or blended with any chloride brine, Fusion liquid is effective down to -30°C and permits users to reduce the impact of deicing products on the environment and infrastructure.

We can confirm with certitude that our product is by far the least corrosive and harmful on the market.



**Corrosion of Deicers** 

## WE HAVE THE SOLUTION

Winter brings us many challenges including freezing rain, high-risk zones, increased presence of cyclists on winter roads, etc... WE HAVE THE SOLUTION!



Our line of de-icing products offers you a multitude of possibilities, both reactive and proactive, making it an indispensable tool for your winter maintenance program.

#### > MAXIMIZE YOUR DEICING OPERATIONS WITH FUSION

Our FUSION line of agricultural-based deicers is by far superior to other eco-friendly products and even outclasses the best of the existing chemical-based products available in the industry. Adding Fusion to your chloride brine increases its performance thanks to its superior melting capacity and fewer re-applications are necessary.

Save time and money while reducing your environmental footprint.

#### > ANTI-ICING

Anti-lcing (direct liquid application or DLA) is a proactive approach that prevents the formation of ice on the surface. This results in reduction of accidents, and ice and snow is completely removed by each pass of the snowplow. **Fusion2350** absorbs into the micro-structure of the surface contrary to salt granules and abrasives that are dispersed into the environment by the snowplow as well as passing vehicles. Each application of **Fusion2350** contains 85% less chlorides than an application of granular salt. What's more, fewer applications are required and a better level of service is obtained.

As a proactive approach, Fusion liquid prevents ice from forming for a significant period of time, often replacing several salt applications.



	Anti-Icing					
Application Rates	100km/h	70km/h	50km/h	Parking lots	Sidewalks	Surface temp.
Salt brine (NaCl)	100 L/lane-km	110 L/Iane-km	110 L/Iane-km	75 ml/m²	110 ml/m²	down to -8ºC
Fusion2330	65 L/lane-km	80 L/lane-km	90 L/lane-km	45 ml/m²	65 ml/m²	down to -18ºC
Fusion2350	65 L/lane-km	80 L/lane-km	90 L/lane-km	45 ml/m²	65 ml/m²	down to -25°C
Fusion	n/a	n/a	n/a	n/a	n/a	n/a
CaCl2 brine	not recommended					
MgCl2 brine	not recommended					

Application rates are always subject to adjustment. Please note that these rates can vary based on weather, site conditions, traffic, etc.

- Creates a natural barrier
- Reduces salt and abrasives
- Saves time and money
- ✓ Effective down to -30°C
- Prevents ice from bonding to the surface





Colorado experienced an average decrease of 14% in snow and ice-related crashes during a 12-year study utilizing the anti-icing process on the interstate system in the Denver metro area.

North Dakota DOT – Bismarck, North Dakota 58501

#### > PRE-WETTING

As an on-board pre-wetting agent, **Fusion2350 liquid** is sprayed directly onto the salt and/or abrasives just before they are applied to the surface. This results in increased efficiency, faster melting action and performance all the way down to  $-30^{\circ}$ C

	Pre-Wetting - Liquid Rates			
Recommended Application rates	L/mt	%	Surface Temp.	
Salt brine (NaCi)	70 – 90 L/mt	9 - 11%	down to -13ºC	
Fusion2330	35 – 60 L/mt	4 - 7%	down to -22ºC	
Fusion2350	35 – 60 L/mt	4 - 7%	down to -30ºC	
Fusion6040	35 – 60 L/mt	4 - 7%	down to -45ºC	
Fusion	n/a	n/a	n/a	
CaCl <sub>2</sub> brine	55 – 80 L/mt	7 – 10%	down to -40ºC	
MgCl <sub>2</sub> brine	55 – 80 L/mt	7 – 10%	down to -30ºC	



- Fast melting
- Reduces salt and abrasives
- Saves time and money
- ✓ Effective down to -30°C
- Cleaner, less Spring cleaning
- Fewer applications with better results
- Improves safety

Application rates are always subject to adjustment.

The liquid rate (% by weight) can vary depending on the desired result. Higher liquid rates generate greater salt and abrasive reductions.

## **> STOCKPILE TREATMENT**

Treat your stockpile of salt and/or abrasives with FUSION liquid to increase melting power and reduce the application rates. A simple and efficient method with no investment required.

	Stockpile Treatment		
Recommended Liquid Rates	Salt	Abrasives	
Salt brine (NaCi)	n/a	n/a	
Fusion2330	n/a	n/a	
Fusion2350	n/a	n/a	
Fusion	12 - 15 L/mt	15 - 20 L/mt	
CaCl <sub>2</sub> brine	25 - 35 L/mt	30 - 45 L/mt	
CaCl <sub>2</sub> brine	25 - 35 L/mt	30 - 45 L/mt	



Application rates are always subject to adjustment.

The liquid rate (% by weight) varies depending on the type and state (moisture content primarily) of the rock salt and abrasives.

- Superior melting power
- Reduces salt and abrasives
- Saves time and money
- ✓ Effective down to -30°C
- Fast melting
- Prevent stockpile from freezing
- Cleaner, less Spring cleaning
- Improves safety



Stockpile treatment can be done using our specialized mobile equipment (turn-key service available) or using a loader for smaller quantities of salt and/or abrasives.

Contact your representative for guidance on the best method for you.

Fusion liquid, guaranteed to improve winter safety.

## **CONTROL: IMPROVED SAFETY AND GUARANTEED COST SAVINGS**

#### > COMPARATIVE ANALYSIS

It is incumbent on us to inform our customers, not only on the benefits of the FUSION deicing products, but also to provide the necessary training to properly use them. We start by analyzing their recent years' annual consumption of salt and abrasives as well as the application methods and equipment. We can help them achieve the best results and ensure the program is a success.

It is our responsibility to show specific quantitative benefits that our clients will achieve by using Fusion products. In all cases, we have achieved a cost savings of at least 30%, not only in material costs but in labor and storage costs as well. Additionally, we have shown quantitative cost savings resulting from the reduction of salt that is released into our environment and on our infrastructure.

Through this analysis, we can put a strategic action plan in place together with our customers' winter maintenance department in order to achieve our pre-established safety and operational objectives.

We offer several services such as stockpile treatment (salt and/or abrasives) to clients who do not possess on-board pre-wetting equipment.

We can also perform turn-key anti-icing applications (before the snow or ice event) providing our clients with a proactive tool that they may not already have.

#### > THE APPLICATION RATE CHART AND THE CONTROL OF RAW MATERIALS

The application rate chart and the raw material consumption data are the best tools to control winter maintenance costs. The collected data allows us to develop a personalized strategic action plan together with our clients that is targeted to their specific needs.

## > BEST PRACTICES





#### > PUMP AND STORAGE

Simple and inexpensive, the required storage equipment is easy to purchase and setup. It is important to assess the exact needs (ie. annual liquid volume, volume per event, etc.) in order to best determine which reservoirs should be used (or even 1,000 L totes for small volumes).



## > ANTI-ICING SYSTEMS

Only a small investment in equipment is required for Anti-Icing; a tanker truck for long runs or highways or a small flatbed or pickup truck with a plastic tank for shorter runs. It is possible to add anti-icing equipment to sidewalk tractors in order to eliminate the need for abrasives thereby lowering Spring cleaning costs and decontamination fees.



#### > ON-BOARD PRE-WETTING SYSTEMS

There are several models of salt trucks on the market and many are already equipped with pre-wetting systems. We highly recommend retrofitting your existing salt trucks which will significantly reduce your initial investment.



Your Eco-Forma representative is happy to help you determine the best choices for your program.

## **FUSION™ TREATED SALT**

#### > PREMIUM ECO-FRIENDLY ICE MELTER – IN BULK

Our treated salt is environmentally friendly and available in bulk. It is treated with FUSION liquid which is 100% organic and biodegradable, derived from sugar beets. It is effective down to -30°C and it covers more surface than the traditional ice melters in the industry.

During an event, or if there is already snow and/or ice on the surface, FUSION treated salt can penetrate through the ice and snow to create a safe surface. Once an event has already started, liquids are no longer efficient since they will be diluted before getting down to the surface. The best method of applying treated salt is On-Board Pre-Wetting for those who have the required equipment. The salt (or abrasives) is sprayed with FUSION liquid just before it leaves the vehicle to be spread on the road, parking lot or sidewalk. If you do not have pre-wetting equipment, you can still benefit from material and labor costs by using our FUSION treated salt.

#### 100% natural ingredients

- ✓ The least corrosive ice melter in clinical trials
- Prevents slips and falls
- Used on roads, highways, parking lots and walkways across North America
- Safe on concrete, asphalt, pavers and for vegetation when used as directed
- ✓ Accepted by LEED and BOMA Best
- Effective down to -30°C (rock salt is not effective below -12°C)
- ✓ Fast acting and long lasting
- Does not stain
- No magnesium or calcium

Powered by











30% LESS CORROSIVE



DOES NOT STAIN



## **ORGANIC MELT**

# **ORGANIC** MELT<sup>®</sup>

Propelled by the appreciation of our industrial ice melters by the cities and municipalities across Canada as well as many requests by individuals, we have developed a packaged line of deicers for the retail market.

Organic Melt, our premium organic-treated ice melter, is by far superior to existing eco-friendly products and even outclasses the best chemical-based products available on the market.







#### > AVAILABILITY

Starting with the distribution of our packaged ice melters in the industrial and construction sectors of the greater Montreal area, we acquired the expertise needed to bring Organic Melt to the retail market.

Having successfully accomplished that, we then put our efforts into making this premium eco-friendly ice melter accessible to the general public. Our goal was to give everyone the chance to benefit from these efficient and safe products formerly only available to the industrial and transportation industries.

You may now purchase our various products at retailers in your area. Visit our website to locate a point of sale near you.



Corrosion Rate by Levelton Analytical Services Richmond, BC

## **FUSION RELEASE**



Our **Fusion RELEASE** is a 100% organic concentrated release agent developed for asphalt and concrete work. Its efficiency has been rigorously tested in order to provide you with a product that surpasses the current industry standards.

Widely used by asphalt producers and paving and concrete contractors, Fusion RELEASE continues to gain popularity across Canada. Contact us for more information.

#### **> SO MANY APPLICATIONS**

- ✓ Asphalt release agent
- ✓ Release agent for concrete form work
- Wood chips and mulch
- ✓ Stone, sand and gravel
- Garbage and debris
- Mechanical mechanisms prone to humidity





## **FUSION BALLAST**

## TIRE BALLAST

Our Fusion Tire Ballast is 100% organic and contains no chlorides nor corrosive materials. It will not damage equipment and it is safe for the environment and operators.

It is resistant to freezing down to -45°C and it is 30% heavier than water.

## > AVAILABLE FORMATS

- 1000 Litre Tote tanks
- 200 Litre Drums
- 20 Litre Pails



- Excellent weight/volume ratio (30% heavier than water)
- ✓ 100% organic and safe for the environment
- ✓ Will not freeze (-45°C)
- ✓ No corrosive magnesium or calcium
- Biodegradable and non-toxic





## HORTICULTURAL VINEGAR



Horticultural Vinegar 20% is used for spot weed control in lawns and gardens as well as for control of vegetation in sidewalk and driveway cracks. This product has been shown to be effective for the treatment of annual weeds such as Black Medic, Chickweed, Lamb's-quarters and Ragweed, as well as perennial weeds such as clover, dandelion, plantain, and wild carrot.

## > AVAILABLE FORMATS

- ✓ 1000 Litre Tote tanks
- 200 Litre Drums
- 20 Litre Pails
- ✓ Non-selective herbicide
- Used for individual weed control
- Ideal for controlling unwanted weeds
- Leaves no toxic residue in the soil







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## **Our Partners**

#### Quebec

CN Ville de Blainville CP Ville de Cowansville Aut. 25 - Montréal-Laval Ville de Matagami Municipalité de Saint-Donat Ville de Pincourt Municipalité Saint-Gabriel-de-Valcartier Ville de Repentigny Municipalité de Saint-Mathias-sur-Richelieu

#### Ontario

City of Elliot Lake Halton Conservation City of Guelph Halton Region City of Hamilton Oxford County City of Kitchener Region of Peel City of Toronto Town of Ingersoll Town of Lincoln Town of Tillsonburg City of Woodstock Town of Whitby County of Norfolk City of Niagara Falls Town of Grimsby

#### **Western Provinces**

Manitoba Infrastructure - Dauphin Town of Carman Manitoba Infrastructure - Manitou Town of Lac du Bonnet Manitoba Infrastructure - Sanford Town of Manitou Manitoba Infrastructure - Treherne Town of Stonewall Rural Municipality of Emerson/Franklin Canadian Base Operations: Southport Aerospace Rural Municipality of Grey CFB Shilo Rural Municipality of La Brocquerie City of Portage La Prairie Rural Municipality of Thompson Manitoba Infrastructure - Altona Rural Municipality of Victoria Manitoba Infrastructure - Carman Town of Carberry

#### Ville de Saint-Constant Municipalité Sainte-Anne-de-la-Pérade Ville de Saint-Jérôme Signature sur le St-Laurent (pont Champlain) Ville de Sherbrooke Voie Maritime du St-Laurent Ville de Varennes Ville de Beaconsfield Ville de Westmount

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