Da-Lee

www.DaLeeGroup.com

350 Jones Road, Stoney Creek, ON Canada L8E 5N2
T 905.643.1135 F 905.643.2299 TF 1.800.268.4490

Calcium Chloride *Market Reviews*

Industrial Uses

9 Freezeproofing

Calcium chloride ($CaCl_2$) provides an economical way to freezeproof coal, ore and other bulk materials during cold weather. It is used by railroads, terminals, transport companies, coal mines (also preparation plants, transporters and consumers), and gold, silver and other metal mining and processing operations to decrease loading/unloading temperature, cost and damage. $CaCl_2$ also has the unique ability to thaw out frozen bulk materials at subzero temperatures.

DESCRIPTION

Transportation and conveyance of coal, crushed stone, ore, gravel, sand and other granular bulk materials from rail cars and stockpiles becomes extremely difficult when they are frozen. Rain, snow and extreme cold can turn flowable materials into solid masses that demand specialized equipment, manpower and demurrage. Problems that arise include:

- Freezing in rail cars creates frozen residual and “pigs” (frozen masses weighing up to several tons) at the ends
- Ice film on conveyors and feed systems causes slippage and poor efficiency
- Freezing in silos, feeders and ore bins causes arching and rat holing that create sporadic, irregular feeding
- Freezing of stockpiles delivered during warm weather

$CaCl_2$ is an effective freezeproofing and thawing agent that can keep bulk commodities flowing freely. Compared to mechanical methods, it can decrease: unloading and handling time; demurrage costs; how long cars and rail sidings are tied up; breakup and re-crushing of frozen materials in silos, bunkers and ore bins; and the malfunction of conveyors and feed systems.

Bulk materials freeze because they have high levels of fines and are exposed to rain, sleet or snow. Freezing is accentuated if shipments are delayed between mine and plant, if cars or trucks have snow in the bottom as they are loaded, and if residual, untreated frozen fines line the bottoms of returning cars.

Mechanical recovery can be costly compared to the use of $CaCl_2$ and can damage equipment. For instance:

- Thaw sheds are expensive and impractical for cars frozen to depths of more than 6 ft
- Car shakers or vibrators can damage cars and are expensive to use
- Hydraulic rams can inflict costly damage
- Drilling into frozen material and injecting air in railcars (“hopper poppers”) and using compressed air blasters in silos are expensive and time consuming
- Bulldozers, backhoes and other equipment used to break up frozen masses are expensive to use
- Fires are hazardous and can damage cars, while dynamite is a last resort and can cause excessive damage.

Several compounds can depress the freezing point of the free water in a bulk material so ice does not occur and form frozen masses. In addition to $CaCl_2$, this includes rock salt, methanol, ethanol, ethylene glycol and glycerol.

350 Jones Road, Stoney Creek, ON Canada L8E 5N2
T 905.643.1135 F 905.643.2299 TF 1.800.268.4490

Calcium chloride is superior to these because it is economical and depresses freezing point a larger amount. Not only does $CaCl_2$ offer freezeprooing down to -40°C, but it is the only one of this group to effectively thaw materials by dissolving ice crystals.

Calcium chloride does not cause significant corrosion or abnormal damage to rail cars or hoppers when it freezeproofs and thaw frozen coal and other bulk materials in them. This also applies to boilers and other combustion equipment that burn coal treated with $CaCl_2$. It also does not change coal's burning properties or affect flotation processes for base metal sulfides, gold-silver cyanidation and uranium solvent extraction processes.

APPLICATION

Calcium chloride is usually sprayed onto bulk materials to keep them flowing and onto the walls and floors of cars and bins to prevent adhesion. The amount of $CaCl_2$ solution needed for freezeproofing is influenced by such variables as:

- Surface moisture (i.e., moisture between particles)
- Size of particles and percent fines
- Time between loading and unloading in transit or storage
- Method of unloading
- Temperature and precipitation during transit or storage
- Condition of car at time of loading (clean vs. "pigs," residual frozen fines, or excessive snow in car)
- Efficiency of treatment

In freezeproofing, the following table indicates the amount of $CaCl_2$ used in relation to surface moisture (in gal. 32% liquid $CaCl_2$ /ton):

	Surface Moisture		
Temp (°F)	**3%**	**6%**	**9%**
+35 to 15	0.30 - 0.45	0.40 - 0.95	1.00 - 1.50
15 to 0	0.45 - 0.67	0.95 - 1.30	1.50 - 2.00
0 to -15	0.67 - 0.86	1.30 - 1.70	2.00 - 2.50
-15 to -30	0.88 - 1.00	1.70 - 2.00	2.50 - 3.00

Calcium chloride application rates also vary when thawing out frozen materials depending on temperature and the depth of frozen material. Typical rates are:

% of material frozen	**Rate (gal./ton)**
25%	1.5
50%	3.0
75%	4.5
100%	6.0

350 Jones Road, Stoney Creek, ON Canada L8E 5N2
T 905.643.1135 F 905.643.2299 TF 1.800.268.4490

Rail Cars

Spray car insides and bottoms with $CaCl_2$ so less material adheres to internal surfaces. Spraying the material with $CaCl_2$ during loading will prevent severe freezing over long distances and times. If only 10% to 20% of the cars in a train are expected to freeze, it may be more economical to thaw materials with $CaCl_2$ afterward, rather than freezeproof cars beforehand.

Conveyors and feed systems

Spray belts with 0.12 gal./sq. yd. to remove ice films. For temperatures below 0°F, use 0.25 gal./sq. yd. and repeat periodically until the ice is gone.

Silos, ore bins and bunkers

Spray the interiors and bottoms with liquid $CaCl_2$ and apply it to the material as it is loaded to prevent severe freezing. In thawing, use the same procedures as for rail cars.

Stockpiles

Freezeproof stockpile materials before or as they are placed. Thaw frozen stockpiles as needed. Rates vary with the depth of frozen material as with rail cars, although less liquid $CaCl_2$ is needed because the liquid tends to move through stockpile faster.

CONTACT:

Da-Lee Group
350 Jones Road
Stoney Creek, ON L8E 5N2

Customer Service: (800) 268-4490
Phone: (905) 643-1135
Fax: (905) 643-2299

Web: www.daleedustcontrol.com
Email: contact@daleegroup.com

Da-Lee Group
491 MacEwan Street
Goderich, ON N7A 3X8

Phone: (519) 524-5903
Fax: (519) 524-5485

Web: www.daleedustcontrol.com
Email: contact@daleegroup.com

Multi Routes Inc
11415 6th Avenue
Montreal, QC H1E 1R8

Phone: (514) 648-2632
Fax: (514) 648-3919

Web: www.multiroutes.com
Email: info@multiroutes.com