GREEN GASES

GREEN SOLUTIONS FOR A BLUE PLANET

In this Fact Sheet:

Dry Ice

A Green Gases Fact Sheet

Whether it be cream cakes or human tissue - more and more goods are shipped refrigerated or frozen using Dry Ice. Green Gases can supply your Dry Ice needs - and as well as being competetive on price, your dry ice will be of the highest quality AND have a low carbon footprint! The low carbon footprint of our Dry Ice is achieved by using green energy to process the pellets.

Green Gases can supply Dry Ice pellets in diameters of 3mm and 16mm, which cover the majority of applications, from dry ice blasting to cooling.

Dry Ice Uses

It goes without saying that Dry Ice has been used for may things but one particular use is Cryogenic Cleaning (Shot blasting)

This method has been about for over 20 years and is widely used within the United Kingdom and overseas. The system bombards the target surface using small rice-size (3mm) pellets of dry ice propelled by compressed air.
It delivers superior results to steam and conventional sand blasting via two mechanisms:

Areas That Dry Ice Cleaning Has Been Used

Electrical	Industrial
Electronic/electrical control panels Armatures/Coils/Windings Generators Printed Circuit Boards Semi-Conductors Transformers Switch Gear Sub-Stations	Molding Equipment Process Equipment Manufacturing Equipment Tanks Printing Presses Pulp/Paper Equipment Oil Field Equipment Boiler Tubes
Food	**Commercial**
Ovens Floors Processing Equipment Bake-Off trays Packaging Areas and Equipment	Buildings Exterior/Interior Graffiti Decal Removal
Other	
Formaldehyde Waste Containers Nuclear Decontamination	

1.The low temperature of the dry ice (-78.5°C) causes the target to shrink and loose hold from its substrate;

2.The small dry ice pellets infiltrate the blast surface and on contact with the warmer surface solid dry ice converts to the gaseous phase ripping off layers of unwanted material.

The beauty of this approach is that the dry ice sublimes into the atmosphere leaving only the removed material to be discarded.

In comparison to alternative methods adhesives are easily removed as the lowered temperature serves to weaken adhesive bond. In the food industry dry ice cleaning is valued because it is non-toxic and will eliminate odours, mold, mildew, and other fungi. Dry Ice cleaning is 100% ecologically safe.

NOTE: This form of surface cleaning is noisy and ear defenders should be used. Adequate ventilation must be provided to ensure that the CO2 gas produced is not a respiratory hazard. Effective cleaning can only occur in a straight front of the Dry Ice jet nozzle.

Carbon Dioxide (Solid) - Safety Data

1 IDENTIFICATION OF THE SUBSTANCE/ PREPARATION AND OF THE COMPANY
Product name Carbon Dioxide (Solid)
Chemical formula CO_2
Company see footer
identification
Emergency phone Nos 01223 864993

2 COMPOSITION/INFORMATION ON INGREDIENTS
Substance/ Substance
Preparation
Components/ Contains no other components
Impurities or impurities which will influence the classification of the product.
CAS Nr 124-38-9
EEC Nr 2046969
(from EINECS)

3 HAZARDS IDENTIFICATION
Hazards identification Refrigerated solidified gas. Contact with product may cause cold burns or frostbite. In high concentrations sublimed vapour may cause asphyxiation.

4 FIRST AID MEASURES
Inhalation of In high concentrations may cause sublimed vapour asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. Low concentrations of CO_2 cause increased respiration and headache. Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
Skin/eye contact with Immediately flush eyes thoroughly
Carbon Dioxide with water for at least 15 minutes.
(Solid) In case of frostbite spray with tepid water for at least 15 minutes. Apply a sterile dressing. Obtain medical assistance.
Ingestion Ingestion is not considered a potential route of exposure.

5 FIRE FIGHTING MEASURES
Specific hazards Non flammable
Hazardous
combustion products None
Suitable All known extinguishants can
extinguishing media be used.
Specific methods Water on Solid Carbon Dioxide increases sublimation. Higher risk of asphyxation.
Special protective In confined space use selfequipment
for contained breathing apparatus.
fire fighters

6 ACCIDENTAL RELEASE MEASURES
Personal precautions Evacuate area. Use protective clothing. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Ensure adequate air ventilation.
Environmental Try to stop release.
precautions Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.
Clean up methods Ventilate area.

7 HANDLING AND STORAGE
Handling and storage Use only properly specified equipment which is suitable for this product. Contact your supplier if in doubt. Refer to supplier's container handling instructions. Keep container in a well ventilated place.

8 EXPOSURE CONTROLS/PERSONAL PROTECTION
Exposure limit UK: STEL; 15000ppm; LTEL: 5000ppm
Personal protection Ensure adequate ventilation. Protect eyes, face and skin from contact with product.

9 PHYSICAL AND CHEMICAL PROPERTIES
Molecular weight 44
Melting point -56.6°C
Boiling point -78.5°C (sublimes)
Critical temperature 30°C
Relative density, gas 1.52 (air=1)
Relative density, liquid 1.03 (water=1)
Relative density, solid 1.87 (water=1)
Vapour Pressure 20°C 57.3 bar
Solubility mg/l water 2000 mg/l
Appearance/Colour Translucent white solid
Odour No odour warning properties
Other data Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

10 STABILITY AND REACTIVITY
Stability and reactivity Stable at atmospheric pressure and -78°C. At normal temperatures product sublimes into Carbon Dioxide gas. Contact with solid can cause embrittlement of structural materials.

11 TOXICOLOGICAL INFORMATION
General High concentrations of sublimed vapour cause rapid circulatory insufficiency. Symptoms are headache, nausea and vomiting, which may lead to unconsciousness.

Manufacturing Dry Ice

Dry ice manufacturing starts with liquid carbon dioxide held under a pressure of 20bar (300 psi) in bulk storage vessels. Liquid carbon dioxide is sent through an expansion valve into an empty chamber where it flashes into CO2 gas. The phase change from liquid to gas causes the temperature to fall rapidly resulting in the freezing of about 46% of the gas as dry ice 'snow'. The gaseous phase is released into the atmosphere or recovered. The 'snow' is then collected in a chamber where it is compressed into block, pellet or sheet form to meet customers' requirements. The denser the dry ice is, the longer it will last, the easier it is to handle, and the better it will perform when used in blast cleaning machinery.

Packaging and Transporting Dry Ice

It is vital to us a good insulated container. A thick well insulated purpose built unit of the type Green Gases supply will reduce the amount of dry ice needed and allow extended shipping times.

Although it sounds obvious, it's worth pointing out that only goods which can be frozen can be shipped using Dry ice.

For Dry Ice plan on using 2 to 5 Kg for each 24-hour period depending upon the quality of the insulated shipping container. This will keep everything frozen in a container up to 10 Litres. For larger containers and greater shipping times, multiply dry ice quantities by this rate.

The best shipping container is a two-inch thick urethane insulated box tested to lose only 2.5 Kg for a 10 Litres storage volume every 24-hours.

Remember the Golden rule is "Less thick or efficient insulation will need more Dry Ice" - it will sublime faster.

Table of average amounts of dry ice for packing frozen goods in a single, well insulated container

Weight of Frozen Food	Amount of Dry Ice for Time In Transit			
	4 Hours	12 Hours	24 Hours	2 Days
1 Kg	1 Kg	2Kg	4Kg	8Kg
2.5 Kg	1.5	3	5	9
5Kg	2	4	7	12
10 Kg	2.5	5	10	15
25 Kg	5	10	17.5	25
For each additional day add 84 to 8 Kg				

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