

Applications

Dry Ice

SOLID CARBON DIOXIDE

| Industry | Process | Application | Pellets | DRICE | Slices | Blocks |
|---------------------------------|------------------------------|----------------------------------|---------|-------|--------|--------|
| Transport & Distribution | Storage & refrigeration | Packaged foods | | | ✓ | ✓ |
| | | Frozen foods | | | ✓ | ✓ |
| | | Fresh seafood | | | ✓ | ✓ |
| | | Fresh meats | | | ✓ | ✓ |
| | | Fresh fruit, vegetables & salads | | | ✓ | ✓ |
| | | Catering trolleys | | | ✓ | ✓ |
| | | Fresh flowers | | | ✓ | ✓ |
| | | Perishable samples | ✓ | ✓ | | |
| Food Manufacturing / Processing | Process cooling | Dough mixtures | ✓ | ✓ | | |
| | | Processed foods | ✓ | ✓ | | |
| | | Sauces | ✓ | ✓ | | |
| | | Meats | ✓ | ✓ | | |
| | Cold grinding | Herbs & spices | ✓ | ✓ | | |
| | | Dried foods | ✓ | ✓ | | |
| | Freeze drying | Processed foods | ✓ | ✓ | | |
| | | Organic compounds | ✓ | ✓ | | |
| | Blast cleaning | Process machinery | | ✓ | | |
| | | Ovens | | ✓ | | |
| | | Mixing vessels | | ✓ | | |
| | | Moulds | | ✓ | | |
| Industrial Cleaning | Blast cleaning | Multiple applications | | ✓ | | |
| Research / Scientific | Storage & refrigeration | Perishable samples | ✓ | ✓ | | |
| | Cold traps | Preventing system contamination | ✓ | ✓ | | |
| Farming | Storage & refrigeration | Semen samples | ✓ | ✓ | | |
| | Blast cleaning | Milking machines | | ✓ | | |
| | | Milk storage vats | | ✓ | | |
| Freeze branding | Livestock | ✓ | ✓ | | | |
| Entertainment Industry | Special effects | Fog effects | ✓ | | ✓ | |
| Engineering | Shrink fitting | Bearings, shafts & components | ✓ | ✓ | | |
| Civil Engineering | Pipe freezing | Pipe & valve repairs | ✓ | ✓ | | |
| | Blast cleaning | Refurbishing building exteriors | ✓ | ✓ | | |
| Rubber / Plastics Manufacturing | Cold grinding | Rubber & plastic compounds | ✓ | ✓ | | |
| | Process cooling | Rubber & plastic compounds | ✓ | ✓ | | |
| | De-flashing | Rubber & plastic parts | ✓ | ✓ | | |
| | Blast cleaning | Process machinery | | | ✓ | |
| | | Ovens | | | ✓ | |
| | | Mixing vessels | | | ✓ | |
| Moulds | | | ✓ | | | |
| Pigment Manufacturing | Cold grinding | Pigment compounds | ✓ | ✓ | | |
| | Blast cleaning | Process machinery | | ✓ | | |
| | | Ovens | | | ✓ | |
| | | Mixing vessels | | | ✓ | |
| Moulds | | | ✓ | | | |
| Electronics Manufacturing | Cold releasing/de-laminating | Removing components from trays | ✓ | ✓ | | |
| Pharmaceutical Manufacturing | Cold grinding | Pharmaceutical compounds | ✓ | ✓ | | |
| | Blast cleaning | Process machinery | | ✓ | | |
| | | Ovens | | | ✓ | |
| | | Mixing vessels | | | ✓ | |
| | | Moulds | | | ✓ | |
| Process cooling | Pharmaceutical compounds | ✓ | ✓ | | | |

Glossary

Dry Ice

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| Process | Definition |
|--|---|
| Blast cleaning | Dry ice blast cleaning is a non-abrasive, non-conductive cleaning process using 3mm dry ice pellets. It is more efficient than traditional blast cleaning using steam, water, solvent, grit or beads because DRICE leaves no contaminated residues. DRICE pellets are accelerated to supersonic speeds through a blasting gun onto the surface to be cleaned. The process significantly reduces downtime since you don't have to disassemble any machinery. Because DRICE cleaning is moistureless, it also removes the need for drying out before re-use. |
| Cold grinding (also known as cryogenic grinding) | Cold grinding produces uniform size particles of rubber, plastics, pigments, pharmaceuticals, chemicals, herbs and spices. Dry ice is spread onto the grinding material so that it cools down to its embrittlement point on passing into a grinding mill. This means that grinding of tough thermoplastic and other soft or pliable materials is possible becoming brittle enough to be ground to very fine particle sizes. Grinding processes usually produce extremely high temperatures. Dry ice helps regulate heat and allows higher material output. The grinding of organic materials has a high risk of explosion as very fine particles combine. The use of dry ice to inert the atmosphere during the grinding process reduces the safety hazard. Cold grinding does not damage or alter the chemical composition of the materials. Normal grinding processes - which do not use a cooling system - can reach up to 200°F and reduce volatile components and heat-sensitive constituents in some materials. |
| Cold releasing / De-laminating | During some production processes the product - or resins and adhesives - can become baked onto trays or moulds making it difficult to remove the product. Sprinkling dry ice onto the surface of the product - or placing the mould or tray on a bed of dry ice - causes the two materials to contract at differing rates thus breaking the bond between them. This makes removal easy. Once ambient temperature has returned there are no detrimental effects to the components or mould and trays. |
| Cold traps | Cold traps are used in many scientific and manufacturing applications to collect evaporated liquids and prevent them from moving throughout a process. The cold trap provides a very low temperature surface on which such molecules can condense. Dry ice is used to create the extreme cold required to condense these vapours, capturing them in liquid form and preventing them from contaminating instrumentation and plant (such as vacuum pumps). |
| De-flashing | When rubber or plastic moulded components are produced they commonly have thin "flashes" of material or mould marks where the two halves of the mould join. Mould trimming by hand is time consuming. Once moulded, the components can be placed into a rotating barrel tumbler with dry ice. The components are then taken down in temperature to their embrittlement point. The flashes are removed solely by contact with each other as the tumbler rotates, leaving a flash free product. No detrimental effects occur from the process and all the components physical attributes are retained once they have returned to ambient temperature. |
| Freeze branding | Freeze branding is a painless, humane and permanent method of livestock identification and is now used in preference to hot branding: <ul style="list-style-type: none"> • Cold branding does not deliver the extreme pain associated with hot branding • Cold branding destroys the pigmentation gland in the hair follicle, causing the hair to grow back white, resulting in permanent identification • Cold branding causes less damage to the hide than hot branding • The animal does not need to be clipped to be identified • The identification mark cannot be concealed or shaved away |
| Freeze drying | Freeze drying is a process widely used with agrochemical, pharmaceutical intermediate and biological products, and foods and flavourings. Freeze-drying is the only way that water can be successfully removed from an organic substance and many other materials without damage to the cell structure and loss of volatile components (ie smell, taste or colour). Dry ice is used to freeze the substance or item, thereby separating out the water as ice crystals. Then, under vacuum, controlled heat is introduced to cause the ice crystals to sublime, slowly coming away as vapour, without actually melting. Eventually all the ice vaporises, leaving the material completely dry. This results in minimal changes to the cell structure, extra cellular matrix or chemical composition. <ul style="list-style-type: none"> • Appearance - Freeze-dried products maintain their original shape and texture, unlike air dried products which shrink and shrivel due to high temperature processing. Just add water and in minutes the product rehydrates to its original form. • Taste - Tastes as good as fresh. Freeze-drying removes the water, not the flavour. So freeze-dried foods retain virtually all their fresh food taste, vitamins and nutritional content. • Weight - Weighs less than fresh. Freeze-dried foods have 98% of their water removed. This significantly reduces the food's weight, making it easier to handle and less costly to transport. For example, 3kg of chicken weighs only 1kg after freeze drying, and rapidly rehydrates back to its original weight. • Long Shelf Life - Freeze-dried products can be stored for months or years at room temperature without deterioration or spoilage. • Low Storage Costs - Because it can be stored at room temperature, freeze dried product does not require costly cold or chilled storage facilities, making it much cheaper to store. |
| Pipe freezing | Sometimes it is necessary to repair a water pipe or insert a joint in an area where there is no stopcock to stop the flow of water. By using dry ice, it is possible to freeze the water inside the pipe so the pipe can be cut or repaired without a continual flow of water to hamper the work. The installation of water meters commonly uses pipe freezing. |
| Process cooling | In certain applications, it is useful to be able to quickly cool, chill or freeze a material in a process. Dry ice can be spread directly onto a material (or mixed in) as it passes along a conveyor or through a chamber. The temperature of the product is reduced and, as the dry ice sublimates, the CO ₂ vapour evaporates into atmosphere. Since the CO ₂ retards the growth of bacteria, this process is particularly useful in food production, providing greater product longevity. |
| Shrink fitting | Shrink fitting is commonly used in engineering to fit together bearings, collars, shafts and other components that require an interference fit. The component to be "fitted in" to the other part is packed in dry ice causing it to contract. While still cold, it is assembled with its mating part and allowed to return to ambient temperature. In doing so, the cold part returns to its original size and creates the tight interference fit required. This process is quick, simple to use and causes no changes in the physical properties of the components, unlike heating the respective components which can change the hardness or toughness of the materials. |
| Special effects | Small, localised fog effects for use in theatres and by photographers and film makers can be achieved by placing dry ice pellets in a bucket of hot water. This increases the sublimation of the product from its solid state to CO ₂ vapour and will immediately produce a dense ground level fog, which can be directed by use of a fan. To achieve a greater area of coverage, dry ice fog machines can be used. These usually incorporate a water heater, dry ice basket and directional fan. The quality of the fog effect is more uniform and consistent due to the greater control available from the machine. Dry ice fog machines can be rented through many companies usually found in the Yellow Pages under Disco Equipment Hire. |
| Storage & refrigeration | Dry ice is commonly used for storage and distribution of perishable products. In the transport industry, it is used instead of expensive specialist refrigeration vehicles. The product is packed into thermal containers with a layer of dry ice pellets, blocks or slices spread on top of the product. Alternatively dry ice blocks or slices can be put into a tray or cell in the top of the storage container so that, as the dry ice sublimates, the CO ₂ vapour falls onto the product and keeps it chilled or frozen. In the scientific and research industry dry ice is used to preserve samples by packing or surrounding them in a thermal container with dry ice pellets. Samples can also be sent via carrier from one establishment to another by packing them into 'one trip' thermal containers with dry ice pellets. |

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