Carbon Dioxide (CO_2)

A powerful ally for the food industry

Freezing and Chilling | Modified Atmosphere Packaging | In Transit Refrigeration

Controlled Atmosphere Stunning | Waste Water pH Control | Inerting/Purging | Carbonation

Plant Growth Stimulation | Beverage Dispensing

AIR PRODUCTS

CO_2

Carbon dioxide is a colourless, odourless, inert gas which is slightly acidic. It is a non toxic gas naturally present in the air that we breathe (0.04%) which is crucial to life on earth.

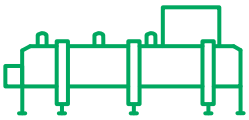
However, CO_2 can cause environmental risks if present in too high a quantity in the air. This is why at Air Products we work at recovering the CO_2 emitted during other production processes, purify it and enable its re-use. Some of our recovery sites allow us also to offer green CO_2 to help our environmentally-conscious customers make the best choice for our planet.

Carbon Dioxide's powerful cryogenic refrigeration properties are ideal for your process chilling/freezing and transportation refrigeration needs. Its gaseous properties are used to carbonate beverages, extend your product's shelf life, more humanely stun hogs/poultry, boost plant growth in greenhouses, and more.

Physical Properties

Molecular weight	44.01 g/mol
Boiling point -78.4°C	
Gas density @ 15°C 1 atm	1.848 g/l
Specific gravity 1.539	H_2O / LCO_2

Liquid Applications: Chilling, Freezing and Refrigeration



Process Freezing/Chilling and Dry Ice

One of the most common applications for CO_2 in the food industry is freezing and chilling. CO_2 is a cryogenic refrigerant that can operate at temperatures as cold as -78°C. Under these conditions it can be used to form a snow commonly called dry ice. Colder operating temperatures mean a faster freezing or chilling process. The result is less product dehydration, improved yield, and better quality than a traditional mechanical system. It also means that a CO_2 freezer (as well as a nitrogen one) has a smaller footprint and a significantly lower cost. There are also no refrigeration coils or the other nooks and crannies found in a mechanical system and less moving parts means it's simpler to clean, operate and maintain. Whether it's batch freezers, tunnel freezers, rotary freezers or spiral freezers, the Air Products team of food industry experts can help determine which equipment and cryogen are the right solution for your process freezing/chilling needs.

CO_2 can also be used for reducing or maintaining product temperatures throughout the manufacturing process. It is commonly added into mixers, blenders, kettles and tumblers to reduce the temperature of products prior to further processing. Common applications are dough, vegetable preparation or cheese curd chilling to speed up production and chilling of proteins or fruit slurries prior to forming nuggets and patties. Due to the versatility of CO_2 as a cryogenic refrigerant, the possibilities are truly endless.

Refrigerated Transport and Other Temporary Chilling

As a cryogenic refrigerant, CO_2 can also be used to form dry ice, snow blocks and pellets. In this format, CO_2 is ideal for keeping your products cold during transportation or storage. Food processors often layer snow onto product in large boxes or tubs to help maintain product temperatures in the supply chain. Retailers can use integrated refrigerated transport solutions or can add dry ice blocks to insulated containers to transport the products to keep frozen. Air Products can help determine if on-site dry ice production is the most efficient solution to meet your dry ice needs. In this scenario, Air Products would deliver liquid CO_2 into a tank located at your site and specify the proper dry ice equipment to manufacture the dry ice at your location.

Gaseous Applications

In its gaseous form, the physical properties of CO_2 can provide a solution to a variety of your processing needs:

Carbonation and Beverage Dispensing

In the carbonation process, CO_2 is dissolved into beverages to give your alcoholic and non-alcoholic beverages the unique fizz and sparkle that only CO_2 can provide. CO_2 also pressurizes beverage dispensing systems of beers and carbonated drinks.

Modified Atmosphere Packaging (MAP)

CO_2's anti-microbial properties make it ideal for extending the shelf life of your products by inhibiting the growth of aerobic bacteria and mould. Air Products' application specialists can help you determine the ideal gas mixture for your products.

Waste Water Treatment

Dissolved CO_2 forms carbonic acid which is a safe, effective and more sustainable alternative to harsher acids (i.e. sulfuric acid) to reduce the pH levels in your waste water stream.

Controlled Atmosphere Stunning (CAS) of Hogs/ Poultry

With an increased consumer focus on animal welfare, there has been a trend toward using CO_2 in a CAS process for hogs or poultry. This reduces animal stress and improves animal welfare while also improving working conditions and producing higher quality meats.

Growth Stimulation in Greenhouses and Hydroponics

Optimizing CO_2 levels in greenhouses allows for product growth earlier in the season, increased harvest and reduced fertilization costs. In hydroponic systems, the use of CO_2 (instead of strong acids) in the nutrient solution ensures the better assimilation of the elements by the plants.

Inerting/Blanketing

CO_2 is heavier than air, making it an effective alternative to nitrogen in some inerting and blanketing applications.

Pest Control

CO_2 is a safe and sustainable alternative to toxic pesticides to effectively fight insect pests in dried foods.

Supercritical CO_2 Extraction

At a certain temperature and pressure (above 73 bar at 31°C), CO_2 behaves like a solvent allowing you to extract certain elements from a product.

Ask Air Products . . . and Expect More

In addition to the equipment and gas supply, we provide training and safety systems necessary for a quality installation. Our food specialists will be there for you to provide technical support before, during, and after installation. Whether your packaging, growing, treating waste water, enhancing animal welfare, chilling, freezing, shipping, or cleaning, the Air Products team offers you the highest purity gases and the latest equipment. We can help improve your productivity, lower your costs, maximize your returns, and help make you more competitive in the market.

Reliability of CO_2 Supply

Air Products' network of CO_2 production facilities ensures the reliability of your supply. Local plant operators, drivers, and mechanics work closely with Air Products' customer service and logistics 24/7/365 to maintain our reliability record of over 99.9%—supplying product on time and at the flow, purity and pressure that you specify.

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