

Industrial Gases for the Food & Beverage Market

A Special Applications Report from Air Products

The food and beverage industry has enjoyed the benefits of using industrial gases for more than 45 years. These gases—primarily nitrogen and carbon dioxide—are used to chill, freeze, grind, and package a variety of products, including bakery and dairy items, beverages, fish and seafood, fruits and vegetables, meat and poultry, prepared meals, and more. In addition to food quality and cost savings benefits, the use of industrial gases in food processing applications can also provide health and safety benefits.

One food processing application that uses industrial gases is Modified Atmosphere Packaging (MAP), which is a preservation technique for minimally processed foods such as fish, meat, and fruits and vegetables. MAP is a process where the breathable atmosphere in a package is replaced with a pure gas, like nitrogen, or a gas mixture to extend the shelf life of food. Because food products spoil in different ways—whether through microbial growth, discoloration, oxidation, or moisture loss—industrial gases can be added into the package to change the composition of the air around the food. This enables food to look, smell, and taste good far longer than it would otherwise. An added benefit of MAP is that food products are protected from outside contamination or tampering by hermetic sealing, where any interference with the packaging would be evident.

In the beverage industry, liquid nitrogen (LIN) can provide costs savings during storage, transportation, and retail display of bottled drinks. For example, LIN dispenser technology enables bottlers to add a metered drop of LIN to a bottle before it is capped. Once the bottle is capped, the small amount of nitrogen rapidly boils into a gas, creating positive internal pressure within the closed container. Bottle rigidity provided by LIN droplets can help reduce costs by allowing processors to use lighter gauge, less expensive polymer materials. In addition, the bottle stiffness allows PET (Polyethylene Terephthalate) bottles to be stacked on top of each other without the worry of bottle collapse. In addition to the practical benefits of LIN droplets, the sound of air being released when opening the bottle conveys a visceral sense of quality and freshness to the consumer.

This technology also has proven effective for packaging of food in rigid containers, such as snack foods and nuts, by creating and maintaining an inert environment. Many foods packaged without hot-process sanitation degrade in the presence of oxygen, which promotes rancidity in fats and oils, and causes carbohydrates to form mold or bacteria. Further, oxygen trapped in a container can also alter food flavor and limit product shelf life. Adding a small drop of LIN to the rigid container before and after product is added helps maintain a high level of product quality by enhancing freshness. This technology can also help lengthen the shelf life of products, reducing costly spoilage and product returns.

Food chilling and freezing are two other applications that use cryogenic industrial gases such as LIN. Air Products offers a range of cryogenic food processing equipment where food products are either directly sprayed with, immersed in, or injected with LIN. Because of



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the extremely cold temperature of LIN (-196°C), food can be frozen within minutes instead of the hours required by conventional systems. This fast freeze provides numerous food quality benefits through the formation of smaller ice crystals, which causes less damage to a product's cellular structure. This allows food to maintain moisture, which not only improves texture, color, and flavor, but also translates into smaller weight loss from dehydration.

Another industrial gas that finds use in the food market is oxygen. For example, supplemental oxygen is used in aquaculture to help maintain the desired dissolved oxygen content in a pond. Oxygen also is used in the food industry for wastewater treatment, which is an increasingly important issue for food producers.

As new regulations and public demand for safe food continue to drive food processors to make investments in their overall food safety programs (see *"The Food and Beverage Industry: Food Safety Initiatives Usher in New Requirements,"* on p. 60), Air Products is responding with equipment and technology to help meet these requirements. For example, the company's freezers meet the latest hygienic design standards and can incorporate clean-in-place capabilities that allow food processors to clean their equipment more quickly and easily, thus minimizing production downtime. And as the food market becomes increasingly global, the use of cryogenic gases can significantly slow harmful microbial growth, allowing a wider distribution of high quality food products. ■

Air Products has worked closely with its customers for more than 40 years to understand their processes, challenges, and needs. This understanding combined with the company's ongoing research and development efforts enable Air Products to continue delivering new equipment, technology, and applications that help food processors improve product quality, reduce costs, increase yields, and add efficiency to their operations. For more information visit www.airproducts.com/industries/FoodBeverage.aspx.