



REFRIGERATION REVIEW

FREEZING SYSTEMS

Freezing of perishable food has a long history, from freezing using nature's cold winters to more recently using mechanical refrigeration, starting in the late 1800s. Bulk freezing of many products became standard, whether in barrels of fruits and vegetables or hanging beef and many other perishable products. As retail markets developed and frozen food packaging began to be used, many variations of frozen product evolved. Some of the most prevalent methods of freezing were the early plate freezers which basically sandwiched products to be frozen between plates that were sub-zero in temperature. Manual tray freezing (products placed on trays), either finished packaged products or unfinished packaged products, was also available.

In the early 1920s and 1930s, IQF (individual quick frozen) was developed, which lent itself to granular fruits and vegetables such as peas and corn. Fluidizing these products facilitated in keeping the quality of the product high as it was individually frozen in a short amount of time. The rapid freezing helps maintain the quality of the product by creating small ice crystals that don't rupture the membrane of the cells, which is typical of a slow freezing process. IQF freezers can freeze product in minutes as opposed to plate freezers that can vary from 4 to 8 hours, depending on whether the product is a retail package or an institutional package. Today most IQF products are packaged in poly bags – a more cost-effective container than cartons.

Depending on the type of product, whether orange concentrate or other solutions, tote bins or plastic containers can be used for the products. In some cases, products such as cranberries can be frozen in tote bins and may require weeks to freeze without damage to the product, which would be used for juices at a later date.

There are some unique processes which use flat steel belts which are maintained at 32°F by circulating a brine solution on the bottom side of the belt while the product is placed on the top side of the belt, such as leafy vegetables similar to spinach and cauliflower.

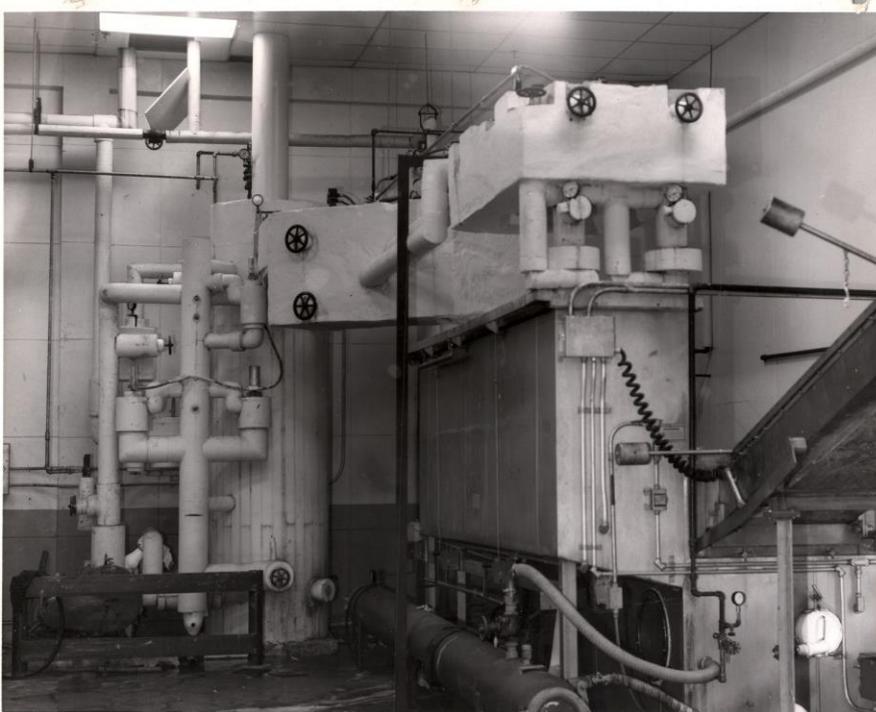
Freezers take a wide variety of forms, and spiral freezers are popular in some production plants where products are portion-packed and frozen for transportation to their markets. Belt freezers (non-fluidized) can be used for products like ice cream, cans of concentrate, corn on the cob, and the like. Each type of process would have its own freezing system to fit the needs of the packaging, the freeze time required, and the quality necessary to maintain the product's shelf life. It is noteworthy that the preservation of food by freezing is generally considered more cost effective than canning products, which requires high temperatures for sterilizing and the blanching of products. Direct cryogenic freezing with CO₂ or nitrogen would normally cost two to three times what a system using mechanical refrigeration would cost, and while room freezing, including rack freezing and fan walls, can be first cost cost effective, depending on the associated storage room, the total freezing cost deserves close scrutiny, especially if it uses a single stage "Freon" refrigeration system.



Rack Freezing, Monterey, Mexico



Tri-Tray Ice Cream Freezer, Cincinnati, Ohio



Freon Direct-Immersion Freezer -- A Futile Experiment by DuPont and FrigoScandia.



Hush Puppy Air Blast Belt Freezer



Automated Ice Cream Plate Freezer -- Lakeland, Florida



IQF Corn -- Fairmont, Minnesota



Hamburger Patty Freezer -- Houston, Texas



Spiral Freezer Bakery Products -- Lakeland, Florida



Close-Up of Bakery Spiral -- Lakeland, Florida



Plate Freezer -- San Salvador, El Salvador



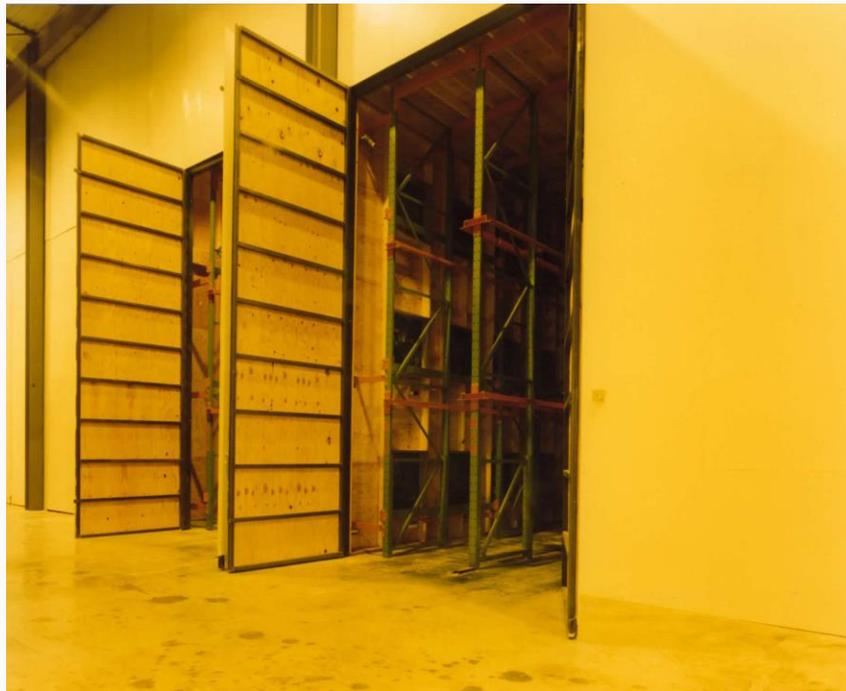
Air Blast Freezers Under Construction -- New Orleans, Louisiana



Ice Cream Belt Freezer -- Tampa, Florida



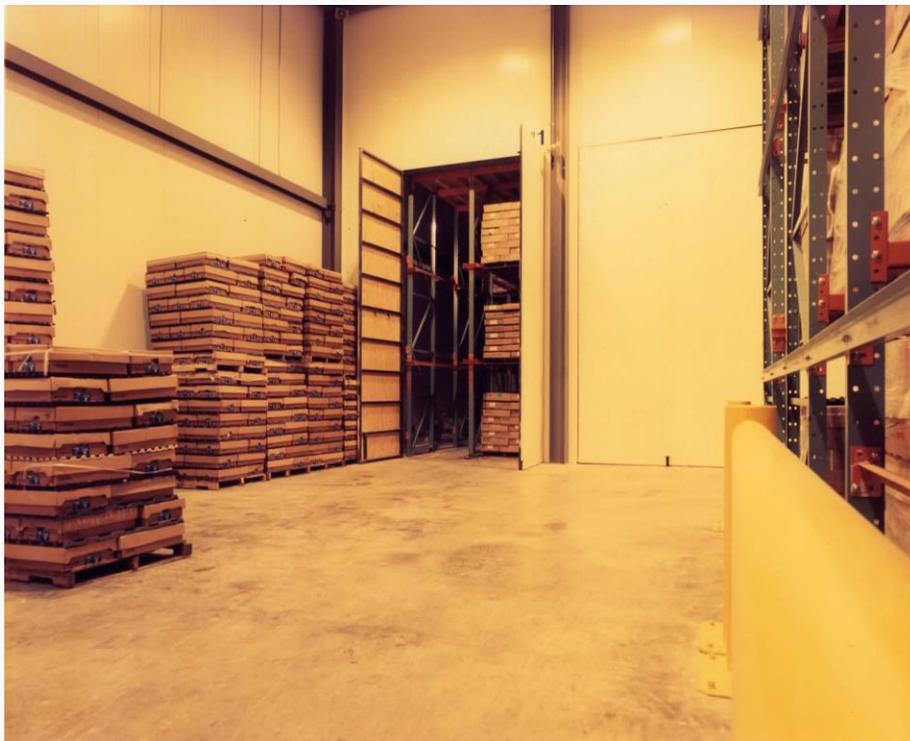
Rack Freezing -- North Carolina



Super Blast -- Pendergrass, Georgia



Super Blast -- Lula, Georgia



Super Blast -- Cartersville, Georgia



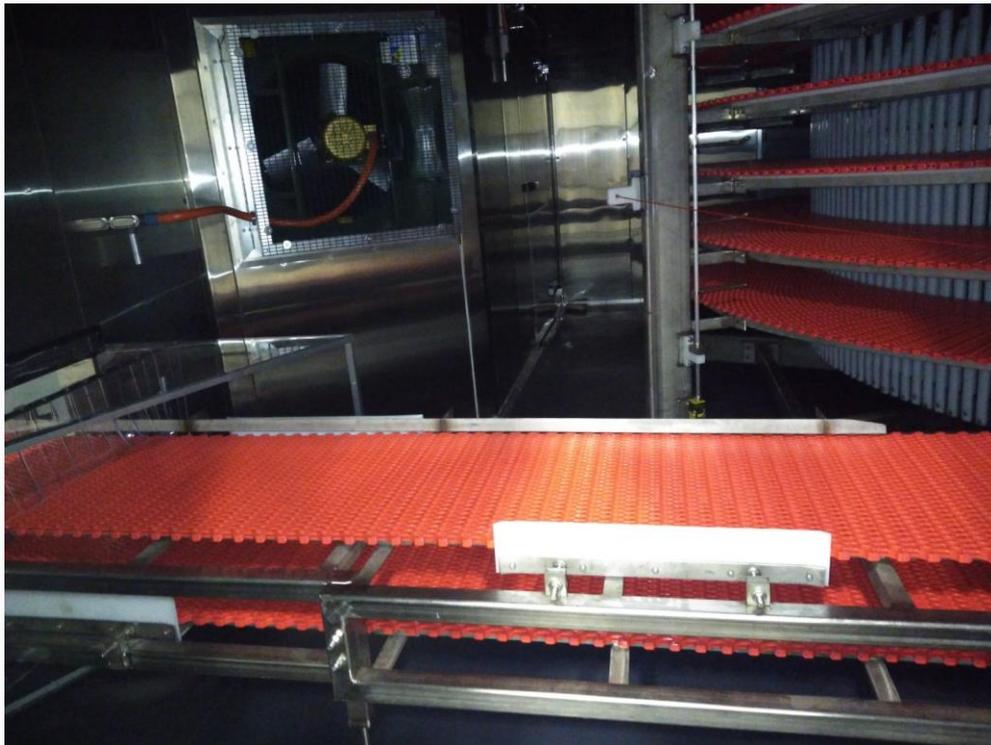
Bulk Air Blast Palletized Poultry Products -- McComb, Mississippi



Air Blast Poultry Products -- Harrisonburg, Virginia



Rack Freezing Poultry Products -- San Pedro Sula, Honduras



New Installation, Spiral Blast Freezer for Fish -- Orlando, Florida



**Spiral Belt Freezer with Desiccant Air Belt Throat Barrier -- Lakeland,
Florida**