



## Cryogenic Freezing – Batch or Continuous?



*Cryogenic tunnel with continuous belting.*

### Starting up with Cryogenic Freezing

Once you have decided that the small footprint, low capital cost, and high-quality benefits of using liquid nitrogen or liquid carbon dioxide are correct for your process, the next step is to determine how best to meet your production needs. Freezing with liquid nitrogen or liquid CO<sub>2</sub> can be achieved regardless of the volume of product to be processed. For lower volume production (up to 350 lbs. per hour), a batch or cabinet freezer is recommended. For mid-low volume production (350 lbs. per hour to 1,200 lbs. per hour), your production process will help dictate whether a cabinet freezer is best or if tunnel-style, continuous freezer addresses the need.

### Temperature Control Batch after Batch



For batch or cabinet freezing, racks of product are wheeled into the cabinet where cryogen gas is metered in to meet freezing time and target temperature goals.

Products are easily placed on trays and into racks and frozen in batches taking just a few minutes (depending upon the product).

Whether the operation is rack after rack after rack or production is more sporadic, the quality of the product and the cryogen use efficiency of the cabinet remains the same.

Cryogenic liquid nitrogen or liquid CO<sub>2</sub> quickly remove heat from food products allowing for a rapid and thorough temperature reduction in minutes. The uniform cooling and resulting smaller ice crystal formation in the food help to maintain the quality aspects of the product during subsequent storage and shipping. The frozen product is also now ready for the vacuum drying step of the freeze-dried

process for products in the pet food industry and other markets. The fast turnaround allows the freezing step to keep pace with upstream and downstream processes.

### Moving on Up

In starting with or moving into a tunnel freezer, a more consistent feed of product is necessary in order to maintain product quality and freezer efficiency. When production volume outpaces the racked process, moving to a continuous tunnel freezer can be the next step. Still relying on the power of cryogenic gas to remove heat, a continuous system allows for conveyer fed product to be frozen on a moving belt. Besides the economies of scale there is also opportunity to better control the consumption of cryogen giving the processor better control over costs. The quality of the product remains constant as well – delivering the quality attributes that customers desire.

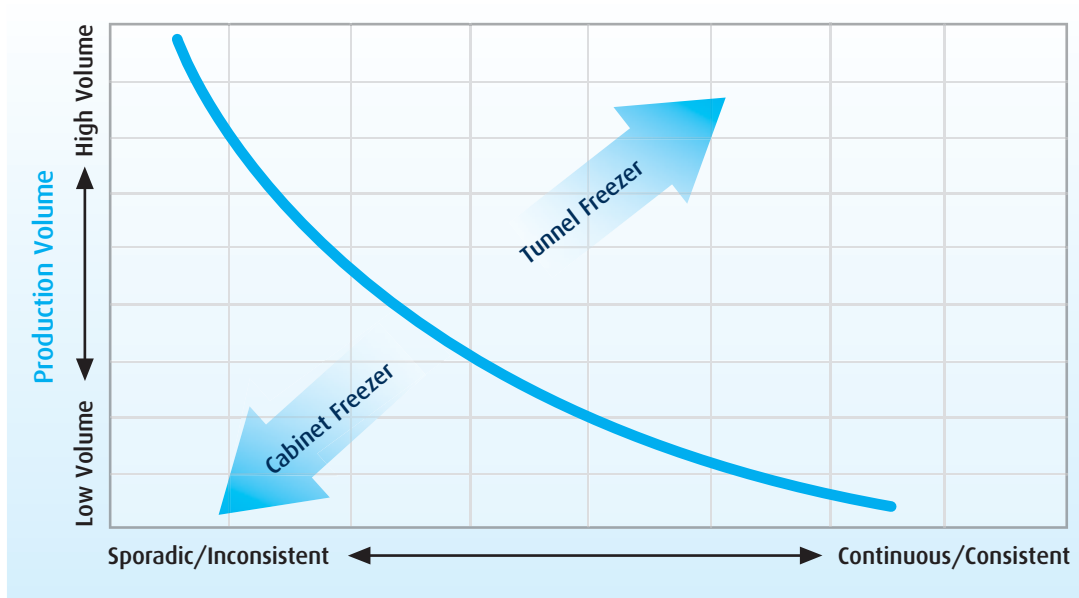
- Feature**
- Minimal floor space requirements
  - Easy to maintain
  - Automated temperature
  - Rapid heat removal
  - Equipment meets USDA sanitary clean-up guidelines



*Freeze-dried pet food – chicken and vegetable.*

- Benefits**
- Improve production rate
  - Achieve consistent product quality
  - Lower losses due to out of spec product
  - Control manual labor costs
  - Test formulations and freezing methods in Linde's food laboratory

### Choosing Cabinet vs Tunnel Freezer



### Wealth of Experience and Support

Years of food research at our technology center have identified the ideal cooling conditions for a broad range of food products.

When you choose Linde, you're selecting more than the largest supplier of industrial gases in North and South America. You're also selecting a support team that includes:

- Experienced food scientists and engineers.
- A complete array of services, including on-site evaluation, designed experimental testing, installation layout and start-up support
- A food technology center featuring an analytical laboratory to evaluate your product in full-sized production equipment.

### Contact Linde Today

For more information about startup of production expansions in your operation, call Linde at **1-844-44LINDE**, or visit our website at [www.lindefood.com](http://www.lindefood.com)

Linde  
10 Riverview Drive  
Danbury, CT 06810  
Phone 1.844.44LINDE (1.844.445.4633), Fax 1.800.772.9985; 716.879.2040  
[www.linde.com](http://www.linde.com)

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