Liquid Nitrogen vs. Carbon Dioxide Food Freezing

Liquid Nitrogen and Carbon Dioxide can be used interchangeably in many food freezing applications. However, Liquid Nitrogen often offers many advantages over Carbon Dioxide.

	Liquid Nitrogen	Carbon Dioxide
Safety and Environmental Considerations	LN_2 is chemically inert. An increase in N_2 levels of 2% is not dangerous to humans. LN_2 is much easier to exhaust than $C0_2$.	$C0_2$ is faintly reactive and toxic. OSHA's carbon dioxide exposure limit in the breathing atmosphere is just 0.5 percent. If incorrectly sized or operated, dry ice snow may collect on the process room floor.
Recommended Safety Equipment	Matheson Tri-Gas recommends an oxygen deficiency monitoring system installed in the processing room for both Liquid Nitrogen and Carbon Dioxide freezing equipment.	
Food Quality	Rapid freezing locks in moisture and preserves texture.	Slower freezing can negatively affect food quality.
Investment Costs	Lower freezing temperatures mean quicker freezing so equipment needed to produce same amount of product is smaller. Smaller size equipment means lower cost.	Higher freezing temperatures mean the equipment has to be proportionally larger to achieve the same throughput.
Operating Cost	LN_2 has about an 18% higher refrigeration value (see chart on back) when compared to $C0_2$*. Therefore, on a pound per pound basis, the freezing process would use about 18% less LN_2 than $C0_2$.	Even if LN_2 is more expensive than CO_2, the price per pound of frozen product can be less using LN_2 since the freezing process would use less cryogen.
Maintenance Cost	Simple equipment with low maintenance requirements.	Complicated equipment requires more maintenance.
Production Rate	Lower operating temperatures and shorter dwell time result in almost twice the throughput in the same footprint. For example, a 20 foot LN_2 tunnel can deliver the same output as a 30 foot CO_2 tunnel	Higher operating temperatures and longer dwell time require 50% larger freezer to produce the same amount of product.
Operational Flexibility	Smaller freezing equipment leaves more room for expansion. Simple to operate and user-friendly. Precise sizing not as critical, can operate efficiently outside of the original design parameters.	Larger freezing equipment takes up more plant space. Less user-friendly, requires more vigilant operator. Freezer must be sized precisely for a specific product and throughput.

**The actual value depends on the storage pressure of the gas, the type of freezer, the freezer's operating temperature, and other factors.*

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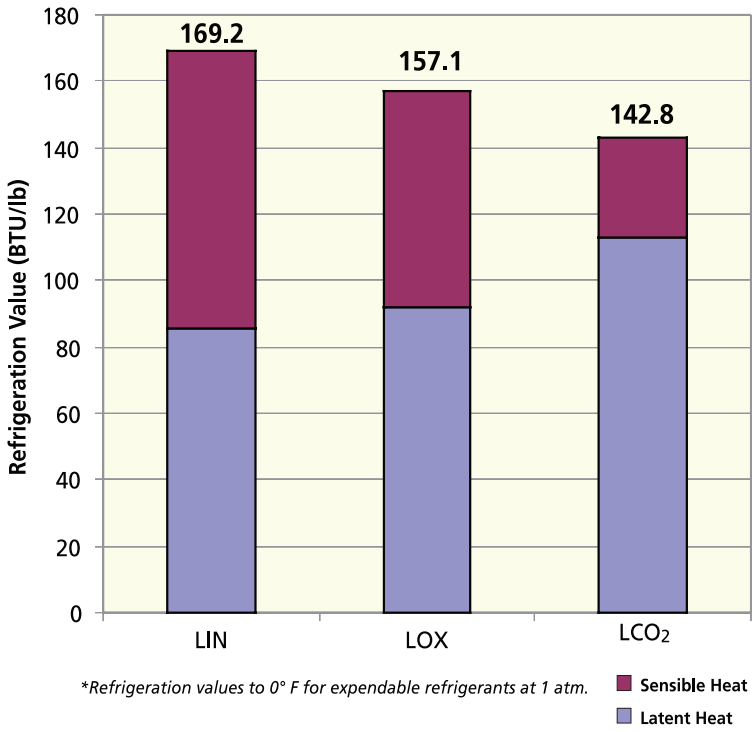
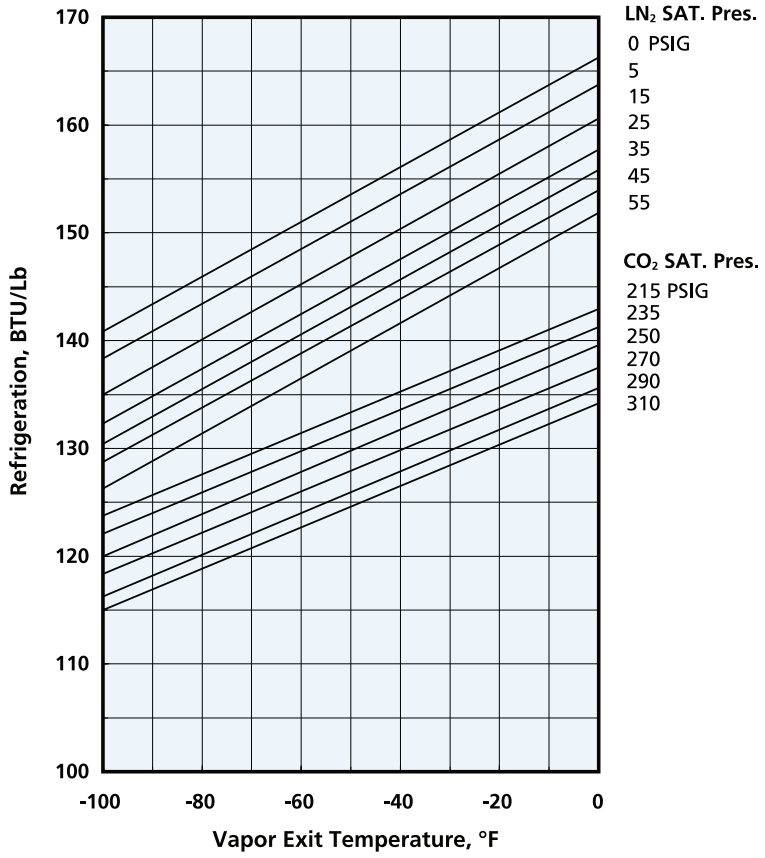
Cryogen Cooling Capacity



**Refrigeration values to 0° F for expendable refrigerants at 1 atm.*

Refrigerant Comparison



Specifications are subject to change. Please check **www.mathesongas.com** for most current information.

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