

Advanced Manufacturing : Altitude Test Chamber

The Objective

Provide precise and reliable cooling of high-pressure airflow in an altitude test chamber using liquid nitrogen. The system needed to achieve cryogenic outlet temperatures while ensuring complete vaporization of the liquid nitrogen.

The Challenge

The customer required a heat exchanger capable of cooling 500 scfm of air at 120 psi from ambient temperature (65 °F) down to -60 °F. This process relied on liquid nitrogen supplied at -340 °F, 3 liters per minute at 20 psi. A key challenge was ensuring the total vaporization of nitrogen during heat transfer while maintaining efficient operation and system integrity under pressure.

The Solution

Exergy engineered a custom tube-in-tube heat exchanger designed specifically for cryogenic performance. The configuration included:

- Dual coils equally spaced to maximize heat transfer efficiency.
- 1” OD outer tube with ¾” OD inner tube for optimal flow dynamics.
- NPT fittings for robust and secure system integration.
- All components constructed of 316L stainless steel for durability and corrosion resistance.

This design ensured complete vaporization of liquid nitrogen while reliably cooling the airflow to the specified temperature.

The Results / Benefits

- Achieved consistent outlet air temperature of -60 °F.
- Ensured total vaporization of liquid nitrogen, improving process safety and reliability.
- Delivered a robust, compact solution designed for high-pressure aerospace test conditions.
- Leveraged durable 316L stainless steel construction to withstand repeated cryogenic cycling.