

Advanced Manufacturing: Altitude Test Chamber

A custom cryogenic heat exchanger solution engineered for precise, high-pressure airflow cooling in aerospace altitude testing environments.

The Objective

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

The Challenge

- Cool **500 scfm of air** at 120 psi from ambient 65 °F down to **-60 °F**
- Liquid nitrogen supplied at **-340 °F**, 3 liters/min at 20 psi
- Ensure **total vaporization** of nitrogen during heat transfer
- Maintain efficient operation and system integrity under pressure

The Solution

Exergy engineered a custom **tube-in-tube heat exchanger** designed specifically for cryogenic performance:

Dual Coil Design

Equally spaced coils to maximize heat transfer efficiency

Optimized Tube Geometry

1" OD outer tube with ¾" OD inner tube for optimal flow dynamics

NPT Fittings

Robust and secure system integration under high pressure

316L Stainless Steel

All components built for durability and corrosion resistance

Results & Benefits

-60 °F

Consistent outlet air temperature achieved reliably under test conditions

Total Vaporization

Complete vaporization of liquid nitrogen, improving process safety and reliability

Compact & Robust

High-pressure aerospace-grade solution in a space-efficient form factor

Cryogenic Cycling

316L stainless steel construction withstands repeated extreme thermal cycling