Advanced Manufacturing : Fuel Oxidizer Rocket Engine

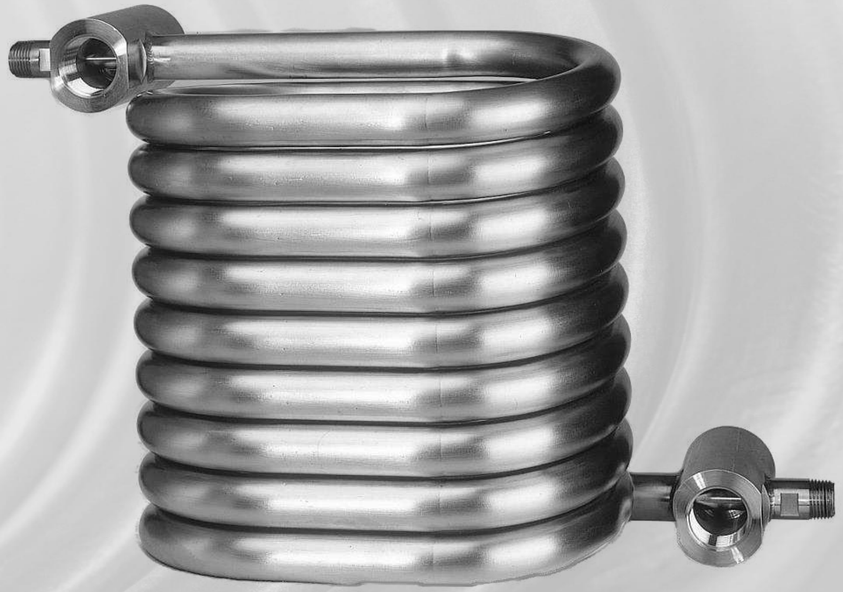
The Objective

Enable precise heating and cooling of highly reactive fuel oxidizers (MMH and NTO) during rocket engine testing. The goal was to achieve accurate propellant conditioning within a compact system that could withstand extreme pressures while ensuring process safety.

The Challenge

The customer, a rocket testing facility, required a system to both heat and cool fuel oxidizers (MMH and NTO) under stringent process conditions. The application involved:
- Heating flow from 10 °F to 140 °F.
- Cooling flow from 150 °F to 20 °F.
- Handling 5 GPM with a 50-gallon batch reaching equilibrium in 2 hours.
- Operating pressure of 400 psi but designed for 2200 psi.

These requirements demanded robust construction, precision control, and materials compatible with the highly reactive propellants.



The Solution

Exergy engineered a custom tube-in-tube heat exchanger (Model #01194-01) constructed entirely of 316L stainless steel. The design included:
- Heat transfer area of 3.7 ft^2.
- Electropolished surface finish of 20 µin (0.5 µm) Ra max.
- Inner tube stubs for secure connections.
- Outer NPT fittings for reliable integration.

This configuration ensured efficient heat transfer while maintaining structural integrity under high-pressure operation.

The Results / Benefits

Achieved precise temperature control for safe and effective propellant conditioning.
- Maintained reliable performance under operating pressure of 400 psi with a safety margin up to 2200 psi.
- Delivered compact, durable solution suited for aerospace testing environments.
- Enhanced operator confidence through robust design and high-quality materials.

ISO 9001:2015 CERTIFIED
QUALITY MANAGEMENT SYSTEM