

Research & Development : High Temperature / Special Alloy

The Objective

Design a high-performance heat exchanger capable of cooling supercritical steam from 650°C to 400°C while preventing boiling in the coolant. The exchanger needed to withstand extreme temperatures and pressures with durable, reliable materials.

The Challenge

Supercritical steam applications present extreme operating conditions. The customer required precise cooling across a significant temperature drop, with water as the coolant. The key challenge was maintaining performance while ensuring the coolant did not reach its boiling point. Standard stainless steel was insufficient for the high thermal stress, necessitating a specialized alloy solution.

The Solution

Exergy engineered a custom tube-in-tube heat exchanger featuring a single coil design optimized for high-temperature resilience. The inner tube was fabricated from Inconel, chosen for its superior strength and oxidation resistance under supercritical conditions. The outer tube measured ½ inch with an inner ¼ inch tube, providing a heat transfer area of 0.11 ft².

The Results / Benefits

The solution successfully delivered efficient cooling from 650°C to 400°C while ensuring coolant stability. Inconel’s durability enabled safe, reliable operation under severe conditions where stainless steel would fail. The compact tube-in-tube design provided a robust solution for the customer’s supercritical steam project.

