Chemical : Acetone and Water

The Objective

To design a compact, efficient heat exchanger capable of condensing acetone and water vapors from a 275°C, 120 slpm gas stream at atmospheric pressure. The solution needed to deliver precise thermal performance, reliability, and minimal maintenance while operating with water at 20°C as the cooling medium.

The Challenge

The customer's process required condensation of mixed acetone and water vapors from a high-temperature gas stream containing non-condensable components.
This presented challenges including:
Managing a large temperature differential (275°C to ambient).
Preventing performance loss due to inert gases in the flow.
Maintaining efficiency within a compact footprint suitable for lab or pilot-scale environments.
The system also had to provide long-term durability and ease of operation under continuous thermal cycling.

The Solution

Exergy engineered a custom shell-and-tube heat exchanger (Model #00540-1, 23 Series) to meet the demanding process conditions.
Key design features included:
- Heat transfer area: 0.58 ft^2
- Compact 1" shell diameter and 8" tube length
- 316L stainless steel construction for corrosion resistance and longevity
- No required maintenance for continuous, reliable operation

The exchanger was optimized for efficient heat transfer and condensation within a compact, rugged design suited for laboratory and process environments.

The Results / Benefits

The Exergy solution effectively condensed the acetone and water vapors, reducing gas temperature from 275°C to near ambient levels using a 20°C water coolant.
Its compact stainless-steel design delivered high performance in a small footprint, with no maintenance required and excellent corrosion resistance.
The result was a stable, efficient, and durable condensing solution that improved process reliability and energy efficiency. This case highlights Exergy's ability to engineer compact, high-temperature heat exchangers that handle complex vapor-condensation challenges with precision and dependability.