CASE STUDY

Chemical: Acetone & Water Vapor Condensation

Exergy engineered a custom shell-and-tube heat exchanger to condense acetone and water vapors from a **275°C, 120 slpm gas stream** — delivering precision thermal performance in a compact, maintenance-free design.

1

The Objective

Design a compact, efficient heat exchanger to condense acetone and water vapors at atmospheric pressure using 20°C water as the cooling medium.

2

The Challenge

Manage a 275°C-to-ambient temperature differential, prevent inert gas performance loss, and maintain efficiency in a lab-scale footprint under continuous thermal cycling.

3

The Solution

Custom shell-and-tube heat exchanger (Model #00540-1, 23 Series) in 316L stainless steel , optimized for high-temperature condensation with zero maintenance requirements.

Key Design Specifications

Heat Transfer Area

0.58 ft^2 — optimized for efficient condensation within a minimal footprint.

Compact Geometry

1" shell diameter × 8" tube length — ideal for laboratory and pilot-scale environments.

316L Stainless Steel

Superior corrosion resistance and longevity under continuous thermal cycling with acetone and water vapors.

Zero Maintenance

No required maintenance for continuous, reliable long-term operation.

Results & Benefits

Temperature Reduction

Gas stream cooled from **275°C to near ambient** using 20°C water coolant.

High Performance

Efficient condensation of mixed acetone and water vapors despite non-condensable components in the flow.

Process Reliability

Stable, durable solution that improved energy efficiency and process dependability.

This case highlights Exergy's ability to engineer compact, high-temperature heat exchangers that handle complex vapor-condensation challenges with precision and dependability — all within a rugged, corrosion-resistant stainless steel design.