

# Research & Development : CO2 Vapor to Liquid

## ***The Objective***

To condense high-pressure CO2 vapor into dense liquid CO2, enabling efficient handling and utilization in downstream processes.

## ***The Challenge***

The customer needed to cool CO2 vapor entering the exchanger at 800–900 psi and 55°C down to 7°C, in order to achieve a stable liquid phase. Operating at such high pressures and temperatures required a highly durable, compact solution. Standard exchangers posed risks of inefficiency, space limitations, and potential safety concerns.

## ***The Solution***

Exergy engineered a custom Shell & Tube Heat Exchanger (Model #00486-09, 54 Series) constructed entirely from 316L stainless steel. The exchanger was designed with a 2.25" shell diameter, 20" tube length, and 10.08 ft<sup>2</sup> of heat transfer area. The design utilized CO2 on the tube side and ethylene glycol on the shell side to achieve efficient cooling and condensation.

## ***The Results / Benefits***

The solution successfully cooled the CO2 vapor to 7°C, delivering cold, dense liquid CO2 for reliable process use. The compact design minimized footprint, while the robust stainless steel construction ensured long-term durability and no maintenance. This project highlights Exergy's expertise in handling high-pressure gas-to-liquid phase transitions.



***ISO 9001:2015 CERTIFIED  
QUALITY MANAGEMENT SYSTEM***