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sCO_2 Brayton Power Cycle Heat Exchanger Test Facility

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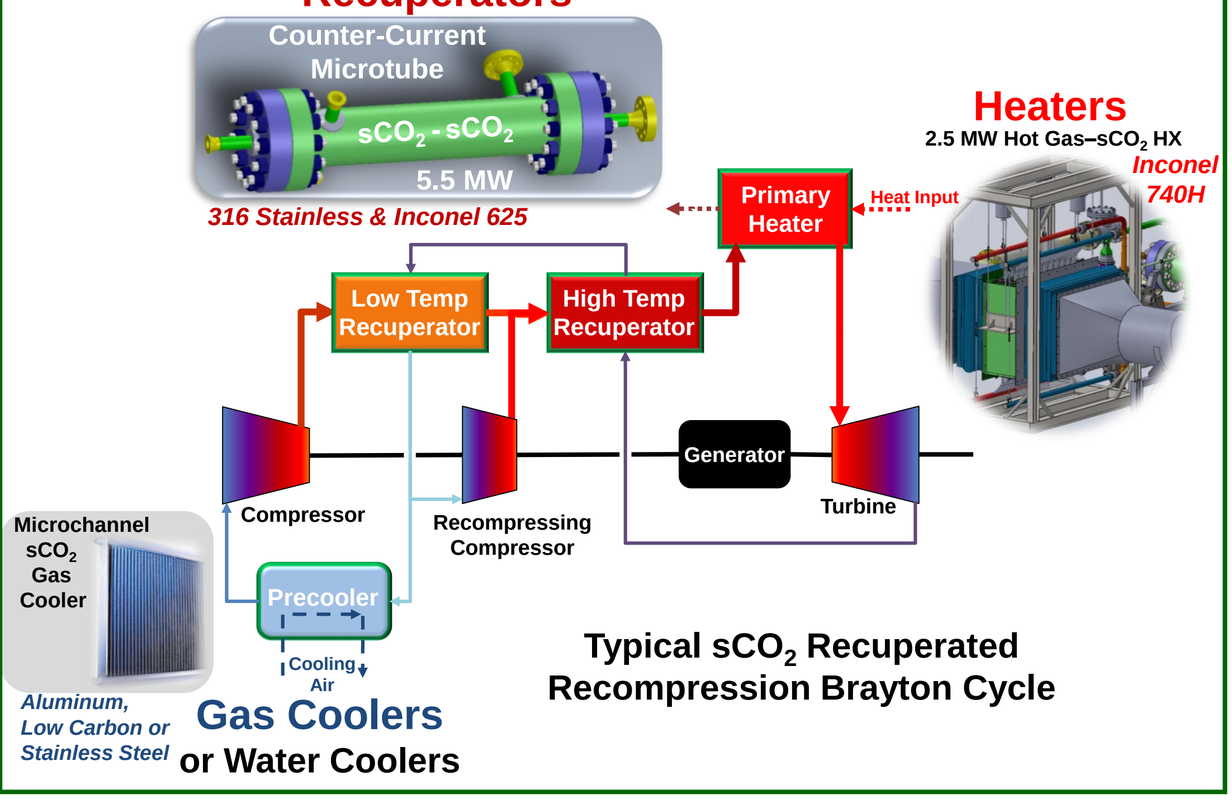
Thar Energy Manufactures sCO_2 Power Cycle Recuperators, Heater HXs & Cooler HXs for



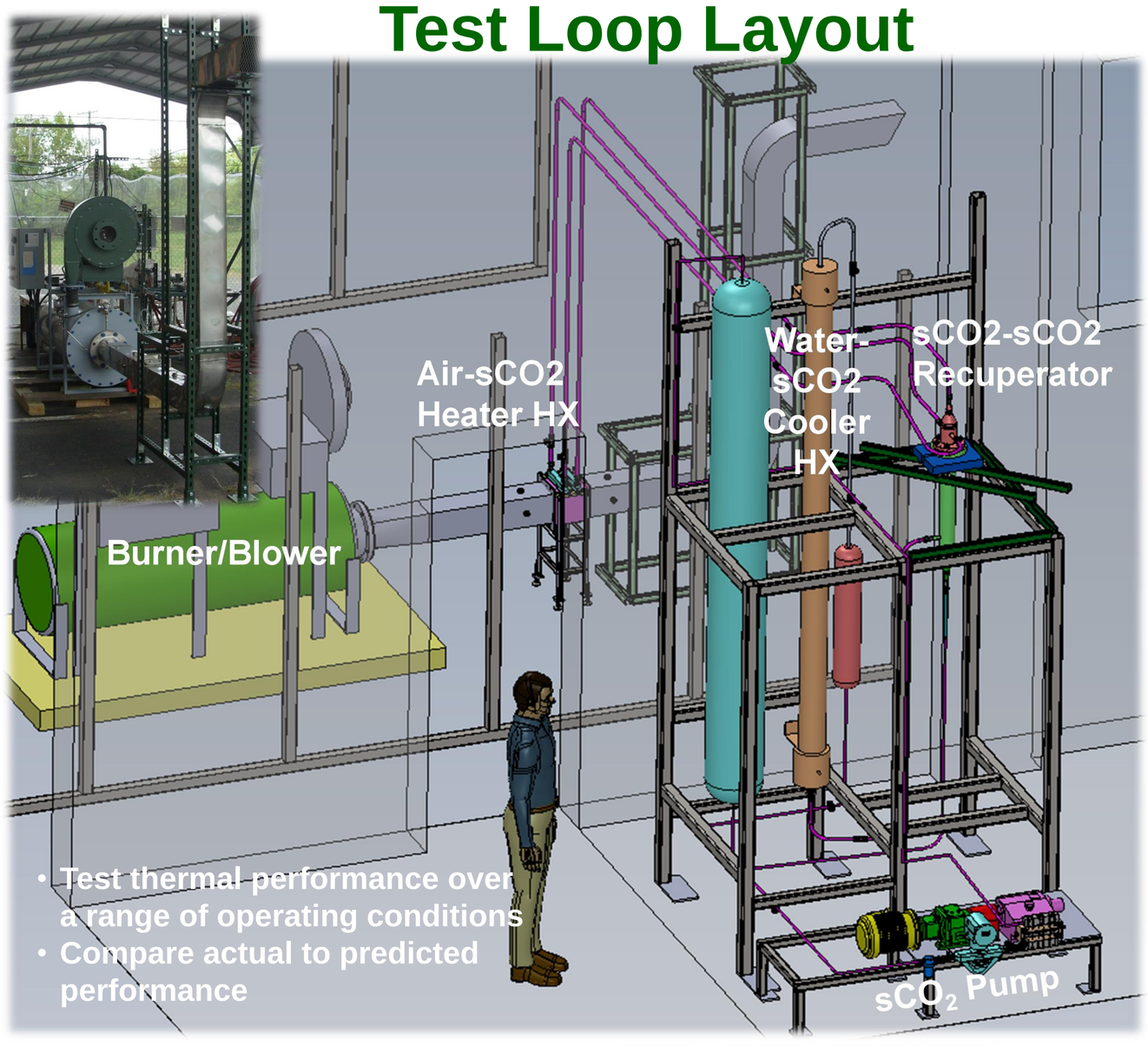
Abstract

The supercritical carbon dioxide (sCO_2) Brayton power cycle is adaptable to a variety of heat sources and has higher cycle efficiency compared to traditional power cycles. As such, it is being considered for multiple power generation applications such as waste heat recovery, fossil, concentrated solar power, geothermal and nuclear.

A key determinant on power cycle efficiency and profitability is heat exchanger (HX) performance and cost.

To evaluate heat exchanger performance, Thar Energy, with funding support from U.S. DOE NETL, has designed a test loop simulating a simple recuperated Brayton cycle. The test facility, under construction, is being sized to evaluate innovative ideas in HX design.

Test Loop Layout



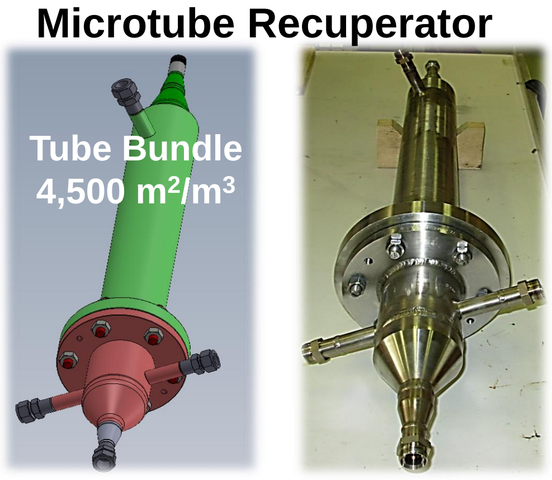
The test loop's focus is on collecting performance measurements to evaluate prototype recuperator, heater HX, and cooler HX.

- **Heat transfer coefficient**
- **Surface density**
- **Fluid flow pressure drop**
- **Friction factor**

The system also allows for the evaluation of individual auxiliary sCO_2 Power Cycle components including pumps, filters, valves, sensors and material properties such as corrosion resistance.

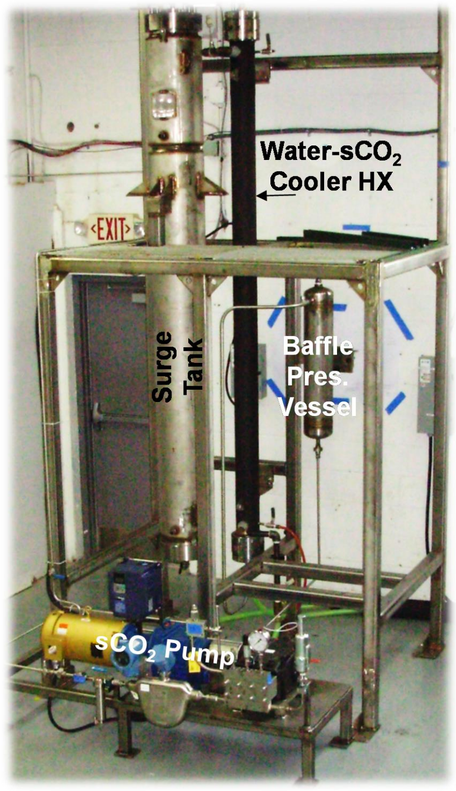
The main components of the loop include a variable speed sCO_2 pump with mass flow monitor, gas fired heater, and a chiller. A pressure control valve has been incorporated as a substitute for the performance of a turbine, thereby enhancing the system's operating flexibility at reasonable costs.

100 kW Inconel 625 Microtube Recuperator



Test Loop Flow Diagram

40 kW Inconel 625 Microtube Heater



Reconfigurable Test Loop

- Pressures to 275 bar
- Temperatures to 700°C
- sCO_2 mass flow to 10 kg/min

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