Heat Exchanger Developments for sCO₂ Power Cycles at Brayton Energy

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Manufacturing Process Development for Lower-Cost Heat Exchangers in High-Temperature/Pressure Applications – Sponsored by DOE/NETL

- Design for lower cost manufacturing
- Process development to execute design – brazing, TLP bonding, welding
- Characterization/validation testing – creep, fatigue of processed heat exchanger
Creep Validation

Configured and processed samples in 800°C, 1000bar, capable CO$_2$ test rig

Creep rupture data for plate-fin tracking with published annealed sheet properties. Testing is ongoing.

Creep Rupture - Plate-Fin IN625
Test Panel, 0.008in Fin, 0.010in Plate, Alloy 625,

Test Data LS Fit
Haynes Data for Annealed Sheet (Interpolated)
Pressure Fatigue Validation

Fatigue capacity exceeds specification requirement. Testing is ongoing.

Configured and processed samples in 1,100°C, 1000bar, capable CO₂ test rig, @ ≈ 120cycles/min.
Thermomechanical Fatigue Validation

Temperature and strain measurements to validate thermo-structural FEA model. Accelerated testing with excess $\Delta T$. 

[Diagram with FEA Model and maneuver graph]