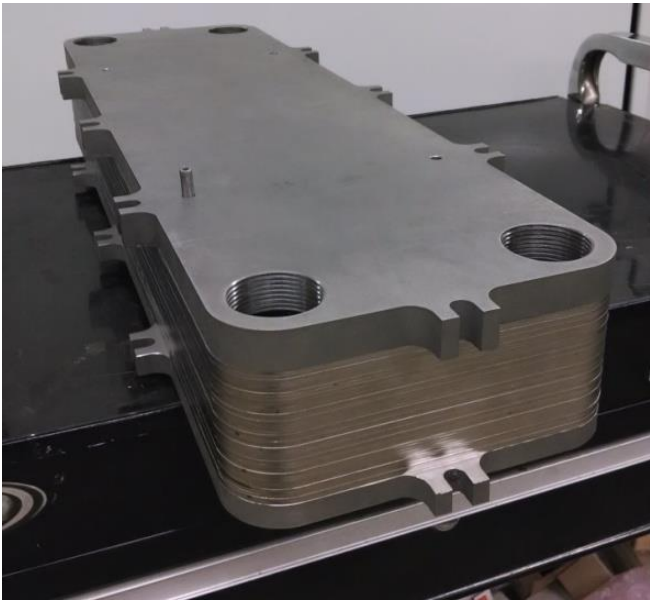


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High Effectiveness and Low Cost (HELIC) Recuperative Heat Exchanger

Purpose built for ScCO₂ waste heat and utility power plant applications



- Stainless steel or high temperature alloy materials
- Nickel-based braze alloy
- Tested to 3,500 psi at low temperature
- Tests show expected high heat transfer rates
- Three 50 KWt units being manufactured for further testing
- 500 KWt HELIC to be built and tested in 2016

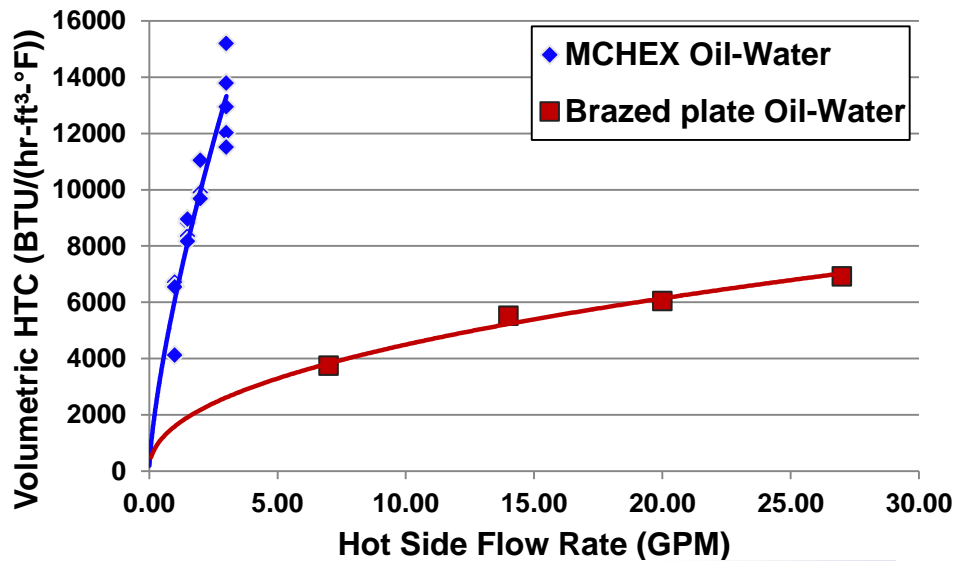


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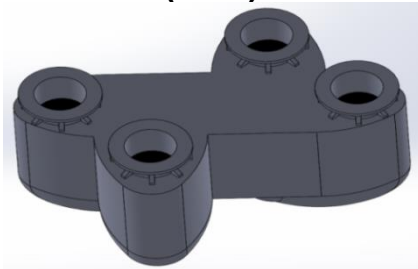
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HELIC Technology Comparison

Volumetric Heat Transfer For Oil-Water



47 MWt
Module

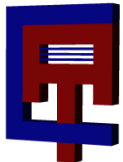


Compared to Brazed Plate

- 400% higher heat transfer rates
- 80% reduction in volume
- 5,000 psi, and higher, pressure capability
- High effectiveness > 90%
- 80% lower external heat loss

Compared to PCHE

- 75% lower weight than target
- 80% fewer parts and joints
- Potential for 60% lower cost
- High efficiency applications will benefit – waste heat and other heat source power systems and heat pump applications



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