Industry Panel Session

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Heatric History and sCO2 to date

- Heatric founded in Australia (1985)
- PCHE developed at Sydney University (1989)
- 1st Application in offshore gas processing (1989)
- First sCO2 Heat Exchanger (1990)
- Relocated to the UK - Joined Meggitt Group (1994)
- SNL sCO2 Test loop (2004)
- First Heatric sCO2 Recuperator (2009)
- Echogen EPS-100 (2011)
sCO2 cycles Heat Exchangers

Rankine
- Evaporator
- Recuperator
- Condensers

Brayton
- IHX?
- Recuperator(s)
- Cooler(s)

Existing Technology
- ASME ‘U’ qualified
- Proven performance in sCO2 test loops since 2004 (TIT, SNL, Echogen, GE, KAERI)
- Proven performances in many other Brayton cycles (Nitrogen, Air, Helium).
- 304 / 304L / 316 / 316L / Duplex / Ti Grade 2 / 6 Moly / 617
- Scalable
- Modular
- Mature
sCO2 cycles Heat Exchangers

Rankine
- Evaporator
- Recuperator
- Condensers

Brayton
- IHX?
- Recuperator(s)
- Cooler(s)

IHX needs development
- High temperature section (material)
- Most likely hybrid to address
  - Low pressure and pressure drop on the hot side
  - High pressure on the sCO2 side
sCO2 Heat Exchangers - Cost optimization

Temperature Approach
- Highly recuperative cycle
- Close temperature approach required
- Care must be exercise when optimising cycles
- 0.94 Eff to 0.98 Eff will double heat exchanger size
sCO2 Heat Exchangers - Cost optimization

**Commercially available materials**
- 316 – 550°C
- 316L - 649°C
- >649°C – higher grade alloys (HR 120 – 617?)
- High grade alloys expensive
- Even 617 do not come in all product forms

**New Materials**
- Must be strong, corrosion resistant, cheap, code qualified and available in many product forms;
- A very large list of material is currently being investigated:
- Which one can answer all these requirements now?
Cycle Commercialization

- Heat exchangers are readily available for commercialisation (Heatric)

- Need to bring cycle designer and product manufacturers together to optimise cycle cost (STEP)

- Need to develop supply chain to reduce cost bringing material suppliers on-board

- Need to bring Utilities to the community to reduce the perception of risk associated with any new technology

- Need to bring the whole community together: this cycle looks driven by the US but what about Asia?
Thank you

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