High-Efficiency Heat Exchanger Operating at Elevated Temperatures and Pressures

Tech ID: 32537 / UC Case 2021-680-0

ABSTRACT

Researchers at the University of California, Davis have developed a heat exchanger produced by additive manufacturing that operates with high efficiency under high pressure and temperature conditions.

FULL DESCRIPTION

Heat exchangers often operate under extreme conditions in large-scale applications. However, exchangers operating at very high temperatures can undergo accelerated corrosion and material fatigue. Similarly, exchangers operating at extreme pressures require increased material thicknesses, increasing production costs. Expensive metal alloys have been introduced for exchangers operating in extreme environments. But, this solution both raises production costs and can lead to lower exchanger thermal conductivity in many applications.

Researchers at the University of California Davis have developed a counter-flow heat exchanger capable of operating under extreme conditions. The exchanger is fabricated using additive manufacturing. It includes an array of microscale pins on both the hot and cold sides of the exchanger – which promotes higher heat transfer rates. This exchanger can be produced through the use of laser powder bed fusion (LPBF) and metallic, 3D printing techniques. It has been tested at temperatures up to 800 degrees C and pressures over 200 bar, and has an estimated operating life of 40,000 hours. The combination of lower fabrication costs and its effectiveness in high temperature/high pressure operating environments exceeds other options available currently.

APPLICATIONS

- A wide range of manufacturing and industrial processes operating at extreme conditions

FEATURES/BENEFITS

- Relatively low manufacturing costs via use of additive manufacturing techniques
- Offers high-efficiency heat transfer
- Size of exchanger can be scaled readily given its fabrication technique

PATENT STATUS

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Reference for National Filings	WO 2022/165022	08/04/2022	2021-680

Patent Pending

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OTHER INFORMATION

KEYWORDS

heat exchanger, energy efficiency, additive manufacturing, 3D printing, metal alloys

CATEGORIZED AS

- **Energy**
  - Other
- **Engineering**
  - Other

RELATED CASES

2021-680-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- A High Flux Microchannel Solar Receiver for Converting Solar Energy into Heat
- Predictive Controller that Optimizes Energy and Water Used to Cool Livestock
- Microchannel Polymer Heat Exchanger

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