Microchannel Polymer Heat Exchanger

Tech ID: 32527 / UC Case 2020-002-0

ABSTRACT

Researchers at the University of California, Davis have developed a highly efficient microchannel polymer heat exchanger in a compact and lightweight design.

FULL DESCRIPTION

Heat exchangers are commonly used for heating, cooling, and refrigeration applications. Their basic function is to transfer heat from one fluid to another, often with the aid of a refrigerant. Most refrigerants are kept in sealed compartments and an additional fluid (typically water) acts as an intermediary transfer between the refrigerant and the fluid being heated or cooled by the heat exchanger. In modern tube-fin heat exchangers a fluid is pumped through metal tube coils and the heat is dissipated through a large collection of fins. This design is not very efficient, as it requires powerful flow across a large volume of fins to effectively transfer heat. Further, the amount of metal needed in this tube design can be expensive to manufacture. A powerful pump is also necessary to compensate for pressure drops throughout the tubes, which is an inefficient use of power.

Researchers at the University of California Davis have developed low-cost, plastic microchannel heat exchangers with superior thermal efficiency. Instead of large metal tube coils, this design features a thin-walled plastic piping network. The surface area in contact with the fluid is thereby substantially increased per fluid volume in this design. The increased surface area contact not only increases the thermal exchange of the system, but also negates the need for a large fan and pump, thus saving additional power and manufacturing costs. The lightweight, chemically-resistant plastic body possibly has a lower manufacturing cost and can be used in a variety of heating, cooling, and refrigeration applications. This novel design is especially promising for cooling single-family and multi-family residences, where it is more efficient compared to finned-tube heat exchangers.

APPLICATIONS

- Chilled fluid distributed heating and cooling
- Centralized heater or chiller systems

FEATURES/BENEFITS

- Possible manufacturing cost savings by using:
- 3-D printing or injection molding instead of more complex metal tube coil manufacturing
- Smaller fan and pump compared to conventional design
- Polymers instead of heavy and expensive metals
- More efficient performance:
- Increased heat transfer compared to conventional metal finned-tube heat exchangers

PATENT STATUS

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OTHER INFORMATION

KEYWORDS

heat exchanger, microchannel plastic, air conditioning, refrigeration/cooling

CATEGORIZED AS

- **Energy**
  - Other
- **Environment**
  - Other
- **Engineering**
  - Engineering
  - Other
- **Materials & Chemicals**
  - Polymers

RELATED CASES

2020-002-0

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,066,197	08/20/2024	2020-002
United States Of America	Published Application	2024/041066	12/12/2024	2020-002

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
- High-Efficiency Heat Exchanger Operating at Elevated Temperatures and Pressures

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