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Mixed Component Internally Cascaded Heat Pump for Industrial Applications

A versatile, single-compressor design that transfers heat between multiple sources and sinks to cut energy costs and emissions in manufacturing.

Researchers at Purdue University developed a novel heat pump configuration that uses a mixed component heat pump fluid with internal cascading. This enables heat transfer from one or more lower temperature heat sources to one or more high temperature heat sinks. Unlike existing heat pumps that require multiple external heat pump loops and cascades at increased cost and number of heat pump compressors, this technology is versatile as it can easily be adapted for any number of heat sources and heat sinks while using only one heat pump compressor. This technology is also advantageous for numerous industrial applications because it increases efficiency of plants by reducing energy costs and carbon emissions.

Technology Validation: The heat pump technology was validated through simulation-based case studies involving industrial distillation processes. Results showed significant improvements, including reduced pressure ratios and lower compressor costs when compared to conventional systems. These outcomes confirm the system's efficiency and versality for heat pumping from plurality of heat sources to plurality of heat sinks.

Advantages:

- Versatile

- Low energy costs

- Carbon dioxide emission reduction

- Utilizes multiple sources and sinks

Applications:

- Chemical manufacturing

- Petrochemical manufacturing

Technology ID

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Category

Energy & Power Systems/Power Generation
Materials Science & Nanotechnology/Thermal Management Materials & Solutions
Chemicals & Advanced Materials/Materials Processing & Manufacturing Technologies

Further information

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- Food manufacturing

- Pharmaceutical manufacturing

TRL: 4

Intellectual Property:

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