A Sustainable, Energy Efficient Process to Quench Chemical Reactions

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- Chemical Engineering

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- chemical reaction
- Cooling
- Electricity
- Ethylene
- Fast
- High-Temperature
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- quenching

Researchers at Purdue University have developed a process for quenching high temperature, high pressure streams without using cooling water. Quenching of reactions is necessary to prevent undesired side reactions or product degradation. Current quenching methods typically require the use of cooling water, but water is expensive and scarce in some places. The Purdue researchers' process cools streams coming from reactors by converting heat to electric power. The process sends the stream to a turboexpander, where the stream generates shaft work. This reduces the pressure and temperature of the stream, and the shaft work is recovered as electric power. The process can also be coupled to a compressor. The compressor uses a portion of the energy from shaft work to compress the stream to allow further processing.

Technology Validation: From streams with inlet temperatures ranging from 700-1000 degrees C, inlet pressures from 5-15 bar, and mass flows of 0.5 kg/s, the researchers were able to generate 217-504 kW of electric power.

Advantages:
- Cools streams from reactors without using cooling water
- Converts heat to electric power
- Sustainable
- Energy efficient
- Water purification not required

Applications:

- Energy recovery from high temperature, high pressure product streams from steam methane reforming or thermal cracking

People:

- Agrawal, Rakesh (Project leader)
- Rodriguez Gil, Edwin Andres

Intellectual Property:

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Contact OTC:

Purdue Office of Technology Commercialization
The Convergence Center
101 Foundry Drive, Suite 2500
West Lafayette, IN 47906

Phone: (765) 588-3475
Fax: (765) 463-3486
Email: otcip@prf.org