

# TechBriefs

## Savannah River National Laboratory

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### Benefits

- > Capable of being inserted into prefabricated vessels
- > High surface area for efficient heat transfer
- > Distributes throughout the vessel for uniform cooling
- > Enables more complete fast-fill

### Applications and Industries

- > Natural gas
- > Hydrogen gas
- > Automotive

### Intellectual Property

- > U. S. Patent 9,809,380 B2
- > Technology in conceptual stage
- > Available for licensing and CRADA opportunities

### Contact Information

Savannah River National Laboratory  
E-mail: [partnerships@srnl.doe.gov](mailto:partnerships@srnl.doe.gov)



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## Innovative Heat Transfer Device for Prefabricated Pressure Vessels

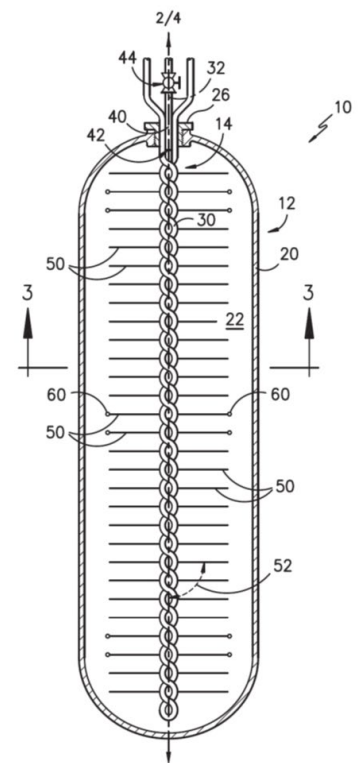
Savannah River National Laboratory has developed a high-surface-area heat transfer device for installation in prefabricated pressure vessels, resolving the “ship in a bottle” issue of how to install a device larger than the opening in a closed vessel and facilitating fast-fill.

### Need

Fast-fill, or the speedy refueling of vehicles, is desirable because it decreases the time and risk of filling fuel tanks, especially in large vehicles, but it is problematic. When the gas is pressurized into the vessel, thermodynamics dictates a temperature increase that causes the pressure to rise, particularly in the new vessels made of thermally insulating polymer or carbon fiber. That phenomenon limits the amount of gas that can be introduced into the vessel and reduces the potential range of the vehicle. Fast-fill exacerbates the increase in temperature and pressure as it allows less opportunity for heat to moderate during fueling. Installing a heat exchanger inside the vessel allows the gas to be cooled during a filling, enabling a higher amount of gas to be transferred and extending the periods between fill-ups.

### Description

The SRNL device generally consists of a twisted cooling tube with thermally conductive fins attached in a radial fashion that can bend enough to be inserted into a small opening. Once inside the vessel, the fins re-extend, distributing the high-surface-area heat transfer device throughout the vessel for uniform cooling to facilitate fast-fill.



Heat transfer unit



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