Spiral Store

A PCM Thermal Energy Storage Device

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New Technology from DIT

Triple Chamber Thermal Energy storage using PCM

Spiral Store is a new type of thermal heat storage unit which involves using Phase Change Material (PCM) around a spiral triple chamber to store and release large amounts of energy at a time. The device can be used for both hot thermal storage and cold thermal storage at an industrial scale, in particular for district heating applications.

Spiral Store is designed to be lightweight and is made up of a cylinder-shaped tank with a base. The tank contains layers, one to heat fluid, one to hold the PCM and one for secondary heated fluid. It is known as a “counter flow device”. The layers in the device work by using flow paths. Each layer has a first flow path and a second flow path. These flow paths are arranged in spirals.

The device stores thermal energy when it is plentiful, and then releases it when and where it is required. A key novelty is that Spiral Store can store both latent and sensible heat – meaning more heat can be stored in a tank of similar size to what is currently used.

As awareness of energy shortages globally improves and the desire to improve how we efficiently store and use heat energy develops, it is hoped that the Spiral Store can be developed as a cost-effective and efficient energy storage technology.

Applications

Spiral Store has been developed as an industrial level energy storage technology, key applications include:

- Use with Co-Generation stations
- Use with electrical generators, boilers and waste heat recovery
- Use in a district heating system

Opportunity

The global market for commercial combined heat and power (CHP) systems will reach $11.2 billion by 2022. CHP for commercial buildings (hospitals, schools, apartment blocks, prisons and other buildings) is also growing with approximately 38 GWe being installed annually.

Commercial installations are primarily located in developed economies, with Northern Europe, South Korea, Japan and the US leading the market. Europe is currently the largest market for commercial CHP.

The Irish market for CHP is relatively small. Presently there are 105 installations with a capacity of 131,521 kWe - only 3 have a capacity of over 10,000 kWe. However, this makes it an ideal test bed for new technologies prior to commercialisation in the European and US markets.

Advantages

Spiral Store has an advanced design for more efficient thermal energy storage, advantages include:

- More storage – the unit holds more heat than water tanks of the same size currently due to spiral design.
- Efficient design – the 3-chamber structure improves heat retention.
- Lighter than equivalent sized storage units.
- More fuel efficient.
- Low cost manufacturing due to uniformity in construction.
- PCM material used may be supplied to the tank as a powder, granular form, solid lumps or liquid meaning that many options are available.

> "A new type of thermal heat storage unit which involves using Phase Change Material (PCM) around a spiral triple chamber to store and release large amounts of energy at a time"

Stage of Development

Spiral Store has been developed by researchers at DIT's Dublin Energy Lab supported by funding from Enterprise Ireland and the International Energy Research Centre (IERC).

The technology is capable of demonstration and an industrial scale prototype has been developed at the Nimbus Centre in CIT. Further development work may be required to develop and scale the device for industrial applications.

The device design is patent-pending. The device and PCM specifications are protected as secret know-how.

DIT is currently seeking expressions of interest from business partners interested in commercialising the technology via a DIT spin-out company, and/or from companies interested in licensing the device for immediate internal use.

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