

應用微膠囊相變材料技術的蓄能裝置 MPCM Thermal Storage System

該蓄能裝置通過集熱器收集並儲存冷量或熱量，並在同時或之後向用戶端供冷或供熱
The device stores heat or cooling from a thermal or cooling collector and simultaneously or later supplies heating or cooling to a thermal service device

專利申請編組及國家：12/024,425 (美國)

特色與優點

該裝置

- 能最大化蓄能效率，減少所需空間
- 可通過選擇特定材料或複合相變材料來滿足不同工作溫度條件的設計需求
- 可避免長時間存儲預熱熱水以改善熱水供應的衛生條件

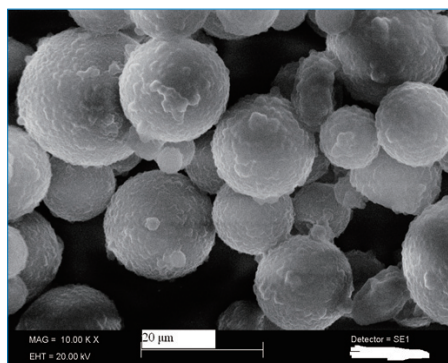
應用

- 利用夜間非峰值電
 - 通過蓄冷為空調系統提供冷凍水
 - 通過蓄熱在需要時提供熱水
- 利用夜間來自冷卻塔或天空輻射板的自然冷源來滿足建築用冷的需求
- 利用太陽能集熱器蓄能以滿足熱水供應

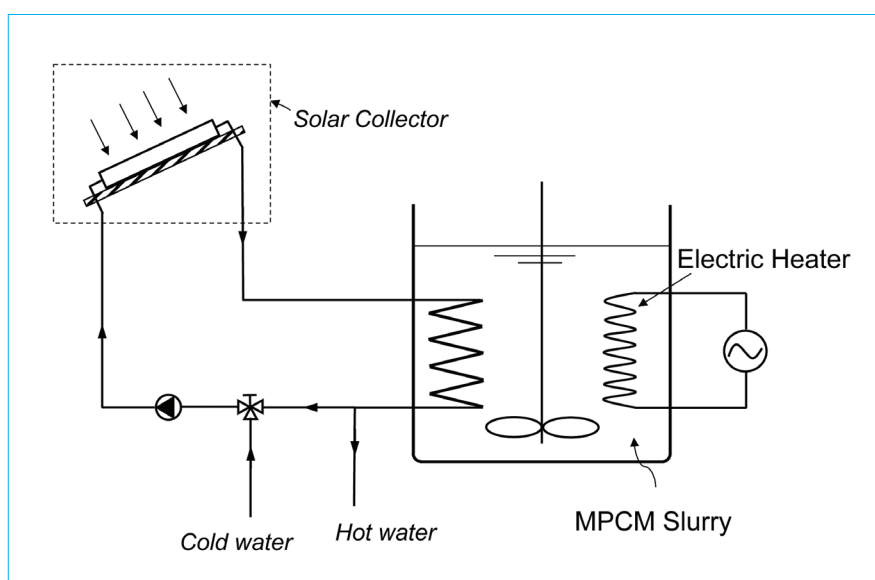
獎項

- 第38屆瑞士日內瓦國際發明展評審特別嘉許金獎(2010年4月)
- 第5屆北京暖通空調國際會議最佳海報獎(2007年9月)

典型的蓄能系統利用非高峰期的低價電能、太陽能、系統或冷卻塔餘熱來滿足採暖、空調或熱水需求。該新型蓄能裝置包括了一個利用微膠囊相變材料水漿液為蓄能材料的蓄能系統，它通過一個熱交換器或直接通過電加熱器來蓄冷或蓄熱，並且在同時或之後通過同個或另一個熱交換器向用戶端提供熱水或向空調或採暖系統供能。由於相變材料封裝在微膠囊中，當相變材料在液態和固態間發生相變時，該水狀蓄能溶液會保持溶液狀態。



微膠囊相變材料溶液
MPCM slurry



用於供應熱水的微膠囊相變材料蓄熱裝置示意圖
Schematics of MPCM storage for hot water supply

Thermal storage systems typically use inexpensive off-peak electric power, solar energy or waste heat, or cooling tower to meet heating, cooling or hot water requirements. This novel thermal storage system includes a thermal storage device that contains an aqueous slurry of micro-encapsulated phase change material(MPCM), which can store heat or cooling through a heat exchanger or directly from an electric heater, and simultaneously or at a later time supplies hot water to a user or heating or cooling to a thermal service device via the same or the 2nd heat exchanger. The aqueous slurry remains as slurry while phase change material within the microcapsules undergoes phase changes between solid and liquid states.



示範裝置：夜間電蓄冷微膠囊相變材料蓄能裝置
Prototype: MPCM slurry storage of night time electric cooling

Patent Application No:12/024,425 (US)

Special Features and Advantages

The device

- is more compact in size by maximizing the energy storage capacity per unit volume, and
- can be designed for different working temperatures by selecting a particular or a combination of phase change materials
- avoid long time storage of preheated warm water, improving hygienic conditions of hot water supply

Applications

- Use Night-time offpeak electricity for
 - Cooling storage for generating chilled water for air-conditioning applications
 - Thermal storage for supplying hot water when needed
- Use nocturnal natural cooling from an cooling tower or a sky-radiator for building cooling applications
- For thermal storage from a solar collector for hot water supply

Awards

- Gold Award with the Congratulations of the Jury, The 38th International Exhibition of Inventions of Geneva, Switzerland (April 2010)
- Best Poster Award, The 5th International Symposium on Heating, Ventilating and Air-conditioning, Beijing (September 2007)

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