



# Probably The Best Thermal Storage In The World

THERMAGINE

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## The Company

Thermagine's mission is to make cost-effective, highly-efficient systems from groundbreaking technologies that allow industrial customers to significantly improve their waste heat utilization inside manufacturing plants in the shortest possible time.

## The Product

Current thermal storage techniques available to industry are large and/or complex, often having payback times that make an investment in such systems uneconomical for the end-user.

Thermagine's thermal storage is different.

Powered by R&D breakthroughs from the Institute of Technical Thermodynamics of Germany's Aerospace Center (DLR), this revolutionary system (patent pending) improves the thermal transmission of heat through phase-change-materials (PCM) by a factor of 50X, paving the way for customers to reduce their environmental emissions by up to 50%, with payback times as low as 18 months.\*

## How It Works

**Charging:** Waste heat in the form of a heat transfer fluid such as thermal oil or steam goes into the heat storage system. At a predetermined temperature, our proprietary, high-performance PCM melts, capturing 100% of the energy and storing it for re-use in the production process. Thermagine's PCMs are safe, non-flammable and recyclable. The system has a built-in, integrated heat exchanger, so that only 1 inlet and 1 outlet connection are required.



**Deployment for Spanish utility company:**  
350 kW<sub>th</sub> for 2 hours: 750 kWh<sub>th</sub>  
Size: 1.0 x 1.5 x 6.0 m

**Discharging:** By feeding in heat transfer fluid at a temperature that is slightly lower than the predetermined melting point, the PCM solidifies, generating heat in the process. Thermagine's systems have a 1:1 charge/discharge performance ratio, which means that 100% of the charging energy is available for discharge. The heat storage system is designed for multiple charge-/discharge cycles daily.

## Benefits

- **Compact:** Up to 1/16<sup>th</sup> the size of current thermal storage systems.
- **Quick ROI:** 2-3 year payback time in a typical batch manufacturing scenario.
- **Cost-effective:** Savings of 30-50% of energy usage possible in both existing and new plants.
- **Recyclable:** PCMs can be re-used for add-on/replacement systems in the event that production parameters change.

\***Disclaimer:** The exact amount of energy savings is strongly dependent on the type of manufacturing process and the physical layout of the plant. Each plant and application has characteristics that are unique to itself.

# SAVING ENERGY TO MAKE YOUR BUSINESS WIN



## THERMAGINE



### Phase-Change-Materials

When a PCM is heated, the material undergoes a transition from solid to liquid. The temperature of the material remains constant whilst the material absorbs the thermal energy. This enables the storage of large amounts of heat within a narrow temperature range. Similarly, when the material is cooled, it releases 100% of the stored energy at a constant temperature, thereby producing a constant thermal power discharge.

### Technology

Scientists at the DLR dramatically increased the power density of PCM storage. This is a result of decades of painstaking research and testing solar thermal and combined heat and power (CHP) systems. In some configurations, an excess of 100 kWh<sub>th</sub>/m<sup>3</sup> is possible (the equivalent of 100 kettles boiling continuously for 1 hour in 1 m<sup>3</sup>).



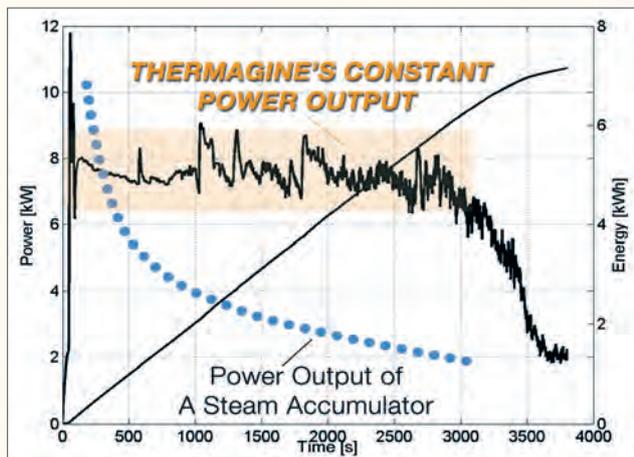
German  
Aerospace Center

### Industry Applications

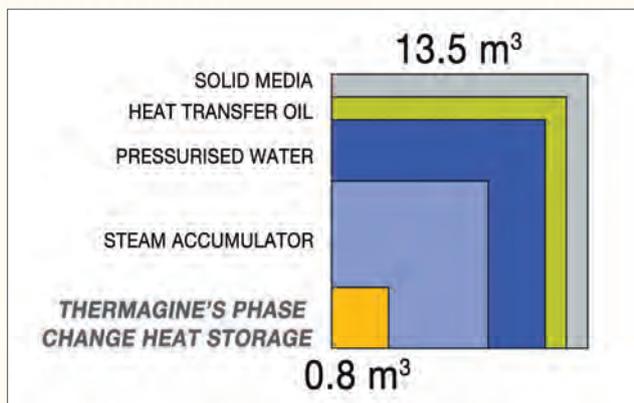
PCM heat storage is ideal for energy-intensive industrial processes involving batch manufacturing; where steam or thermal oil is used as the heat transfer medium. It is especially suited to steam-based industrial processes because the steam temperature remains constant during the energy absorption and release cycles through the latent heat of condensation and evaporation.

#### Examples

- Paper production
- Bulk chemical production
- Food products manufacturing
- Cement manufacturing
- Plastics Production
- Refining



**Constant Power Output:**  
Actual power profile of Thermagine's PCM storage compared with a typical steam accumulator.



**Thermagine's storage is up to 16X smaller:**  
Size comparison of different heat storage techniques for a typical 160°C (320°F) steam storage application.