

Why do we want to store thermal energy?

Thermal energy storage makes it possible to:

- use alternative energy sources which are available at times when energy is not needed. For example, solar energy can be saved for night use.
- reduce the size of energy production equipment. Energy can be produced and stored during off-peak hours.

How can thermal energy be stored?

Thermal energy can be stored in several different ways:

- Traditionally as *sensible heat*, i.e. by heating and cooling a material such as water. The material is heated to a higher temperature at loading and cooled down at deloading. Water is a common material for sensible heat storage at temperatures between 5 and 100 °C. An every day example is the warm water accumulator.
- In Phase Change Materials (PCMs) utilising the *latent heat* of a material. Every time a material changes phase (e.g from solid to liquid, liquid to vapour etc.) heat is given off or taken up. For example, when an ice cube melts in a drink heat is required and is taken from the liquid which is cooled. The heat of melting is 80 to 100 times larger than the heat required for heating a material one degree. The use of liquid-vapor phase change further increases the energy density.
- Using the *heat of reaction*, i.e. the heat released or required during a chemical reaction. The reaction must be reversible, i.e. possible in both directions. The chemicals can be stored separately and mixed when heat is needed. The use of chemical reactions for thermal energy storage expands the temperature range for storage and also increases the possible energy density in the storage.

Where can PCMs and chemical reactions be used for thermal energy storage?

Some potential applications of PCMs and chemical reactions for thermal energy storage are

- Residential heating and cooling
- Commercial building heating and cooling
- District heating and cooling
- Green houses temperature control
- Temperature control of telecom and other electronic equipment
- Conservation and transportation of temperature sensitive goods
- Cold bags, warm keeping, medical wraps etc.