

Cooling naturally with Phase Change Materials



TROX[®] TECHNİK

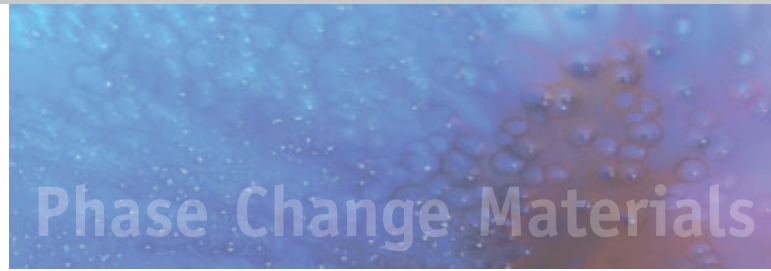
The art of handling air

Cooling naturally with Phase Change Materials

Modern architecture must combine aesthetics with functionality and energy with comfort. TROX innovations in ventilation and air-conditioning technology meet all these requirements at the highest level. We do not talk about energy efficiency, we achieve energy efficiency. One of these trend-setting innovations is the TROX decentralised sill ventilation unit with PCM latent-heat storage. Developed especially to meet today's requirements, ideal for renovations, it takes energy efficiency to a whole new dimension.

PCM – the energy of phase change

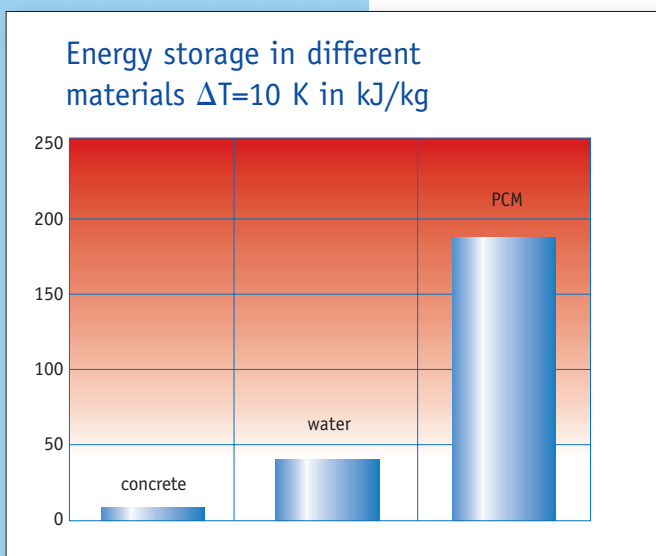
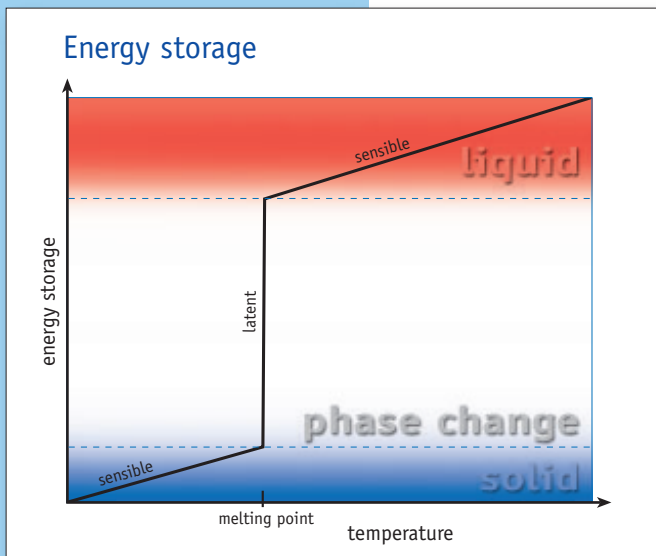
Every material is actually a Phase Change Material (PCM) because at certain combinations of pressure and temperature every material can change its aggregate state (solid, liquid, gaseous). In a change of aggregate state, a large amount of energy, the so-called latent heat, can be stored or released at an almost constant temperature. Compared to the storage of sensible heat, there is no temperature change in the storage.



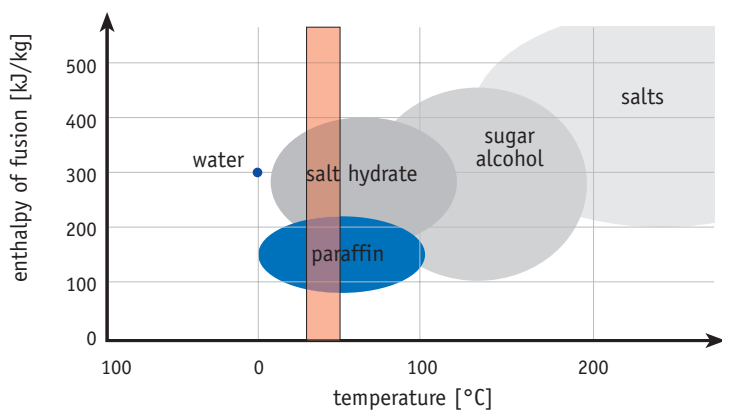
Thus a small difference in temperature can be used for storing energy and releasing the stored energy. Let's suppose that a storage medium at room temperature is cooled by 10 K at night, then the thermal mass of a kilo of concrete has the cooling potential to absorb 10 kJ heat from the room over the day. As during night-time cooling, the PCM changes its aggregate state from liquid to solid under the same conditions, this gives rise to a cooling potential of approx. 190 kJ (approx. 0.05 kWh) per kilogramme, which is 19 times greater than concrete.

Use of natural storage materials

Today, classic cooling systems are used for room cooling, and these ensure that the rooms are cooled to a comfortable temperature in all environment climates. These systems are effective, however they would be a lot more energy-efficient if they used the natural temperature differences between day and night for cooling purposes. The use of the building mass as a storage medium is well known. This concept of night-time cooling has already been successfully implemented in many construction projects. Energy storage is achieved through the use of PCMs. Due to the range of use being between 20 and 25 °C, paraffin or salt hydrates can be used.



Areas of application of different PCMs



TROX PCM – cooling without a refrigerating machine

This is how an air-based PCM system works: in daily operation, warm outside air is sucked in by a PCM storage unit, where it is cooled and introduced into the room. This cooling process is effective until the previously solid PCM in the storage unit has liquefied as a result of the heat it has absorbed. At night, the cold air is sucked in, the PCM solidifies and this can then be re-used during the day to cool the room.

Depending on the design of the latent-heat storage unit, a pleasant room temperature can be ensured for up to 10 hours during the day.



Heating, cooling and fresh air – all in one unit at TROX

With the decentralised undersill unit with PCM module, the outside air is sucked through an opening in the façade and introduced into the room in a displacement mode through the under sill trim. The adding of room air (called secondary air) or solely secondary air operation enables the PCM in the storage unit to melt at a slower rate. A class F7 fine dust filter protects the interior of the unit and guarantees excellent supply air quality.

A shut-off damper with a spring return actuator ensures that the façade is completely sealed during a power failure. An energy-efficient and acoustically optimised EC fan is installed in the bottom of the unit. For the purpose of heating, there is an integrated air-water heat exchanger. In summer, during the night-time discharging of the storage unit, the building structure is also cooled.

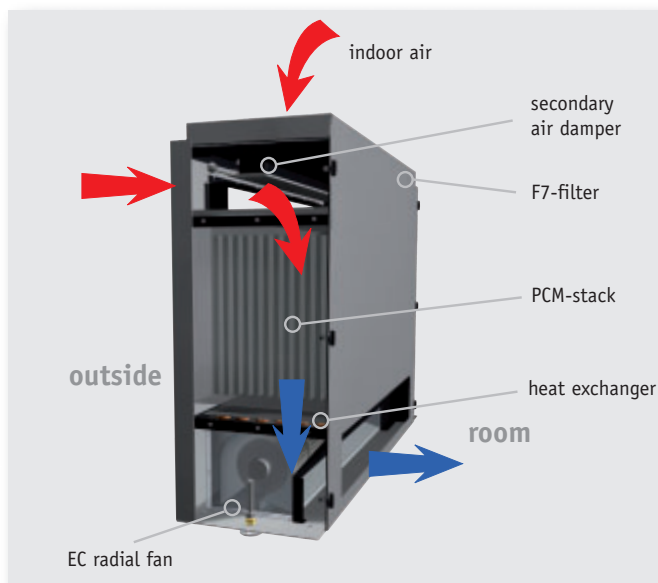
This means that the unit can be used in rooms with a cooling load of up to 60 W/m².

Energy-efficient and sustainable

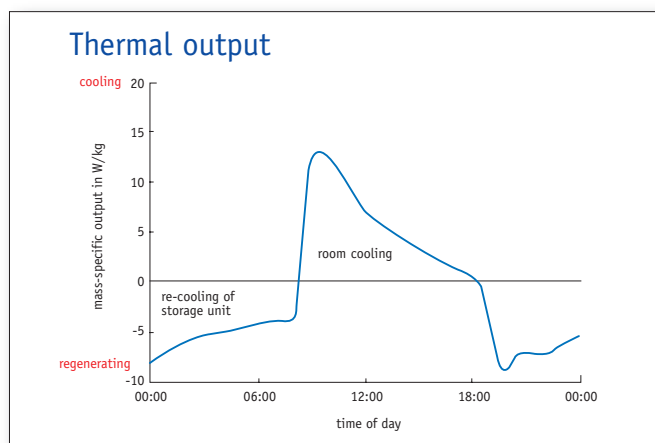
TROX PCM units allow you to use the natural cycle of nature and not only save huge amounts of energy but also a lot of money in investment and operating costs.

Your advantages at a glance

- No investment costs in centralised cooling systems and piping systems
- Reduced operating costs with lowest use of energy (fan capacity < 10 W)
- Environmentally friendly as a result of cooling without refrigerants and CO₂-neutral
- Ideal for renovations

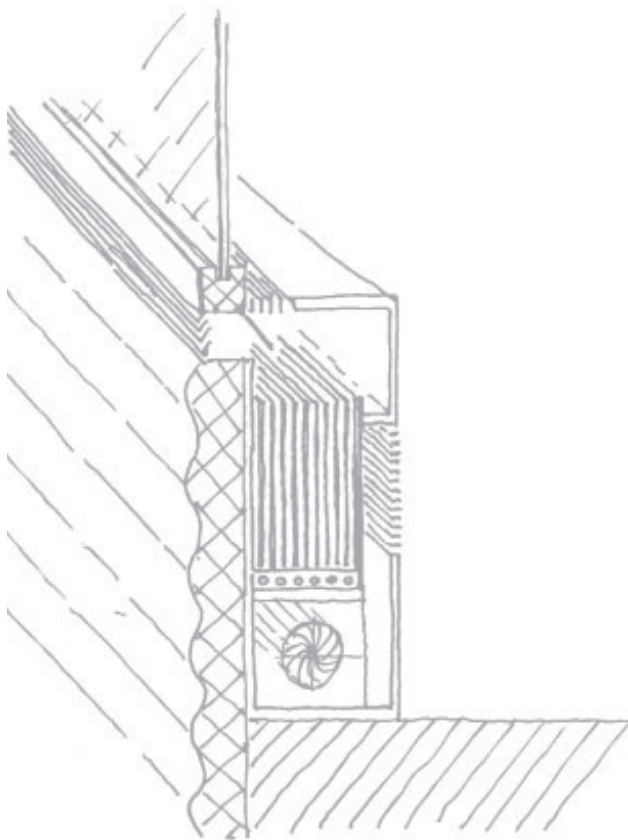


Cooling operation, summer, daytime



Technical Data:

Volume flow rate: 150 m³/h
 Sound pressure level at 8 dB room attenuation: 32 dB(A)
 Thermal mass of PCM: approx. 30 kg
 Cooling potential: approx. 1.4 kWh
 Average cooling capacity when used for 5 hours: approx. 280 W



TROX[®] TECHNIK



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