



LHTES: a Latent Heat Thermal Energy Storage Unit

Notice

Concept

The LHTES is a heat exchanger composed of phase change materials (PCM) that have the property to store and to release a big amount of energy when the materials change from solid to liquid. This property of the PCM, combined with external and internal temperatures, will allow to discharge the heat from the building in summer, and to preheat it in winter.

Functioning description

The system is fixed to the existing wall and connected to the interior and to the exterior through two different circuits that are presented in Figure 1.

The LHTES system can function as a cooling system or a heating system, as can be seen in Figure 2:

- Heating: during a cold sunny day, the heat is stored in the PCM by melting and at night when the temperature drops, the air is blown and heats the internal zone
- Cooling: during summer, at night the EXT – EXT circuit allows the solidification of the PCM, and during the next day it is used as a cooler
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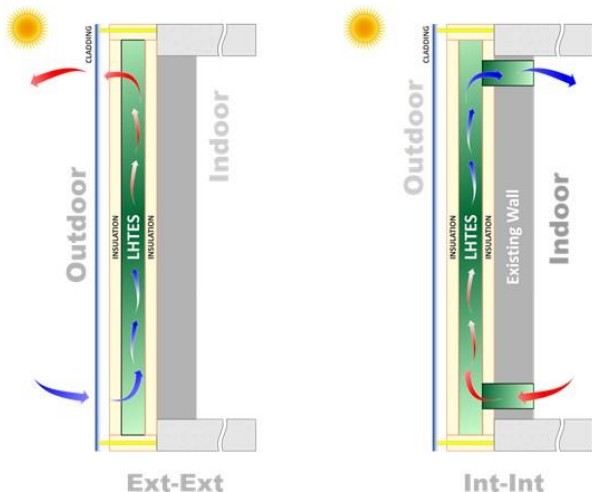


Figure 1: The modes of LHTES system: EXT - EXT and INT - INT

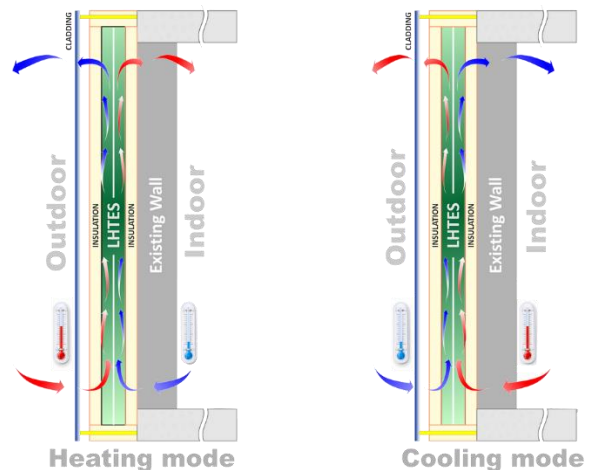


Figure 2: Heating and cooling functioning with LHTES

Technical presentation

The LHTES system fits into a casing that is made of Etalbond produced by ELVAL COLOR, partner of the project. The casing allows the air tightness of the system that is crucial for its efficiency. The dimensions

of the casing are 654 mm width, 2700 mm of height (that corresponds to a floor to floor space) and 154 mm of thickness.

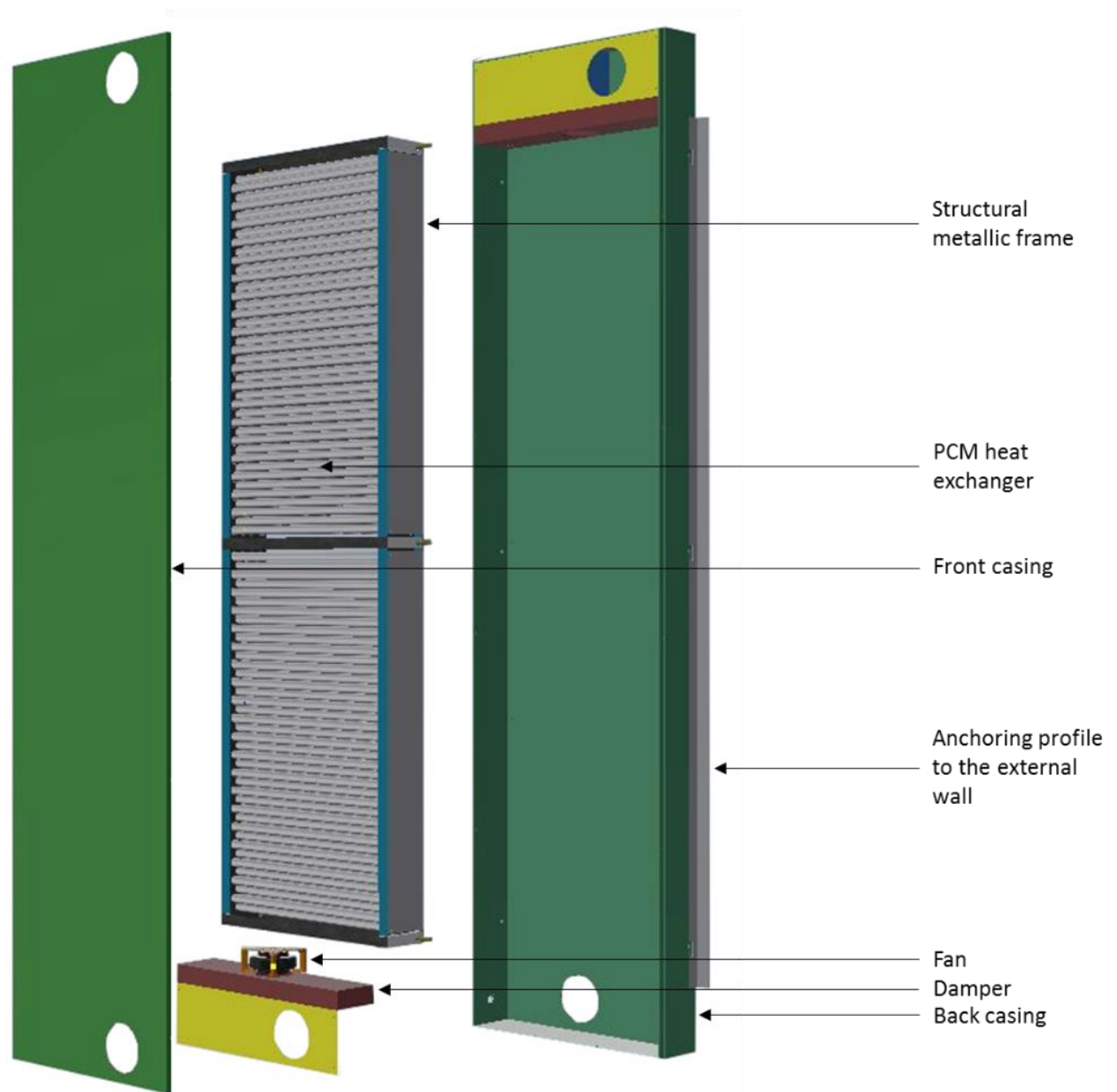


Figure 3 : LHTES components

The LHTES system is composed of four different main blocks that are in order of installation:

- The back of the casing, in which the accessories such as fans, dampers are integrated. Behind it, there is a 20 mm insulation layer.
- The structural metallic frame that holds the PCM exchanger. It is associated to the back of the casing, it is the main structural piece.
- The PCM heat exchanger that can be made of PCM plates as in the above figure or horizontal tubes. It weighs approximately 80kg. The PCM itself can differ from one solution to another. The type of PCM is selected based on the building's location weather.
- The front part of the casing that assures the air tightness. A 30 mm insulation layer will be fixed in front of it (for a total 50 mm of insulation layer)

LHTES – an energy storage system of the E2VENT module developed by Nobatek/INEF4

Technical characteristics summary table

Height*Width*Thickness (mm)	2500 * 600 * 160
Weight	
- Total	180 kg
- PCM	56 kg
- Etalbond (casing)	55 kg
Air flow	120 m ³ /h
Cycle duration (16°C to 24°C or 24°C to 16°C)	10h
Energy stored (same temperature)	1,75 kWh
Maximum power	400 W
Average power	180 W
Fan energy consumption	27 W
COP	9

Dimensions and installation process

The dimensions of the LHTES are visible in the following technical drawings.

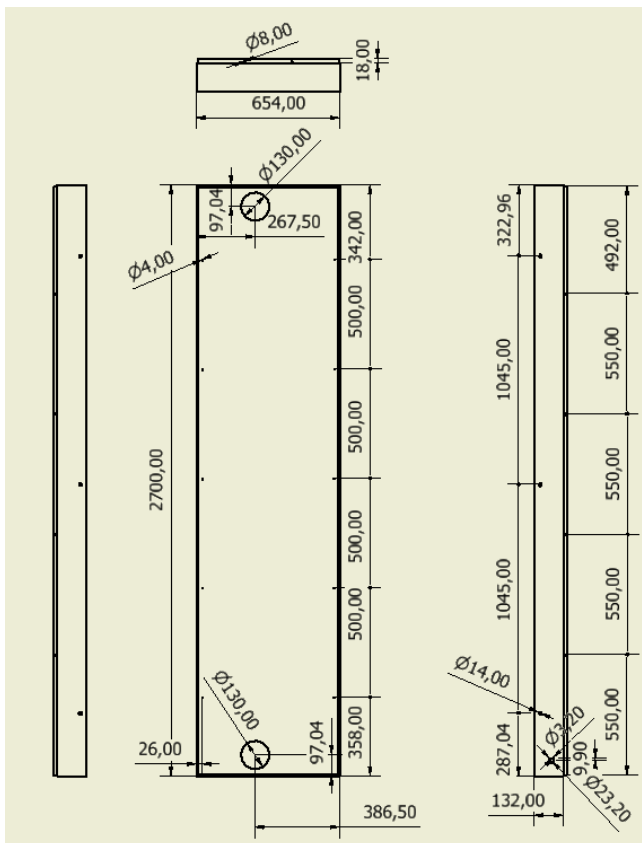


Figure 4 : Figure 5 : Layout of the back casing

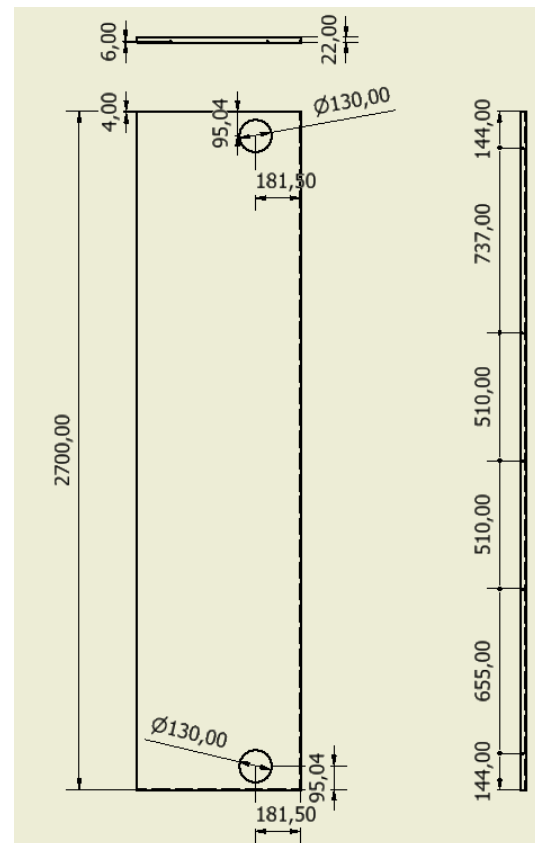


Figure 6 : Layout of the front casing

The LHTES is pre-assembled in laboratory in order that the onsite installation is eased and quickened. Therefore, the following elements are assembled: the casing, the PCM heat exchanger, the sensors, the actuators (fan and dampers). The onsite installation process is divided in 6 steps that are detailed in the following table.

LHTES – an energy storage system of the E2VENT module developed by Nobatek/INEF4

The LHTES detailed installation process on a building is composed of the following steps:

Steps		Description
1	Installation of the LHTES support profiles	<p>Drill 2 holes (ø130 mm) in the external wall for the air ducts</p> <p>Drill 6 holes (approx. ø14mm) in the wall to fix the anchoring profiles</p> <p>Check the correct position of the holes (L profiles and wall) with the template</p> <p>Stick the rubber thermos- pads to the back of the L profile</p> <p>Install the chemical anchors (to fix the L profiles)</p> <p>Install the L profiles</p>
2	Installation of the LHTES on the anchoring profiles	<p>Place the back-insulation layer (20 mm) of the casing</p> <p>Lift the LHTES from the top in order that it is in the correct position to place it on the profiles</p> <p>With the lifting device, place the LHTES on the anchoring profiles and fix it</p> <p>Open the front casing to check the alignment between the casing holes for internal air circuit and the holes drilled in the wall</p>
3	Installation of the air ducts	<p>Saw the ducts to the correct length for internal and external air circuit</p> <p>Collocate the ducts and the duct collars (with aluminium tape and rivets) that correspond to internal air circuit, insert them and fix them to the back casing with rivets</p> <p>Go inside the room and use sealing foam to make airtight the connexion between the duct and the internal wall</p> <p>Install the internal grids and air filters</p> <p>Collocate the ducts and the duct collars (with aluminium tape and rivets) that correspond to external air circuit, insert them and fix them to the internal cover with rivets</p>
4	Devices installation	<p>Fix the connector on the outside of the casing and connect it to the electric connections from the inside of the casing</p> <p>Connect the cable from the BEMS and process to basic testing to check the correct functioning of the fan and dampers</p>
5	Closing the casing	<p>Close the front casing with screws</p> <p>Place the external grids and air filters</p> <p>Use tape all around the casing to improve its air tightness</p> <p>Scotch the insulation layers on the front of the LHTES (30 mm)</p>
6	Commissioning	<p>Tests the dampers</p> <p>Test the fan</p> <p>Air tightness test with</p> <p>Air flow measurements</p> <p>Acoustic measurements</p>

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More on the E2VENT website: <http://e2vent.eu/>

More on the system of the E2VENT module: <http://systems.e2vent.eu/>

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