

SALCA

Smart Materials
Smart Applications

PHASE CHANGE MATERIALS
Bart Winters

SALCA

Phase Change Materials

Materials for latent heat storage

"A PCM is a substance which, melting and solidifying at a certain temperature, is capable of storing and releasing large amounts of thermal energy."

LIQUID
0 °C
SOLID
0 °C

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Phase Change Materials

- ▶ Water
- ▶ Salt Hydrates
- ▶ Paraffine

Temperature Range	Water (kJ/kg)	Thermusol® (kJ/kg)	Microcapsules (Paraffine) (kJ/kg)
10	260	126	42
15	276	138	63
20	293	150	94
25	309	162	105
30	325	175	125
35	341	187	146
40	358	199	167

Source: Capzo International 3

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THERMUSOL

- ▶ An innovative, patented PCM, developed by Capzo International and produced by Salca
- ▶ Micro-encapsulated salt-hydrates:
 - High capacity because of salt-hydrates as a basis
 - High stability because of composure of core-material and micro-encapsulation
 - High heat transfer because of micro-encapsulation
- ▶ Thermusol can be an additive in many materials, but there are some challenges.....

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PCM in end-products



- ▶ Important issues:
 - Smart integration into existing materials or systems
 - Heat transfer “packaging” in combination with PCM
 - Charging and recharging of the PCM (Heat Battery)
 - Active versus passive systems

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THERMUSOL



Owner of Thermusol® and technology.

- 2 PhD students
- European project
- www.prospie.eu



Producer of Thermusol® and Thermusol® related products



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Thursday, November 25, 2010

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Laboratory



SEM, particle analyses



MDSC, analyses of thermal behaviour of PCM.
TA Q200

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Thursday, November 25, 2010

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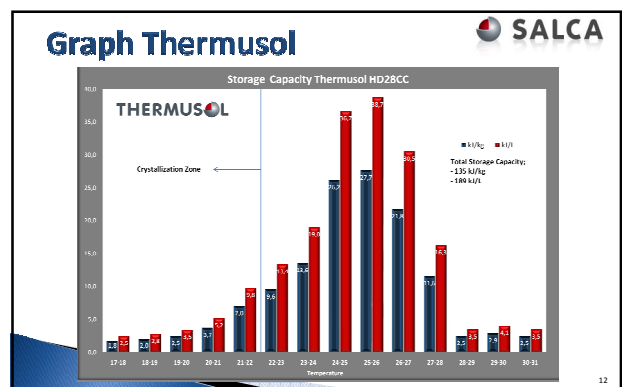
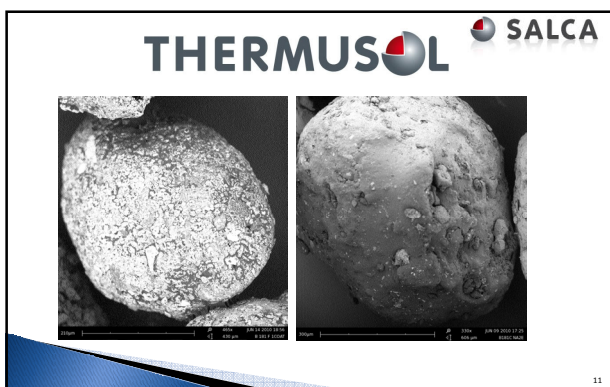
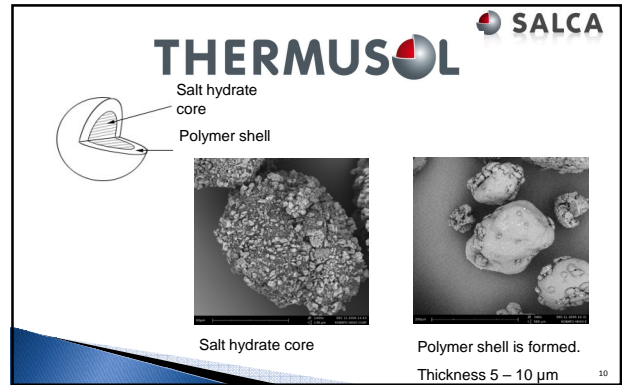
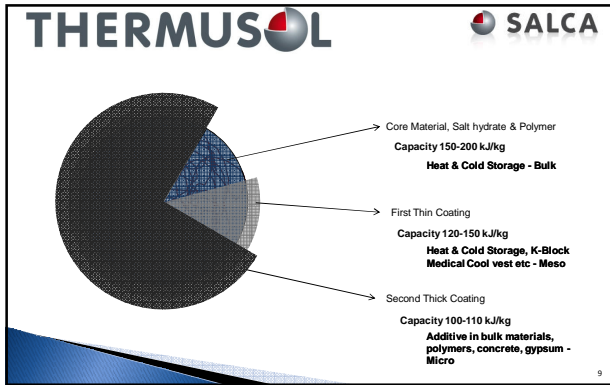
Production




Capacity for 100 ton Thermusol


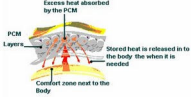
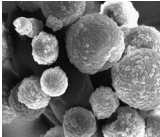
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PCM in Textile

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Smart Applications










Smart Applications

- ▶ **Building Materials (wallboards, ceilingboards/baffles)**
- ▶ **Boilers (heat storage)**
- ▶ Medical
- ▶ Clothing
- ▶ Fire Retarding products
- ▶ Etc.



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K-BLOCK





- Easy and quick to install in existing situations
- Adjustable for different temperature
- Competitive price with reference-product
- High heat transfer (TNO measurements available)
- Durable way of peak-shaving temperatures in spaces with excess internal heat

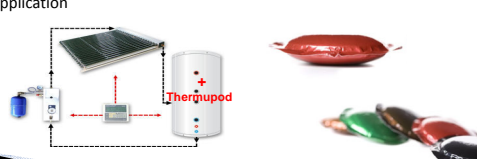
Available unit for night-ventilation




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THERMUPOD[®] SALCA

- Available in different temperatures
- Price level is compatible with reference solutions
- Good heat transfer
- Easy in application



Bicell[®] & THERMUSOL

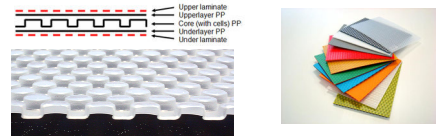
The Ideal Combination of Packaging and PCM



IPB
Bicell Energy
Thermusol Trade
Phase Change Materials
SALCA
It's K Time

Bicell[®]

Bicell is an extruded polypropylene sheet, consisting of several layers. The cell structure is the core of this sheet. It gives Bicell its main characteristics : high flexural resistance in all directions, high compression strength and an enhanced strength/thickness ratio.



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Heat Transfer

The right heat transfer is the key for all PCM applications.

Heat Transfer is dependent on:

- the type of PCM
- the packaging material
- the maximum possible contact of air/water with the packaging and PCM (m² packaging/kg PCM)
- the ΔT and ventilation/flow speed

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Bicell Energy
Thermusol® Inside

The Ideal Packaging

Bicell® and Thermusol® tablets are the ideal combination for optimal heat transfer, high durability and flexibility.

Phase Change Materials

It's K Time

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Bicell Energy
Thermusol® Inside

Potential Markets

Buildings
For durable cooling and heating of existing and new buildings

Heat Buffering
For enlarging the storage capacity of existing and new buffers

Ventilation
PCM induction units as durable cooling with existing and new ventilation systems

Clothing & Textile
Cool vests, protection clothing for police, army, firemen, etc.

Automotive
Durable cooling and heating of cars
Heat management of batteries of electric cars

Your Market

Phase Change Materials

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Bicell Energy
Thermusol® Inside

Bicell® Energy THERMUSOL INSIDE

The Ideal Combination of Packaging and PCM

Bicell® Energy vs Concrete

The same heat storage capacity, different weight and size...

Material	Weight (kg)	Thickness (mm)	Heat Capacity (kJ/m²)
Bicell Energy	1.0	10	167
Concrete	2.5	100	167

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Graph Thermusol

Storage Capacity Thermusol HD10TB

Temperature Range (°C)	Storage Capacity (kJ/kg)
0-1	1.0
1-2	1.0
2-3	1.0
3-4	1.0
4-5	1.0
5-6	1.0
6-7	1.0
7-8	1.0
8-9	1.0
9-10	1.0
10-11	1.0
11-12	1.0
12-13	1.0
13-14	1.0
14-15	1.0
15-16	1.0
16-17	167

Crystallization Zone

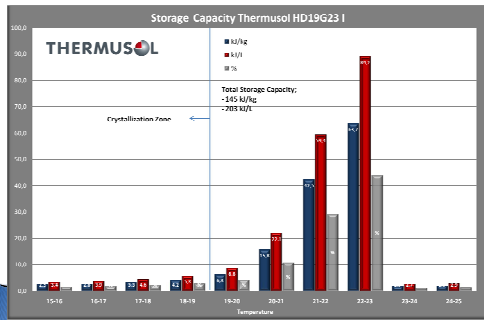
Total Storage Capacity:
- 165 kJ/kg
- 167 kJ/kg

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It's K Time

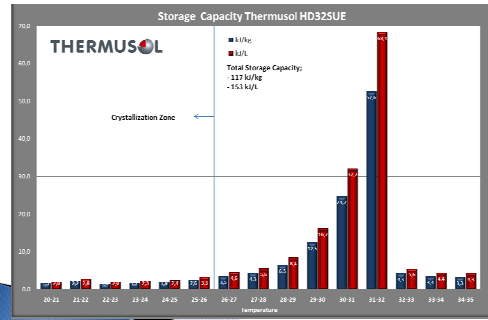
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Graph Thermusol



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Graph Thermusol



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Thank You



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