

## **TECHNICAL DATA SHEET – savE® HS 22**

savE® Phase Change Materials (PCM) are organic or inorganic chemical compounds that have large amount of heat energy stored in the form of Latent Heat which is absorbed or released when the materials change state from solid to liquid or liquid to solid. The PCM retains its latent heat without any change in physical or chemical properties over thousands of cycles. Various specific temperature savE® PCM's are commercially available (-33<sup>0</sup>C to +89<sup>0</sup>C) depending upon the applications.

### **Applications**

PCM provides energy efficient solutions for many industries including:

- Insulation for Building and Piping Products
- Biopharmaceutical Transportation
- Telecommunications and Heat Sinks
- Hot and Cold Storage
- Food / Poultry / Milk Products Transportation
- Boiler and Hot Water Systems Industry looking to exploit Off-Peak Electricity Tariffs / Reducing Chilling Equipment Costs by Storing Energy at Off-Peak Hours

However there is no limit as to who can apply PCM technology to their operation, to improve thermal management, cost and energy efficiencies.

### **PLUSS® Encapsulation**

Pluss® pioneered the use of HDPE panels as encapsulation for PCMs in India. Our calculations for total heat transfer across thin membranes show that HDPE/ PP is as good as aluminum, stainless steel, etc. Pluss® encapsulations are thin enough to give good overall heat transfer coefficient with good mechanical strength.

### **savE® HS 22**

savE® HS 22 is an inorganic chemical based PCM having freezing temp. of 22<sup>0</sup>C. It stores thermal energy as latent heat in its crystalline form. On changing phase this latent heat is released or absorbed, allowing the ambient temperature within the system to be maintained.

HS 22 is constituted of the right mix of various salts, additives and nucleating agents allowing equilibrium between solid and liquid phases to be attained at the melting point. The savE® HS 22 is free flowing in molten state and can be encapsulated in various forms .

### Why *savE<sup>®</sup>* HS 22?

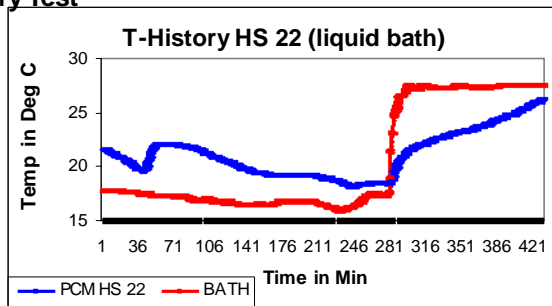
*savE<sup>®</sup>* HS 22N has a phase change temperature of 22<sup>0</sup>C, a temperature that makes it ideal for several heating/cooling thermal energy applications. Some of its salient features include:

- The salt is chemically and thermally stable by using PLUSS<sup>®</sup> proprietary additives
- Mixture of Inorganic Salts

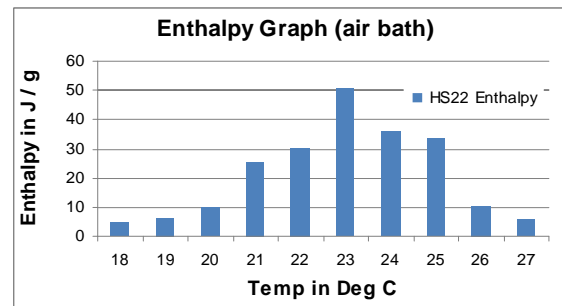
### Technical Specification:

Product	: <i>savE<sup>®</sup></i>
Series	: HS 22
Description	: Mixture of Inorganic salts
Appearance	: Brown / Grey coloured liquid

### T-History Test



T-History graph for *savE<sup>®</sup>* HS 22



Enthalpy Vs Temp for *savE<sup>®</sup>* HS 22

A 30g sample is taken in a test tube in molten condition and placed in a temperature controlled bath. A temperature sensor is placed in the test tube and bath to record the temperatures using a datalogger. The bath is maintained at around 17 °C during the freezing cycle and at around 27 °C during the melting cycle.

Property	Value*	Test Method	Test Conditions (if any)
Melting Temp. (°C)	23	PLUSS® T - History	@ 27 °C - maximum (liquid bath)
Freezing Temp. (°C)	22	T - History	@ 17 °C (liquid bath)
Latent Heat (kJ/kg)	185	Calorimetry	solid PCM is taken at 12 °C
Liquid Density (kg/m <sup>3</sup> )	1540	ASTM D891-95	@ 32 °C
Solid Density (kg/m <sup>3</sup> )	1840	PLUSS® Internal	@ 12 °C
Liquid Specific Heat (J/g.K)	3.04	Hot Disk Method	@ 31 °C
Solid Specific Heat (J/g.K)	2.20	Hot Disk Method	@ 10 °C
Thermal Conductivity (W/m.K)	0.56	Hot Disk Method	For Liquid
Thermal Conductivity (W/m.K)	1.13	Hot Disk Method	For Solid
Liq. Viscosity (centistokes)	70	-	@ 40 °C
Base Material	Inorganic	-	-
Congruent Melting	Yes	-	-
Flammability	No	-	-
Thermal Stability (cycles)	~3000	PLUSS® Internal	-
Max.Operating Temp. (°C)	~80	-	-

\*- Nominal Values. Actual values lie in a range. Consult test certificate for details.

\*\* - Calculated from literature value

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