



TECHNICAL DATA SHEET OF savE® FS21

savE® Phase Change Materials (PCM) are organic or inorganic chemical compound 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 PCM's are commercially available in the market (varying between -35°C to 90°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 as good as many metals with better mechanical strength.

savE® FS21

savE® FS21 is an organic chemical based PCM having nominal freezing and melting temperature of 21°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. FS21 is constituted of the right mix of various additives allowing equilibrium between solid and liquid phases to be attained at the melting point. Also FS21R is shape-stabilized and able to attain any shape in molten state and can be encapsulated in various forms.

Why savE® FS21?

savE® FS21 has a phase change temperature of 19°C a temperature that makes it ideal for many heating/cooling thermal energy applications. Some of its salient features include:

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- FS21 is chemically and thermally stable by using PlusS® proprietary additives.
- This is a blend of various organic fatty acids suspended in the matrix of polymers.

Technical Specification:

Product : savE®
 Series : FS21
 Description : Blend of organic materials in a polymer matrix
 Appearance : Black solid

T-History Test

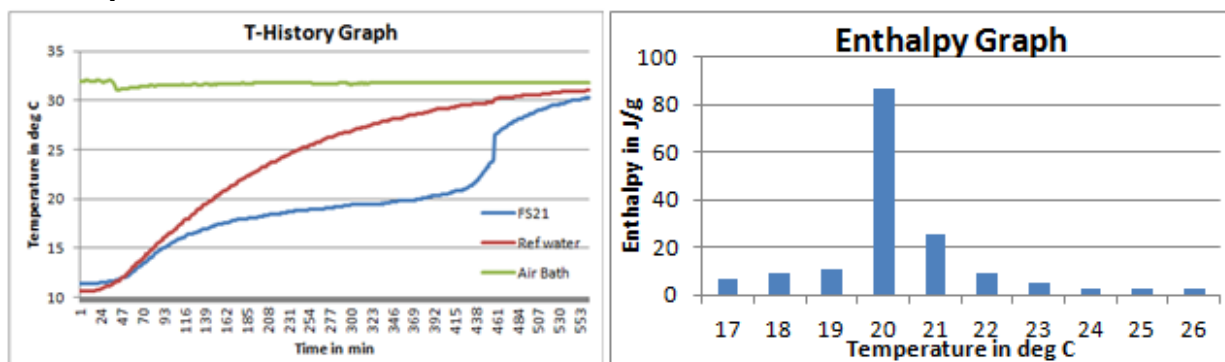


Fig1: T-History graph for FS21 done in air bath

A 20g 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 data logger. The bath is maintained at 11°C during the freezing cycle and at around 31°C during the melting cycle.

| Property | Value* | Test Method | Test Conditions (if any) |
|-------------------------------------|---------|-----------------|--------------------------|
| Melting Temp (°C) | 21 | PLUS® T-History | @ 31°C Liquid Bath |
| Freezing Temp (°C) | 20 | PLUS® T-History | @ 11°C Liquid Bath |
| Latent Heat (kJ/kg) | 130 | PLUS® T-History | @ 17 to 27°C |
| Liquid Density (kg/m ³) | NA | | |
| Solid Density (kg/m ³) | 870 | PLUS® Internal | @ 30°C |
| Liquid Specific Heat (kJ/kgK) | NA | | |
| Solid Specific Heat (kJ/kgK) | NA | | |
| Liquid Thermal Conductivity (W/mK) | 0.10 | KD2Pro | @ 40°C |
| Solid Thermal Conductivity (W/mK) | 0.30 | KD2Pro | @ 6°C |
| Base Material | Organic | | |
| Congruent Melting | YES | | |
| Flammability | NO | | |
| Thermal Stability (Cycles) | ~2000 | PLUS® Internal | |
| Maximum Operating Temperature (°C) | 120 | | |
| Flash Point (°C) | 160 | | |

* Nominal Values. Actual values mentioned in Test Certificate