Boca Phase Change Material Thermal Energy Storage Systems
Reduce >50% Global Warming Effect
due to Air Conditioning Systems
**NATURAL ALTERNATIVE TO REDUCE ENERGY**

**INTRODUCTION;**

Thermal Energy Storage (TES) is the temporary storage of high or low temperature energy for later use. It bridges the gap between energy requirement and energy use.

A thermal storage application may involve a 24 hour or alternatively a weekly or seasonal storage cycle depending on the system design requirements. Whilst the output is always thermal, the input energy may be either thermal or electrical.

BocaPCM-TES-Panel concept is based on custom-made HDPE plastic containers filled with our Phase Change Materials (PCM) solutions which have very wide operating temperatures between $+8^\circ C$/$+46^\circ F$ & $+117^\circ C$/$+273^\circ F$.

**FEATURES;**

BocaPCM-TES-Panel custom-made HDPE plastic containers are filled with BocaPCM solutions and the filling screwed cap fully Ultra Sonic Welded after filling in order to ensure safe and reliable operation.

The design of plastic container incorporates internal support columns as well as external guide circles so that the containers can be stacked on top of each other forming a self-assembling large heat exchanger within the tank.

The self-stacking concept can be applied for both water and air circuits and the gap between each container provides an ideal flow passage with a large heat exchange surface.

**HOW DOES IT WORK ?**

Thermal Energy Storage (TES) reduces the size of heating and cooling machinery by means of spreading the day / peak time load over either night / off-peak times as in the case of Full Storage TES systems, or alternatively over a 24 hour period in the case of Partial Storage TES systems. Hence, any type of TES system can not only be considered as a useful tool to reduce the overall environmental impact for a given cooling / heating application but also it offers significant operational cost savings.

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TANK DESIGN;
Generally concrete tanks are either built buried below ground level and the top of the tank used as parking or landscape areas or alternatively within the basement area as part of the foundations. Tanks ideally should be constructed as close as possible to chillers and load to minimise the pipe work and pumping energy penalties. If the system requires pressurised tank a cylindrical tank can be constructed to accommodate BocaPCM-TES Panels with minimum by-pass. BocaPCM-TES Panels can only be stacked up to a height of 2.6 m (8 ½ ft) level and therefore the height of the tank is restricted to around 3m (10 ft) and the foot print of the tank can be adjusted around this limit. In principal.

Furthermore, if the required storage capacity is too large and the design requires multiple tanks, they can be arranged either in parallel or series format to suit the application and available space. Typically the depth of the tank will be 2.6 m (8½ ft) inside dimension which corresponds to approx. 52 BocaPCM-TES Panels high and 150mm (6") of head room above the containers. Therefore, to estimate the approximate rectangular tank size and shape one can use the following formula inline with BocaPCM-TES-Panel capacity table.

**SI Units:**

\[
\frac{\text{Load (kWh)}}{\text{BocaPCM Capacity (kWh/m}^3\text{)}} \times 2.6 = \text{Length (m) x Width (m)}
\]

**IP Units:**

\[
\frac{\text{Load (TRh)}}{\text{BocaPCM Capacity (TRh/m}^3\text{)}} \times 8.528 = \text{Length (ft) x Width (ft)}
\]

INNOVATION FOR ENERGY SAVING TECHNOLOGIES

**WATER SYSTEM**

**REDUCED RUNNING COST**
Load shifting provides reliable operation and lower annual electricity / energy running costs.

**REDUCED MACHINERY**
Shifting some of the peak load may enable designers to reduce the main machine size.

**INCREASED CAPACITY**
As a retrofit application, the additional TES load may increase the system output without any additional machinery.

**GREEN SOLUTION**
Reduced machinery size, energy consumption results in both direct and indirect CO2 emission.

**AIR SYSTEM**

**BENEFITS**

**QUICK RESPONSE**
BocaPCM-TES panels offer quicker response in comparison with any other TES systems on the market.

**LOWER MAINTENANCE COST**
Machinery runs for longer periods without any start / stop and therefore it offers a far more reliable operation.

**FLEXIBLE SYSTEM**
The overall machinery capacity and TES capacity can be exactly matched to system loads.

**STAND-BY CAPACITY**
In case the main machinery fails, the stored energy can be utilised to handle the system loads, hence, providing a degree of back up facility.
## TECHNICAL SUPPORT:

Boca International Limited has been setup since 1992 in Hong Kong and is now spending full effort in Environmental Energy Saving Solutions research & development by means of Inorganic Phase Change Material and offers full system design support to assist in proper selection and integration into existing or new installations as part of our customer commitment.

## FREE IMPORT TAX TO CHINA (CEPA):

Our factory in Hong Kong has been approved by Hong Kong & China Government as one of the CEPA manufacturer in Hong Kong, as a result, there will be no import tax for our products to be delivered to China.