

**POSITIVE TEMPERATURE EUTECTIC THERMAL ENERGY STORAGE
SYSTEMS**

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Abstract

Thermal Energy Storage (TES) is the temporary storage of high or low temperature energy for later use. It bridges the time gap between energy requirement and energy use. For HVAC and refrigeration application purposes, water and the water ice constitute the principal storage media. Water has the advantage of universal availability, low cost and transport ability through other system components.

However, water ice can only be produced with low temperature chillers which are subject to lower night time COP values for a given duty in comparison with day time COP. Hence, the benefits of night time low temperature can not be fully utilised. On the other hand, positive phase change materials (*Eutectic Solutions*) which freeze and melt above water freezing temperature of 0°C can provide increased COP as well as the possibility of existing chillers utilisation without any modification and/or capacity increase. Moreover, considerable portion of the system annual operating period, thermal energy storage can be charged without the need for a chiller by means of free cooling.

Eutectic TES system has the potential to achieve considerable environmental as well as economical benefits when used in conjunction with Co-Generation and Conventional Absorption Chiller systems to bridge the gap between the electricity, heating and cooling requirement.

Eutectics temperature range between +4 °C and +90 °C covers the majority of air conditioning and process applications and this paper aims to explore the advantages and disadvantages of Eutectic positive temperature thermal energy storage system and their low energy design applications.

A practical application guide will be presented in a form that will help practising engineers or consultants to develop an effective and low energy design based on Eutectic positive temperature thermal energy storage cooling/heating and heat recovery systems.