

# **Thermal Energy Storage for Low Temperature Applications and Integrating Them with Solar Cooker**

By :- K P A Chaitanya

M.Tech – Solar Energy

S R M University, Chennai

Due to the increase in the prices of the fuels and also due to the depletion of the fuels used mainly fossil fuels, focus is shifted on to various renewable energies. Therefore in such instances, thermal energy storage plays a major role in using the energy for domestic applications like hot water and other domestic applications. This thermal storage uses materials which can store heat as internal energy. This energy can be stored as sensible heat or latent heat. Latent heat storage materials are storage materials which can store energy depending on the boiling point of the material. In this paper we will be seeing a thermal storage system which can store energy for a longer time, which can be used for space heating by using a secondary fluid as air. The main motive of this storage is use it for hot water purposes by indirect heating of water through this storage. The requirement of energy for cooking is accounted to be around 36% of total energy consumption in India. Therefore there is a need for the development of alternative, appropriate, affordable mode of cooking for use in developing countries. In such case if thermal storage energy is used in solar cookers, it can be very advantageous. There are several problems in solar cooking like time consuming, solar cookers cannot be used in evenings, therefore by designing a solar cooker which can have a thermal storage with good insulating and heat storage material which can either be sensible heat storage material or phase change material for storing heat which could be useful at nights.

The temperatures used for cooking would be around  $100^{\circ}\text{C}$  to  $130^{\circ}\text{C}$ , therefore the materials used must hold temperatures up to  $130^{\circ}\text{C}$ . Sensible storage material can store the temperatures without change in phase; depending on the capacity the material can store the heat energy. If phase change materials are used it depends on the phase change transition temperature i.e., the melting point of the material used for storage, at a specific point the phase change takes place which can be (solid-liquid ; liquid-gaseous) generally solid-liquid transition is comparatively better than other transitions. Phase change materials are proven to be more advantageous when compared to sensible heat storage materials because of its high storage density with small temperature change. This high temperature would help in reducing the time consumed for cooking food. Comparison of properties between different materials for solar cooking and the best suitable material at different temperatures from  $70^{\circ}\text{C}$  to  $130^{\circ}\text{C}$  are being discussed. Advantages of thermal energy storage and formulae for calculation of thermal energy storage are being discussed. The choice of PCM plays an important role in addition to heat transfer mechanism in the PCM. In this paper a review has been made to study all the research and development work carried out in the field of solar cooker and the storage type solar cookers. A novel concept of PCM-based storage type solar cooker is also presented which is under experimental investigation.