

Experimental Analysis of Forced Circulation of Solar Air Heating System Using Phase Change Materials (Paraffin Wax) Energy Storage – A Review

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Abstract – Latent heat thermal energy storage is one of the most economical ways in which to store the thermal energy for heating air by energy received from the sun. This project is investigation and analysis of thermal energy storage incorporating with action materials (PCM) and integrated solar dish plate to be utilized in solar air heater. Throughout this project reflector plate with stand and paraffin is utilized. The heat storage capability of paraffin is further. Therefore the range of heat energy is enhanced with the help of this reflector. Due to this further amount of heat energy the distinction of water air temperature and outlet air temperature is additional, therefore high temperature of hot air is obtained and efficiency of collector plate is increased. This improved collector efficiency by reducing heat loss to the atmosphere, and facilitate reach an overall efficiency, that accosts of pumping loss for moving air through the collector.

Keyword: Solar Air Heater, Thermal Storage, Paraffin Wax, Experimental Analysis

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I. INTRODUCTION

Now days since last 3 decades the most environmental problem is that the imminent energy shortage and therefore the high price of energy. Central to the matter is the ought to store excess energy that might otherwise be wasted and conjointly to bridge the gap between energy generation and consumption. Heat thermal energy storage is especially attractive technique because it provides a high energy storage density. When compared to traditional smart energy storage systems, heat energy storage system needs a smaller weight and volume of material for a given quantity of energy. In addition heat storage has the capability to store heat of fusion at a continuing or close to constant temperature that respond to the phase transition temperature of the part change material (PCM). After 1970 an outsized range of studies have been conducted to assess the general thermal behavior of heat thermal storage system. Studies of part change system have investigated style fundamentals of system and method optimization, transient behavior, and field performance. The analysis and development has been broad based mostly and productive, concentrating on each the resolution of specific phase change material and also the study of

the characteristics of recent materials. As reportable by several researchers the foremost disadvantage has been the low thermal conductivity possessed by PCM that ends up in low charging and discharging rates particularly for organic based mostly materials).

II. DIFFERENT TYPES SOLAR AIR HEATER WITH ENERGY STORAGE

Storage of solar power is a very important issue as radiation could be a time dependent energy supply, i.e. has an intermittent character. Thus, the energy supply and also the heating demands of the systems don't match. Solar thermal energy are often hold on as smart heat (water and rock), latent. Heat (water/ice and salt hydrates), heat of reaction, or combination of those. Parameters as well as storage amount needed, economic viability or operative conditions are effective on choice of those ways. Latent storage system via phase change material (PCM) was most well-liked during this study. the reason for this choice is that the fact that the employment of PCMs for thermal energy storage (TES) in solar heating systems has received considerable attention within the literature. PCMs will store massive amounts of heat

ever-changing the part from solid to liquid. in a very heat TES system, decisive of the PCM plays vital role additionally to heat transfer mechanisms within the PCM. The most vital PCMs embody Glauber's salt, salt hexahydrate, sodium thiosulfate confined hydrate, washing soda decahydrate, fatty acid, and paraffin waxes. These applications square measure listed in Zalba et al. Each fatty acids and paraffins are low-cost, readily out there, and soften at completely different temperatures. However, PCMs are smart TES from the purpose of read security of energy provide. There are several applications of PCM for various spaces within the literature for solar collectors, greenhouses, building heating.



Storage type solar air heater by Huseyin Benli

B. S. Romdhane used little extensions from a metal plate to enhance mixing of air on the plate. These extensions had the advantage of not increasing pressure drop light-weight packed Bade solar air heaters. HO et al. accumulated the collector potency of a plate metal absorber plate to 68 by running the air higher than and below absorbing plate as shown in plate. The flow turns 180 degree to move back higher than the plate this confurance increase pressure drop flow, however the paper will report.

B.Kumar used a tank of paraffin that absorbs radiation, and heat was removed by water flowing through 3 finned heat exchangers. In some cases, water flowed through pipes between absorbent material surfaces with integrated natural process material. The oil served as an interface between the PCM and water, spreading the warmth over the surface. A black absorber plate was higher than the oil to gather the solar power.

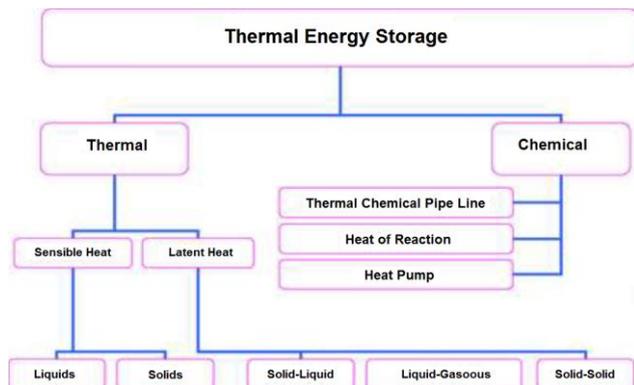


Fig. 1 Different types of thermal storage of solar energy

III. LITERATURE REVIEW

HuseyinBenli has used ten pieced solar air collectors heating system for area heating of a greenhouse. He used $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$ as PCM for thermal energy storage with a melting temperature of 29°C . Hot air delivered by 10 pieced solar air collector is passed through the PCM to charge the storage unit. The keep heat is employed to heat close air before being admitted to a greenhouse. His study was supported experimental results of the PCM used to investigate the transient thermal behavior of the storage unit throughout the charge and discharge periods. The planned size of collectors integrated PCM provided concerning 18–23% of total daily thermal energy needs of the greenhouse for 3–4 hour, compared with the traditional heating device.

IV. CONCLUSION

The researchers' styles getting to the mixing between solar power collection and thermal storage to reduce the heat loss, volume and system value. Wax could be a smart PCM for energy storage in latent heat storage system. It's an acceptable transition temperature vary of $58\text{--}60^\circ\text{C}$ and a comparatively high latent heat of 210 kJ/kg . From this study it's complete that the recent researches centered on the phase change materials (PCMs) as a storage materials, owing to the upper thermal energy storage density of those materials in contrast of smart heat storage materials. For a better thermal performance of star air heater a natural action material with high latent heat and with massive area for heat transfer is needed.

V. REFERENCES

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