

# Experimental Study on Hybrid Natural Circulation Type Solar Air Heater with Thermal Storage

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## Abstract

The hybrid natural circulation type solar air heater has the potential of preserving the agricultural produces and it saves conventional fuels and reducing environmental destruction. A new type of V-trough solar collector has been proposed, designed and tested. The proposed hybrid system consists of absorber plate, insulation materials, glass covers, Phase Change Materials (PCM), V trough reflectors with thermal energy storage and a drying chamber. The dimension of the hybrid solar air heater is 1 m long, 0.27 m wide and 0.025 m thick and incorporates absorber and thermal energy storage unit. Air flows through pipe by natural circulation for 3 m length as 3 passes and excess thermal energy stored in PCM. The experiments are conducted for drying half kilo capsicum and the results show that considerable improvement in moisture removal. It is concluded that the design is compact, sufficiently simple and gives a high thermal performance. The fabricated system is tested at outdoor condition on sunny days in Kengeri, Mysuru Road, Bengaluru (Latitude :12.96° North, Longitude:77.63° East). It is found from the experimental results, the thermal efficiency of the solar air heater is varies from 12 % to 65 % in a day.

**Keywords:** Phase Change Material (PCM), V-Trough Solar Collector, Solar Air Heaters, Absorber plate, Free Convection