National Conference on Innovations in Science, Engineering, Technology and Humanities (NCISETH – 2023)
30th July, 2023, New Delhi, India

CERTIFICATE NO : NCISETH/2023/C0723563

Experimental Evaluation of DPSAH Configurations for Enhanced Performance and Lower Pressure Drop

Khoob Singh
Research Scholar, Department of ARNI School of Technology,
ARNI University, Himachal Pradesh, India.

ABSTRACT

The thermal efficiency and aerodynamic behaviour of Double-Pass Solar Air Heater (DPSAH) systems are strongly influenced by airflow characteristics and channel configuration. In this study, an experimental investigation was conducted to evaluate the performance of multiple DPSAH configurations under varying airflow rates, with a focus on enhancing heat transfer while minimizing pressure drop. Different absorber and flow-channel arrangements were fabricated and tested across a controlled range of mass flow rates. Key thermodynamic parameters including temperature rise, thermal efficiency, friction factor, and pressure drop were measured to determine the relative effectiveness of each configuration. The results demonstrate that specific DPSAH geometries significantly improve heat transfer performance without proportionally increasing aerodynamic resistance. Configurations incorporating optimized channel depth and absorber surface modifications exhibited the highest efficiency gains while maintaining low pressure drop, indicating improved energy utilization and reduced fan power requirements. The study highlights the importance of configuration design in achieving a balanced trade-off between thermal enhancement and aerodynamic performance. These findings contribute to the development of more efficient solar air heating systems suitable for drying, space heating, and other thermal applications.

Keywords: Solar Air Heater, Airflow Variation, Thermal Performance, Pressure Drop, Energy Efficiency.