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**Evaluation of Efficiency-Influencing Factors in Conventional  
Single-Pass Solar Air Heaters**

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**ABSTRACT**

Conventional single-pass solar air heaters (SAHs) are widely used in industrial and domestic applications due to their simplicity and cost-effectiveness. However, their thermal efficiency is often limited by design constraints, flow characteristics, and heat transfer losses. This study investigates the key factors influencing the performance of single-pass SAHs, including absorber plate design, airflow rate, channel geometry, and environmental conditions. Experimental and theoretical analyses were conducted to quantify the impact of these parameters on thermal efficiency. The results indicate that variations in airflow and absorber surface properties significantly affect heat transfer rates, while channel depth and uniformity influence temperature distribution. Recommendations for design optimization and operational improvements are provided to enhance efficiency. The findings offer valuable insights for improving the performance of single-pass solar air heating systems and for guiding future innovations in solar thermal energy utilization.

*Keywords: Thermal Efficiency, Absorber Plate, Airflow Rate, Heat Transfer, Channel Geometry, Solar Thermal Systems.*