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## Thermal performance of flexible air duct using a new absorber construction in a solar air collector

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### Abstract

This paper presents the comparative experimental energy and exergy analysis of a solar air collector (SAC) with flexible aluminum foil duct and conventional flat plate SAC, with and without glazing. Effect on performance enhancement of the aluminum foil duct has been determined at air mass flow rates of 0.013, 0.03 and 0.044 kg/s. It reveals that the average energy and exergy efficiency of the flexible duct SAC were 81.3% and 25% at glazed experiments for 0.044 kg/s, respectively. The experimental results with and without glass demonstrated that designed collector has 15.9-41.2% higher efficiency than the flat collector and the designed collector to be preferable due to its performance and cost advantage for sustainable competitiveness. As expected, the performance of the SAC with glazing is better than those of the unglazed collector. The new application of flexible air duct as an absorber plate can be used as an energy and cost-efficient option for SACs. Moreover, the results showed that the higher thermal efficiency of SAC mainly depends on glazing, absorber structure, and the circulation time of the air.

**Keywords:** Solar air collector, heater, flexible aluminum foil duct, flat plate, energy, exergy.

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