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NUMERICAL STUDY OF A MODIFIED TROMBE WALL SOLAR COLLECTOR SYSTEM

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ABSTRACT

The paper presents numerical analysis of efficiency of the modified Trombe wall with forced convection. The analyzed system comprises a double glass glazing, and a massive wall with opening and central channel in it. In order to increase the efficiency, a fan is provided at the bottom vent of the wall. It is more advanced as compared with simple Trombe solar wall with a relatively low thermal resistance, which is taken as a reference in experimental analysis. The mathematical model, composed for the massive solar wall efficiency, is usually very complicated and assessment of the thermal behaviour requires the use of thermal simulation techniques. This paper presents steady-state and one-dimensional mathematical model for simplified analysis of thermal efficiency of modified Trombe solar wall. The results from presented model were analyzed to predict the effects of variations in the operational parameters on the solar wall efficiency: solar radiation intensity, air velocity in the entrance duct, and room air temperature. The results have been compared with the available experimental study, and the comparison has shown satisfactory agreement. The obtained results have be used for simple and fast running design tools that designers can use in the early phases of the design process for approximate calculations of efficiency of the passive solar heating systems.

KEYWORDS

modified Trombe wall, solar air heating, energy efficiency

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