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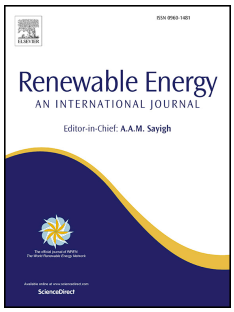

A comprehensive investigation of using mutual air and water heating in multi-functional *DX-SAMHP* for moderate cold climate

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Title: A comprehensive investigation of using mutual air and water heating in multi-functional *DX-SAMHP* for moderate cold climate.

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Abstract

Solar energy assisted heat pump systems (*SAHP*) have been used in this application. *SAHP* system with solar collectors and the heat pump are combined into one unit so as to convey the solar energy to the refrigerant. The solar collector is used as the evaporator, where the refrigerant is directly vaporized by solar energy input. Due to the complicated technical issues associated with a combined system that provides air for space heating and domestic hot water, most of the previous studies have concentrated on water heater heat pump mechanism. The current work is aimed at examining the use of a new multi-functional heat pump (*DX-SAMHP),* air for space heating mutually with solar for domestic hot water without employing an auxiliary heater. Comprehensive experimental and analytical studies in the first of its kind have been performed on the new system. The novel system with ternary panels and the thermal performance of the collector has been examined in this study. Results indicate that the *DX-SAMHP* using solar inner and outer panels for space and water heating is a promising substitute for the existing *DX-SAHP* water heater. Compared to the conventional solar-assisted *SAHP* heat pump systems, the coefficient performance of the new design doubles that of the conventional *DX-SAHP* systems.

Keywords

Heat pump in low temperature, Solar energy system, Refrigeration cycle**,** Heating system application.