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

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9 **Abstract**

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

25 **Keywords**

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

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