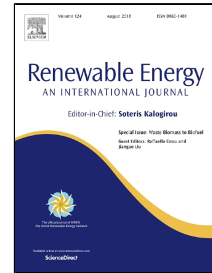


# Accepted Manuscript

Research on operation strategy and performance prediction of flat plate solar collector with dual-function for drying agricultural products

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14 **Abstract:**

15 In this study, a flat plate solar collector with dual-function (FSDF) embeddable in a hybrid  
16 solar drying system is proposed and constructed. In the present drying system, air outlet  
17 temperature of FSDF is controlled within the suitable drying temperature range. Thereby the  
18 efficiency of solar energy utilization and the quality of dry product can be improved. This study  
19 has revealed, for the first time, solar drying air temperature can be controlled by adopting  
20 operation strategy based on FSDF. The operation strategy, thermal performance and economic  
21 analysis of flat plate solar collector with dual-function hybrid dryer (FSDFHD) are investigated. A  
22 detail mathematical modelling is developed to calculate the thermal parameters of FSDF.  
23 Performance test of FSDF were also carried out in the September of 2017. The results show that  
24 there is a good agreement between the simulated and experimental values of these parameters. For  
25 the glass cover, absorber plate and outlet air temperature, the root mean square deviation (RMSD)  
26 value is 8.9%, 11.9% and 10.5% respectively. The range of maximum heat collecting efficiency of  
27 FSDF is 32.5%~50.8% for three different heat collecting modes. The range of heat loss coefficient  
28 of FSDF is about 2.5~6.2 W/ (K·m<sup>2</sup>). In addition, operation strategy of FSDFHD all year round is  
29 given and analyzed through case study. The solar fraction and energy distribution of FSDFHD can  
30 be calculated at any day of the year. Finally, economic analysis is conducted to study the  
31 application of FSDFHD in china. The results show that FSDFHD has applicative enough for their  
32 advantages in economy with the help of judgement criteria of the present value of the cost and the  
33 annual cost. Thus, this study can provide theoretical basis for designing and operating strategy of  
34 FSDFHD in drying agricultural products.  
35

36 **Keywords:** Flat plate solar collector with dual-function; Mathematical modelling; Thermal  
37 performance; Operation strategy; Economic analysis  
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