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TWO DIMENSIONAL ANALYSIS OF FLAT PLATE SOLAR COLLECTOR

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ABSTRACT

Numerical analysis is a good tool used to save time and effort and reduce cost when compared with practical methods that are expensive and time consuming. Two dimensional thermal analysis to obtain a mathematical model that represents thermal equilibrium of solar collectors was conducted to obtain a theoretical way to design flat plate solar collectors. A design characteristics and the effect of operational and geometrical parameters were studied. The results were compared with data from practically tested rigs. The results have shown good agreement with experimental data, where the error rate did not exceed 2.8% when compared to experimental results. In addition, the results were compared with data obtained from one-dimensional thermal analysis of flat plate solar collectors and the error was about 3.5%. Results also show that the solar collector's insulation and the wind speed have a negative effect on the solar collector's thermal efficiency. On the other hand, the water flow rate, solar irradiance and ambient temperature have positive effect on thermal efficiency with various degrees of impact.

Keywords: Heat transfer, Solar collector, Numerical analysis, two dimension.