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Influence of Bed Depth on Performance of Wire Screen Packed Bed Solar Air Heater

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Abstract : This paper deals with theoretical analysis of performance of solar air collector having its duct packed with blackened wire screen matrices. The heat transfer equations for two-dimensional fully developed fluid flows under quasi-steady-state conditions have been developed in order to analyze the effect of bed depth on performance. A computer programme is developed in C++ language to estimate the temperature rise of entering air for evaluation of performance by solving the governing equations numerically using relevant correlations for heat transfer coefficient for packed bed systems. Results of air temperature rise and thermal efficiency obtained from the analysis have been compared with available experimental results and results have been found fairly in closed agreement. It has been found that there is considerable enhancement in performance with packed bed collector upto a certain total bed depth. Effect of total bed depth on efficiency show that there is an upper limiting value of total bed depth beyond which the thermal efficiency begins to fall again and this type of characteristics behavior is observed at all mass flow rate.

Keywords : plane collector, solar air heater, solar energy, wire screen packed bed
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