

Comparative Performance Analysis of Parabolic Trough Collector Using Twisted Tape Inserts

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Abstract : In this paper, an analytical investigation of the enhancement of thermal performance of parabolic trough collector (PTC) with twisted tape inserts in the absorber tube is being reported. A comparative study between the absorber with various types of twisted tape inserts and plain tube collector has been performed in turbulent flows conditions. The parametric studies were conducted to investigate the effects of system and operating parameters on the performance of the collector. The parameters such as heat gain, overall heat loss coefficient, air rise temperature and efficiency are used to analyze the relative performance of PTC. The results show that parabolic through collector with serrated twisted tape insert shows the best performance under same set of conditions under range of parameters investigated. Results reveal that for serrated twisted tape with $x=1$, Nusselt number/heat transfer coefficient is found to be 4.38 and 3.51 times over plain absorber of PTC at mass flow rate of 0.06 kg/s and 0.16 kg/s respectively; while corresponding enhancement in thermal efficiency is 15.7% and 5.41% respectively.

Keywords : efficiency, heat transfer, twisted tape ratio, turbulent flow

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