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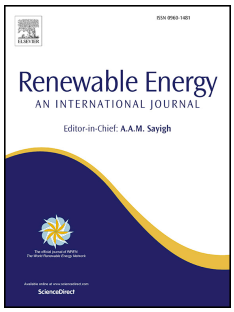

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Heat transfer network for parabolic trough collector as a heat collecting element by using of nanofluid

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Abstract

In this study, a solar thermal heat transfer network for a parabolic trough collector is introduced, in which a nanofluid is considered as the heat transfer medium. The finite difference scheme (FDM) was adopted as the approach, and a code was created in MATLAB. The model could be used to investigate the thermal performance of a heat collecting element (HCE). In the developed formulation, each section of the solar receiver collecting element was discretized into various segments in both axial and radial directions. Then, energy balance equations were presented for each segment in the control volume. The heat transfer equations, the thermodynamic properties, and the optical formulations were all taken into account in details. The set of algebraic equations were solved numerically by using iterative numerical solutions simultaneously. The radiant loss was increased from 26.5 to 57.3 W/m in the range of 30-100 °C. Also, the convective heat losses show a growth of 220% from 30 °C to 100 °C. On the other hand, the convective heat transfer coefficient is increased by adding multiwall carbon nanotube (MWCNT) nanoparticles to the base fluid (thermal oil). The amelioration is 15% by adding 6% volume fraction of nanoparticles.