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Influence of Mass Flow Rate on Forced Convective Heat Transfer through a Nanofluid Filled Direct Absorption Solar Collector

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Abstract : The convective and radiative heat transfer performance and entropy generation on forced convection through a direct absorption solar collector (DASC) is investigated numerically. Four different fluids, including Cu-water nanofluid, Al₂O₃-waternanofluid, TiO₂-waternanofluid, and pure water are used as the working fluid. Entropy production has been taken into account in addition to the collector efficiency and heat transfer enhancement. Penalty finite element method with Galerkin’s weighted residual technique is used to solve the governing non-linear partial differential equations. Numerical simulations are performed for the variation of mass flow rate. The outcomes are presented in the form of isotherms, average output temperature, the average Nusselt number, collector efficiency, average entropy generation, and Bejan number. The results present that the rate of heat transfer and collector efficiency enhance significantly for raising the values of m up to a certain range.

Keywords : DASC, forced convection, mass flow rate, nanofluid
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