

Numerical Investigation of Hot Oil Velocity Effect on Force Heat Convection and Impact of Wind Velocity on Convection Heat Transfer in Receiver Tube of Parabolic Trough Collector System

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Abstract : A solar receiver is designed for operation under extremely uneven heat flux distribution, cyclic weather, and cloud transient cycle conditions, which can include large thermal stress and even receiver failure. In this study, the effect of different oil velocity on convection coefficient factor and impact of wind velocity on local Nusselt number by Finite Volume Method will be analyzed. This study is organized to give an overview of the numerical modeling using a MATLAB software, as an accurate, time efficient and economical way of analyzing the heat transfer trends over stationary receiver tube for different Reynolds number. The results reveal when oil velocity is below 0.33m/s, the value of convection coefficient is negligible at low temperature. The numerical graphs indicate that when oil velocity increases up to 1.2 m/s, heat convection coefficient increases significantly. In fact, a reduction in oil velocity causes a reduction in heat conduction through the glass envelope. In addition, the different local Nusselt number is reduced when the wind blows toward the concave side of the collector and it has a significant effect on heat losses reduction through the glass envelope.

Keywords : receiver tube, heat convection, heat conduction, Nusselt number

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