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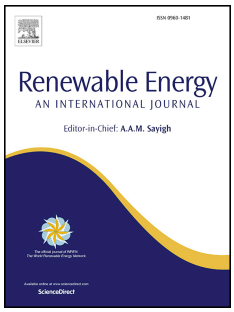

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Experimental and analytical thermal analysis of cylindrical cavity receiver for solar dish

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Abstract

In this paper, an experimental and analytical study of various parameters which affected the thermal efficiency as well as total heat loss of solar cylindrical cavity receiver for solar dish is presented. The downward facing receiver having a depth of 20 cm, inner diameter of 10 cm and 19 helically turns of copper tube thermally insulated has been designed. The wind speed effect was not taken into account in the experimental tests which are conducted under a solar irradiation of 957 W/m² and a receiver inclination angle of 36° which corresponds to the experimentation site latitude. The developed analytical model is based in its structure on the different Nusselt number correlations suggested to evaluate the convective and radiative heat losses through the cylindrical cavity. Then, the model makes it possible to predict the total heat loss in order to determine the receiver thermal efficiency under a given inclination angle. The experimental and analytical thermal efficiency estimations agree reasonably well with a maximum deviation of about 12%.

Keywords: cylindrical cavity receiver, heat loss, Nusselt number correlation, analytical investigation