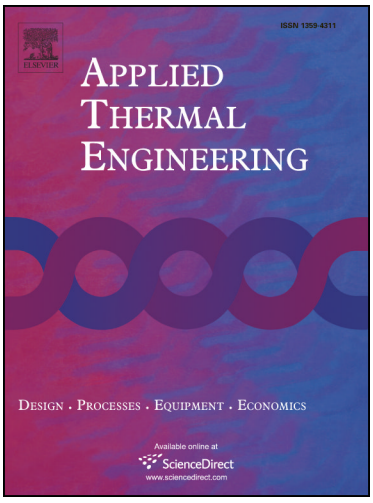

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PII: S1359-4311(18)31480-7
DOI: https://doi.org/10.1016/j.applthermaleng.2018.05.016
Reference: ATE 12155

To appear in: *Applied Thermal Engineering*

Received Date: 7 March 2018
Revised Date: 28 April 2018
Accepted Date: 6 May 2018

Please cite this article as: Y. Liu, W-J. Ye, Y-H. Li, J-F. Li, Numerical analysis of inserts configurations in a cavity receiver tube of a solar power tower plant with non-uniform heat flux, *Applied Thermal Engineering* (2018), doi: https://doi.org/10.1016/j.applthermaleng.2018.05.016

Numerical analysis of inserts configurations in a cavity receiver tube of a solar power tower plant with non-uniform heat flux

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Abstract: In order to analyse the effects of inserts configurations on heat transfer performance of solar cavity receiver tube (RT), a three-dimensional numerical model with four different inserts under non-uniform heat flux boundary condition was developed. Based on this model, the effects of inserts configurations, the effects of non-uniform heat flux boundary condition, the effects of thickness and positions of twisted-tape were analyzed. The numerical results show that RT-I with the twisted-tapes has the better comprehensive performances than those of other three kinds of RTs, and the RT-I with twisted-tapes is recommended to the solar cavity tower receiver. The twisted-tape RT-I has the highest *Nu* and the lowest circumferential temperature difference ΔT and average temperature of outer surface of receiver tube T_m, which are 21.74, 43 K, and 586K, respectively. In addition, the thickness of twisted-tape has the significant effect on heat transfer performances of RTs. The twisted-tape with much more thickness will enhance the heat transfer and reduce the ΔT and T_m. Moreover, under the non-uniform boundary heat fluxes, RT-I with twisted-tapes placed in the back-sunlight domain is favorable than that of twisted-tapes placed in the sunlight concentrated domain. The contribution can provide a reference for this type of receiver design and reconstruction.

Keywords: solar power tower plant; cavity receiver tube; non-uniform heat flux boundary condition; different inserts configurations

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