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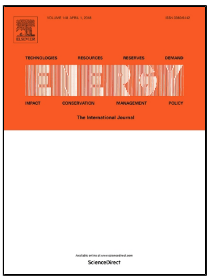

Experimental and Numerical Study on Dish Concentrator with Cubical and Cylindrical Cavity Receivers using Thermal Oil

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PII:	S0360-5442(18)30715-1
DOI:	10.1016/j.energy.2018.04.102
Reference:	EGY 12741
To appear in:	*Energy*
Received Date:	25 September 2017
Revised Date:	14 April 2018
Accepted Date:	17 April 2018

Please cite this article as: R. Loni, A.B. Kasaeian, E. Askari Asli-Ardeh, B. Ghobadian, Sh. Gorjian, Experimental and Numerical Study on Dish Concentrator with Cubical and Cylindrical Cavity Receivers using Thermal Oil, *Energy* (2018), doi: 10.1016/j.energy.2018.04.102

Experimental and Numerical Study on Dish Concentrator with Cubical and Cylindrical Cavity Receivers using Thermal Oil

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Abstract

In this study, a parabolic dish concentrator with two types of cavity receivers was investigated. The designed experimental setup included a parabolic dish concentrator, cavity receivers, a heat exchanger system, and hydraulic circuit unit. Two optimized shapes of cubical and cylindrical cavity receiver were made and studied. Also, numerical modeling was developed for predicting the cavity receiver performance. The numerical results of the cavity receivers show a good agreement with the experimental results. The results indicated that the receiver heat gain and thermal efficiency of the cavity receivers had a similar trend compared to the temperature difference of the heat transfer fluid between the inlet and outlet of the cavity receivers. The results also clarified that the thermal efficiency of the cubical cavity receiver was higher than the thermal efficiency of the cylindrical cavity receiver in the steady-state period. The average thermal efficiency of the cubical and cylindrical cavity receiver was obtained as 65.14% and 56.44% in the steady-state period, respectively. The cubical cavity receiver can be recommended for an efficient heat gain, in comparison with the cylindrical cavity receiver based on the conducted experimental tests on 12 October, and 26 September 2016.

Keywords: Experimental analysis; cubical and cylindrical cavity receivers; energy analysis; thermal oil; solar parabolic dish.