Comparative Study of Parabolic Dish and Trough Concentrators for Domestic Water Heating Systems in the Mosul City

Ammar Y. Al- Rawy[a], Ahmed M. Daabo[a]*, Yaser S. Mahmood[a]
[b] The University of Mosul, School of Mechanical Engineering, Mosul, Iraq

*Corresponding author: ahmeddaboo@uomosul.edu.iq

1. Introduction

Despite the fact that CSP technology was first investigated around 50 years ago, it is only more recently that this technology has gained the interest of both researchers and investors around the world [see Figure (1)]. Zambolin et al [3] proposed, using quasi-dynamic tests, an example for deriving the ETCs' incidence angle modifier. After collecting a huge amount of dialy experimental daily data; the authors have thermally evaluated the two types of tested collectors based on the factor they proposed, which is known as input/ output diagrams. The two types of the investigated collectors were the evacuated tube and flat plate.

In recent works, enhancing the thermal perormance of flat-plate solar collector using tow different shapes of extended components added to the absorbing tube was a study conducted by Balaji et al [4]. In that study, two objectives were introduced know as enhancing the convective mode of heat transfer between the flwo path geometry and the fluid and at the same time mintainting the pressure drop at its minimum value.

2. Body of abstract

Renewable energy sources and their applications are receiving increased interest by industry and researchers as being sustainable, available and environmentally friendly. This works aims to paramatically study the thermal performance of two simple configurations of Concentrated Solar Power CSP systems in terms of the outlet water temperature in order to highlight the most effective system. By doing so, the temperature of the water whcic can be used in the daily works can be rasied to decrease the continsious dependance on the electricity.

3. Equations, figures, and tables

The other important type of evaluation for any thermal system is the thermal analysis, which can be achieved by starting with the principles of heat transfer. The two main equations, required for the thermal balance that is necessary to obtain the solution, are Equation 1 and 2.

$$Q_T = Q_{Cond} + Q_{Conv} + Q_{Rad} \quad (1)$$

$$Q_T = mC_P(T_{fi} - T_{fo}) \quad (2)$$

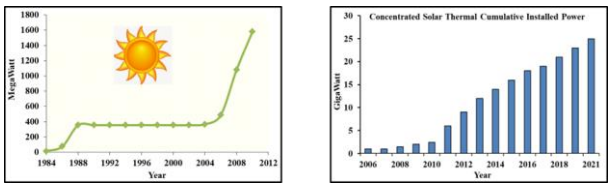

Figure (1): The advantages of CSP [1, 2].

Table 1: Dimensions of the Parabolic Dish and the Thermal Cylindrical Shaped Cavity Receiver.

Component	Aperture Diameter (m)	Height (m)	Inclination (Deg.)	Thickness (m)
Parabolic Dish	1.5	-	45° (Tilt angle)	0.01
Cylindrical Shaped Receiver	0.225	0.35	0°	0.03

Acknowledgment

The authors would like to thank the University of Mosul for the facilities provided for the current research study.

References:

1. https://www.evwind.es/2013/11/18/new-markets-for-concentrated-solar-power-csp-gain-some-momentum/38085.
2. Prasad, Kalapala, B. Anjaneya Prasad, and M. Anandarao. "Numerical and

Experimental Study of Gas Turbine Rotor." Materials Today: Proceedings 4.8 (2017): 7942-7947.

3. Zambolin, E., and D. Del Col. "Experimental analysis of thermal performance of flat plate and evacuated tube solar collectors in stationary standard and daily conditions." *Solar Energy* 84.8 (2010): 1382-1396.
4. Balaji, K., S. Iniyan, and Ranko Goic. "Thermal performance of solar water heater using velocity enhancer." *Renewable energy* 115 (2018): 887-895.