IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 1, January 2024

Studies on Photovoltaic Thermal System Utilising Titanium Oxide Nano Fluid Experimentally

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Abstract*: The present study was designed to experimentally investigate the performance of a solar water heater consisting of a flattened tube absorber with spiral configuration. The analysis is carried out by using water as the working fluid adopting forced circulation for various flow rates of 0.05 kg/s, 0.1 kg/s, 0.15 kg/s, 0.2 kg/s and 0.3 kg/s. The effect of mass flow rate on the flatness of the tube and spiral configuration of the absorber is investigated. The instantaneous efficiency, outlet fluid temperature, Reynolds number, Nusselt number, and heat transfer coefficient, friction factor, and Dean number are investigated. The results presented indicate higher instantaneous efficiency of a flattened tube absorber and a highest outlet temperature was obtained for a mass flow rate of 0.1 kg/s. The removed energy parameter FRUL increases by 3.5% and the absorbed energy parameter FR(τα) increases by 2% for every increase in a flow rate of 0.05 kg/s. The values of the Nusselt number, friction factor and dean number obtained experimentally were compared with numerical correlation and the deviation was found to be. within limits. The Dean number was calculated for different curvature ratio of κ1 ¼ 0:141, κ2 ¼ 0:070and κ3 ¼ 0:047 increase dean number with the increase in curvature ratio was found resulting in an increased Nusselt number better heat transfer was obtained.*

Keywords: Flattened tube; spiral configuration; flow rate; heat transfer; Nusselt number; curvature ratio; Dean number

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