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| Title | Experimental Performance Investigation of a Nanofluid Based Parabolic Trough Concentrator in Malaysia | | |
| Author(s) Name | M.K. Islam, Afroza Nahar | | |
| Contact Email(s) | afroza@aiub.edu | | |
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| Abstract |  |
| Concentrating solar energy system is a potential solar thermal technology and parabolic trough concentrators (PTC) are becoming growingly popular. In this research, both analytical and experimental analyses have been carried out to examine and compare the effect of different operating parameters on PTC performance. Water and water-carbon nanotube (w-CNT) are used to explore the performance of PTC system. The optimum receiver diameter is found 51.80 mm for the maximum efficiency of the collector. Performance optimization reveals that mass flow rate and concentration ratio are the inducing parameters on the thermal efficiency and heat removal factor. Investigations show improvement in heat transfer for added nanoparticles. Heat transfer rate is better in laminar flow than in turbulent flow. Experimental results show that with water as heat transfer fluid (HTF), for every 1oC increase in outlet temperature heat gain and thermal efficiency increase at the rate of 0.02 kJ/s and 1.6% respectively. On the other hand, for w-CNT as HTF, for every 100 W/m2 increase in irradiance, heat gain augments at a rate of 0.23 kJ/s and thermal efficiency upsurges by 7%. Flow rate of working fluids and solar irradiance are found to have respective negative and positive impact on thermal efficiency of the system. Findings of this research work are vital in designing parabolic trough concentrator for supplying industrial process heat (IPH) and running boilers in thermal power plants. | |