Abstract

The fabrication of a parabolic trough solar collector system has been experimentally designed and tested to improve of the thermal performance of the parabolic trough solar collector. Three working fluids were used water, distilled water with copper oxide nanoparticles, distilled water with titanium dioxide nanoparticles with a volume concentration of 0.02.

Experimental tests are conducted at the University of Anbar-Ramadi (32.559°N - 41.9196°E) during selected days from January 2021 to March 2021. The performance of the PTSC system is evaluated using three main indicators outlet water temperature, useful energy and thermal efficiency. The influence of mass flow rate ranges from (30 to 80) L/hr. In parallel, an artificial neural network has been proposed to predict the thermal efficiency of parabolic trough solar collector depending on the experimental results. An artificial neural network model consists of four inputs and one output parameter, the input parameters include inlet water temperature, solar density, ambient temperature and receiver temperature. While the output parameter includes thermal efficiency. Two neural network models (4-2-2-1) and (4-9-9-1) are built by using MATLAB. The experimental results show that distilled water with copper oxide nanoparticles and distilled water with titanium dioxide nanoparticles have higher thermal performance than water. Overall, it is verified that distilled water with titanium dioxide nanoparticles achieved an enhanced thermal efficiency of PTSC around 7.12% while the maximum increase in thermal efficiency around 19.2% is recorded for distilled water with copper oxide nanoparticles compared to water.