Application of Genetic Algorithm with Multiobjective Function to Improve the Efficiency of Photovoltaic Thermal System

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Abstract : The aim of this paper is to improve the efficiency of photovoltaic thermal (PVT) system with the help of Genetic Algorithms with multi-objective function. There are some parameters that affect the efficiency of PVT system like depth and length of the channel, velocity of flowing fluid through the channel, thickness of the tedlar and glass, temperature of inlet fluid i.e. all above parameters are considered for optimization. An attempt has been made to the model and optimizes the parameters of glazed hybrid single channel PVT module when two objective functions have been considered separately. The two objective function for optimization of PVT module is overall electrical and thermal efficiency. All equations for PVT module have been derived. Using genetic algorithms (GAs), above two objective functions of the system has been optimized separately and analysis has been carried out for two cases. Two cases are: Case-I; Improvement in electrical and thermal efficiency when overall electrical efficiency is optimized, Case-II; Improvement in electrical and thermal efficiency when overall thermal efficiency is optimized. All the parameters that are used in genetic algorithms are the parameters that could be changed, and the non-changeable parameters, like solar radiation, ambient temperature cannot be used in the algorithm. It has been observed that electrical efficiency (14.08%) and thermal efficiency (19.48%) are obtained when overall thermal efficiency was an objective function for optimization. It is observed that GA is a very efficient technique to estimate the design parameters of hybrid single channel PVT module.

Keywords : genetic algorithm, energy, exergy, PVT module, optimization
Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development
Conference Location : Chicago, United States
Conference Dates : December 12-13, 2020