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HYBRID CONCENTRATED PHOTOVOLTAIC THERMAL (CPVT) SYSTEM FOR SUSTAINABLE COOLING WITH HYDROGEN PRODUCTION AS ENERGY STORAGE

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Standalone power systems have vital importance as energy source for remote area. On the other hand, a significant portion of such power production is used for cooling purposes. In this scenario, renewable energy sources provide sustainable solution, especially solar energy due to its global availability. Concentrated photovoltaic (CPV) system provides highest efficiency photovoltaic technology, which can operate at x1000 concentration ratio. However, such high concentration ratio requires heat dissipation from the cell area to maintain optimum temperature. This paper discusses the size optimization algorithm of sustainable cooling system using CPVT. Based upon the CPV which is operating at x1000 concentration with back plate liquid cooling, the CPVT system size is optimized to drive a hybrid mechanical vapor compression (MVC) chiller and adsorption chiller, by utilizing both electricity and heat obtained from the solar system. The electrolysis based hydrogen is used as primary energy storage system along with the hot water storage tanks. The micro genetic algorithm (micro-GA) based optimization algorithm is developed to find the optimum size of each component of CPVT-cooling system with uninterrupted power supply and minimum cost, according to the developed operational strategy. The hybrid system is operated with solar energy system efficiency of 71%.

Biography

Muhammad Burhan is working as a Post-doctoral Fellow in the Water Desalination and Reuse Center of King Abdullah University of Science and Technology. He has completed his PhD degree from the National University Singapore (NUS) in 2016. He obtained his Bachelor's degree in Mechanical Engineering from University of Engineering and Technology (UET) Lahore, Pakistan in 2011. To date, he published 16 peer-reviewed journal papers. He also received two best paper awards in international conferences.

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