Research Findings (PhD)

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Name of Department - Electrical Engineering

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The research findings are as follows:

The present research is conducted to understand the different aspects of the PV/T technology, along with its various design modification, development, and applications. It has been observed that the heat energy exhausted below the PV module can be further utilized in different ways and helps in achieving better efficiency. The PV/T systems can be categorized as an air collector, water collector, and combi system based upon the type of coolant/fluid used in the channel. In this research, certain design aspects like modifications in the channel by adding V-Groove and various nanoparticles mixed with base fluid have been investigated. The impact of these modifications on the thermoelectrical outcomes of hybrid PV/T is also carried out. It has been observed from the numerical and experimental investigation that the use of V-groove v and nanofluids in the channel improve the thermo-electrical performance of a single-channel PV/T module.

The experimental setup of a hybrid PV/T air collector with a V-groove absorber in the air channel is developed to investigate the impact of environmental parameters on

its performance. A low power brushless DC fan is fixed at the air channel's input to ensure the circulation of air through the Vgroove. The experimental setup's thermo-electrical performance is investigated under Ghaziabad's climatic conditions (28.667856o N, 77.4538o E), U.P., India. The energy balance equation across various layers is developed with the help of a novel matrix-inversion method to estimate the PV and air output temperatures. The theoretical results obtained using mathematical modeling have been compared with real-time experimental results to validate the vi experimental model. A strong correlation is found between the experimental and theoretical outcomes. The electrical, thermal, and overall effectiveness for the theoretical and experimental studies are found in the range of 10.39- 10.26%, 41.78-41.57%, and 52.17-51.81%, respectively. It has been observed that the hypothetical outcomes are coherent with experimental outcomes for the proposed model achieving an accuracy of 98.98%, 99.43%, and 99.31% for electrical, thermal, and overall efficiencies, respectively.