TESTS AND THEORETICAL ANALYSIS OF A PVT HYBRID COLLECTOR OPERATING UNDER VARIOUS INSOLATION CONDITIONS

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Abstract

The main goal of the study was to investigate the relationship between the orientation of the PVT (PhotoVoltaic Thermal) collector and the thermal and electric power generated. Extensive research was performed to find optimal tilt angles for hybrid solar thermal collectors, which combine photovoltaic as well as thermal collection in a single unit, known as PVT (PhotoVoltaic Thermal) modules for an office building with working hours between 7.00 and 16.00. The comprehensive study included field measurements of the modules in central Poland and tests under AM (air mass) 1.5 conditions in a certified laboratory KEZO (Centre for Energy Conversion and Renewable Resources) Polish Academy of Sciences in Jablonna. Furthermore, a PVT system was investigated using the simulation method based on the dedicated *Polysun* software. The PV characteristics and efficiency of the PV module and the relation between power or efficiency of the PVT module and incidence angle of solar-irradiance were studied. Optimal work conditions for commercial PVT modules were ascertained. In addition, it was found that the maximum efficiencies of PV module (η_{PV}), solar thermal-collector (η_c) and PVT hybrid collector (η_{PVT}) registered under field conditions were higher than the ones measured under laboratory conditions.

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