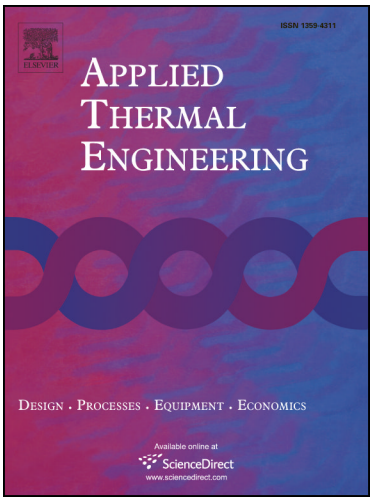

Research Paper

Experimental analysis of an air conditioner powered by photovoltaic energy and supported by the grid

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Experimental analysis of an air conditioner powered by photovoltaic energy and supported by the grid

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Abstract

The present document describes experimental work carried out on an air conditioning unit which has been powered using both a photovoltaic installation and the grid simultaneously. This document exposes the information gathered during an entire year of data collection. The control system has been designed to give priority to the renewable energy source in order to maximise solar contribution.

The aim of the study is to analyse any real possibilities and the viability of the use of photovoltaic systems to supply energy to air conditioning equipment without batteries or regulators. In this case, the conventional energy source has been used to supply energy when the PV energy is insufficient.

The main elements of the experimental setup were; an air conditioning unit with a nominal cooling capacity of 3.52kW, and a photovoltaic installation with three 235W_p panels connected directly to the equipment at 24Vdc.

The equipment has been monitored during the 12 hours of daily usage (from 8 to 20h), to condition an office with 35 m^2 in Alicante (Spain). The results during a cooling period of 6 months have demonstrated that the average EER could be close to 15. Both the solar contribution and the production factor are close to 65%. Experimental correlations are given in order to extend the obtained results to simulate other climatic conditions and demands.

Keywords: Energy Efficiency; Solar energy; Photovoltaic panels, Solar Heat Pump

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