

Thermodynamic and economic analysis of solar photovoltaic operated vapour compressor refrigeration system

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Received : 19.03.2014; Revised : 06.08.2014; Accepted : 20.08.2014

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■ **ABSTRACT** : A large number of people in developing countries still live in rural and remote area like India where the grid electricity is yet unavailable or not envisaged by the people. Vaccine preservation has become an important issue and the basic needs in rural areas. Solar power refrigeration is the one of promising option to resolve such burning problem. This paper describes the thermodynamic and economic results of developed solar photovoltaic panels operated 20 litre refrigerator system. No load and full load test were carried out to study the performance of the system. The co-efficient of performance (COP) was observed to decrease with time from morning to afternoon and average COP 3.39 and 3.29 was observed for no load and full load condition, respectively. The exergetic efficiency of both photovoltaic and refrigerator systems were also evaluated for both no load and full load conditions. The overall system energy efficiency was found low because of energy conversion efficiency and exergy efficiency of the photovoltaic system was low. The payback period of the SPV refrigerator was found approximate 6 months.

■ **KEY WORDS** : Vapour compression refrigerator, Photovoltaic, Battery bank, UPS, COP, Exergy, Payback period

■ **HOW TO CITE THIS PAPER** : Samar, Kapil K., Kothari, S. and Jindal, S. (2014). Thermodynamic and economic analysis of solar photovoltaic operated vapour compressor refrigeration system. *Internat. J. Agric. Engg.*, 7(2) : 352-359.