

## Solar-Powered Adsorption Cooling System: A Case Study on the Climatic Conditions of Al Minya

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**Abstract :** Energy saving and environment friendly applications are turning out to be one of the most important topics nowadays. In this work, a simulation analysis using TRNSYS software has been carried out to study the benefit of employing a solar adsorption cooling system under the climatic conditions of Al-Minya city, Egypt. A theoretical model was carried out on a two bed adsorption cooling system employing granular activated carbon-HFC-404A as working pair. Temporal and averaged history of solar collector, adsorbent beds, evaporator and condenser has been shown. System performance in terms of daily average cooling capacity and average coefficient of performance around the year has been investigated. The results showed that maximum yearly average coefficient of performance (COP) and cooling capacity are about 0.26 and 8 kW respectively. The maximum value of the both average cooling capacity and COP cyclic is directly proportional to the maximum solar radiation. The system performance was found to be increased with the average ambient temperature. Finally, the proposed solar powered adsorption cooling systems can be used effectively under Al-Minya climatic conditions.

**Keywords :** adsorption, cooling, Egypt, environment, solar energy

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