

# Thermal Analysis of a Solar Cooling Adsorption System by a Dynamic Model

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**Abstract**—In this paper is shown the possibilities to implement an energy solar system, without auxiliary elements, made to cool. The new technologies (vacuum-packed tube, tanks of build-up with variable volume, etc.), allow the possibility to obtain easily a stand-alone refrigerating system. Today it is always more and more the case where during the summer season there is a surplus of thermal energy whose use is to be assigned within the energy optimization system. The most immediate solution to this problem is the ability to produce cold by means of simple adsorption solutions, thus contributing to the cooling problem with low COP values. The most beneficial adsorbent both for its thermal/physical and low cost is the silica gel, a polymer of silicon dioxide, commonly used for its dehydrating properties, especially in the preservation of electronic material [1,3,13].

In this study we have developed a dynamic model with the software trnsys to verify the obtaining of appropriate warm fluid for an innovative cooling system adsorption with gel of silica and water and it is tested on a real building as case study.

The dynamic model analyzes the performance thermodynamic balance of a small size system has been made (about 20-50 kW), adequate to cool a Building of 900 sq m. and allow to assess the conformation (surface, storage volume, etc.) of a new generation solar power plant is able to guarantee a continuous operation during the summer period [2].

We have tested a solar cooling system with solar vacuum collectors on a real Building with Meteo data of three Cities as Rome Milan and Tunisi and we have tested the model comparing the results obtained.

The model in fact allows to make a preliminary design of principal part of the plant and to evaluate function cost-benefit of a complex investment for innovative technology. The interesting results obtained allow at a later stage to make a prototype validating the theoretical results with experimental measures.

**Index Terms**—Silica gel, Solar Cooling, Building

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