Modeling and Analysis of a Solar-Driven Absorption Chiller with Nanofluids Using GNU Octave: energy, economic and environmental study

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Abstract

Absorption chillers combined with renewable energy sources are considered a promising alternative to conventional vapor-compression cooling technologies.
Previous studies have already shown that performance can be enhanced by adding small quantities of nanoparticles into the working cycle: the selection of the nanoparticle type and its concentration improve the thermophysical properties of the working fluid. In order to investigate the influence of these parameters under realistic operating scenarios for a medium-scale absorption chiller, a numerical model will be presented and developed in GNU Octave. This cooling system is designed to operate in a typical summer climate for Portuguese latitudes and is coupled with thermal energy storage and a flat plate collector as a primary energy source. Various types of nanoparticles will be investigated and studied at different concentration in order to assess their influence on the Coefficient of Performance (COP). Particular attention then is focused on the environmental and economic impact associated with the proposed configuration: it will obtain detailed information about the variation of carbon dioxide emissions, payback period and Net Present Value (NPV).

Keywords: Absorption chiller, nanofluids, flat plate collector, solar climatization, GNU Octave, air conditioning.

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