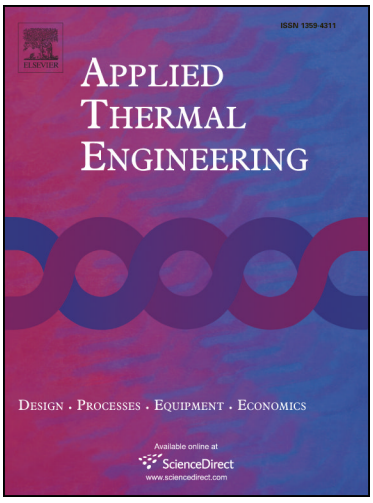
Accepted Manuscript



Multi-objective optimization of a solar-assisted heat pump for swimming pool heating using genetic algorithm

Allan R. Starke, José M. Cardemil, Sergio Colle

PII: S1359-4311(17)36151-3
DOI: https://doi.org/10.1016/j.applthermaleng.2018.06.067
Reference: ATE 12338

To appear in: *Applied Thermal Engineering*

Received Date: 22 September 2017
Revised Date: 15 February 2018
Accepted Date: 21 June 2018

Please cite this article as: A.R. Starke, J.M. Cardemil, S. Colle, Multi-objective optimization of a solar-assisted heat pump for swimming pool heating using genetic algorithm, *Applied Thermal Engineering* (2018), doi: https://doi.org/10.1016/j.applthermaleng.2018.06.067

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Multi-objective optimization of a solar-assisted heat pump for swimming pool heating using genetic algorithm

Allan R. Starke[a], José M. Cardemil[b], Sergio Colle[a]

[a] *LEPTEN - Laboratory of Energy Conversion Engineering and Energy Technology, Department of Mechanical Engineering, Federal University of Santa Catarina (UFSC), Florianópolis, Brazil*
[b] *Mechanical Engineering Department, Universidad de Chile, Beauchef 851, Santiago, Chile*

Abstract

A proper assessment of heating systems for swimming pools should evaluate the compromise between comfort level and the willingness to pay for it. The present work presents a multi-objective optimization of indirect solar assisted heat pump systems for outdoor swimming pool heating. Four different configurations are reported; (air-to-water heat pump and three solar assisted heat pumps, air-to-water, water-to-water and a dual-source); and evaluated in six different locations (three location in Chile: Antofagasta, Santiago, and Concepción; and three locations in Brazil: Brazilia, São Paulo, and Florianópolis). The methodology approach configures two objectives optimization, the minimization of the Annualized Life Cycle Cost (ALCC) and the maximization of the comfort level offered by the swimming pool. The optimization scheme consists of using a combination of tools: the energy-savings potential of i-SAHP are evaluated using the TRNSYS software in combination with GenOpt; and the economic modeling and optimization are performed in the MATLAB environment, using an approximation model and variant of NSGA-II genetic algorithm for building the Pareto frontiers. The optimization results demonstrate that solar-assisted configurations present significant improvements in performance for almost all locations, reaching the same levels of comfort at lower ALCCs when compared with the ASHP configuration.

Keywords: Swimming pool heating, solar energy, solar-assisted heat pumps, Multi-Objective Optimization, Genetic Algorithm, TRNSYS

1. Introduction

The use of heating systems for swimming pools has grown significantly recent years and currently it represents a significant share of energy consumption

Email address: allan.starke@lepten.ufsc.br (Allan R. Starke)

Download English Version:

https://daneshyari.com/en/article/7044724

Download Persian Version:

https://daneshyari.com/article/7044724

Daneshyari.com