Environmental Engineering and Management Journal *August 2012, Vol.11, No. 8, 1367-1374*
http://omicron.ch.tuiasi.ro/EEMJ/

"Gheorghe Asachi" Technical University of Iasi, Romania

EXERGY ANALYSIS OF THE AIR SOLAR COLLECTOR BASED ON EXPERIMENTAL DATA

Ioan Luminosu[1], Laurenţiu Fara[2], Nicolina Pop[1*], Marius Costache[1], Silvian Fara[3]

[1]Politehnica University of Timisoara, Department of Physical Foundations of Engineering, 2 Vasile Pârvan Blvd., 300223 Timişoara, Romania
[2]Politehnica University of Bucharest, Department of Physics, Faculty of Applied Scieces, 313 Splaiul Independentei Blvd., 060032 Bucharest, Romania
[3]IPA SA, 169 Calea Floreasca Street, Building P1, 014459 Bucharest, Romania

Abstract

An experimental study of solar collectors with a collecting area of 4.2 m^2 and a variable flow rate of 0.02~0.06 kg/s was developed. During the operation of the solar collector, entropy is generated due to the frictional forces occurring at the flow of the working fluid through the solar heater serpentine as well as due to the heating processes of the working fluid of the solar collector. The generated irreversibility contributes to the decrease of the exergy efficiency and produces unwanted effects upon the ambient environment. The aim of this paper is to establish the optimum flow rate of the working fluid for the collector's area established by construction. In this way, the exergy efficiency is improved and the negative impact on the ambient environment is minimized.
For a solar collector with an area of 4.2 m^2, the optimum flow rate of the working fluid is 0.04 kg/s. The exergy transferred by the collector to the working fluid is 6.41% based on the exergy received from the Sun in an average summer day, for a flow rate of 0.04 kg/s.

Key words: entropy, exergy, irreversibility, overall exergy efficiency

Received: February, 2011; Revised final: July, 2011; Accepted: August, 2011

[*] Author to whom all correspondence should be addressed: e-mail: nicolina.pop@et.upt.ro