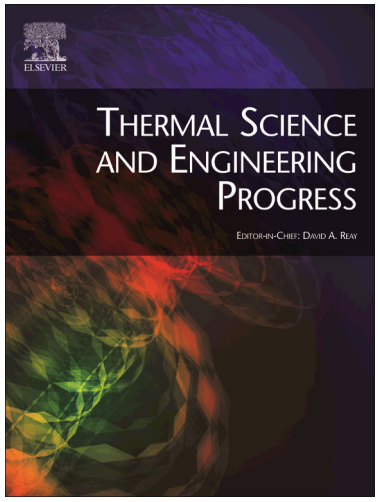

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Experimental investigation on the performance of chilled - water air conditioning unit using alumina nanofluids

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Abstract

One of the important contributions to the application of nanotechnology is the nanofluids technique in which will be become a good alternative to the conventional heat transfer medium. This is done by addition of nanoparticles of high thermal conductivity to the base fluid of the low thermal conductivity.

In the present paper, the performance of chilled-water air conditioning unit with and without alumina nanofluids has been experimentally investigated. The first method technique was used to prepare Al_2O_3- water nanofluids. Al_2O_3 nanoparticles was added with water in the cooling tank through using different concentrations by weight varies from 0.1,0.2,0.3, and 1% wt. and the alumina nanofluids have been continuously supplied to the cooling coil. The experiments have been performed under operation conditions include a variation of flow rate of chilled water/ alumina nanofluids and the air through the cooling coil. The experimental results have been shown a less time is achieved to obtain the desired child fluid temperature for all the different concentrations of nanofluids (Al_2O_3- water) compared with pure water. Also, the results revealed a reduction of the power consumption and increasing the cooling capacity which in turn increasing the COP by about 5%, and 17% for alumina nanoparticles concentration 0.1, and1% by weight respectively.

Key words: nanofluids, alumina, chilled water, air conditioning, nanotechnology, COP

Nomenclature

COP = coefficient of performance, [-]

$\dot{m}$ =mass flow of alumia-water nanofluid[kg/s]

$\dot{Q} = heat\ transfer\ rate\ across\ the\ cooling\ tank\ (evaporative)[W]$

T = temperature, [oc]

U = velocity of air, [m/s]

V= volume flow rate of air, [CFM]

W = power, [W]

Subscripts

R_1,R_2, = inlet and outlet refrigerants to the cooling tank

c.w = chilled alumina / water nanofluid

in = inlet

out = outlet

Abbreviation