عنوان مقاله:

Experimental and CFD analysis for the solar heat pump by using phase change material

محل انتشار:

فصلنامه تحقیقات کاربردی در مهندسی صنایع, دوره 5, شماره 2 (سال: 1397)

تعداد صفحات اصل مقاله: 12

نویسندگان:

.Saadoon Fahad Dakhil - *Basra Engineering Technical College, Southern Technical University, Basra, Iraq*

.Kifaya Oudah - *Basra Engineering Technical College, Southern Technical University, Basra, Iraq*

خلاصه مقاله:

The hot climate in Basra city requires many research to find a solution to reduce heat. Usually, the thermal pump needs an external energy to ensure its continued operation. The objective of the study is the possibility of building a heat pump using renewable energy. The present work addresses a renewable energy heat bump by using paraffin wax during the daytime. The experimental and the CFD model of the solar collector and Thermal Energy Storage (TES) system based on Phase Change Materials (PCM) as a renewable heat pump system are presented. The system consists of three main parts: The solar collector, paraffin wax cavity, and cooling room. An experimental rig is constructed to conduct a practical analysis by measuring the intensity of solar radiation at different hours of the daytime. Temperatures distribution are measured with ۲۴ type K thermocouples at different sites for the system. A numerical investigation has carried out to predict flow and heat transfer for the solar heat pump. Free convection of turbulent flow with ۲-D unsteady state incompressible flow is examined. The numerical work is divided into two parts: The first part presents the development of numerical models of the heating collector room while the second is the numerical model of paraffin wax room. ANSYS FLUENT code ۱۶ is applied to solve Navier Stock, energy, and k-ε model equations by using finite volume method. The calculations of the velocity, temperatures distribution, and the Nusselt number values with different Rayleigh number for air at both heat collector room and paraffin wax room at different daytime are reported.The results of the present work guarantee future development of this technology for the food or agriculture industry. Maximum cooling temperature of the hot air is reached more than ۲۰oC. It is found that a PCM leads to maximum energy savings and greater peak load at high solar intensity value. The practical results are .also compared with numerical results, and good agreement is obtained

کلمات کلیدی:

Free Convection, Parafin Wax, Heat Pump, CFD