Faculty of Engineering

Department: Mechanical Power

Name: A.E. Kabeel

Title: Application of sandy bed solar collector system for water extraction from air

Authors: A.E. Kabeel

Published In: Internaional Journal of energy research,30,381 (2006)

Impact Factor: 0.525

Abstract:

Extracting water from air by suing sandy bed solar collector system is explored in the current paper. The system is studied theoretically and experimentally to evaluate the performance of the sandy bed impregnated with 30% concentration $CaCl_2$ to produce water from moist air. In addition, the system was investigated at three different tilt angles; 15 , 20 and 25 . The theoretical model was constructed to study the effect of various parameters including solution concentration, and solar radiation intensity on the amount of collected water. Results show that sandy bed is effective for collecting water from moist air. The system can provide up to about 1.2-1 fresh water per square meter of glass cover per day. A reasonable agreement between theoretical results and experimental measurements is achieved. Results show also that a slight increase in the system productivity can be generated for 25° inclination angle .

Key words:

Desiccant, water from air, absorption-regeneration

Faculty of Engineering

Department: Mechanical Power

Name: A. E. Kabeel

Title: Water production from air using muilti-shelves solar glass pyramid system

Authors: A.El Kabeel

Published In: Renewable energy 32, 157(2007)

Impact Factor: 0.795

Abstract:

The capability of the glass pyramid shape with a mult-shelf solar system to extract water from humid air is explored. Two pyramids were used with different types of beds on the shelves. The beds are saturated with 30% concentrated Calcium Chloride solution . The pyramid sides ere opened at night to allow the bed saturated with moist air and closed during the day to extract the moisture from the bed by solar radiation. The bed in the first pyramid was made of saw wood while it is made of only cloth in the second pyramid with the same dimensions. The system was experimentally investigated at different climatic conditions to study the effect of pyramid shape on the absorption and regeneration processes. Preliminary results have shown that the cloths bed absorbs more solution (9 kg) as compared to the saw wood bed (8 kg). Adopting this approach produces 2.5 L/day m^2 . The use of the pyramid shape with four glass surfaces and multi-shelves enhances the produced water by 90-95% compared with solar desiccant/collector system with horizontal and corrugated beds. Results also show that the clothes bed has higher productivity than that of saw wood bed by about 5% . This due mainly to the greater carrying solution at the onset of the experimental work. The obtained results may help in designing more efficient system.

Key words:

Water from air, desiccant

Faculty of Engineering

Department: Mechanical Power

Name: A.E. Kabeel

Title: Solar powered air conditioning system using rotary honeycomb desiccant wheel

Authors: A.E. Kabeel

Published In: Renewable energy,32,1842 (2007)

Impact Factor: 0.795

Abstract:

A solar powered air conditioning system using liquid desiccant is proposed. A solar air heater containing a porous material is used for regeneration purpose in the proposed system. The honeycomb desiccant rotary wheel is constructed from iron wire and clothes layer impregnated with calcium chloride solution, in honeycomb form, is utilized for the regeneration and absorption processes. The effect of airflow rate and solar radiation intensity on the system regeneration and absorption processes are studied. The obtained results show that the system is highly effective in the regeneration process. An empirical equation to calculate the removed moisture as a function of air flow rate at solar noon is obtained. Also empirical equation for wheel effectiveness as a function of air flow rate for regeneration and absorption process was obtained.

Keywords:

air conditioning system, liquid desiccant, desiccant rotary wheel, absorption and regeneration.

Faculty of Engineering

Department: Mechanical power

Name: A.E.Kabeel

Title: Adosrption-desorption operations of multilayer desiccant packed bed for dehumidification applications

Authors: A.E. Kabeel

Published In: Renewable energy,34,255 (2009)

Impact Factor: 0.85

Abstract:

In this work, the effect of design and operating parameters on the performance of multilayer desiccant packed bed was theoretically and experimentally studied. In the experimental work, a silica gel packed bed of eight layers has been studied. The transient value of the mass of adsorbed water and desorbed water was measured for different values of the bed length. The theoretical model shows the dependence of the dimensionless value of water content in the bed on the dimensionless time. Also the model shows that the dimensionless temperature depends on the bed characteristics and bed water content . The effect of inlet air humidity and velocity on the adsorption process for each bed layer was studied at different inlet velocities and at different air humidities.The effect of inlet temperature on desorption process for each packed bed layer was also studied at different inlet temperatures. The theoretical model also introduces an equation which can be used to predict the optimum bed length. Also, the optimum length of the bed can be recommended from the experimental results according to the operation time. Good agreement between experimental and theoretical results was found.

Paper Data:

Paper Title: Performance study of spot cooling of tractor cabinet.

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Paper abstract:

The target of this research is to study theoretically and experimentally the performance of spot cooling of a tractor cabinet including a single internal heat source (tested body) by using vortex tube. In the theoretical study, the cabinet is cooled from the roof by one port while the lower and side walls temperature is kept constant. The effect of inlet and outlet air ports positions in the cabinet is considered. Moreover, we study the influence of varying some parameters as velocity and temperature of inlet cold air to the cabinet, the pressure of inlet air to the vortex tube and the cold fraction of the vortex tube in the presence of a heat source with a constant heat flux of 120 W/m². In this work, FLUENT 6.3.26 package is used in the numerical study. The steady of the 2-D incompressible viscous flow problem is solved by using the fluent package. Various spot cooling geometries are applied. Specific conditions for each case are defined, and the computational fluid dynamics is provided for three different groups containing twelve cases of local inlet and outlet ports. The calculations are performed for ventilation effectiveness factor (VEF) which is ranging from 0.58 to 1.29. The best position for the inlet locations in this study is found in upper right side of roof and the outlet locations in upper left side of cabinet. To validate the numerical model, an experimental test rig has been designed and constructed with the actual dimensions of a tractor cabinet. The experiments are carried out with the same conditions of the ideal case. The comparison of the experimental data, for that of best position of the inlet port, with the theoretical results gives a satisfactory agreement.

Keywords:

Spot cooling,Vortex tube,Ventilation systems

Article info:

Energy 35 (2010) 1679–1687

Accepted 11 December 2009

Available online 2 February 2010