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Development of Intelligent Façade Based on Outdoor Environment and Indoor thermal Comfort


Abstract:

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Keywords:

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8th International Conference Interdisciplinarity in Engineering, INTER-ENG 2014, NULL, NULL
Abstract:

This study aims at investigating experimentally and analytically the characteristics and properties of a membrane utilized to design compact absorbers for lithium bromide-water absorption chillers. The main focus of this study are the factors that influence the water vapor transfer flux into a lithium bromide-water solution in confined narrow channels under vacuum conditions, as well as the properties limits for utilization in compact absorber design. The results indicate that the desired membrane characteristics for this application are as follows: high permeability to water vapor, hydrophobic to the aqueous solution with high liquid entry pressure (LEP) to avoid wettability of the membrane pores and no capillary condensation of water vapor to avoid blocking of the pores. For practical use, this membrane should have a thin hydrophobic microporous active layer with a thickness up to 60 mm, mean pore sizes around 0.45 mm and a porosity of up to 80%. The active layer should be attached to a porous support layer to meet the mechanical strength requirements needed for practical use in the absorber of lithium bromide water absorption chillers application.

Keywords:

Absorption system, Water/lithium bromide, Modelling, Mass transfer, Heat transfer, Membrane, Absorber

Published In:

Abstract:

In this study, a direct formula that predicts either the frost formation on cold walls is correspondence to psychrometric-sub-saturated or supersaturated regions is presented. The developed formula uses the data of the entering air dry-bulb temperature and absolute humidity, and the absolute humidity of the air at saturation corresponding to the coil surface temperature. Cases studies of demarcation criteria for frost formation on evaporator coil using experimental measured data, and on walls of cold storage freezer using measured data from literature are used to validate the formula and it is found that results are completely matches to the graphic plot of the data on the psychrometric chart. In case of cold storage freezers, the result clearly shows that a greater demarcation criteria value indicates frost formation under sever condition that is characterized as snow-like with low density and thermal conductivity.

Keywords:

Frost, Cold storage, Psychrometric chart, Evaporator Coil, Performance

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Energy Conversion and Management, Vol. 50 Issue 6, 1570-1577 pp
Design of a compact absorber with a hydrophobic membrane contactor at the liquid–vapor interface for lithium bromide–water absorption chillers

Ahmed Hamza H. Ali

Abstract:

In this study, design of a compact plates-and-frames absorber possessing a hydrophobic microporous membrane contactor at the aqueous solution–water vapor interface is performed analytically. The absorber is a component of a 5 kW cooling capacity single-effect lithium bromide–water absorption chiller that incorporates a hot water thermally driven generator and a water-cooled absorber and condenser. Good agreement prevailed for the analytically evaluated water vapor mass transfer flux and aqueous solution outlet temperature when compared with measured values at similar operating conditions. At design point conditions, the main design parameters obtained are a membrane contactor area of 6.06 m², a ratio of the mass transfer area to absorber net volume (Am=Vnet) of 130.1 (m²/m³), and ratio of the membrane area (mass transfer area) in this design configuration to the area required for heat transfer is 1.162, respectively. The results clearly indicate that the aqueous solution channel thickness is the most significant design parameter that affects the absorber size compactness; the thinner the thickness of the solution channel, the higher the ratio (Am=Vnet). The results also show the countercurrent refrigerant flow with the aqueous solution has positive effects on the absorber size compactness.

Published In:

Applied Energy, vol 87 - no 4, 1112-1121
Energy efficiency and indoor thermal perception: a comparative study between radiant panel and portable convective heaters

Ahmed Hamza H. Ali & Mahmoud Gaber Morsy

Abstract:

This study investigates experimentally the thermal perception of indoor environment for evaluating the ability of radiant panel heaters to produce thermal comfort for space occupants as well as the energy consumption in comparison with conventional portable natural convective heaters. The thermal perception results show that, compared with conventional convection heater, a radiantly heated office room maintains a lower ambient air temperature while providing equal levels of thermal perception on the thermal dummy head as the convective heater and saves up to 39.1% of the energy consumption per day. However, for human subjects' vote experiments, the results show that for an environmentally controlled test room at outdoor environment temperatures of 0°C and 5°C, using two radiant panel heaters with a total capacity of 580 W leads to a better comfort sensation than the conventional portable natural convective heater with a 670 W capacity, with an energy saving of about 13.4%. In addition, for an outdoor environment temperature of 10°C, using one radiant panel heater with a capacity of 290 W leads to a better comfort sensation than the conventional convection heater with a 670 W capacity, with an energy saving of about 56.7%. From the analytical results, it is found that distributing the radiant panel heater inside the office

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Energy Efficiency, vol 87 - no 4, 1112-1121
Investigation of heat transfer and fluid flow in transitional regime inside a channel with staggered plates heated by radiation for PV/T System

Ahmed Hamza H. Ali, Mahmoud Ahmed, S.M. Abdel-Gaied

Abstract:

This study investigates experimentally and theoretically the effects of operating and configuration parameters on convection heat transfer process and fluid flow characteristics for air flowing in transitional regimes through parallel plate channels with staggered plates segments heated by radiant heat flux. This configuration is to be utilized in air heater solar collectors and/or in a combined photovoltaic and air heater solar collector systems (PV/T). The operating parameters tested were Reynolds number (Re) values ranging from 2580 to 4650 with a combination of incident radiation heat flux (qinc) values of 400, 700, and 1000 W/m², respectively. The experimental results show that the local Nusselt number (Nu_x) is not a unique function of the axial distance, in addition, a linear relationship between Re and apparent friction factor (f) was observed. Moreover, the model results show that combination of Re values in the laminar flow regime with proper selection of both plate's length and thickness can lead to enhancement in the heat transfer from the plate segments to the air stream. This is due to self-oscillatory flow mixer in wake zone behind each plate segment. Consequently, this will lead to avoid the need of more pumping power for the case of the flow falling within the transitional regime in the channel.

Keywords:

Staggered plate; Transitional flow regime; Convection; Radiation heat transfer; Combined photovoltaic air heater solar collectors (PV/T)

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Energy, Vol.59, No. 15, PP.255–264
The onset of liquid entrainment from a stratified two-phase region through small branches

Mahmoud Ahmed, M. S. Youssef, Ahmed Hamza H. Ali

Abstract:

A new criterion has been developed to predict the onset of liquid (heavier fluid) entrainment from a stratified two-phase region. The criterion was developed based on the local instability of the interface between two fluids due to the suction effect associated with the discharging of the lighter fluid. To validate the proposed criterion, comparisons were conducted between the measured critical height at the onset and those predicted using a three-dimensional analysis of the flow through two configurations: (1) a single branch mounted on an inclined wall with an inclination angle ranging between −90° and + 60° and (2) dual branches mounted on a vertical wall with the plane passing through the branch centerlines and inclined with an angle ranging between 0° and 60°. Comparisons demonstrate a very good agreement between the predicted and the measured values for both single and dual branches. This verifies that the onset of liquid entrainment mechanism occurs due to local flow instability of the interface, analogous to Rayleigh/Taylor instability.

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Acta Mechanica, , Vol. 225, No.11 , PP.3023-3039
Intelligent Façade: The State of Art based on Outdoor Environment and Indoor thermal Comfort


Abstract:

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Keywords:

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Published In:

Towards 100% Renewables And Sustainable Communities For Africa, The American University in Cairo, New Cairo, NULL, NULL
Effect of hot and cold buffers on the performance of a residential scale solar driven adsorption cooling system


Abstract:

Abstract: A residential scale solar driven adsorption cooling system was designed, constructed, and operated at Assiut University, Assiut city, Egypt. The system consists of evacuated tube with back reflectors solar collector arrays field of total area 36 m², a silica gel- water adsorption chiller of 8 kW nominal cooling capacity, and hot and cold water storage tanks of volumes 1.8 m³ and 1.2 m³ respectively. The system was designed to operate with or without both cold and hot thermal buffers. The aim of this study is to investigate experimentally the effect of hot and cold buffers on performance of the chiller, solar collectors, and the overall system performance. The experimental results show that both the chiller and solar collectors operates steadily with integration of the hot storage. In addition, the chiller performance is higher with the hot storage with an increase in the cooling capacity of about 18% and about 10 % in the COP than the case without integration the hot thermal buffer. Also the results show that, the existence of the hot storage is necessary, on the system as it effect on both the collector field and chiller performance. Moreover, the cold storage has no significant effect on the chiller and collector/s performance. The chiller performance is sensitive to any fluctuation in the chilled water inlet temperature. The collector/s efficiency is slightly higher without the cold storage, due to the lower inlet temperature to collector field.

Keywords:

Keywords: Solar cooling; adsorption chiller; cold and hot thermal storage, solar cooling performance.

Published In:

7th Annual Conf. on Future of new and renewable energy in the Arab world, 19
Experimental Study on Thermal Comfort Conditions in Existing Public Primary Schools Buildings in Upper Egypt

Saleem, A. Abel-Rahman, A. H. Ali, and S. Ookawara,

Abstract:

The present study is an attempt to primarily examine thermal performance of public primary school in Assiut city, Upper Egypt (hot arid climate) targeting to identify how much time pupils achieve thermal comfort conditions in their classrooms. In order to achieve this aim the current status of a typical public primary school is investigated through field measurements in terms of thermal comfort indices. These thermal comfort indices are the Predicted Mean Vote (PMV) and Predicted Percentage of Dissatisfied people (PPD). The results show that for the recent school building design there is strong relation between indoor comfort conditions and outdoor temperature. In addition to the average measured values of both the PMV and PPD inside the classrooms were 1.17 and 38.86%; respectively. Clearly, these results indicate that a higher level of thermal discomfort is existing within the primary public school classrooms as the pupils spent more than 36.5% of their time inside the classrooms under thermal stress conditions.

Keywords:

Thermal comfort; school building; hot-arid climate; naturally ventilated.

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proceedings of the Sustainability in Energy and Buildings, SEB-14, Cardiff, Wales, UK.
An Analysis of Thermal Comfort and Energy Consumption within Public Primary Schools in Egypt

Saleem, A. Abel-Rahman, A. H. Ali, and S. Ookawara,

Abstract:

Schools are the most suitable type of building for the application of indoor thermal comfort quality as they represent the main sector of the community. Thermal comfort plays a major factor in the educational building sector, especially in hot-arid climate. It has a big impact on building interior temperature as well as on energy consumption. The present study is an attempt to primarily introduce the existent indoor thermal comfort status as well as energy consumption in Egyptian public primary school building. To meet this objective, a methodological procedure has been followed. A field study is conducted in a school building that are designed based on natural ventilation and air movement through ceiling fans to assess the indoor thermal conditions based on adaptive standard comfort (ASC) model during the students' lesson hours during a three-day. In addition, electrical utility bills have been collected. Then, a dynamic building energy simulation model carried out by using, DesignBuilder/EnergyPlus software for examining indoor comfort conditions as well as energy consumption of a typical school building in Egypt. Findings revealed that lighting sources represent the largest proportion of energy consumption. In terms of indoor thermal comfort, results indicate that a higher level of thermal discomfort within the primary public school classrooms and the pupils stay more than 36.5% of their time daily in classrooms with thermal stress conditions.

Keywords:

Thermal comfort; school building; hot-arid climate; naturally ventilated

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proceedings of The Asian Conference on Sustainability, Energy and the Environment 2014, Osaka, Japan
Double Skin Façade: The state of art on Building Energy efficiency


Abstract:

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Keywords:

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4th International Conference on Clean and Green Energy, NULL, NULL
Performance Assessment of a Solar Powered Residential Scale Adsorption Cooling System at Assiut, Egypt


Abstract:

A small scale solar powered adsorption cooling plant has been constructed in Assiut University, Egypt. The plant consists of evacuated tube solar collector arrays of area 36 m² with high reflective parabolic surface used at the back, a silica gel-water adsorption chiller of 8 kW nominal cooling capacity, and hot and cold water storage tanks of 1.8 and 1.2 m³ in volume, respectively. Field test results from June to September 2012 showed that under daily solar insolation varies from 21 to 27 MJ/m², the solar collectors employed in the system have higher and constant thermal efficiency during the day. The performance analysis of the adsorption chiller showed that the chiller average daily COP was 0.41 with average chilling power of 4.4 kW when the cooling water temperature was about 31 °C and chilled water temperature of 19 °C. Using the city water of temperature about 27.7 °C as cooling medium enhanced the chiller COP by 40 % and the chilling power by 17 %.

Published In:

7th Annual Conf. on Future of new and renewable energy in the Arab world, Assiut, 14
Energy Conservation in Existing Office Building: Case study Petrojet Company Head Office Buildings in Cairo, Egypt


Abstract:

The energy performance in two administrative office buildings in Egypt is evaluated. One building is a traditional classic building while in the other building the designer consider energy efficiency and solar energy generated power contribution to the power required. The office buildings in this study has been designed with the compliance of the building regulation during their contraction time. The evaluation is done by ENERGY STAR. The main conclusions were that ENERGY STAR can be used to evaluate energy performance of office buildings in Egypt. Egyptian office buildings can compete the USA office buildings in applying energy efficiency strategies. In addition, energy efficient lighting and HVAC systems used in the new building save 19% and 64% of the energy used respectively and will save about 46% from the source energy used. In addition the GHG emissions / m2 in the new building is half that of the existing one.

Keywords:

energy efficient building, ENERGY STAR, GHG reduction, energy performance

Published In:

World Sustainable Building 2014 Conference (WSB 14), Barcelona, Spain.
Performance assessment and gained operational experiences of a residential scale solar thermal driven adsorption cooling system installed in hot arid area

Ahmed Hamza H.Ali

Abstract:

In this study, performance assessment of a residential scale size solar thermal driven adsorption cooling system installed in hot arid and dusty area at Upper Egypt, and, in operation since summer 2012 until now is carried out experimentally for four years in operation, moreover, the gained operational experiences are presented. The system performance is expressed in term of the solar collectors' field thermal efficiency, actual chiller chilling capacity, the temperature of cold-water outlet from the chiller, chiller coefficient of performance (COP) and cooling-water temperature outlet from the cooling tower. The system performance results show that the daily solar collector efficiency during the reported period was ranged from about 50% to 78%. While, the average chiller COP was varied from 0.4 to 0.64 in combination with average chilling power ranged from 3.6 to 6.42 kW and average chiller outlet cold water temperature ranged from 19 °C to 12.12 °C correspondence to cooling tower outlet cooling water temperature ranged from 31.4 °C to 23.4 °C, respectively. In the cooling session of 2014, a 50 kW cooling capacity wet cooling tower is integrated into the system, and the measurements show that the outlet water temperature from the cooling tower is about 23.4 °C at ambient air dry bulb temperature of 35.7 °C and wet bulb temperature of about 19 °C. Consequently, under this new heat rejection condition, the chiller average cooling capacity and COP reaches were 6.42 kW and 0.64 with a chilled water temperature of 15 °C. Clearly from the system operation period, the heat rejection through the recooling sub-system has the main significant impact on the system performance in the hot arid areas. Therefore, it should be based on alternative heat sink recourses with appropriate cost performance techniques.

Keywords:

Residential solar thermal cooling Ambient effect on performance Solar cooling hot arid area Vacuum tubes field efficiency

Published In:

Energy performance, environmental impact, and cost assessments of a photovoltaic plant under Kuwait climate condition

Ali, Ahmed Hamza H.; Zeid, Heba AbdelRasheed S.; AlFadhli, Hassan M.G.

Abstract:

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Keywords:

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Sustainable Energy Technologies and Assessments, v 22, p 25-33
Performance-cost and global warming assessments of two residential scale solar cooling systems versus a conventional one in hot arid areas

Ali, Ahmed Hamza H.

Abstract:
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Keywords:
NULL

Published In:
Sustainable Energy Technologies and Assessments, v 20, p 1-8
Performance and environmental impact of a turbojet engine fueled by blends of biodiesels

Ali, A.H.H.; Ibrahim, M.N.

Abstract:

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Keywords:

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Published In:

International Journal of Environmental Science and Technology, v 14, n 6, p 1253-1266
Design optimization of staggered plates' channel heated by radiation heat flux based on the convective heat transfer and fluid flow for hybrid Photovoltaic/Thermal system

Ali, Ahmed Hamza H.

Abstract:

NULL

Keywords:

NULL

Published In:

Sustainable Energy Technologies and Assessments , v 24 , p 55-70
Residential scale solar driven cooling systems versus conventional air-conditioning in hot arid areas: A comparative study

Ali, Ahmed Hamza H.; Alzaed, Ali Nasser

Abstract:

NULL

Keywords:

NULL

Published In:

Materials Physics and Mechanics, v 32, n 1, p 21-30
Performance of a small-scale solar-powered adsorption cooling system

Reda, Ahmed M.(1); Ali, Ahmed Hamza H.(1); Taha, Ibrahim S.(1); Morsy, Mahmoud G.(1)

Abstract:

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Keywords:

NULL

Published In:

International Journal of Green Energy, v 14, n 1, p 75-85
Design optimization of a residential scale solar driven adsorption cooling system in upper Egypt based

Reda, Ahmed M.(1); Ali, Ahmed Hamza H.(1); Morsy, Mahmoud G.(1); Taha, Ibrahim S.(1)

Abstract:

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Keywords:

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