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A Review on Model of Centralized Solar Air Cooling with Evaporating System

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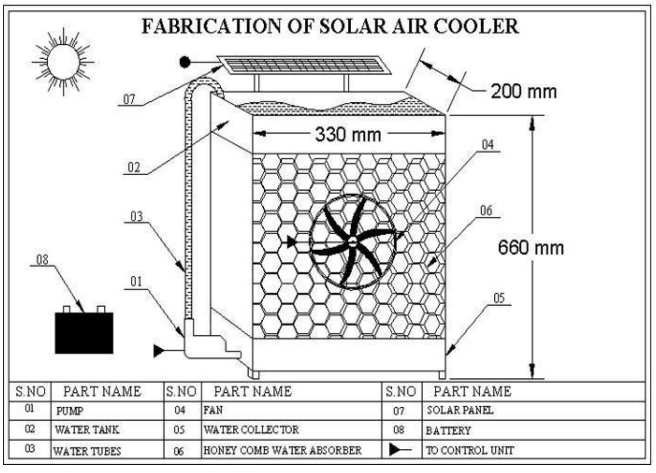
Abstract - Cooling process is very important to maintain the foods, fish and many items at constant temperature to avoid the effect of viruses. Cooling process employs the different methods to cool the air. But considering the lower application and cost effective the water cooling system is considered for our project. The main aim of our project is to supply the cooled air with the help of water circulation. It consists of Solar panel, Battery, Fan, Water tank and Pump. The present air cooling methods are evaporative coolers, air conditioning, fans and dehumidifiers. But running these products need a source called electricity. The producing of electricity is ultimately responsible for hot and humid conditions i.e. global warming. In hot and humid conditions the need to feel relaxed and comfortable has become one of few needs and for this purpose utilization of systems like air- 0conditioning and refrigeration has increased rapidly. These systems are most of the time not suitable for villages due to longer power cut durations and high cost of products. Solar power systems being considered as one of the path towards more sustainable energy systems, considering solar-cooling systems in villages would comprise of many attractive features. Despite increasing performance and mandatory energy efficiency requirements, peak electricity demand is growing and there is currently no prevalent solar air cooling technology suited to residential application especially for villages, schools and offices.

Key Words: Evaporative pad, Solar Power Systems, Dehumidifier, Water Circulation.

1. INTRODUCTION

Solar energy is the light and radiant heat from the Sun that influences Earth's climate and weather and sustains life. Solar power is sometimes used as a synonym for solar energy or more specifically to refer to electricity generated from solar radiation. Since ancient times, solar energy has been harnessed for human use through a range of technologies. Solar radiation along with secondary solar resources such as wind and wave power, hydroelectricity and biomass account for most of the available flow of renewable energy on Earth. Solar energy technologies can provide electrical generation by heat engine or photovoltaic means, space heating and cooling in active and passive solar buildings; potable water via distillation and disinfection, day lighting, hot water, thermal energy for cooking, and high temperature process heat for industrial purposes. Sunlight can be converted into electricity using photovoltaics (PV), concentrating solar power (CSP), and various experimental technologies. PV has mainly been used to power small and medium-sized applications, from the calculator powered by a single solar cell to off-grid homes powered by a photovoltaic array.

The term "photovoltaic" comes from the Greek φώς (*phos*) meaning "light", and "voltaic", meaning electrical, from the name of the Italian physicist Volta, after whom a unit of electrical potential, the volt, is named. A solar cell, or photovoltaic cell (PV), is a device that converts light into direct current using the photoelectric effect. The first solar cell was constructed by Charles Fritts in the 1880s. Although the prototype selenium cells converted less than 1% of incident light into electricity, both Ernst Werner von Siemens and James Clerk Maxwell recognized the importance of this discovery.



S.NO	PART NAME	S.NO	PART NAME	S.NO	PART NAME
01	PUMP	04	FAN	07	SOLAR PANEL
02	WATER TANK	05	WATER COLLECTOR	08	BATTERY
03	WATER TUBES	06	HONEY COMB WATER ABSORBER	▶	TO CONTROL UNIT

RESEARCH PAPER

(1) Vipin Das1, Nidhin Mj2 the project carried out by us made an impressing task in the field of Cost of generation of power is very less so the source of power is free and available in plenty and then is no power interruptions. This project has also reduced the cost involved in the concern. Project has been designed to perform the entire requirement task which has also been provided

(2) Takahiko Miyazakia,*, Atsushi Akisawaa, The study proposed the solar chimney driven evaporative cooling system that was integrated with the ceiling of a room. The cooling performance of the system was

predicted by simulationof the solar chimney and the M-Cycle evaporative cooling channel.

(3) Wenzhong Gaoa, William Worekb, Conclusion Solid-desiccant-based evaporative cooling system is an alter-native to achieve a thermal comfort condition in the humid environments where the conventional indirect/direct evaporative cooling air conditioning cannot be applied. A multi- component model for the solid-desiccant- based evaporative cooling system has been proposed and the validity is confirmed by comparing with the experimental results. COP and Emis adopted as in dices to describe the performance of the hybrid system.

(4) Giuseppe Franchini*, Antonio Perdichizzi A solar driven HD desalination system has been investigated in the present study. Two different configurations have been compared: an integrated solar cooling and desalination system and separated solar cooling and solar desalination units. A computer code has been developed to carefully model the desalinate and the LiBr absorption chillers and to carry out annual simulations on hourly basis.

(5) Alibakhsh Kasaeiana, Sahar Babaeia, Fresh water supply crisis is spreading throughout the globe. Arid and semi-arid regions must move toward reliable sources of fresh water considering the extreme population growth. Therefore, desalinating sweater and brackish water is becoming a must for sustainable development of many regions in the world. Humidification- dehumidification desalination is among the direct desalination methods, the power of which could be appropriately supplied by solar energy

(6) O. Amer, R. Boukhanouf Using water for evaporation as a mean of decreasing air temperature is considerably the most environmentally friendly and effective cooling system. In this paper a review of evaporative cooling technology that could be efficiently applicable in building air-conditioning was carried out. Indirect evaporative coolers showed higher values of effectiveness and are more economical in terms of energy consumption saving, particularly the breakthrough brought about by the M-cycle based dew-point IEC system .

(7) Miss*. Namrata Govekar* Report is sequential details about research carried out on the evaporative cooler in order to remove this disadvantage. The important parameter in whole report is nothing but relative humidity which should be maintained in specific range for getting better thermal comfort. Report briefly explains the basic concept required to understand evaporative cooling and performance of evaporative cooling. It also explains why evaporative cooler is not as effective as air conditioners.

(8) Parag Mishra The outcome of this literature review is that, we can achieved power saving in Air Cooled Heat Exchanger by fans, because in Air Cooled Heat Exchanger, the main consumption of Auxilary power are fans.

(9) P. Tamil Selvam, H. Imdad Ahmed,

The "Modified air cooler cum storage system" provides both air cooling as well as cold storage systems. It provides better cooling effects than a normal air cooler and consumes lesser energy than air conditioners. That is, the temperature of 4o-5o C less than the conventional coolers is obtained where as a temperature range of 6o-80 C more than the air conditioners is obtained. It is very energy efficient as only the fan and pump require electricity.

(10) Rupal R. Patel the evaporative air cooling is natural, simple and low cost phenomena. There are many types of systems designed and operated till date based on this concept, e.g. systems like domestic air coolers, mist fans provide humid air creating health problems like asthma, air conditions give dry and cold air with high operation and maintenance cost. Humidity free air can be obtained using indirect air cooling. This is the best concept for reducing temperature up to 10□C - 15□C in dry and hot climate suitable for weather during March, April, May and June in India.

(11) Pratik Bhake In this paper a literature review of evaporative cooling technology applicable in hot & dry area was carried out. Evaporative cooling is more economic, effective and energy saving in hot and dry climates. The performance and effectiveness of evaporative cooling depends upon inlet air velocity, air mass flow rates and moisture contents present in the environment and it also depends on thickness of evaporative media and geographical locations.

(12) Kunal Kumar Mishra, as less number of parts are coming in contact with the water the chances of rust is reduced and life of the cooler is increased. Eliminating the use of water pump, so there is no need of change the water pumps yearly which cost around Rs.300-400. Water consumption is low as compared to conventional air cooler.

(13) Himanshu Srivastava It reduces the cost of air cooling compare to normal air cooler. It is eco-friendly. It is efficient for cooling in small area. Long run it proves eco-friendly. Clay pipe arrangement enhances the heat transfer between air and the clay pipe surface. An air cooler works satisfactorily. But, there were some improvement should be done. Solar panel should be used in this air cooler in future for save electricity.

(14) J. Lin, R.Z. The cross-flow dew point evaporative cooler is investigated numerically and experimentally via a cooler prototype. This paper has demonstrated that the cross-flow cooler is able to achieve good cooling potential when the supply air humidity is suitable for indoor conditions. A cross-flow cooler prototype has been tested for the supply air temperature and humidity of 25.0 □C-37.0 □C and 12.0 g/kg-13.0 g/kg, respectively. It is observed that the overall wet bulb and dew point effectiveness of the cooler approach 1.25 and 0.85,

respectively.

(15) Fabio Armanasco The solar-aided plant performs always better than a conventional air conditioning system based on a compression chiller and a water loop (standard system). Hence, from a technical standpoint, the combination of the liquid desiccant evaporative cooler with the solar collectors proves to be a promising solution for solar cooling and a valuable alternative to conventional air treatment units. On the other hand, the absorber unit always operates near the lower bound of the nominal temperature range. Therefore, higher performance could be achieved by optimizing the solar system design

(16) Deepak Bishoyi, K. Sudhakar This paper presents the results of a direct evaporative cooler tested in a residential building for human thermal comfort with two different types of cooling pads. From the experimental analysis, the following conclusions are drawn 1. Honeycomb cooling pad cooler is able to reduce dry bulb temp up to 8 whereas 5 reduction is only possible with the Aspen swamp cooling pad cooler.

(17) Haitao Hu, Trygve Magne Eikevik, Petter Neksa, A R744 GSHP system with the ambient air-cooled and water-cooled gas coolers was designed for the building under different cooling dominated climates, which can provide the heating and cooling energy loads needed for the buildings by adjusting the air cooling load proportion. A numerical model for the proposed R744 system was developed to analyze the system performance, and the following results can be obtained. The operation indoor temperature for the archives building under the different climates is recommended as 20 C by considering the earth's energy imbalance degree, the system investment cost and the operation cost;

(18) Yi Chen, Hongxing Yang, Yimo Luo The solar assisted liquid desiccant dehumidifier and regenerative indirect evaporative cooling (LDD- RIEC) semi-centralized air-conditioning (A/C) system was investigated in this paper. The system model was developed by solving the heat and mass transfer equations of each component integrally in a closed loop. The main results are as follows. . The proposed system can provide supply air of 17.2°C and 9.8g/kg when ambient air is 30°C and 20g/kg. . The optimal extraction air ratio of RIEC is 0.3 considering the interacted influence of 481 dehumidifier, regenerator and RIEC. . In terms of thermal performance alone under fixed operating conditions.

(19) Atsushi Akisawaa, Isao Nikai b the study proposed the solar chimney driven evaporative cooling system that was integrated with the ceiling of a room. The cooling performance of the system was predicted by simulation of the solar chimney and the M-Cycle evaporative cooling channel. The main findings of the study are summarized as follows. • The proposed system was feasible as a solar energy driven cooling system because the sufficient air flow to the M-Cycle evaporative cooling channel could be induced by the solar chimney when the solar radiation was available.

(20) Chang Hyun Leeb, In Gwan Kimc, Chan Woo Parka In the present study, based on the experimental validation, the theoretical analysis on a thermally-driven hybrid absorption system was conducted for the simultaneous and flexible use of the heat pump and refrigeration applications. The proposed hybrid absorption system has a sub-heat pump and a sub- refrigeration cycle, and they share a generator and a condenser. The sub-heat pump cycle runs at the highpressure level with a high-pressure absorber and evaporator, and the sub-refrigeration cycle also has a low-pressure absorber and evaporator operating at the low- pressure level. Simulation investigations clarified the variations of the pressure levels, the circulation ratio, the heat capacities, and the COPs under various working conditions.

CONCLUSION

There are many nonconventional sources which are available in the nature, among these solar energy is highlighted in this paper since of its abundant availability and its ability to reduce the pollution, and electric consumption. This paper concludes that by using the solar energy, there is a possibility to save energy by reducing the electricity consumption, cost, and by using the solar flat plate collectors cooling effect can be produced. From the review of the work, the solar air cooler can be installed in the rural areas as well as urban areas where the electric consumption is high. After conducting the experimental analysis, it is proved that the cooling effect produced at water temperature is 14.78 watts, and 31.4 watts. The experimental analysis highlights that there is a variation in water temperature is observed that is if the temperature reduces, the cooling effect and the coefficient of performance are doubled respectively which proves that a good cooling effect can be produced if the temperature of cooling water is reduced. Hence from it is concluded that the Solar Air Cooler is one of the most important equipment to produce the cooling effect which helps to reduce the electric charges, and also the annual cost of the unit. Although the initial cost of the Solar Air Cooler is higher, still there is a need to use this cooler for sustainable energy and to reduce the demand of the electricity.

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