

Chapter 29

Air Conditioning System Using Solid Desiccant (Silica Gel) as Dehumidifier



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Abstract In this paper, we have arranged different mechanical components to produce air conditioning effect by using solid desiccant material (silica gel) as a dehumidifier. This assembled equipment was tested at various atmospheric temperatures and coolant conditions for monitoring the effect. On room temperatures with relative humidity which consumes very less power to operate with no such harmful effect on climate except releasing hot water, which may be used for any thermodynamic process. The overall performance of the proposed work was checked with proper insulation. The entire system runs by using solar PV as input energy since the system comprises of few DC power operated equipments. In our experiment, we took different temperatures of water, such as natural water from bore well, chilled water and direct ice to produce cooling effect for a room of smaller volume (0.9126 ft^3) made up of acrylic boards. It has composite water tanks containing sands inside it which were used to generate cold water by natural evaporation process along with two water-cooled radiators for exchanging heat between air and cold water for this air conditioning system. From experiments, it has been found that cold water having temperature ranges between 24 and 29 °C provide a good result (COP—0.04) over other water inlet conditions such as applying chilled water and simply putting ice into the water tanks. Also, this type of air conditioning system has many advantages over other conventional types as it is not using any kind of chemical refrigerants and high energy-consuming device with less mechanical components by which mechanical losses, energy consumption with harmful effect to the environment reduces up to a certain limit. This concept can be used for rural and remote areas where a significant energy crisis is observed.

Keywords Desiccants · Evaporator · Humidity · Psychrometry

29.1 Introduction

India is a tropical country and more than 80% of Indian subcontinental area falls under warm humid or composite climatic zone. These climatic zones are characterized by

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