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Saving Energy by Reducing Cooling Load of Rural Houses with using Passive Solar System and Well Water

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Abstract. Saving energy helps in reducing the effect of the environmental contamination. This could be obtained by decreasing the cooling load of rural houses and small buildings by using passive and active solar systems. The big temperature differences between the well water and the ambient temperatures is also utilizing for the purpose of air conditioning. This is done by adding heat exchanger (Fan-Coil) inside the house, which is operated by external photoelectric cells to reduce the cooling load of the house. The passive systems have also been studied like the directions and areas of the windows. Its significance comes from the importance of passive system applications to reduce the cooling load of houses in summer. Energy balance is done to get the governing equation that is necessary to calculate the variation in cooling load along the day for different parameters design, then to find out the optimum values of these parameters in order to reduce the houses' cooling load through the day hours. The results have shown that the use of well water to cool the house would help to reduce the cooling load by 30%. Also the best orientation of windows in the south direction with suitable length of overhang, which prevent the direct solar radiation through the windows is investigated. This results in a reduction by 6% in cooling load during the summer season. The use of the passive system and well water in house cooling decreases the cooling load of the house by 36%.

1. Introduction

Air conditioning of houses consumes approximately (60%) of the total electricity that is consumed during the summer season [1]. Therefore, it is wise to look for solutions to reduce the cooling load and to save energy by reducing the environmental influence on the houses. Since thirties of the last century, scientists had introduced the uses of solar energy to meet the houses' requirements from hot water, which helped to save energy and overcome the economic crisis, that hits many countries at that time [2]. Therefore, attention has been focused on conditioning houses by solar power. Many researchers [3] have studied the effect of using the overhang in the buildings on cooling load, were their walls constructed using materials. Z-transformation method had been used to guess the cooling load of the building for different lengths and trends of overhang in order to show and count its effect on the cooling load. The researcher concluded that the use of a specific width of overhang on the southern wall leads to 9% reduction in the cooling load.

The importance of utilizing the subterranean water is studied [4] for the purposes of decreasing cooling load and air conditioning. They have concluded that the proposed system has less consumption of energy, in addition to, it is considered a clean source of power, but it needs more time their conventional electric air-conditioning systems to obtain the wanted temperature. Consequently it can be seen that the capacity of the subterranean water is clean power. In reality, energy consumption,

