Solar Powered Air Conditioning System

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Abstract

Air-conditioning is one of the important appliances in many parts of the world today and already today air-conditioning causes energy shortage in for example UAE. The demand can be expected to increase because of changing working times, increased comfort expectations, and global warming. Air-conditioning systems in use are most often built around a vapor compression system driven by grid-electricity. Air conditioning system is almost a must in every building if we want to have an excellent indoor comfort inside the building. We will use **Passive Techniques** and **Nanotechnology** to Improve system Coefficient of Performance

Introduction

Energy is the primary and most universal measure of all kinds of work by human beings and nature. Energy is a crucial input in the process of economic, social and industrial development. Day by day the energy consumption is increasing very rapidly. The rate of energy consumption is rising. Supply is depleting resulting in inflation and energy shortage. This is called the energy crisis. Therefore, alternative or non-conventional or renewable energy resources are very essential to develop for future energy requirements.

Figure 1 Experimental Room

Methods and Materials

1. Cooling Load Calculation By HAP software (Hourly Analysis Program)

❖Passive Techniques added:

1. Double Glazed Window-
2. Reflective Roofing, Fiber glass material
3. Trees Concorpous
4. Overhang
5. Nano Particle Single Wall Carbon Nano Tube.

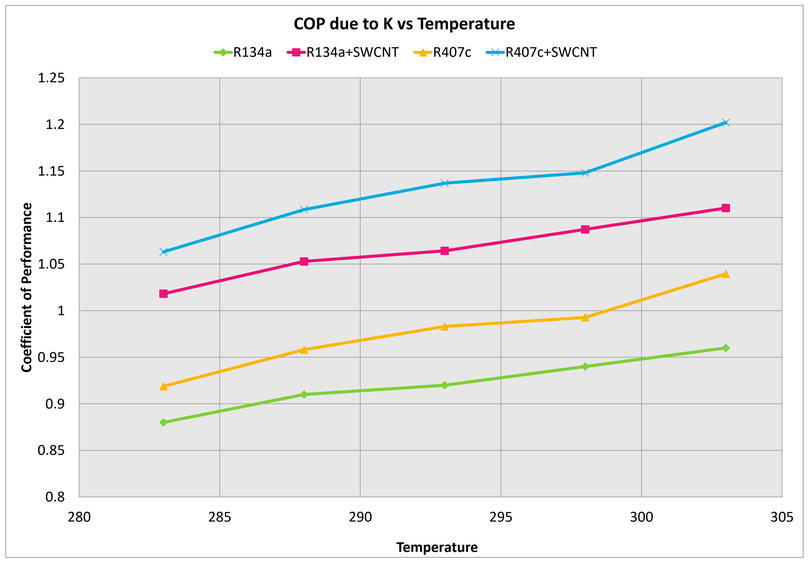

Chart 1Refrigerant + Nano-particle SWCNT Thermal Conductivity COP

Results

After the Thermodynamic analysis of the system, we have concluded that the savings due to the usage of passive techniques compared to the standard system we have reduced the cooling load by 25% using trees, reflective material, overhang and double glazing which verifies our analytical assumption in our design. Thus increase the coefficient of performance of our system as a whole. In addition to that the Compressor works less when adding Nano particles thus saving electricity and lowering the electricity bill.

COP = 3.7

Item	Cost(AED)
Solar PV Panel	800
Battery	356
Charge Controller	228
Inverter	954
R407 gas	324
Split unit	199

Item	Cost(AED)
Double glazed window	1800
Trees	170
Nano- SWCNT	2200
Reflective material	160
Total	7191 AED

Energy Sources Comparison

Energy delivered for ten years	**21878 Kwh**
Cost of grid energy	**54 AED/month**
Cost of grid for ten years	**6563 AED**
Cost of system	**5030 AED**
Saving in 10 years solar to conventional	**1533 AED**
Saving in 10 years solar to geo	**8777 AED**
Profit if excess energy to grid	**2023.92 AED**

Conclusions

solar powered air conditioning is economically cheaper on large scale application. In this paper, we have designed, analyzed the performance of the system. In addition to that we enhanced the design of our system by adding both passive techniques and Nano-particles, recalculated the performance of the system. Results show that the usage of passive technique reduced our cooling load and the usage of Nano-particle decreased the work of the compressor thus reducing our electricity consumption. In term of comparison between renewable and conventional sources of energy, solar energy is more efficient in terms of cost in the long run and on a large scale.

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