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Design & Development of Test Rig to Optimize the Current Air Conditioning System by Adding Nano Particles

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Abstract – *Nanoparticles are being used in recent years due to their excellent advantages as well as benefits . In addition nanoparticles leads to significant change in thermal properties of base fluid. A new engineering medium called as Nanofluid. Where many researchers are working on cooling process in engg application. Recently many experiments will carried on refrigeration and Air Conditioning system, because of significant improvement in heat transfer capability to enhance the efficiency of system as well as increases the coefficient of performances. In this paper cooper oxide (Cuo) nanoparticles of 40nm diameter are dispersed into R22 in AC system to check the performances and improvements in thermal properties over the conventional refrigerants.*

Key Words: Air Conditioning Test Rig, Nanoparticles, Refrigeration cycle, Refrigerants, Nanofluid, Coefficients of performance

1. INTRODUCTION

This In present days the environment problems is one of the most serious problems. Energy consumption by industry and buildings are responsible for this problem. In past time only refrigerants used in refrigeration process and they having global warming coefficient at high level. Now time will change and new technology and upgradation will done in cooling process which become more efficient and safe. Nano fluids a advanced kind of fluid which contain Nano meter size (10^-9)solid particles known as Nanoparticles. Nanoparticles enhance the properties of normal fluid. In few decades advancements in Nanotecnology lead to a cover various application as domestic refrigeration system, industrial refrigeration system, Air conditioning system, Heat exchanger, Diesel generators for the purpose of coolant etc.

The addition of nanoparticles (Cuo) into different base fluid results improvements in thermophysical properties like coefficient of performance (COP)and effective temperatures etc. In general, the physical properties of material are dependent on the dimension of material are dependent on the dimension of material .It properties for example thermal conductivity ,Elasticity, Heat transfer capacity, viscosity with respect to the amount of atoms in the materials .So Nanoparticles are applied in various forms such as nanoparticles in different size, Nanotubes ,Nanowires.

1.1 Literatures Review

1. "Cooper Oxide Nanoparticles for Advanced Refrigerant"

S.A.Fadhilah, S.Marhamah, H.M.Izzat.

In this paper this three researchers give the information about advance Refrigerant used in different cooling application in engineering. They investigated thoroughly in many ways to reduce the energy consumption .Hence Nano refrigerant which is advanced kind of Nano fluid has been introduced as a superior properties refrigerant that increased the heat transfer rate in the refrigeration system. Many types of material could be used as the Nano particles to be suspended into the conventional refrigerants.

2. "Performance Analysis of VCRS with Nano Refrigerant"

K.T.Pawale, A.H.Dhumal , G.M.Kerkal.

In this paper they explained ,It has been observed that as compared to alternative refrigerants there is better improvements in heat transfer capacity of the refrigerants after addition of Nanoparticles .They found that their improvements in thermo physical properties over the conventional refrigerants .Nano particles can be used along with refrigerant in order to improve the performance of vapour compression refrigeration system.

3."Effect Of Nano Particles In Refrigeration System"

P. Deepika.

In this study ,they give information about very important look for energy efficient and safe refrigerants so as to improve the effect of refrigeration and cop.This is study attempted to bring out some works in field of Nano refrigerants as well as Nano lubricants .Thus it is evident that Nano refrigerants have great capability of increasing heat transfer rates as well as performances of system.And has significant effect on other thermos physical properties as well as various other variables pertaining to refrigeration system.

2. TEST SETUP & METHODOLOGY

2.1Components of Air Conditioning System

1.Evaporator :-
In this the refrigerant extracts the latent heat vapourization from the body to be maintained at lower temperature than the surrounding and gets converted into vapour phase. The state of refrigerant leaving at evaporator is low temperature and low vapour pressure.

2.Compressor
Before admitting the refrigerant to reject heat to surrounding in condenser, the pressure & temperature of refrigerants is isentropically in the compressors .where the volume the refrigerants gets reduced.

3.Condenser
The condensation takes place at isobaric condition. The refrigerants dissipates heat to outside environment by flowing through condenser tubing.

4.Expansation Valve
The pressure and temperatures gets reduced as the refrigerants is passed through the expansion valve .The state of refrigerant leaving the expansion valve is low temperature, low pressure liquid.

2.2 EXPERIMENTAL TEST SETUP

Fig 2.2 - Window AC Test Rig

Table No -1: Technical Specification Of Test Set Up

Parameters	Specification
Model No	Cw-C123FY
Cooling Capacity	3125Kcal/h
Refrigerant/WGHT.	R22/680g
Test Pressure	24Kg/cm^2G
Phase	1
Input Power	1.31Kw

2.3. Nano-Refrigerant Preparation:

2.3.1 Using Two Step Method

Two step method preparation process is extensively used in the synthesis of nano fluids by mixing base fluids with commercially available Nano powder obtained from physical or chemical routes. An ultrasonic vibrator mixing devices is generally used to stir Nano powder with fluids.

3. RESULT & DISCUSSSION

COP is ratio of Refrigerating effect and Work input .In this study, COP has been calculated with help of experimental reading data .Refrigeration effect is estimated by means of energy meter connected to heater. As Therotical &Actual Cop will be calculated by means of collecting readings on different time of interval

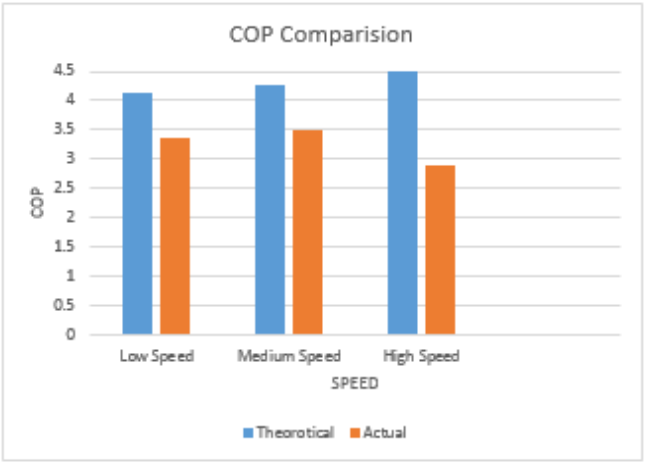

Fig No3.1:-Cop Comparison

CALCULATIONS TABLE -

Speed Variartion	H1 kj/kg	H2 Kj/kg	Ref Effect kj/kg	Compressor Work input
Low	198	231	136	33
Medium	205	237	144	32
High	198	230	136	32

Table No 3.2:- Calculation Chart

Chart reading is based upon different speed variation like low, medium, high. On this basis we get the refrigerating effect and compressor work input without mixing Nano particles in refrigerant . This is our earlier stage where same rfeigerant as R22 refrigerant inside thr window AC Test rig. Then we take reading after mixing the nano particles inside the test rig. This reading we will give in next paper.

4. CONCLUSION:

From above result and discussion it is conclude that, We have prepared test rig for optimization of ac system in future we will check its cop and performance by adding Nano particles along with comparing is performance as well as efficiency with current ac system. However, we adding the Nano particles then we gets improved results in refrigerating effect and Coefficient of performance.

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