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DEVELOPMENT OF ICE PLANT TEST RIG

[#1]Mr. Shubham A. Pawar, [#2]Mr. Vikrant S. Pawar, [#3]Mr. Suraj V. Bhoir,
[#4]Mr. Akshay N. Yadav, [#5]Asst. Prof. Hitesh Muthiyan

[2]vikrantp868@gmail.com
[3]bhoirsuraj729@gmail.com

[#12345]Department of Mechanical Engineering ,
P.G.M.C.O.E, Wagholi, Pune, Maharashtra, India

ABSTRACT

The project aims to designing experiment test set up for commercial as well as experimental purpose in Refrigeration and Air conditioning laboratories. The ice plant test rig is used to evaluate capacity of the ice plant, calculate coefficient of performance (COP) of the system, to reduce the refrigeration time and plot the system performance on P-H chart. For the design purpose cooling load required to produce definite quantity of ice estimated using heat transfer relation is calculated by using vapour compression cycle. The model is analysed for its cooling capacity assumed per unit mass flow rate of refrigerant. As per the study of research paper, physical and chemical properties of different refrigerants, we come to the conclusion that R134a is best suitable refrigerant for the proposed system.

Keywords: Refrigeration, Compression, refrigerant, Cycle, Evaporation, Coefficient of performance.

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I. INTRODUCTION

ICE manufacture is used for producing refrigeration effect to freeze potable water in standard cans placed in rectangular tank which is filled by brine. A good definition of refrigeration is the removal of heat energy so that a space or material is colder than its surroundings an ice plant based on same principle as a simple refrigeration system. An ice plant contains various parts such as compressor, condenser, receiver, expansion valve, evaporator and refrigeration accumulator. A refrigeration is always been a great deal for human being and play a vital role in preserving food , chemical, medicine, fisheries and providing appropriate temperature in working Entity of any industry.

The vapour-compression uses a circulating liquid refrigerant as the medium which absorbs and removes heat from the space to be cooled and subsequently rejects that heat elsewhere. Circulating refrigerant enters the compressor in the thermodynamic state known as a saturated vapour and is compressed to a higher pressure, resulting in a higher temperature as well. That hot vapour is routed through a condenser where it is cooled and condensed into a liquid by flowing through a coil cool air flowing across the coil. This is where the circulating refrigerant rejects heat from the system and the rejected heat is carried away by the air .Next routed through an expansion valve where it undergoes an abrupt reduction in pressure.

PROBLEM STATEMENT

In existing plant R12 refrigerant is used. It has higher GWP and ODP. It cause the global warming and ozone depletion. Therefore to overcome this problem , it had to eliminate CFC from the system. It replace with HFC i.e.R134A.

II. OBJECTIVES

- To replace the CFC refrigerant to HFC refrigerant to over come effect of GWP and ODP.
- To carry out actual ice formation test.
- To calculate the actual C.O.P of the system.
- To calculate the theoretical C.O.P of the cycle.
- To evaluate the cooling capacity in Watts & in Tons of the system.
- To study various components and controls used in Vapour Compression Cycle.

III. LITERATURE SURVEY

Arora, A. a. studied the Theoretical analysis of a vapour compression refrigeration system with R502, R404A and R507A in 2008. In this paper presented the use of water as a refrigerant in industrial chillers is an environmental friendly new technology, successfully installed over the recent years. This technology has its ch allenges in all stages of its realization from the development, through design and manufacturing and it is rewarding to an out of the box thinking in the phase of planning the chillers implementation.

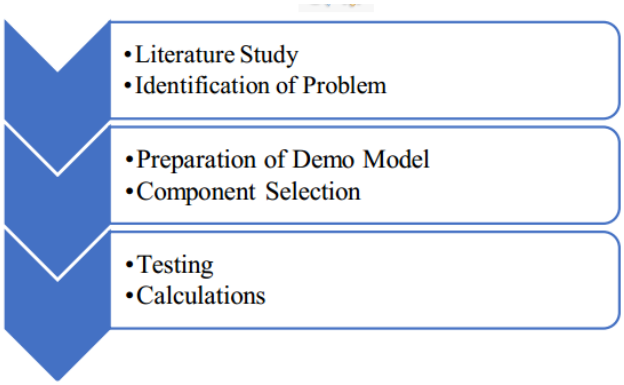
Cabello, R. N studied the simplified steady-state modelling of a single stage vapour compression plant. Model development and validation in 2005. In this paper an understanding of basic vapour compression refrigeration cycle & performance of refrigeration system can be determined using refrigerator test. In domestic refrigerator have been conducted sub cooling parameter take in order to analyze performance of the refrigerator. Using of thermoelectric, module in domestic refrigerator for cooling the effect on COP and refrigerating effect is investigated. The performance of the refrigerator test rig analyze by using the actual pressure enthalpy diagram of actual refrigeration cycle and using the equation. The result obtained showed that COP of vapour compression refrigeration cycle with thermoelectric module is higher than vapour compression system without module. As increase in the cooling reduces the compressor work done and increases the system refrigeration capacity J.

Winkler, J. A. has studied investigation of potential benefits of compressor cooling in 2008. Presented in this paper summarizes vacuum process technology producing chilled water and ice needs no refrigerant of the conventional kind, but water from the process itself is used to generate cooling. This eye catching novelty incorporates many of the considerations about the future of refrigerants „ozone friendly" no extra demand for safety measures or for skilful operators, no special requirements concerning the installation components, lower maintenance cost since leakage can be accommodated room the system. Vacuum-process technology may be used not only for production for chilled water but also for Binary Ice –Pump able suspension of minute crystals in an aqueous solution. This means that all the advantages related to a latent heat system may become available.

S H Ecir K. E., S. R. has studied the data mining techniques for thermo physical properties of refrigerants in 2009. Presented on this paper describes performance characteristics due to use of different refrigerant In retrofit cases, considering the high sensitivity of COP to the relative size of heat exchangers in the sub cooler and low gain in COP obtained due to installation of dedicated cooling cycle with other refrigerant, it seems that dedicated mechanical cooling may be more suited by use of R134a rather than to use other.

Calm has studied The next generation of refrigerants – Historical review, considerations, and outlook in 2008. In this paper reviewed the progression of refrigerants, from early uses to the present, and also addressed future directions and International Journal of Energy and Environment (IJEE), Volume 2, Issue 2, 2011, pp.297-310 ISSN 2076-2895 (Print), ISSN 2076-2909 (Online) ©2011 International Energy & Environment Foundation. All rights reserved.298 substitutes International Journal of Advanced Technology & Engineering Research (IJATER)pment of Ice plant. All rights reserved.298 substitutes International Journal of Advanced Technology & Engineering Research (IJATER)pment of Ice plant.in this paper we hav studied that progression of refrigerents.

IV. METHODOLOGY



V. FIGURE AND TABLE

Fig. 1 Experimental Set-up

Fig. 2 Condenser

Fig. 3 Compressor

Fig. 4 Dryer

VI. CONCLUSION

1. In the present work an experimental study has been conducted to replace the CFC refrigerant (R12) with HFC (R134a) refrigerant in manufacturing of ice. CFC refrigerant R12 use in conventional ice manufacturing unit having high GWP and ODP. This refrigerant is replace with HFC (R134a) refrigerant having 0 ODP.

2. In order to achieve lower temperature with 0 ODP we use R134a as a refrigerant in ice plant testing

3. R134a is widely used in medium and low temperature refrigeration especially in supermarket sector and for refrigerated transport.

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