

ICE PLANT TEST RIG

Mangesh. N. Pohare

Asst Prof. Department Of Mechanical Engineering

Dr. D. Y. Patil College of engineering and innovation, varale, Pune, INDIA
mangesh.pohare@dypatilef.com

Siddiqui Rizwanullah Sadullah

Department Of Mechanical Engineering

Dr. D. Y. Patil College of engineering and innovation, varale, Pune, INDIA

Shaikh Juned Taher

Department Of Mechanical Engineering

Dr. D. Y. Patil College of engineering and innovation, varale, Pune, INDIA

Narvate Sunil

Department Of Mechanical Engineering

Dr. D. Y. Patil College of engineering and innovation, varale, Pune, INDIA

Wadekar Akshay

Department Of Mechanical Engineering

Dr. D. Y. Patil College of engineering and innovation, varale, Pune, INDIA

ABSTRACT: Our project aims to design experiment test set up for experimental purpose in Refrigeration and college laboratories. The ice plant test rig is used to calculate capacity of the ice plant, evaluate coefficient of performance (COP) of the system, to decrease the refrigeration time. As per our studies of research paper, physical and chemical properties of different type's refrigerants, we concluded that R134a is best suitable refrigerant for the proposed system. Brine solution is most suitable as a secondary refrigerant for the requirements of the system due to its excellent properties over refrigerant Used in Earlier Era. The typical old ice plant has been studied and a prototype model of an ice plant has been fabricated with above said accessories.

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

I INTRODUCTION

Ice manufacturing is a process used for producing refrigeration effect to freeze liquid water in chilling tanks placed in rectangular tank which is filled by brine solution. A proper definition of refrigeration is to remove heat energy from a system so substance gets colder than surrounding. An ice plant test rig is based on same principle as a simple refrigeration system. An ice plant test rig system consists of different parts like compressor, evaporator, expansion device, evaporator, chilling tank etc. In this system R134a or R404a is used due to its ecofriendly properties. Brine solution is used as a secondary refrigerant to increase cooling effects.

II LITERATURE SURVEY

In this report author study of an ice plant components generally used are viz. compressor, condenser, expansion

valve, evaporator, chilling Tank, refrigerant accumulator and pressure gauge ,volt meter ammeter etc. author also explains its specification, types, and working also.[1]

In this report author describe his report about experiment were conducted. They determine that the characteristics of ice flow through an industrial heat exchanger. They conclude that experiment presents many problems with respect to cleaning so this experimental work has shows that thick ice slurries about (15-60%) can be pump by using commercial heat exchanger. [2]

In this research paper author research about methodology and design of an experimental ice plant test rig. The ice plant test rig system is designed to determine the thermal stability based on temperature as well as its evaluate the mixture and chemical analysis of vapor and liquid phase.[3]

Author studies about the chloroacetates in snow, glacier, fir undertaken to determine compounds are in perception and to elucidate the possible involvement of anthropogenic and natural sources. The samples of snows are collected in remote areas such as Antarctica, Russian tundra northern Scandinavia and few populated sites.[4]

In this paper author researches about performance analysis of ice plant test rig with TiO₂-R134a nano refrigerant and evaporative cooled condenser [5]

Research about state of the art of ice bearing capacity and ice construction. Paper describes the various applications of ice such as load bearing medium. Paper presents a method of estimating long time deflection and also describes a method to the effect of moving and dynamic loads.[6]

This paper presents the study of wall slip in ice cream rheometry. In this author discussed about two important phenomena which should be considered in ice cream pipe rheometry wall slip and viscous dissipation.[7]

III COMPONENT DESCRIPTION

Hermetically sealed compressor

In semi-hermetic compressors, the compressor and motor driving the compressor are integrated, and operate within the pressurized gas envelope of the system. The motor is designed to operate and cooled by the vapor being compressed. A semi-hermetic uses a large cast metal shell with gasket covers that can be opened to replace motor and pump components. The primary advantage of a semi-hermetic is that there is no route for the gas to leak of system. Fig showssmall hermetically sealed compressor unit Fig Small hermetically sealed compressor unit Specification of compressor.

Condenser

Condenser is an important component of refrigeration system. In a typical refrigerant condenser, the refrigerant enters the condenser in a superheated form. It is first de-superheated and then condensed by rejecting heat to an outside medium. The refrigerant may leave the condenser as a saturated or a sub-cooled liquid, depending upon the temperature of the external medium and design of the condenser

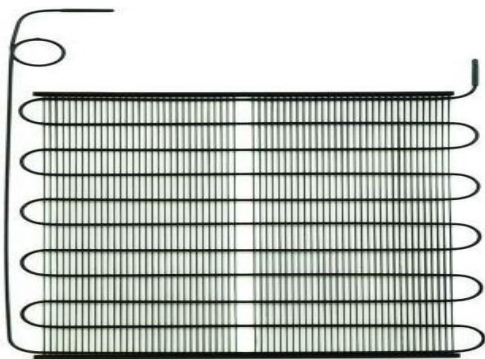


Fig 1:-condenser

Evaporator

Evaporator is used to convert the low pressure and low temperature liquid into low temperature evaporative refrigerant. Long bare tube or finned type pipe is used as evaporator. The liquid present inside the tube cools the secondary refrigerant.

Expansion device

It's also called as metering or throttle device.its located between high pressure and low pressure side .in refrigeration system there is different type of expansion devices are used. Such as thermostatic expansion valve and capillary tubes are used. In thermostatic expansion valve it consist of

1. Capillary tube
2. Feeler bulb
3. Adjustable spring
4. Bellows
5. Screw

IV SCHEMATIC DIAGRAM OF ICE PLANT TEST RIG

Fig 2 shows the schematicdiagram of ice plant test rig system generally its works on the principle of vapor compression system. As diagram shows it consist of hermetically sealed compressor. After that condenser is

located where change of phase is takes place. . And after that there is expansion device is located where high pressure refrigerant changes in low pressure refrigerant and the evaporator is used to change the liquid refrigerant into evaporative refrigerant .in this ice plant test rig system we're going to use R143a as primary refrigerant and brine solution used as secondary refrigerant.

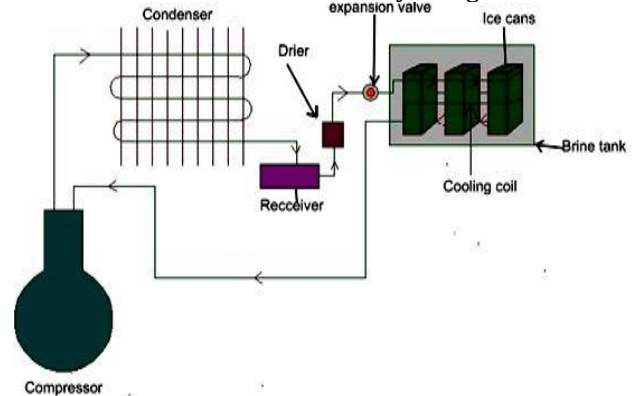


Fig 2:-Schematic Diagram Of Ice Plant Test rig

The tank is coated with wooden frame. Tank consists of cans inside it. Primary refrigerant absorb latent heat from brine solution and produces ice.

V METHODOLOGY

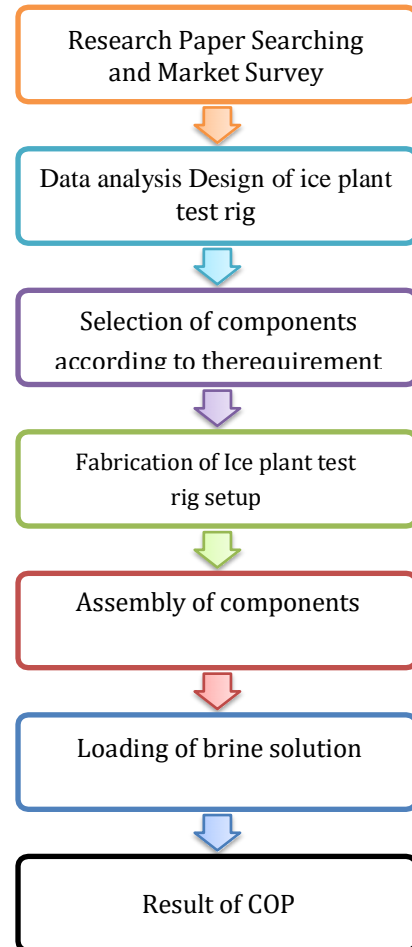


Fig 3:- Methodology

VI ACKNOWLEDGEMENT

It is pleasant Endeavour to present paper on "ICE PLANT TEST RIG". I am thankful to **Prof.R. Y. Daspute** HOD (Mech) & Principal **Dr. S. B.Ingole** for their guidance constant supervision as well as for providing necessary information regarding the project.

VII REFERENCE

1. H. S. Salve, V. N. Raibhole(2017) Study Of Ice Plant Components.
2. G.S.F Shire,G. L Quraini (2009). Design And Commissioning Of Thermal.
3. L. Keulene, C. Landolina(2017) Design and commissioning of a thermal stability test rig
4. L Von Sydo, H. B. (1999). Chloroacetate In Snow, Firn And Glacier.
5. Amrat Kumar Damneya, S. P. S. Rajput(2017) performance analysis of ice plant test rig with TiO₂-R-134a
6. D.M Masterson (2009) State of the art of ice bearing capacity and ice construction
7. N A A Rahman, A. F. (2013). Wall Slip And Viscous Dissipation In Ice Cream Pipe Rheometry.