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Review of micro channel condenser with metal foam & round tube finned condenser

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Abstract - The microchannel condenser requires less space as compared to regular condenser and it also requires less amount of refrigerant. More surface area is available to reject the heat to surrounding air as thin tubes are used in micro channel condenser. The purpose of the present study is to develop a setup of a refrigeration system with micro channel condenser, performance comparison of conventional heat exchangers. For its performance, refrigeration set up is done to detect experimental performance of microchannel condenser. In this paper performance analysis of microchannel condenser is compared with coil tube. The analysis results on the micro channel condenser can be more effective at various loads and operating conditions. For review purpose, same size of micro channel and round tube condenser are considered. Also C.O.P & Efficiency of microchannel can be more with less usage of refrigerants.

Keywords: Microchannel condenser, Refrigeration, Round tube condenser, COP, Efficiency.

I. INTRODUCTION

Refrigeration is one of the most important aspects of thermal engineering. The term refrigeration may be defined as the process of removing heat from a substance or a space under controlled conditions. It also includes the process of reducing and maintaining the temperature of a body below the general temperature of its surroundings. There are many applications of refrigeration in our daily life. It can be done by various ways like vapour compression, absorption, adsorption depends on application and availability.

In simple vapour compression as shown in fig.1 system refrigerant is used for cooling and components are compressor, condenser, expansion device and evaporator.

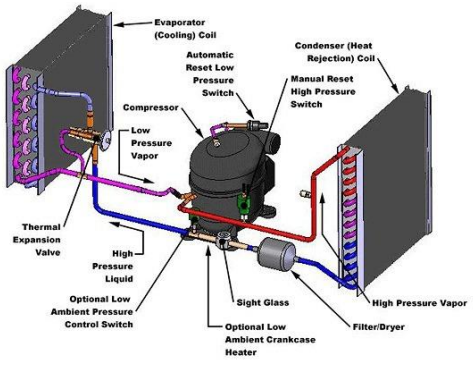

Fig:1 simple vapor compression cycle

Fig.2 & fig.3 shows t-s and p-h diagrams respectively. According to the requirement, vapour compression system is further modified for better performance and control. Such systems are compound systems, cascade systems and multi evaporator system.

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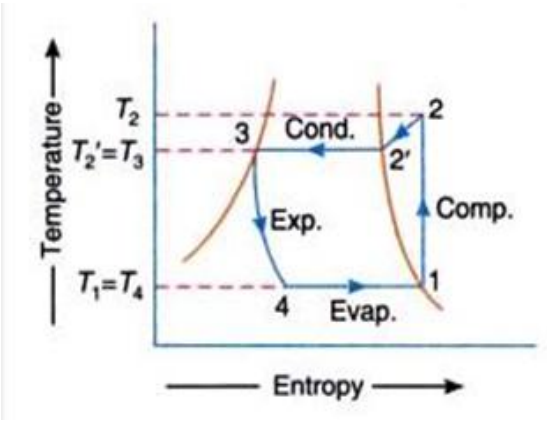

Fig: 2 T-S diagrams

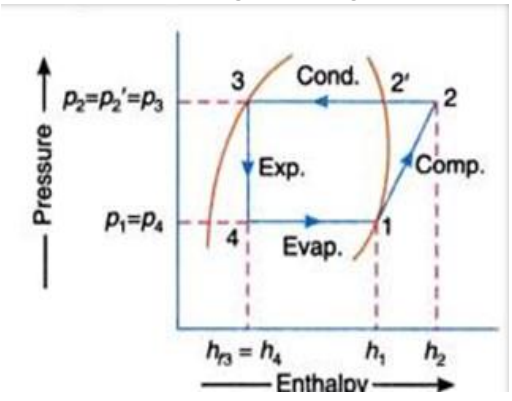

Fig:2 P-h diagrams

Micro channel condenser coils:

Micro-channel condenser coils are all aluminum coils with multiple flat tubes containing small channels (micro-channels) through which refrigerant flows. Heat transfer is

maximized by the insertion of angled and louvered fins in-between the flat tubes.

The coil is composed of three components:

- A flat micro-channel tube.
- Fins located between the micro-channel tubes.
- Two refrigerant manifolds.

These components are joined with two refrigerant manifolds using an aluminum-zinc alloy brazing material in a nitrogen-charged braze furnace to make the completed micro-channel coil. Coil circuiting is accomplished by placing baffles in the distribution manifolds to feed the refrigerant through the flat tubes.

II. LITERATURE REVIEW

(Tejas pawar, 2017), developed a setup of a refrigeration system with micro channel condenser, Performance comparison of conventional and microchannel condenser. For its performance, refrigeration set up to detect experimental performance of micro-channel condenser. They analyzed the performance of micro-channel condenser and compared with coil tube. In analysis of microchannel condensers it was found more effective at various loads and operating conditions.

(Rohit pingale, 2016), carried out numerical analysis for rectangular micro channels with five sets of rectangular configurations, in order to find optimum configuration of micro-channel. Analysis of rectangular micro-channel has carried out for forced convection heat transfer condition with constant base area of 30mm length and 20 mm width.

(A.zoughaib, 2014)**,** used a low capacity integrated air to air heat pump prototype to perform an experimental comparison of both a round finned tube and a MCHE used as an evaporator. The MCHE is a prototype one using flat fins. The comparison is based on a constant face surface criterion and an equivalent cooling capacity for different inlet temperature and air flow rate conditions. R-134a is the refrigerant used in the heat pump

(G.b. ribeiro, 2012), the thermal-hydraulic performance of micro-channel condensers with open-cell metal foams to enhance the air-side heat transfer is investigated in this paper. Three different copper metal foam structures with distinct pore densities (10 and 20 PPI) and porosities (0.893 and 0.947) were tested. A conventional condenser surface, with copper plain fins, was also tested for performance comparison purposes. The experimental apparatus consisted of a closed-loop wind tunnel calorimeter and a refrigerant loop, which allowed the specification of the mass flow rate and thermodynamic state of R-600a at the condenser

III. COUNCLUSION

Study of base paper following conclusion can be predicted

Objective 1: Performance Evaluation of Micro-channel Condenser with Metal Foam.

- Metal foam is a cellular structure consisting of a solid metal (frequently aluminium) with gas-filled pores comprising a large portion of the volume. The pores can be sealed (closed-cell foam) or interconnected (open-cell foam). The defining characteristic of metal foams is a high porosity: typically only 5–25% of the volume is the base metal, making these ultralight material
- The effect of using metal foam with micro channel in condenser of vapor compression refrigeration system would be studied

Objective 2: CFD Evaluation and analysis of Micro-channel condenser with metal foam and round tube finned condenser

- Micro-channel and round tube fins both are different methods used to enhance the heat transfer rate of the condenser
- In this study performance evaluation and comparison of both ways used for heat transfer enhancement would be done

IV. REFRENCE

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