A Review Paper on Latest Refrigerants

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ABSTRACT: ***The rising problem in today's atmosphere is the effects of various refrigerants on the degradation of the ozone layer and the rise of global warming. The key explanation for this environmental effect is chlorine with halogenated hydrocarbons, known as CFCs, which are used as refrigerants in refrigerators and air conditioners in all residential, industrial or commercial applications. This paper examines the different refrigerants generated to address numerous other issues such as flammability and toxicity of refrigerants generation after generation. By observing the physical, chemical, environmental and protection properties of different refrigerants. With the development in the refrigeration and air conditioning field, we must have heard that science is now in the process of choosing or developing the right option of refrigerant that is environmentally friendly with the substitution of older refrigerants. In addition, it is observed that next generation refrigerants are generated on the basis of '0' ozone depletion potential and low global warming potential to be both environmentally stable and environmentally friendly.***

KEYWORDS: Compressor, Condenser, Valve, Evaporator, Receiver, Refrigerants, Ecological concerns.

INTRODUCTION

Refrigeration (figure 1) is a method in which work is performed to remove heat from one spot to another. Refrigeration has many uses, including but not limited to domestic refrigerators, commercial freezers, cryogens, air conditioning and heat pumps. In order to conform to the Second Thermodynamics Law, some form of work must be carried out in order to do this. Traditionally, the work is performed by means of mechanical work, but it may also be done by magnetism, laser or other means. At the turn of the century, the use of refrigeration has been steadily increasing in the maintenance of perishable food products, agriculture and fisheries. The aim of food refrigeration is to delay the degradation of micro-organisms, chemical and physical processes. Through cooling at temperatures only above zero, a small period of storage time can be obtained, which is also necessary for healthy shipment and promotion. By freezing to temperatures as low as-30OC, the decay can be further slowed down and this increases the storage time. Refrigeration also has uses in a number of sectors, such as chemical processing, petroleum, refinery, paper and pulp industries [1].

COMPONENTS OF COOLING SYSTEM

There are five basic components of the refrigeration system: evaporator, compressor, condenser, expansion valve and refrigerant-to heat the substance. In order for the cooling cycle to work efficiently, each part must be present in the refrigeration process [2].

1.1.1 Expansion Valve: This is positioned at the end of the liquid line before the evaporator. It is a system that monitors the volume of refrigerant that flows through the evaporator. Here you can find the flood back that is necessary to optimize the efficiency of the evaporator, thus preventing the extra liquid refrigerant from returning to the compressor. This unit also allows distinguishing the high and low pressure aspects of the air conditioning system. A high-pressure liquid refrigerant reaches the valve via the liquid line of the device, but with the inclusion, the volume of liquid refrigerant entering the evaporator would be decreased.

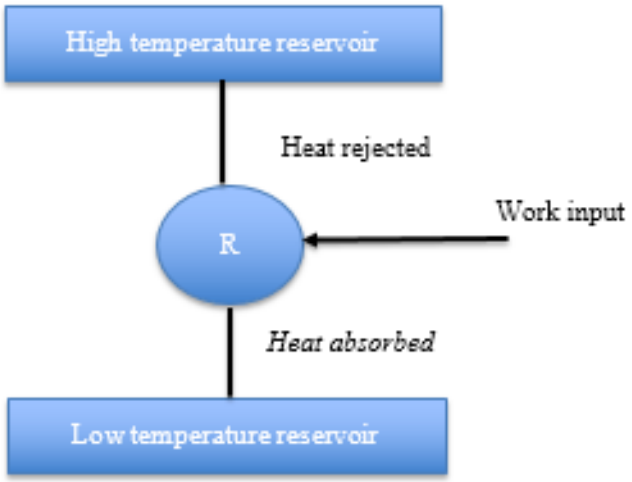

Figure 1: Refrigeration system

1.1.2 Evaporators: The sole aim of the evaporator is to extract excessive heat from the substance by means of liquid refrigerants. The liquid refrigerant must be low-pressure. This low-pressure can be measured by two factors – one is the heat absorbed from the substance to the liquid refrigerant and the other is the removal of low-pressure vapor by the compressor.

1.1.3 Compressor: This pulls low-temperature and low-pressure vapor from the evaporator into the suction line; the vapor will be squeezed immediately when redirected – the temperature will still increase as the vapor is compressed. In basic terms, a compressor may transform low-temperatures to high-temperatures, which can lead to a rise in pressure. The heat can be quickly emitted via a compressor [3].

1.1.4 Condensers: This system is capable of removing heat from the refrigerant. Fans mounted above the condenser device pull air from the condenser coils. The condensation temperature should be between-12°C and-1°C; the vapor should be cooled before the liquid refrigerant is refrigerated again [4]

1.1.5 Receiver: As a temporary holding tank for liquid refrigerant, the receiver serves as a vapor seal. For the primary function of maintaining the steam flowing down the liquid line to the expansion valve, the receivers may be used for both horizontal and vertical mounting.

CLASSIFICATION OF REFRIGERANTS

They are usually split into the following two groups:

1.2.1 Primary refrigerants: all refrigerants that communicate directly with the refrigeration mechanism are known as primary refrigerants.

Main refrigerants are further categorized in the following categories*:*

1.2.1.1 Halo-carbon or organic refrigerants: both of these compounds are synthetically developed in the Freon family of refrigerants, and their designation depends on the chemical composition (chlorine, hydrogen and Fluorine).

1.2.1.2 Chlorofluorocarbons (CFCs) – contains R11, R113, R114, R12 and R115.

1.2.1.4 Hydrochlorofluorocarbons (HCFCs)-includes R22 and R123

1.2.1.5 Hydrofluorocarbons (HFCs)-includes R134a, R407C, R410a and R404a

1.2.2 Azeotropic refrigerant: there is an equal combination of the composition of the liquid phase and the composition of the vapour phase with a wide temperature spectrum. Four of the azeotropic species are R500, R502, R503 and R504.

1.2.3 Inorganic refrigerants: They are used earlier because of their thermodynamic and physical properties due to the advent of halo-carbon refrigerants. Any of the inorganic refrigerants are R717, R729, R744, R764 and R118 [5].

1.2.4 Hydrocarbon refrigerants: these types of refrigerants are primarily used for industrial and commercial uses because of their thermodynamic properties, which are highly flammable and explosive. Hydrofluorocarbons (HFCs)-includes R134a, R407C, R410a and R404a.

1.2.5 Secondary refrigerant: refrigerants which do not interfere directly with the refrigeration mechanism but are first cooled by primary refrigerant and then further used for cooling purposes are known as secondary refrigerants. In general, this type of refrigerant uses a small refrigerator [6] with less refrigerant. Two of the widely used secondary refrigerants are water and brine calcium/sodium solution.

LITERATURE REVIEW

The biggest setback of hydrocarbons as a commonly recognized refrigerant is its flammability, which was perceived to be a major safety threat by the majority of respondents to the study, and the key benefits are the improved output coefficient of equipment (COP) and the improved TEWI factor. This resulted in a 12% reduction in energy consumption. Despite the excellent thermodynamic properties of ammonia, its application was mostly restricted to commercial refrigeration owing to its toxicity [7].

RESULT AND CONCLUSION

By observing the physical, chemical, environmental and protection properties of different refrigerants. With the development in the refrigeration and air conditioning field, we must have heard that science is now in the process of choosing or developing the right option of refrigerant that is environmentally friendly with the substitution of older refrigerants. In addition, it is observed that next generation refrigerants are generated on the basis of '0' ozone depletion potential and low global warming potential to be both environmentally stable and environmentally friendly. The biggest setback of hydrocarbons as a commonly recognized refrigerant is its flammability, which was perceived to be a major safety threat by the majority of respondents to the study, and the key benefits are the improved output coefficient of equipment (COP) and the improved TEWI factor. This resulted in a 12% reduction in energy consumption. Despite the excellent thermodynamic properties of ammonia, its application was mostly restricted to commercial refrigeration owing to its toxicity. The big setback of carbon dioxide as a refrigerant is the high operating pressure that is called a safety threat. The high initial investment costs and the shortage of trained repair technicians are also a matter of concern. The use of CO_2 is primarily considered in the industrial refrigeration market.

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