CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Refrigeration is the process of removing heat from matter which is maybe solid, liquid or gas in the enclosed space at a lower temperature than the surrounding temperature. This process will continuous by extracting the heat in the enclosed system where the temperature is lower than the surrounding temperature.

Nowadays refrigeration become important in our daily life. In household especially the refrigeration system is used for the prevention their food or keep the food in fresh condition. Refrigeration also use in industry for cooling and freezing the product, condensing vapour, maintaining environmental condition and cold storage.

The first known method of artificial refrigeration was demonstrated by William Cullen at the University of Glasgow in Scotland in 1756. Cullen used a pump to create a partial vacuum over a container of diethyl ether, which then boiled, absorbing heat from the surrounding air. The experiment even created a small amount of ice, but had no practical application at that time. In the following 50 years, an American inventor, Oliver Evans, designed the first refrigeration machine. An American physician, John Gorrie, built a refrigerator based on Oliver Evans' design in 1844 to make ice to cool the air for his yellow fever patients. A German engineer named Carl von Linden patented not a refrigerator but the process of liquefying gas in 1876 that is part of basic refrigeration technology.
The refrigeration system showed in Figure 1.1 is based on vapour compression refrigeration system:

![Diagram of Refrigeration System](image)

**Figure 1.1**: Schematic Diagram Refrigeration

A refrigeration system is combination of component and equipment connected in a sequential order to produce refrigeration effect which is compressor, condenser, expansion valve and evaporator.

Vapor compression is not the only one system or cycle use in the refrigeration, there many more refrigeration system and cycle will were deal which is Absorption refrigeration cycle, Air- standard refrigeration system, Jet- ejector refrigeration system, Thermoelectric refrigeration and Thermoacoustic refrigeration.

As we know that refrigeration system is a combination of component and equipment connected in sequential order to produce the refrigeration effect. Main component in refrigeration system is compressor, condenser, evaporator and throttling device.

Compressor the main objective this component is to increase the pressure from low pressure refrigerant to high pressure of refrigerant. In this component refrigerant was compressed to a higher pressure and temperature for condensation. This compression process takes the gas from low pressure and low temperature to high
pressure and temperature. So we can conclude that the energy is required in this process and usually provided by an electric.

Condenser in this component condensation process is occur which is refrigerant is condensed to liquid form by being superheated, then condensed, and finally sub-cooled, giving up it’s latent heat of condensation to some cooling medium. Heat is removed from high temperature. Heat is removed from high temperature, high pressure refrigerant vapour in condenser, which is a heat exchanger cooled by water or air.

Third main component in refrigeration system is evaporator, in this component occur process which is the refrigerant evaporate from liquid to the gas at a lower temperature than that of its surrounding, absorbing its latent heat of vaporization. This process of heat extraction at low temperature show the useful part of the refrigerator, the low pressure and temperature need for evaporation at the required temperature is maintained by the suction of the compressor.

Throttling device or expansion device this component play the role to convert the higher-pressure liquid refrigerant is throttled to the lower evaporating pressure and is ready to evaporation. The temperature also drop considerably at constant enthalpy. Because the reduction in temperature and the refrigerant exits as two-phase liquid-vapor typically a mixture of 75percent liquid, 23percent vapour.

1.1 PROBLEM STATEMENT

Nowadays we know that the refrigerator is one of basic need in the daily life, so the important for us to determine the optimization of refrigeration system. Understanding the concept of actual domestic refrigerator is must because we can analyze and find the optimum performance for the refrigeration system. The amount of refrigerant charged after servicing and repair of refrigerator major problem in refrigeration system because of different amount of refrigerant charge produces different performance. In order to optimize of refrigerant charge into the system this thesis introduces the refrigerant charging method based on different charge.