

ABSTRACT

Ice cream is frozen food made from dairy products, flavorings and dyes. The process of freezing ice cream requires a long time. However, along with the development of food innovations, ice cream in frozen conditions also varies. One of them is freezing ice cream on a cold plate with a short amount of time. To produce fast freezing process, a cooling system with the appropriate refrigerant is needed. One of them is a cooling machine for freezing ice cream using R22, it should be banned because it is harmful to the environment. Therefore, there are several other alternatives, such as R143a. This fluid is more environmentally friendly and in previous studies showed that R22 can be replaced with R134a. The cooling machine designed using the Steam Compression Refrigeration System with four main components consists of a compressor, condenser, capillary pipe, and evaporator. The design of the tool starts with the calculation of the cooling load on the evaporator and the minimum work required for the compressor to reach a temperature of 2°C. In this system, the compressor's low pressure is set at a pressure of 132.82 kPa to produce a temperature of -20 °C on the evaporator and a compressor working minimum of 13.02 W with a cooling load of 19.28 W (No cooling load, TBP) and 40, 50 W (with cooling load, DBP). In the TBP process for 5 minutes the temperature was 0.63°C at a pressure of 132.82 kPa and -0.24°C at a pressure of 101.73 kPa. Therefore, these two pressure values can be used for plate cooling for 5 minutes. In the DBP process for 4 minutes the temperature was 5.40°C at a pressure of 132.82 kPa and 3.14°C at a pressure of 101.73 kPa. Because it does not reach a temperature of 2°C, the process is added a minute and the temperature is 4.11°C at a pressure of 132.82 kPa and a temperature of 1.51°C at a pressure of 101.73 kPa. Therefore, the value at a pressure of 101.73 kPa can be used to freeze ice cream for 5 minutes.

Keywords: ice cream, refrigerant, Steam Compression Refrigeration System.