

Modification in Food Delivery Box

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Abstract— Business of food home delivery is growing day by day. Online food ordering has been grown faster than traditional system since last few years. But main problem is that, it is hard to maintain temperature of that food for long time. In present time different insulation box and bags are use to deliver food but it fails to maintain quality of food after certain time. So my project is to overcome that difficulties of conventional food delivery box by using refrigeration or Carnot cycle which helps to keep hot food hot and cold food cold. Box will use power of engine of bike.

Key words: Food Delivery Box with Hot and Cold Storage, Cold Storage Run by Vehicle Engine

I. INTRODUCTION

A. Problems in Old System

Insulating material is use to resist heat transfer between two layers. In present day insulated delivery box is use to deliver food. But if is help to sustain food temperature for short distance only or for short time. For a long distance food deliver it has many problems such as hot food become cold, change in test of food and many other problems. There is also chance of rejection of order which lead to loss of organization. When it's come to deliver cold food like ice cream it is totally fail to maintain required temperature. Because such kind of food required to maintain it at almost 0 degree Celsius. Nowadays there are many researches have been done but those are not effectively.

B. Aim and Objectives

My aim is to keep food temperature as required with the test of food as well with dimension according suggested by government of food delivery box. This system will help to maintain cold food cold and hot food hot with longer distance and longer t time. It is very easy to operate and maintain. It will use in food delivery organization like Zomato, swiggy and other to deliver any kind of food cold and hot. This will boost relationship between organization and consumer and helps to increase number of consumer for any food deliver company. This device work by the using power of engine so it does not required any external power source or it can be used by battery which can be charged by engine.

C. Previous Researches

There are many research have done to make improvement in food delivery box by changing insulating material and by increasing thickness of insulation across the world. Recent development is circulating hot fluid around the box. But it is only help to keep hot food. Another development is directly use of exhaust gases of vehicle. There are very few development for cold food storage.

II. WORKING PRINCIPLE

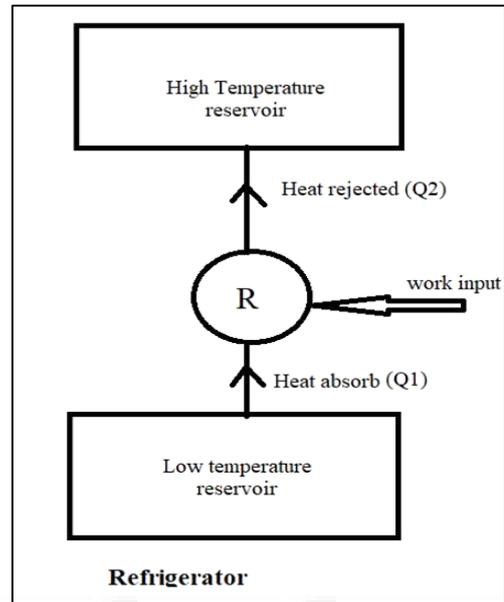


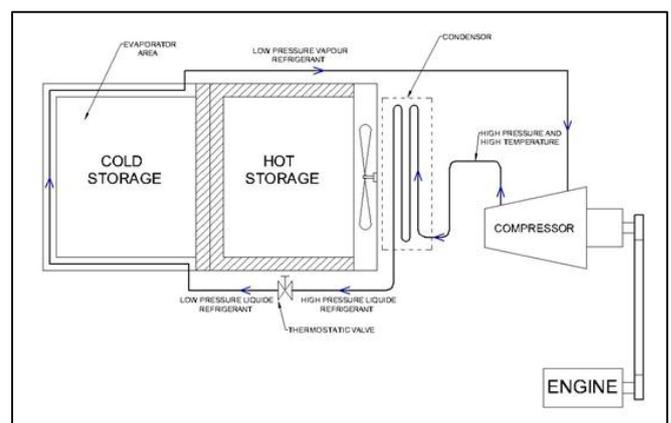
Figure shows basic principle of refrigeration system in which by giving external work it is absorb heat energy (Q_1) from low temperature (sink) and reject heat energy (Q_2) in higher temperature (source). Q_1 is always has greater value than Q_2

$$COP = \frac{\text{Heat absorb}}{\text{Work done}} = \frac{Q_1}{Q_2 - Q_1}$$

A. Convection:

Convection is one of the mode of heat transfer in which heat transferred by circulation or mixing of fluid.

III. CONSTRUCTION OF MODEL



IV. WORKING

Working of model is same as working of refrigeration system which is basically works on the reversed Carnot cycle. It is consist of small reciprocating compressor, air cooled condenser, thermostatic expansion valve, Evaporator and fan and sensors.

Vapour Refrigerant at low pressure from evaporator enters in compressor. Compressor shaft is connected with engine shaft by belt. Refrigerant compress in compressor and high pressure and temperature vapor refrigerant enters into air cooled condenser. Where it is condensed by forced convection by fan which is situated beside the hot storage of the box at the constant pressure. In condenser, refrigerant release its heat energy which is supply in hot storage of the box to increase temperature of hot storage.

After condensation, high pressure liquid refrigerant enters into thermostatic expansion valve where it is expanded to lower pressure by throttling process. Lower pressure and temperature refrigerant enters into evaporator. Evaporator tubes are located around the cold storage. Where refrigerant absorb heat from the cold storage and decreases the temperature of cold storage. After evaporation low pressure and low temperature vapour refrigerant again enters into compressor and repeat cycle.

Heat rejected by condenser is not able to create high temperature difference between hot storage and atmosphere also don't required to create high temperature difference

because it could affect food package or it can be deteriorate food taste also sometime. So we required small temperature difference between surrounding and inside the hot storage which is obtain by using heat rejected by condensation.

There are many refrigerant which can be use but HFC R134a is largely use as refrigerant because of its property. It does not deplete the ozone layer.

V. EQUATIONS

Capacity of evaporator: it is defined as how much amount of heat absorb from the cold storage in unite time. It is given by $Q = UA (T_2 - T_1)$

Where,

- U = Overall heat transfer coefficient
- A = Area of evaporator surface
- T₂ = temperature of cold storage area
- T₁ = Temperature inside the Evaporator.

VI. DIFFERENT REFRIGERANT AND ITS PROPERTY

Refrigerant number	Name	Formula	Boiling temperature (c)	Freezing temperature (c)
R12	Dichloro diafluoro methane	CCl ₂ F ₂	-29	-157.5
R11	Trichloro monofluoro methane	CCL ₃ F	+23	-111
R21	Dichloro monofluoro methane	CHCL ₂ F	+9	-135
R22	Monochloro difluoro methane	CHCLF ₂	-41	-160
R134a	Tetrafluoro ethane	CF ₃ CH ₂ F	-26	-101
R113	Trichloro trifluoro ethane	C ₂ CL ₃ F ₃	+47.3	-35
R114	Dichloro tetrafluoro ethane	C ₂ CL ₂ F ₄	+3.6	-94
R30	Methylene chloride	CH ₂ CL ₂	+39	-96
R40	Methyl chloride	CH ₃ CL	-23.7	-97
R764	Sulphur dioxide	So ₂	-10	-75.5

REFERENCES

- [1] A textbook of Refrigeration and Air conditioning by R.s. khurmi and J.k.gupta, S.chand publication.
- [2] Heat and mass transfer by Dr.D.S.Kumar
- [3] Nikunj chaudhari, Yash shah ,Deep shah, Amit patel "Food delivery Heating System" IOSR journal of mechanical and civil Engineering, volume 14,Issue2, ver.I.