

# Study on Automatic Regulation of Evaporating Temperature of Refrigerated Vehicle in Multi - temperature Zone

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**Abstract :-**Cold chain logistics is based on the freezing process, Refrigeration technology as a means. Cold chain items from the production, circulation, sales to consumers Each link is always in the specified temperature environment. To ensure the quality of cold chain items, Reduce the loss of cold chain items logistics activities. The Multi-temperature refrigerated vehicle play an indispensable role in the refrigerated transport. In view of the existing refrigerated vehicles evaporating temperature cannot be automatically adjusted lead to food freezing, frostbite and other issues, This paper presents a multi-zone refrigerated vehicles, Not only has a number of temperature zones and can achieve the temperature of each temperature zone can be automatically adjusted. Multi-temperature refrigerated vehicle to meet the needs of different items on the evaporation temperature.

**KEY WORDS:-**Multi-temperature refrigerated vehicle; Evaporation temperature, Auto-adjusting

## I. INTRODUCTION

Refrigerated vehicles with wide applicability, Flexibility, Transit links less, Can achieve point to point transport. Refrigerated vehicles is the main means of transport of food distribution process, From the distribution center to the retail business, There are differences in the storage temperature of different kinds of food, Multi-species, small quantities of transport demand makes the single-zone refrigerated trucks cannot meet the transport needs. The refrigerator car is divided into a plurality of temperature zones, Multi-temperature refrigerated vehicle. Each temperature zone is set to a different temperature to meet the different food transport needs, Not only to save costs but also to improve the efficiency of transport.

## II. FIXED EVAPORATURE OF REFRIGERATED VEHICLES

Refrigerated vehicles by refrigeration is divided into mechanical refrigeration, cold storage plate refrigeration, liquefied gas cooling. At present the application of more refrigerated vehicles for the mechanical refrigerated vehicles, According to the drive can be divided into independent and non-independent. Independent refrigeration unit is a mechanical cooling device with its own power unit, Commonly used power plant has internal combustion engine and electric. Some refrigeration units are only equipped with a power source, Only an internal combustion engine, or only an electric motor; Some are equipped with both internal combustion engine and motor, Use the clutch to switch. In the transport process using internal combustion engine-driven refrigeration compressors, In the loading and unloading sites and garages are motor-driven to save energy. A non-freestanding refrigerator, which has no power unit itself, Refrigeration compressors are typically driven by an automotive main engine. Currently, Mechanical refrigeration vehicles are generally used vapor compression refrigeration unit.

At present, multi-temperature refrigerated vehicles mostly use an evaporator. Single-evaporator multi-zone refrigerated trucks are installed in the freezing zone evaporator, Set the air duct at the top of the

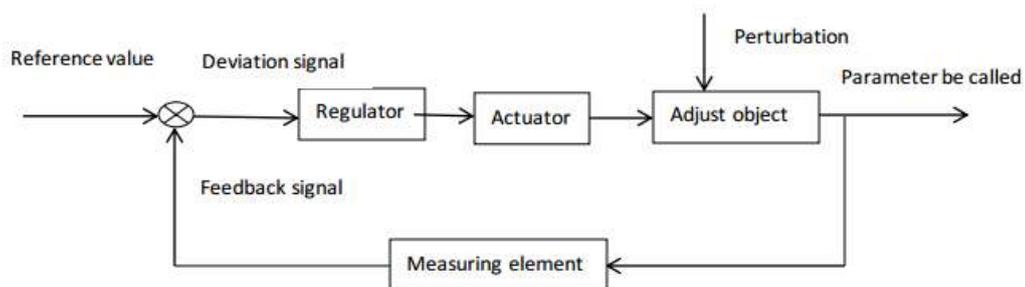
compartment to send the cold air to the cold storage area, normal temperature zone to reduce the temperature. The set temperature of the refrigerated truck can be set according to the preservation requirements of different foods, Even if the refrigerating temperature can be set to 0 °C or more, the increase of the storage temperature does not increase the opening degree of the expansion valve or increase the evaporation temperature to a great extent, Making some suitable for preservation at 0 °C above the fruits and vegetables near the outlet when the vulnerable to frostbite.

### III. AUTO-ADJUSTING SYSTEM

Transporting different foods requires a different library temperature, Transportation of vegetables, fruits, the best library temperature is about 5 °C, Transport some frozen food temperature to reach -20 °C below. Different temperature of the refrigerated vehicles are derived from different evaporation temperature. The evaporation temperature is determined at design time, Compressor and expansion valve to achieve the result of dynamic balance. After the refrigeration unit starts to run, the evaporation temperature will quickly stabilize to a fixed temperature, It is not affected by the external environment and the set temperature, Therefore, the refrigerating unit is a refrigerated vehicle with a fixed evaporation temperature.

### IV. REFRIGERATION PRINCIPLE OF MULTI-TEMPERATURE REFRIGERATED VEHICLES

Automatic adjustment system is generally by the regulation of objects, measuring components, regulators and actuators, As shown in Figure 1. When working, first by the measuring element to detect the parameters of the deviation of the given value, According to the nature and size of the deviation, by the regulator sends a corresponding signal, command actuator action, Make parameter to be adjusted remains within the range of the given value. In the automatic adjustment of the cold storage refrigeration system, The measurement components, regulators, actuators made of three as a whole. Simplified into a direct-acting automatic regulator.

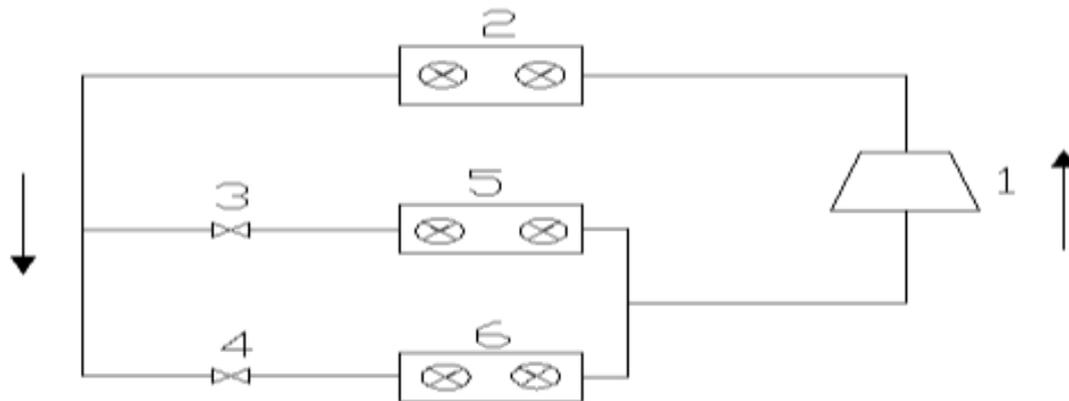


**Figure 1:** Automatic adjustment system

### V. REFRIGERATION PRINCIPLE OF MULTI-TEMPERATURE REFRIGERATED VEHICLES

When the multi-temperature zone of refrigerated vehicles to work, The low temperature low pressure refrigerant gas from the evaporator enters the compressor. After the compressor compression, a high temperature and high pressure superheated steam, Through the oil separator into the condenser and heat exchange with the cooling water, Cooling and condensing into saturated liquid at room temperature and high pressure into the liquid reservoir, The refrigerant is filtered by a drying filter, and is divided into two paths through the liquid supply solenoid valves of the banks, The electronic expansion valve throttling into low-temperature low-pressure

saturated steam, respectively, into the two evaporators, In the evaporator endothermic vaporization, a low-temperature low-pressure refrigerant gas, the compressor sucked back again, so the cycle, to achieve refrigeration. Multi-temperature refrigerated vehicle refrigeration schematic diagram shown in Figure 2.



1-compressor 2-Condenser 3~4 Electronic expansion valve 5~6 Chillers

**Figure 2:** Refrigeration principle of refrigerated vehicles

## VI. AUTOMATIC ADJUSTMENT OF EVAPORATION TEMPERATURE

The electronic expansion valve used for the vehicle refrigeration unit of the double evaporator is different from the conventional one, The refrigeration system has no fixed evaporation temperature. The first task of the control system is based on the set temperature and pre-input temperature difference between the heat transfer calculation of the target evaporation temperature and the corresponding stepper motor steps, And then directly adjust the electronic expansion valve opening to the calculated value, Thus establishing a new equilibrium state, to achieve a new evaporation temperature, After the control logic and the general control of the same expansion valve will be based on superheat fluctuations in the timely adjustment of opening, maintenance has been established evaporation temperature. The electronic expansion valve on the refrigeration unit control logic more than one link, is to calculate the target evaporation temperature, And take the initiative to change the opening in order to achieve this target evaporation temperature.

## VII. CONCLUSION

The design of multi-zone refrigerated vehicles using two evaporators to control the temperature of the two separate evaporation temperature, Not distinguish between freezer zone, refrigerated area, normal temperature zone, Two evaporator control of the two temperature zones can achieve the conversion of the three temperature zones, more convenient and efficient. A Multi - temperature Area Refrigeration Vehicle with Auto - regulation of Evaporating Temperature is to meet the needs of different foods. Reduce fruit and vegetable water loss, More energy-saving, lower fuel consumption. Has a strong practical value.

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