How Does a truck refrigeration unit work?

As the main equipment of modern cold chain logistics, the working performance of truck refrigeration unit is directly related to the quality and safety of food, medicine and other temperature-sensitive goods.

I. THE BASIC COMPOSITION OF REFRIGERATED TRUCK REFRIGERATION UNIT

Refrigerated truck refrigeration system is mainly composed of the following key components:

1.1,Compressor: the heart of the system, responsible for compression and circulation of refrigerant
1.2. Condenser: high temperature and high pressure gaseous refrigerant cooled to liquid state
1.3. Expansion Valve: controls the flow of refrigerant and reduces the pressure
1.4. **Evaporator:** Absorbs heat from the compartment and cools it down.
1.5. Control system: monitoring and regulating temperature, humidity and other parameters
1.6. Fan system: promote air circulation, ensure uniform temperature

2,REFRIGERATION CYCLE WORKING PRINCIPLE

The refrigerated truck refrigeration unit is based on vapor compression refrigeration cycle, and its working process can be divided into four main stages:

2.1. Compression process

Low-temperature and low-pressure gaseous refrigerant is sucked in by the compressor, and is transformed into a high-temperature and high-pressure gas through mechanical compression by the piston or scroll mechanism. During this process, the temperature and pressure of the refrigerant rise significantly, creating conditions for subsequent heat exchange.

2.2. Condensation

High-temperature and high-pressure refrigerant gas into the condenser, in the condensing fan under the action of forced convection, heat exchange with the outside air. The refrigerant gradually cools down and condenses into a high-pressure liquid, and at the same time releases a large amount of heat into the external environment.

2.3. Expansion process

High-pressure liquid refrigerant is throttled through the expansion valve (or capillary tube), and the pressure and temperature drop sharply to a low-temperature, low-pressure mist liquid. The expansion valve automatically adjusts the opening according to the degree of superheat at the outlet of the evaporator to control the refrigerant flow.

2.4. Evaporation process

The low-temperature and low-pressure refrigerant enters into the evaporator, absorbs the heat in the car and evaporates into gas. The evaporator fan makes the air in the compartment forced circulation, constantly flowing through the evaporator finned tube, the heat is absorbed by the refrigerant, the air temperature is reduced, so as to achieve the refrigeration effect.

3. SPECIAL DESIGN OF REFRIGERATED TRUCK REFRIGERATION SYSTEM

Compared with fixed refrigeration equipment, refrigerated truck refrigeration unit has some special designs:

3.1. Anti-vibration design: all parts are fixed with anti-vibration to adapt to the bumps in the vehicle traveling
3.2. Compact structure: optimize the use of space, reduce the impact on the cargo space
3.3. Multi-temperature zone control: some advanced refrigerated trucks can realize independent temperature control in different zones.
3.4. Remote monitoring: equipped with GPS and IOT module, real-time transmission of temperature data.

4.REFRIGERANT SELECTION

Modern refrigerated trucks mainly use the following environmentally friendly refrigerants:
- R404A: currently widely used medium and low temperature refrigerant
- R407C: transitional environmental protection refrigerant
- R134a: used in high-temperature refrigeration system
- New natural refrigerants: such as CO_2 (R744) and ammonia, etc.

5. TEMPERATURE CONTROL PRINCIPLE OF REFRIGERATED VEHICLE

The temperature control system realizes precise temperature control by the following ways:
1. Temperature sensors monitor the temperature of the compartment in real time
2. The controller compares the set value with the actual value
3. Adjusting the compressor operation status according to the temperature difference (start-stop or frequency conversion speed regulation)
4. Part of the system can adjust the speed of the evaporator fan
5. Record temperature data to meet the cold chain compliance requirements.

6. MAINTENANCE POINTS OF REFRIGERATED TRUCK REFRIGERATION SYSTEM

In order to ensure efficient and reliable operation of the refrigeration system, it is necessary to pay attention to:
1. Clean the condenser regularly to ensure the heat dissipation effect
2. Check the refrigerant charge, replenish or recover in time
3. Check the compressor lubricant level and quality

4. Keep the evaporator draining smoothly
5. Calibrate the temperature sensor regularly
6. Check all electrical connections and insulation

7.CONCLUSION

Refrigerated truck refrigeration units achieve reliable temperature control in a mobile environment through sophisticated mechanical systems and intelligent control technology. Understanding its working principle not only helps to use and maintain the equipment correctly, but also provides a technical basis for the quality management of cold chain logistics. With the development of new energy and intelligent technology, the future refrigerated truck refrigeration system will be more efficient, environmentally friendly and intelligent.