1. Screw refrigeration compressor unit and circulation system

————REAL-TEMP

Screw compressor when working, lubricating oil should be continuously injected into the working chamber, which plays the roles of lubrication, cooling, sealing and noise elimination, as well as lubricating oil of main bearing, thrust bearing and shaft seal,pushing the oil piston and balancing the pressure oil of the piston, and these oils are finally mixed with high-pressure gas and discharged from the compressor. These oils must be separated, cooled, filtered and pressurized for recycling. In order to prevent the impurities in the refrigeration system from entering the compressor with suction and causing wear to the rotor and the machine body, a suction filter must be set.

① Suction filter

The suction filter is mainly composed of a shell and a metal filter screen. A suction thermometer, a pressure gauge and a refueling valve are installed on the shell. The refueling valve is the part of refueling when the unit is running.

Precautions:

When removing the end cover, avoid being hurt by the spring; During installation, it should be noted that the apron at one end of the filter screen is intact, and it should be replaced if it is damaged or deformed.

When refueling, adjust the suction cut-off valve to make the suction pressure slightly lower than atmospheric pressure, and suck the oil through the oil pipe. The operation should be carried out slowly.

For the Freon unit, when the evaporation temperature is low, if the water content of the system is high, the filter will be blocked by ice. Water can be filtered by replacing the drying filter or by the suction filter. How to judge and operate.

② Oil separator

There are two main types of oil separators for screw compressor sets: vertical and horizontal, and the packing type is the main one. At present, our company generally adopts horizontal two-stage oil separation and three oil separation methods, with high oil separation efficiency, up to 10PPm. The oil separator is also the foundation of compressors and motors, making the unit compact in structure. The oil is divided into three cavities, and the barrel near the compressor keeps the oil level. There are two sight glasses arranged up and down on the outer shell to monitor the oil level (the automatic unit

has an oil level controller). The barrel near the motor is equipped with a high- efficiency oil separation filter element for secondary oil separation, and there is also an oil sight glass on the outside to judge whether to take oil return measures according to the oil level.

Precautions:

Oil level control: between two sight glasses; The return oil in the front and rear parts of the oil separation filter element operates the oil heater; If the oil separation filter element is seriously polluted, it will increase the exhaust resistance, increase the power consumption and reduce the efficiency, so it should be more change; Because of the long oil separation length, stress and deformation will occur under the influence of temperature and vibration, which will change the coaxiality of the motor and compressor. The coaxiality of the compressor should be adjusted at any time during the initial operation. The specific interval time is determined by the deviation measured in the previous alignment.

③ Oil cooler

The temperature of lubricating oil separated from oil increases (close to the exhaust temperature) because it absorbs friction heat and gas heat. The normal service temperature of lubricating oil is 30 ~ 60℃. If the oil temperature is too high, the viscosity will decrease, which will weaken the sealing effect, increase the internal leakage and reduce the efficiency of the compressor. Therefore, the lubricating oil must be cooled before it can be recycled.

The oil cooler is used to cool the oil.

Generally, the oil cooler adopts water cooling method. Oil takes the shell side, water takes the tube side, and it is convenient to clean the waterway. The advantages are that the system is simple and the oil temperature can be reduced to a relatively low temperature(depending on the water temperature); The disadvantage is Louis corrosion of water side pipe.

Working medium cooling. Oil takes the tube side, and working medium takes the shell side. The advantages are that oil cooling is not easy to corrode, and operation and maintenance are simple;save a set of waterway system, which is suitable for occasions with poor water quality or difficult water supply; The oil temperature is relatively stable. The disadvantage is that the lowest temperature of oil temperature is controlled by condensation temperature, and the system needs to add auxiliary liquid storage or ammonia pump. There should be a height difference of at least 1 meter between the liquid outlet of the auxiliary liquid reservoir and the oil cooler.

④ Crude oil filter

In order to protect the normal operation of the oil pump,impurities are filtered through the crude oil filter before the lubricating oil enters the oil pump. The filter consits of a shell and a metal screen. The shell is provided with a refueling valve, and the first refueling is through this valve. Refueling can be done by vacuumizing the system or by oil pump. For the machine running for the first time, the cleanliness of the crude oil filter should be checked after the initial operation, and the filter screen should be dismantled regularly according to the cleanliness of the system. You can use gasoline or kerosene to clean the filter screen, and blow it clean with dry air before continuing to use it.

⑤ Oil pump

The function of oil pump in compressor unit is to increase oil pressure. Gear pumps or rotor pumps are often used. Check the rotation direction of the oil pump before starting the machine. Serious wear of oil pump gear or rotor will lead to insufficient oil pressure and must be repaired or replaced; Oil pump shaft seal oil leakage must also be repaired or replaced.

⑥ Essential oil filter

The essential oil filter is also composed of a shell and a filter screen, which is installed behind the oil pump and before the oil distributor to filter the fine particles in the oil nd protect the compressor rotor and shaft seal. In order to filter out the fine metal debris, a permanent magnet is installed in the filter screen.

The filter screen of the essential oil filter is relatively fine, which is easy to be polluted and increases the resistance. When the pressure drop of oil flowingthrough the essential oil filter exceeds 0.05 ~ 0.1 MPa, it is necessary to clean or replace the fine filter. The unit is equipped with differential pressure protection before and after the fine filter, with a set value of 0.1Mpa.

⑦ Oil pressure regulating valve

The function of the oil pressure regulating valve is to regulate the injection pressure of the compressor. If the oil pressure entering the compressor is too high, the fuelinjection will be too large, which will not only affect the suction capacity of the compressor, but also increase the power consumption of the compressor and increase the possibility of oil leakage from the shaft seal. If the oil pressure is too low, the fuel injection will be too small, which will weaken the role of lubricating oil. Generally, the oil pressure after the essential oil filter, that is, the injection pressure, is required to be 0.15 ~ 0.3 MPa higher than the exhaust pressure (except for the compressor with adjustable

internal volume ratio). The oil pressure regulating valve is generally located between the inlet and outlet pipes of the oil pump, and is generally spring-type. When the outlet pressure of the oil pump is higher than the set value of the oil pressure regulating valve, the valve head of the regulating valve is automatically pushed open, so that part of the oil flows back into the oil pipe or oil, and the oil pressure is reduced. Usually, when the oil pump is just started or the oil temperature is relatively low, the oil pressure will be relatively high, reaching 0.4~0.6MPa, so it is not necessary to adjust the set value of the oil pressure regulating valve at this time. After the machine runs normally, adjust the oil pressure to an appropriate value as needed.pipes of the oil pump, and is generally spring-type. When the outlet pressure of the oil pump is higher than the set value of the oil pressure regulating valve, the valve head of the regulating valve is automatically pushed open, so that part of the oil flows back into the oil pipe or oil, and the oil pressure is reduced. Usually, when the oil pump is just started or the oil temperature is relatively low, the oil pressure will be relatively high, reaching 0.4~0.6MPa, so it is not necessary to adjust the set value of the oil pressure regulating valve at this time. After the machine runs normally, adjust the oil pressure to an appropriate value as needed.

⑧ check valve

Check valve is also called check valve or one-way valve. Because there is no example in screw compressor that the suction and exhaust valves can automatically separate the high and low pressure chambers, when the compressor stops suddenly without closing the suction and exhaust stop valves, the refrigerant gas will flow from the high pressure side to the low pressure side, and the compressor rotor will also reverse under the action of airflow. The inversion of screw compressor will have many bad effects: the rotor will have serious wear; The pressure on the low-pressure side (evaporator) rises and the temperature rises; The lubricating oil in the compressor will flow to the low pressure side in large quantities with the airflow, which will make the oil quantity of the unit insufficient, affect the heat exchange of the evaporator, or cause liquid hammer when the machine is started again.

Screw compressor is equipped with suction check valve and exhaust check valve between suction stop valve and suction port of machine body, and between oil outlet and exhaust stop valve to prevent refrigerant gas from flowing in the opposite direction. The check valve cannot be used as a

stop valve. Pay attention to the direction when installing the suction and exhaust check valves, and do not invert them.

There is also an electromagnetic valve (commonly known as valve B) between the air inlet and the oil outlet of the machine body. When the machine is stopped artificially, the electromagnetic valve is opened, so that the pressure of the air inlet and outlet of the compressor can be quickly balanced and the compressor can be reduced from reversing when it is stopped.

2, Single-stage screw refrigeration compressor system, lubrication and control.

（1）Compressor unit system

Single-stage screw refrigeration compressor unit is generally composed of compressor, motor, suction filter, oil separator, oil cooler, oil filter, oil pump, check valve and electrical console, which are installed on the same common base. Electrical starting cabinets are generally concentrated in a control room.

（2）Lubrication and oil injection

Screw refrigeration compressor has two types: internal oil circuit and external oil circuit. No matter what kind of oil circuit, the following points should be guaranteed to be lubricated:

a.Slide valve injection

b.Balanced piston injection

c.Slide valve guide rail injection

d.Oil injection of main bearing and thrust bearing at suction and exhaust ends.

e.Shaft seal oil injection

（3）Control and protection

The control of screw refrigeration compressor unit is generally divided into full automatic type and manual operation plus automatic protection type. Regardless of the type, the following automatic protection should be set:

a.overload protection of main motor

b.High exhaust pressure protection: ≤1.57MPa

c.High fuel injection temperature protection: ≤65℃

d.Protection of oil pressure and exhaust pressure difference: ≥0.10MPa

e.Protection of high pressure difference before and after essential oil filter: ≤0.1MPa

f.Low suction pressure protection: set according to working conditions.

3. Screw refrigeration cycle system with economizer

One of the characteristics of screw compressor is that the single-stage pressure ratio is large, but with the increase of pressure ratio, the internal leakage of compressor increases, the efficiency decreases and the power consumption is large. Taking advantage of the one-way suction, compression and exhaust of screw compressor, an intermediate air hole is set at a certain position where the rotor rotates to start compression, and refrigerant gas at an intermediate pressure is added, so that the single- stage screw operates according to two-pole compression, which is equivalent to quasi-two-stage, that is, the screw compressor with economizer.

Screw refrigeration cycle system with economizer is also called energy-saving system. As shown in Figure 2-18, it is the schematic diagram of primary throttling cycle with economizer.

A-Compressor

B-Oil separator

C-Condenser

S-Liquid reservoir

J-Economizer

E-Evaporator

P-Oil pump

F-Oil cooling

G1-Throttle valve1

G2-Throttle valve2

The economizer is a shell-and-tube heat exchanger, with the shell side being the low pressure side and the tube side being the high pressure side. The economizer is equipped with accessories such as air supply filter, check valve and throttle valve. When the pressure ratio changes, the liquid supply amount of the throttle valve should be properly adjusted according to the superheat degree of the intermediate air supply to prevent the liquid from returning, especially by using heat.Expansion valve freon system for liquid supply.

Screw compressor set with economizer is often used in refrigeration system with evaporation temperature of -25~-40℃. Compared with the original single-stage compressor, the refrigeration capacity and efficiency have been greatly improved, while saving electricity. As shown in Figure 2-19, the relationship between the increase rate of refrigeration capacity and shaft power of ammonia

screw compressor with economizer and temperature shows that the change of shaft power is relatively gentle,while the increase rate of refrigeration capacity increases with the decrease of evaporation temperature, and the greater the pressure ratio, the more obvious the increase effect.

4. Screw liquid ammonia cooling compressor unit

Compressor set with liquid ammonia oil cooler.Suitable for occasions with poor water quality,difficult water supply or high water cost； The oil temperature is relatively stable.The disadvantage is that the lowest temperature of oi temperature is controlled by condensation temperature,and the system needs to add auxiliary liquid storage or ammonia pump.When the auxiliary reservoir is used， the height difference between the liquid outlet of the auxiliary reservoir and the oil cooler should beat least1meter.

5. Screw chiller

The screw compressor unit, evaporator, condenser, drying filter, solenoid valve and thermal expansion valve are combined on a common base, and water is used as the coolant. R22 is often used as refrigerant in water chillers, and the thermal expansion valve is used to automatically adjust the liquid supply. At present, ammonia is also used as refrigerant and plate heat exchange is used as evaporator and condenser. The shell-and-tube heat exchange can be used to produce water for air conditioning or cooling at 4 ~15℃; The plate heat exchange can be used to produce cold water of about 1℃. In addition to the automatic protection of the normal compressor unit, the water chiller also has the protection of cold water, water cut-off of cooling water and low water temperature of cold water. Thermal expansion valve: it is composed of temperature sensing bulb, capillary tube, elastic diaphragm, spring, valve core, valve seat and regulating device. The temperature sensing bulb is tied to the suction pipeline near the compressor. Using the corresponding relationship between the saturated temperature and saturated pressure of the refrigerant in the temperature sensing bulb, the pressure changes when the temperature changes, changing the opening of the valve core and adjusting the liquid supply of the expansion valve. The adjusting device is used to change the elastic force of the spring pressing on the diaphragm, thus changing the suction super heat.

6. Screw brine (glycol) unit

The structure is similar to that of a water chiller.Saltwater(glycol solution)is used as a cool ant to prepare low-temperature saltwater(glycol solution)at-10~-40℃.

Due to the corrosiveness of brine,the heat exchange tube in the evaporator of brine unitis made of high-efficiency brass tube with low temperature resistance and corrosion resistance.The evaporation temperature of brine(glycol)unitis relatively low,so it is necessary to observe whether the suction filter is blocked by ice during the initial operation.

The above contents are compiled according to the problems encountered by the students in their actual work for reference. If you have any questions, please communicate and correct them in time.

Second, the water vapor capture pump

The produced water vapor capture pump, also known as the rapid circulating water vapor cryogenic pump, places a refrigeration coil that can reach below -120℃ in a vacuum chamber or the pump mouth of an oil diffusion pump, and quickly captures the residual gas in the vacuum system through the low-temperature condensation effect on its surface. Thereby greatly shortening the vacuumizing time (the vacuumizing time can be shortened by 60-90%) and obtaining a clean vacuum environment.

——End——