Noise sources of vane pumps

Nowadays, hydraulic equipments are widely used, and the noise produced by them is quite common. Moreover, hydraulic equipments are developing towards high speed, high pressure and high power. High noise hydraulic equipments are difficult to work normally, and even affect their proper performance and hydraulic components and life. In the hydraulic equipment, it is generally believed that the main noise source is the hydraulic pump, and the basic principle and method of controlling the noise of the hydraulic pump is completely applicable to other parts of the system. As the main type of hydraulic pump, vane pump has the tendency to gradually replace other pumps. For vane pump, the noise mainly includes mechanical noise and fluid noise.

1. mechanical noise

The rotating part of a machine is eccentric due to structural design, manufacturing and installation errors, and periodic unbalanced forces are generated when it works, so the vibration produces noise. In the drive system, the unbalance of rotary parts will exist in the connecting parts such as keys, couplings, gears, etc. Therefore, it is necessary to control the machining accuracy, assembly accuracy and minimize the unbalance influence of rotary parts. The best choice of the coupling is the elastic coupling, with vibration and noise absorption effect, but must be calibrated to install coaxiality.

Compared with the usual test, the good bearing has great influence on noise. In order to reduce bearing noise, it is necessary to: (1) improve cage accuracy; (2) improve bearing accuracy grade and shape error, especially roller accuracy is the key. Therefore, the selection of bearings in vane pumps is also an important part. The radial vibration of stator and rotor caused by periodic pressure switching, the vibration of blade caused by stator curve characteristics and the vibration caused by the change of blade force depend on the design and manufacture quality. Various parts of vane pump, especially the manufacturing accuracy of key parts (valve plate, stator, rotor, blade), such as surface roughness, shape tolerance, etc., all affect the existence of noise. And assembly accuracy is also a knowledge, such as rotor and blade clearance and stator circle and pump body clearance must be reasonable, otherwise easy to produce noise. Therefore, when we design well, we must do well in manufacturing quality and assembly quality. The vibration of the vane pump or other components is mostly caused by the rigidity of the bottom plate. For this reason, the bottom plate can be thickened, and vibration isolation can be adopted to improve the installation conditions to eliminate the body vibration to remove or reduce noise.

2. fluid noise

The fluid noise of vane pump is usually caused by cavitation or suction in suction system. When the vane pump works, if the suction system (including filters, pipes and pump passages) has a great resistance, the oil can not fill the pump cavity, resulting in local vacuum after the formation of "cavitation" phenomenon, resulting in cavitation damage parts and

Generate noise. In order to avoid cavitation, it is important to minimize the resistance of suction pipeline besides selecting vane pump with good oil absorption performance. The following measures should be taken: (1) increase the diameter of the oil suction pipeline, reduce or avoid the bending of the pipeline, reasonable length of the pipeline, reduce the speed of oil suction; (2) select a reasonable capacity of the filter, and often clean to avoid blockage; (3) the height of oil suction vane pump as small as possible, or lower than the oil surface; (4) avoid excessive oil viscosity and the phenomenon of insufficient oil suction. It is necessary to select different grades of work oil according to the season and season, or to run the equipment after preheating the oil. Vane pump suction mainly refers to the pump sucked into the oil mixed with air. This situation will cause cavitation, increase noise, but also affect the volume efficiency of the vane pump, and make the working oil easy to deteriorate, which is the most taboo hydraulic. Measures to be taken include: (1) the relevant parts of the vane pump itself (such as oil seals, O-rings, etc.) and pipelines must be strictly sealed to minimize the number of pipe joints to prevent suction; (2) tank structure design and pipeline arrangement should be reasonable, the liquid level should not be too low; (3) the use of good defoaming working oil or the addition of defoaming agent in the oil, so that it will soon disappear. Remove bubbles from oil.

3. noise caused by improper use and maintenance.

(1) the stator, rotor, blade and valve plate have been worn out, and the sound must be removed.

(2) the triangular groove of the distributor plate is blocked by dirt and must be cleaned.

(3) vane pump overpressure operation or overspeed operation is not allowed. The research shows that the overspeed operation has more serious impact on the pump than the overpressure operation. Therefore, under the same power, in order to reduce noise, large displacement hydraulic pump should be selected to work at low speed.

(4) the oil has been contaminated, which will aggravate the wear and tear of parts and cause noise. Therefore, it is necessary to keep the oil clean and filter smooth at ordinary times.