Common Failures of Electro-hydraulic Hammer

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As an efficient and energy-saving hydraulic equipment, electro-hydraulic hammer has the following characteristics:

1. Electro-hydraulic hammers generally work under heavy load and harsh working environment, which requires high reliability of components.

2. The flow in the system is large, which will be impacted and destructive to valves, cooling system and piping system.

3. The running speed of the cylinder is fast, and the speed of the hammer rod piston is more than 9 m / s, which is rare in the ordinary hydraulic system.

Users will find it difficult to maintain such a special hydraulic system. How to keep it in good working condition? Here we would like to share our experiences on the practice, hoping to help the majority of users.

A. Good design concept can not only improve the reliability of the product, but also support the accuracy of failure diagnosis.

We know that the fault shooting of hydraulic equipment always need the good maintenance personnel with plenty of experience, he need follow the following aspects to deal with the failures:

1. Observe the operation status of the equipment, and check the instruments and indicator lights of each part;

2. Listen to the noises of equipment operation, experienced maintenance personnel can find abnormalities in various sounds;

3. Ask the operator about the situation when the fault occurs and find clues;

4 . In the operation of the equipment, touch some specific parts by hand to feel the temperature, vibration, etc., or use the instrument to measure the accurate parameters.

Our electro-hydraulic hammer is designed with many pressure gauges and fault indication to help the maintenance personnel quickly understand the internal and external conditions of the equipment. For example, the maintenance personnel can quickly judge whether the pressure value of a single oil pump is adjusted in place.

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In the program, we set a lot of alarm items, and set the failure memory function, to a certain extent, to solve the hard problem of failure location, or when the maintenance personnel arrive, the operator can't accurately express the failure phenomenon.

Therefore, the humanized design of our products fully considers the convenience of operation and maintenance, meets the user's requirements for the use and maintenance of electro-hydraulic hammer products.

B. Problems of main control valve and secondary valve

During maintenance, we encountered that a reformed electro-hydraulic hammer was out of service due to failure. The phenomenon was that the hammer head was not controlled stably, and it would suddenly fall when the hammer head was slowly put down, and causing the equipment to be idle for years. After checking the secondary valve, we determined it was in good condition, so we drilled an additional damping hole at the control oil port of the main control valve to solve this problem.

We also met a leak issue on another user's electro-hydraulic hammer. The main control valve leaked for a long time, resulting in high oil temperature of the equipment and low efficient work. It is said that replacing all the sealing rings can't solve the problem, and the hammer must be stopped running for cooling down after each two hours of operation. The reason is that the user did not seriously study the technical data and train the maintenance personnel. The small valve core of the main control valve is a vulnerable part, which be required to replace every six months. After we replaced it, the issue disappears.

It is worth mentioning that we often encounter users who have been using electro-hydraulic hammers for years, they don't even have an assembly drawing of the main control valve, and they know little about the working principles of several valves. As manufacturers, we should provide sufficient maintenance support files, do a good job in training, and users should actively cooperate with training and establish maintenance system, which achieve a win-win situation.

C. The problem of insufficient oil supply in the system

The insufficient oil supply in the system is the most common and typical failure of the electro-hydraulic hammer. Most of the electro-hydraulic hammers with the combination of fixed displacement pump and accumulator will encounter this problem. Insufficient oil supply refers to the phenomenon that when the accumulator is full of oil, the speed of the first few hits is normal, and

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after a few hits, the hammerhead suddenly slows down, accompanied by a large fluctuation of pressure. However, many users have misunderstandings when dealing with it. They often start with the oil pump first and think that it is caused by the decline of the working efficiency of the oil pump for a long time, but most cases are not.

Of course, the possibility of this phenomenon caused by oil pump wear also exists. At this time, we should check whether the insufficient oil supply is accompanied by the abnormal rise of oil temperature. If so, it has nothing to do with the oil pump, but there is internal leakage in the system. If the efficiency of the oil pump decreases, it will also generate heat, but its heat is far less than that of the internal leakage of the system!

So how to find the leakage point correctly? We should first observe the frequency of automatic unloading of the system. If the unloading frequency is high, it means that the leakage point is in the main control valve or secondary valve. If it is normal, we should check the electromagnetic relief valve. Practice has proved that most of the symptoms of insufficient oil supply are caused by the pressure adjustment of the relief valve. This kind of fault has great concealment, especially in the oil supply system of multiple oil pumps, the relief valve pressure of one or several oil pumps is adjusted too low, which can't be seen on the total pressure gauge, and these parts are the internal leakage points.

D. Sealing problem

The service condition of electro-hydraulic hammer has some particularities, one is high load, many manufacturers work in three shifts 24 hours continuously; the other is the piston rod movement speed is fast, some equipment is as high as 9 m / s, such working conditions require high performance and service life of seals.

Of course, through our continuous development and improvement, we solved this issue from the aspects of material, component, and structure design.

In terms of materials, fluoro-rubber, high-strength polyurethane, composite polytetrafluoroethylene, and other high-grade materials are tested and selected for our equipment.

About the components, we choose advanced components with high performance from many countries, such as imported components from the United States, Germany, and Japan.

In terms of structural adjustment, we have improved the following aspects:

1. Try to increase the area of sealing guide surface and improve the material of guide element. For example, we increase the length of the guide sleeve and select the strength of the material

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properly, which has achieved good results.

2. Pay attention to the influence of elastic deformation of oil cylinder on seals. Due to the inevitable working condition of the hammer, the pressure at the lower part of the cylinder may rise instantaneously. If the structural strength is not enough, it may produce large elastic deformation. At this time, the seal may squeeze into the deformed gap with the movement of the piston, forming trimming. Therefore, we add the wall thickness and structural rigidity of the cylinder to control the elastic deformation to achieve a good sealing effect.

3. Adjust the configuration reasonably to reduce the local severe heat in specific parts of the system. For example, the local severe heat has a direct impact on the life of the main cylinder seal. We have made the structural improvement to make the heat dissipation reach the natural balance.

4. Adopt reasonable combination of seals to give full play to their own characteristics. In the key position of the equipment, we use the combination seals to make full use of their respective performance characteristics, and the sealing effect is ideal.

E. High oil temperature

The best working temperature of the electro-hydraulic hammer is between 35 ℃ and 50 ℃. Overload of high oil temperature has a great impact on the system, which usually leads to accelerated aging of seals and increase of internal leakage. It is dangerous when the oil temperature reaches above 60 ℃, and a large number of seals may fail when working at high temperature for a long time.

In the design and improvement, we fully consider the problem of oil temperature control, so that it can be better solved. For routine maintenance and inspection, the following measures can be taken when the oil temperature is too high:

1. According to experience, 80% of the abnormal oil temperature rise is caused by improper adjustment of the electromagnetic relief valve. It should be ensured that the set pressure of each relief valve is about 0.5 ~ 1MPa higher than the top pressure of the accumulator.

2. If the solenoid relief valve has been used for a long time and can't be completely closed after adjustment, or the closing time is too long, which belongs to excessive wear, it should be replaced (in order to save cost, you must replace the solenoid valve and pilot valve at least).

3. Check whether there is a large internal leakage in the system, such as the cone of the safety valve and the small spool of the main control valve. The inspection measure as below: turn on 1-2 motors, lift the hammer head to the top and keep the operating handle in the hammer lifting position

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for about 30 seconds. If the system is unloaded frequently (more than 10 times) within 30 seconds, it indicates that there is a large internal leakage. It is necessary to find out the leakage point and replace the relevant components.

4. Touch the outlet pipe of the cooler with your hand, and you should feel that the temperature of the hot oil decreases after passing through the cooler. If the change is small or no change, you should check the cooling system:

a. Whether the cooling oil pump operates normally and whether the coupling connection is reliable. If the working pressure of the cooling pump is on the high side (above 0.2MPa), it indicates that the oil return filter is blocked and should be replaced.

b. Whether the cooler is assembled correctly: the cooler must be assembled correctly to work effectively.

c. Ensure that the cooler has enough water and low water temperature.

The above is our daily work in the summary of some experience, hope to help users solve some problems in production and maintenance.

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