Cause and analysis of hydraulic pump failure

Shang li\textsuperscript{a}; Wang Na\textsuperscript{b}

\textsuperscript{a}Shenyang urban construction University, Shenyang, Liaoning, China
\textsuperscript{b}shanglicindy@163.com, susanwn@163.com

*Shang li: shanglicindy@163.com

Abstract. After a period of use, the internal parts of the hydraulic pump will be worn one after another, resulting in the reduction of the movement efficiency of the hydraulic pump and various problems. Usually, this is a sign of damage to the hydraulic pump. If the hydraulic pump is seriously damaged and beyond the scope of repairable technology, it should be replaced in time and repaired effectively. If it is difficult to repair, replace the parts if necessary to improve the working efficiency of the hydraulic pump. Under certain circumstances, experienced maintenance personnel can fully improve the working efficiency of hydraulic pump through precise maintenance and effective matching.

1. Introduction
The hydraulic pump is an important part of the hydraulic system, which provides power for the hydraulic system. The hydraulic pump is just like the heart of the hydraulic system. If there is a problem with the hydraulic pump, the whole system can not work. This paper mainly analyzes the damage failure and main reasons of hydraulic pump, and puts forward effective solutions for reference of relevant personnel.

2. Common problems and damage causes of hydraulic pump

2.1. No oil or pressure from hydraulic pump
If there is no oil or pressure from the hydraulic pump, the hydraulic system can not work normally. There are many reasons for this problem, first of all, the prime mover and the hydraulic pump work in different directions; second, the oil level in the oil tank is too low or the oil suction pipe is blocked; third, the hydraulic pump in the process of working speed is too low, the oil viscosity is too high, the blade can not work normally; in addition, the blade and the pump body are not in good contact, causing inconvenience, or hydraulic pump seal ring is not tight, resulting in no pressure hydraulic pump.

2.2. The noise problem of hydraulic pump is serious
The noise problem of hydraulic pump is also a common fault. In the initial stage of hydraulic pump start-up, the noise problem is very obvious, in the process of continuous work, there may be too serious noise interference, lasting for a long time or a short time. For example, in the hydraulic lifting equipment of a cabin, two hydraulic pumps are arranged on the oil tank. Due to the aging of internal equipment, the noise lasts for more than ten minutes during the start-up process. Another common example is that the oil absorbent of a hydraulic system is seriously blocked, resulting in serious noise phenomenon, seriously damaging the hydraulic pump, causing damage to internal parts and shortening the service life.
2.2.1. Causes of hydraulic pump noise

Noise is a common problem in the early start-up of hydraulic pump. There are two main reasons for the noise, one is the air into the hydraulic system, the other is the mechanical failure. If it is the first reason, it is due to the insufficient sealing of the oil suction pipe joint and the pump drive shaft. When a certain degree of air is accumulated in the oil suction pipe, it is difficult to effectively remove it, and serious noise will appear. Or, if the air dissolves in the oil, if the pressure at the inlet of the hydraulic pump is lower than the air pressure, there will be cavitation problem and noise interference. Or, if the oil temperature is too high, there will be gasification, cavitation and noise interference. In the process of daily application, if the suction pressure of the hydraulic pump is too high, the resistance of the oil suction filter will increase, resulting in the decrease of the suction pressure, which may cause cavitation and noise interference. The internal pressure of the liquid will fluctuate with the change of temperature. During the start-up of the liquid pump, if the suction pressure is greater than the saturation pressure, there will be noise interference.

If it is the noise interference caused by mechanical failure, it is mainly because the supervision and management is not in place. After the hydraulic pump stops working, there will still be noise interference in the next start. This is due to internal parts wear problems, or drive shaft asymmetry. If the gear pump is aged and worn, the accuracy of the gear is reduced, and it is difficult to work effectively, or some blades and gears can not effectively bite, the fracture problem occurs in the operation process, which will also cause different degrees of noise interference.

2.2.2. Noise elimination measures of hydraulic pump

To sum up, in order to eliminate the noise of the hydraulic pump, the technical staff should do a good job in the inspection of various parts, and also avoid air entering the hydraulic system. If the air enters the system, the air in the oil suction pipe shall be discharged in time to avoid that the suction pressure is greater than the separation pressure of the air. First of all, it is necessary to seal the oil suction pipe and drive shaft to avoid air leakage. Secondly, in the process of starting the hydraulic device, the outlet connecting pipe of the hydraulic device should be properly relaxed, and the air should be gradually discharged. After all the air is discharged from the oil suction pipe, the outlet connecting pipe should be tightened. In addition, the oil suction filter should be cleaned regularly, and the internal temperature of the oil suction should be controlled to avoid that the suction pressure is greater than the saturation pressure. The vent valve can be set at the outlet of the hydraulic pump to control the gas pressure. Air can be allowed to flow in under low pressure, and the air valve should be closed in time under high pressure to avoid excessive gas pressure.

2.3. Insufficient flow or low pressure

If the flow of the hydraulic pump is insufficient or the pressure is too low, the working speed of the hydraulic system is not high and the actual work can not be realized. To find the cause of the problem, and stabilize the working state of the hydraulic system. There are many reasons leading to insufficient flow or low pressure of the hydraulic pump. If the oil suction pipe filter is blocked, or the sealing at the inlet of the oil suction pipe is not strong, leading to air inflow, the problem of insufficient flow will be caused. Or part of the blade work efficiency is not high, operation efficiency is not strong, appear loose phenomenon. Moreover, the screw of the hydraulic pump is loose, the overall structure is too loose, resulting in air leakage, which will also lead to these problems. Or the matching degree between the plunger and the cylinder block of the hydraulic pump is not high, so it is difficult to achieve effective return, which leads to the poor sealing between the cylinder block and the oil distribution plate, which also causes this kind of problem. To solve this kind of problem, the first thing to do is to deal with the debris of the hydraulic pump, to ensure that the oil absorber can work normally. Secondly, apply lubricating oil on the joint of the oil absorber, strengthen the connecting equipment or replace the sealing ring to reduce the oil absorption height. Moreover, check the blades one by one, and replace them in time if they are seriously worn. In addition, the plunger should be replaced regularly to ensure the good contact between the oil distribution plate and the cylinder block.
2.4. **Low or no pump pressure**

The pressure of the hydraulic system is determined by the external load. If the load pressure is very small, the pressure of the natural hydraulic pump can not be effectively improved. But if the hydraulic pump can not output normal pressure, it means that there is a problem. The main reason is that the hydraulic pump can not discharge oil, there is internal leakage or external leakage, or parts matching is unreasonable, the driving device of the hydraulic pump has problems. In case of internal leakage, timely check and replace the shaft seal if necessary. In case of external leakage, check the surrounding parts and solve the problem in time. If the working state of the relief valve is abnormal, the parts may be damaged, the spring may break and other problems, and the parts need to be replaced. In the process of supporting management, the pipeline condition of the hydraulic pump should be checked in time. If the driving device of the hydraulic pump slips, the pressure of the hydraulic pump will be low or no pressure.

As mentioned above, we only introduced several common faults of hydraulic pump. In the process of practical application, the hydraulic pump may have a variety of fault problems. Some problems may be caused by excessive damage of one part or joint damage of multiple parts. Or it may be because the hydraulic oil is contaminated. For the same fault phenomenon, the fault causes are different. From the current point of view, most of the hydraulic equipment is a combination of mechanical equipment and intelligent equipment. The types of faults are various, and the specific causes of faults are different. Therefore, in the work of troubleshooting, we should effectively analyze the fault phenomenon, find out the internal problems in time, and solve the fundamental problems in time. Generally speaking, before the development and deterioration of technical failure, there will be various symptoms, such as abnormal sound, decreased work efficiency, oil deterioration, increased leakage, loose parts, etc. In some cases, the oil temperature will rise, the pipeline will be damaged, and the oil will be burnt. This requires technical management personnel combined with personal experience, through the inspection mode of looking, hearing, sound and cutting, timely check the mechanical failure of hydraulic pump, find out the cause of the problem, master the correct inspection method, accurately judge the fault problem, timely improve the technical problem, avoid the continuous deterioration of the fault problem, cause irreparable technical loss, and lead to other application problems.

3. **Application method of hydraulic pump**

3.1. **Application mode of gear pump**

The external gear pump has the best self-priming performance, strong anti pollution ability, simple operation steps, uncomplicated overall structure, wide application range and low investment cost. But it can't be used in variable rate and belongs to quantitative pump. At present, domestic gear pumps are mostly used in mobile mechanical equipment, such as tractors, bulldozers, forklifts, loaders and other equipment. They can also be used in fixed machinery with small pressure bearing capacity, such as small hydraulic press.

3.2. **Application mode of vane pump**

If the flow in the hydraulic system changes, especially when the large flow time is less than the small flow time, it is better to use the dual pump or variable displacement pump. In the selection of hydraulic pump, it should meet the requirements of large flow. If the energy loss is serious, variable vane pump can be used to solve this problem, or double vane pump can be used. If necessary, large pump and small pump supply oil at the same time, small flow pump supply oil under high pressure and large flow pump supply oil under low pressure, so as to reduce the working pressure. The application control of vane pump can solve the technical problems.

3.3. **Application mode of axial piston pump**

In the process of using axial piston pump, attention should be paid: first of all, the temperature of hydraulic pump should be checked regularly to ensure that it is below 80 °C. Second, the specific situation of the oil should be checked regularly to ensure that the water content, impurities and viscosity
are within the required range. If it exceeds the standard range, the new oil should be replaced in time. Third, the filter element of the filter should be replaced regularly to ensure that the filter element meets the technical requirements and avoid the blockage of the filter element. Fourth, in the inspection and maintenance of the host, do not easily open the hydraulic pump. If necessary, the hydraulic pump must be disassembled and cleaned to avoid wrong installation.

4. Summary
To sum up, the hydraulic pump has a variety of fault problems, there are a variety of causes. To do a specific analysis of specific problems, according to the actual situation, select the appropriate maintenance program to solve the problem of hydraulic pump failure. In order to effectively solve the technical problems of the hydraulic pump, it is necessary to carry out regular troubleshooting. The technicians should deeply understand the important role of the hydraulic pump and adopt a rigorous attitude towards the maintenance work. At the same time, it is necessary to do a good job in the inspection of parts, and timely update if there is serious wear and tear. In the process of technology application, we should do a good job in the technical management of the hydraulic pump, improve the working efficiency of the hydraulic system, improve the working condition of the hydraulic system, reduce the workload of the technical personnel, and achieve efficient work.

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