



OVERHAUL AND MAINTENANCE OF HIGH-SPEED CENTRIFUGAL PUMPS.

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Abstract: High-speed centrifugal pump is of small flow and high lift. It has stable specific performance coefficient, reliable and steady speed-up mechanism and sealing device, high anti-cavitation and corrosion resistance performance. The high-speed centrifugal pump can run continuously for 3 to 5 years. And whether the maintenance and overhaul work is in place or not is directly related to the service life of the pump and the continuous production time of the device. So the maintenance work of high-speed centrifugal pump is very important in a refining enterprise. Reliable maintenance and correct overhaul methods are the guarantee for the stable and long-cycle operation of high-speed centrifugal pump.

Keywords: *high speed centrifugal pump, mechanical seal, inducer, seal flatness, axial clearance*

Regardless of the shape of the pump, before an overhaul it is necessary to have a clear knowledge of the condition of the equipment, to know which parts may be damaged, what needs to be replaced during the overhaul, and to prepare spare parts in advance. Before shutting down the pump, make a detailed inspection of the equipment. Then go through the maintenance procedures. Before overhauling the pump, check whether the safety measures have been fully implemented, whether the pump has been depressurized, etc. A centrifugal pump overhaul consists of three main steps: disassembly, inspection, reassembly. Due to differences in the pump structure, the specific content of the procedure is not the same.

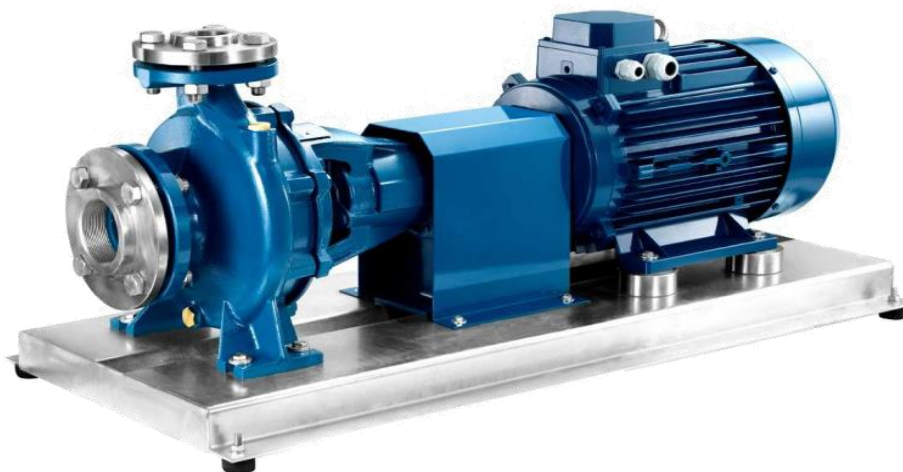


Fig.1. Centrifugal pump type SH .
General disassembly of centrifugal pump type SH .

1. Separate the pump housing Remove the coupling pin to disconnect the pump from the motor. Remove the bolts and horizontal clutch face pins to separate the pump cover from the bottom of the pump housing. Remove the oil seal. Disassemble the piping connected to the system (e.g., air line, sealing water line). After disassembly, wrap a cloth around the pipe head to prevent falling to prevent debris from entering the pipe head.
2. Lifting the pump cover After completing the above work and inspection, lift the pump cover. Be careful not to jam the cover with other parts.
3. Lifting the rotor Disassemble the bearings at both ends and remove the bearings and upper shaft tile. Pull the oil ring on both sides of the lower shaft tile, mainly when lifting, without removing the lower shaft tile. Pull the rope through both ends of the rotor (gland) for safety.

Inspection and cleaning of centrifugal pump type SH

1. Inspection of the bearings in the pump casing. Check for wear, burns; U-shaped gold ring removed (old shaft tile, as long as the hand presses the U-shaped gold ring, oil will return from the removed seam, squeezing out). If you can't continue to use a new one. On a new half axle, you should also check the tire situation by placing it in a paraffin soak. Do not remove the tire more than 20% area. The bearing housing should be cleaned and the oil window should be checked to see if the oil window is clear. Pump cooling water, sealing water channel is blocked, no leakage, should be smooth and undamaged. Pump cover and pump housing with combined surface clean. The bonding surface of the asbestos gasket should be intact, if damaged, it should be replaced according to the original thickness.

2. Rotor part Check impeller wear, cavitation and cracks. If it can be continued to be used, it must not be unloaded from the shaft as it is difficult to dismantle under normal circumstances. If it cannot be unloaded, special tools must be used for disassembly, and the side heating must be removed.

After unloading the impeller, the shaft must be cleaned, the side of the shaft flooded with curvature. The shaft sleeve often rubs with the oil seal, especially in water with sand this is particularly serious, so in a general situation it should be replaced.

Measuring instruments and tools required for maintenance.

1. General tools: wrenches, drain wrenches, hand hammers, cones, crowbars, etc;
2. Measuring tools: micrometer, centimeter (magnetic holder), vernier calipers, internal calipers, steel plate ruler, etc;
3. Other items: wrapping cloths, oil draining devices, stainless steel disks or cloth, etc.

Disassembly of the pump:

1. First shut off the power and water (or other materials), close the inlet and outlet valves, and confirm the shutdown report;
2. The motor and pump should be disconnected, and the motor should be tapped to judge whether the motor is normal or not, which is very important;
3. Before draining the lubricant in the suspension, check whether there are impurities or metal chips in the lubricant, which is very important, it can help us to analyze whether the bearing, suspension, etc. is damaged;
4. Please note that when removing the screws connecting the pump body and pump cover, we must leave 2 screws that must not be removed to avoid a large amount of water or material overflow due to valve damage;
5. Some pump housing bolt holes slip buckle, changed the bolt specifications, try to note when removing the screws, the correct number, the gasket on the motor should also be well marked, which can help us improve our work efficiency.

Standard procedure for overhauling a centrifugal pump:

1. Pump shaft overhaul procedure

If the bending of the pump shaft exceeds 0.05% of the original diameter, it should be corrected. The eccentricity between the pump shaft and the shaft sleeve should not exceed 0.05 mm, if it exceeds 0.05 mm, the shaft sleeve should be replaced. If the pump shaft is corroded or worn by more than 2% of the original diameter, it should be replaced with a new one.

2. Criteria for bushing overhaul

If the regular wear of the shaft sleeve exceeds 3% of the original diameter and the irregular wear exceeds 2% of the original diameter, it should be replaced. At the same time, check the contact surface of the pump shaft and shaft sleeve, there is no sign of water seepage, the shaft sleeve and impeller between the gasket is intact, not required, should be modified or replaced. The new shaft is installed after tightening and the bearing is not concentric.

3. Standard of impeller overhaul

If the impeller and vanes are cracked, damaged and corroded, epoxy can be used to repair in mild cases, and in serious cases, the impeller should be replaced with a new impeller. If the impeller and pump shaft connectors are loose and water is leaking in, the connecting key should be repaired or replaced and the amount of wobble after the impeller is mounted on the pump shaft should not exceed 0.05 mm (this value is for reference only as some high speed impellers have higher wobble requirements). Repair or replacement of impeller requires calibration of dynamic balance and static balance, if it is out of the allowable range, it should be corrected in time, such as sawing off part of the heavier side, etc., but it is prohibited to drill holes in the impeller to achieve balance to avoid damage caused by stress concentration in the drilled holes.

4. Centrifugal pump o-ring overhaul standard

Check the centrifugal pump O-ring has no cracks and wear, the radial clearance of the impeller should not exceed the specified zui large allowable value, more than need to replace. When replacing the o-ring, the impeller should be suction mouth outer diameter of the swivel, the principle is to see the light can be swivel, to pay attention to the concentricity with the pump shaft. Then the O-ring inner diameter according to the value of the car fit clearance is a good size, the O-ring and the axial clearance between the impeller in 3 ~ 5mm is reasonable.

5. Centrifugal pump bearing overhaul standard

Ball bearings and bearing caps should be cleaned, such as bearing pitting, cracks or clearance exceeds the standard, should be replaced in time. The replacement bearing grade should not be lower than the original bearing grade, be sure to use the products of ordinary bearing factory. Replacement before use plunger clearance measurement, large pumps every overhaul should be cleaned the water jacket cooling bearing scale and debris to ensure the smooth flow of water.

6. Centrifugal pump stuffing box packing overhaul standard

The stuffing box gland in the shaft or sleeve should move freely, the gland bore and clearance between the pump shaft or sleeve should be maintained uniform, wear should not exceed 3%, more should be built in or renewed. The water seal piping shall be free.

7. Centrifugal pump casing maintenance standards

Clean the pump casing from rust, if there is a big hole, it should be repaired and repainted with anti-corrosion paint after cleaning.

8. Centrifugal pump bottom valve maintenance standard

Requirements for the lower suction valve, the action should be flexible, the seal should be good. The use of water vacuum pump water ring to make sure that the suction valve tube no air leakage phenomenon, vacuum pump to remain intact, if you think the lower valve is prone to problems, then we recommend that the selection of pumps do not need to install the lower valve products.

9. Centrifugal pump check valve maintenance standards

Check the working condition of the check valve, whether the O-ring is tight, whether the pin is not badly worn, whether the buffer and other devices are effective, if there is damage, the valve should be repaired or replaced in time.

10. The water outlet control valve should be checked and the gland should be replaced in time to prevent water leakage.

11. The pressure gauge on the pump, vacuum gauge, should be calibrated by the measurement department once a year, and the pipelines and valves should be cleaned.

12. Coupling maintenance standards

Check whether the coupling is well connected to the motor, and whether the key and keyway are loose, and correct the fault in time. If you think that the coupling of the centrifugal pump with coupling is easily damaged, you can choose the centrifugal pump without coupling.

13. Engine maintenance should be carried out by professional electricians, it is forbidden to disassemble and repair the engine by those who do not understand electricity.

14. In case of catastrophic situation, such as flooding of underground pump room, etc., water should be removed in time to clean and dry the motor and other electrical devices, and prove that all electrical and mechanical devices are not damaged before the test run.

15. Replace the lubricating oil and grease in the bearings regularly. For a new pump fitted with plain bearings, the lubricating oil should be changed when running for about 100 h and then every 300-500 h thereafter, but at least once every six months for oil change. Rolling bearings should be supplemented with lubricant every 1200-1500 h of operation, but at least one oil change per year. The service life of low speed pumps can be extended accordingly.

16. If the pump will not be used for a long period of time or in winter, the pump and water pipes should be drained to prevent rusting or freezing.

Causes and repair methods are as follows:

1. Centrifugal pump exciter or power supply is out of order. The repair method is to check the condition of the power supply and primary winding.
2. The centrifugal pump is jammed. The method of repair is to check the coupling with a hand disk, disassemble and check if necessary, and troubleshoot the dynamic and static parts.
3. The pump seal gland is too tight. The repair method is to loosen the seal.
4. The pump discharge valve is not closed. The repair method is to close the discharge valve and restart.
5. The balance pipe is not smooth. Repair consists of removing the blockage in the balance pipe.

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