

## Technical causes of locking between screw sleeve and axial diameter of screw pump



### First, preface

My company a [screw pump](#) suddenly tripping. Maintenance personnel at the scene to the pump cause investigation and maintenance. After the demolition of the pump inspection, the reason for the trip is the copper bushing and shaft diameter of the death caused. Now combine the bushing and shaft diameter clearance to do a technical description of its death.

### Second, reason analysis

According to the working condition of the sliding bearing, the general bushing hole and the shaft fit are the clearance fit, the size deviation of the shaft diameter and the bushing bore diameter on the part drawing, is generally determined by the average operating temperature of 20 ° to ensure that the shaft and bushing hole have a reasonable gap between the changes. There are many factors affecting the thermal failure of sliding bearing, in the case of reasonable design of bearing structure and correct selection of material, the heat of sliding bearing is mainly caused by improper assembly and improper use of the radial clearance of bearings.

The radial gap of sliding bearing is the difference between the bearing hole diameter and the axle neck diameter, and the sliding bearing has a certain radial clearance, the effect is as follows: It is the minimum condition to realize the joint of shaft and bearing, and it is the guarantee of the operation precision of the control shaft and the important condition of forming

liquid lubrication. Therefore, the radial clearance of sliding bearings is very important, too large or too small is extremely harmful. Gap too small, difficult to form a lubricant film, friction heat is not easy to take away, so that the bearing overheating, serious will "hold the shaft", the gap is too large, the oil film is difficult to form, will reduce the machine's running accuracy, will produce severe vibration and noise, and even caused burning tile accident.

Three, the determination of the radial clearance of sliding bearing

The technical performance of the [screw pump](#): the shaft neck speed  $n=2950\text{r/min}$ , the axle neck diameter  $d=30\text{mm}$ , the motor is the synchronous motor, the lubricating oil is the residue, the bearing material is the tin-SN copper. Theoretical value of the radial clearance of sliding bearings radial clearance  $\Delta=k D$ .

Type: K —— high-precision bearing coefficient, by the "Mechanical Design Manual" search  $k=0.0008$ .

D —— the diameter of the shaft neck,  $d=30\text{mm}$ .

Generation:  $\Delta=0.02\text{mm}$ .

By the "Mechanical Design Manual", the maximum clearance  $\Delta_{\text{max}}=0.10\text{mm}$ .

measurement, data and position of the original bushing:

To measure the shaft diameter, the corresponding position dimension data:

Shaft diameter 1:  $29.99\text{mm}$   $29.94\text{mm}$   $29.90\text{mm}$

Shaft diameter 2:  $29.92\text{mm}$   $29.90\text{mm}$   $29.90\text{mm}$

Bushing 1:  $30.01\text{mm}$   $29.97\text{mm}$   $29.92\text{mm}$

Bushing 2:  $29.94\text{mm}$   $29.92\text{mm}$   $29.915\text{mm}$

Sliding bearing Radial clearance actual value maximum clearance: Active Lever:  $0.03\text{mm}$   
follower:  $0.02\text{mm}$ .

The bearing in the actual use of the process, because the gap is too small, friction heat is not easy to take away, together with lubricants for the medium residue oil, more impurities, easy to enter the gap, so that the bearing overheating, serious will "hold the shaft", the phenomenon of burning tile.

#### **Iv. Prevention and improvement measures**

In order to prevent the bearing from overheating fault, if the radial clearance is larger,  $\Delta=0.03\text{mm}$ . At this time the bearing of the co-operation, but the service life is greatly shortened,

so in determining the bearing radial clearance, should ensure that the bearings in the normal work under the premise of keeping as small as possible. In the bearing assembly, the first should be in accordance with the running-in test code for good run-in and commissioning, and then gradually loaded to accelerate, so that the shaft and bearing the surface of the bump to grind flat, and finally put into normal operation. Otherwise, even if the clearance is not small, but because the assembly is not run-in commissioning, and put into normal operation, resulting in the bearing overheating or even burning tile. For this, the sliding bearing radial clearance should be controlled in 0.10mm~0.15mm.

The radial clearance of sliding bearings has a great influence on the bearing overheating and life, so the radial clearance must be strictly controlled within a reasonable range. In determining the bearing radial clearance, to comprehensively consider the factors affecting the radial clearance, in addition to considering the shaft diameter, speed, load and machine precision, but also consider the following points:

- A. Bearing material. Different bearing materials, different expansion coefficients, the gap is different.
- B. Roughness of shaft and bearing surface.
- C. Geometrical and positional errors (i.e. roundness, cylindricity, coaxial degree, etc.) of the journal and bearing.
- D. Operating temperature of the bearing.
- F. Abrupt changes in the starting condition.

## **V. Conclusion**

Different media and different rotational speed of the screw pump bushing clearance requirements are not the same. Through the above calculation and analysis, the optimum clearance data of the sleeve is obtained. The equipment has been in operation for a year, and it is proven that our analysis is feasible.