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The application of magnetic drive technology in the desulfurization side entering agitator

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Abstract. In order to solve the problems followed mechanical seal leakage of the side entering agitator in wangtan power plant limestone - gypsum FGD, a magnetic drive technology was introduced, compared the characteristics of mechanical transmission to the magnetic drive technology. Magnetic drive technology was used in the desulfurization side entering agitator, and it's an effective solution to the desulfurization side entering agitator mechanical seal leakage problem, the effect is significant.

Introduction

At present, limestone - gypsum wet flue gas desulfurization were mainly used in thermal power plant. A large number of facts proved that this process in the mechanism and technically is mature, the main risk is in supporting equipment manufacture. The operation of the existing level of flue gas desulphurization equipment, in addition to the environmental requirements still a gap with the state, the main problem lies in the process of desulfurization equipment corrosion, leakage and other problems have not been solved. One FGD equipment - absorber side entering agitator, now there a main question is: mechanical seal wear and leakage, impeller wear, these problems can lead directly to on-site environmental pollution, maintenance and frequently replaced parts and even cause withdrawal the desulfurization system and other consequences.

The application of the domestic market absorber side entering agitator were mostly imported, representing products EKATO, SHAPE and so on. Imports of seal agitator mechanical seals are in the equipment operation, such a structure would often seal leakage, mechanical seal damage and so on, the amount of equipment maintenance costs and high maintenance, equipment reliability is low. Wangtan Power Plant Unit 1,2 600MW coal-fired units as each is equipped with a set of limestone - gypsum wet flue gas desulfurization equipment, 2 sets of desulfurization equipment was put into operation in June 2006, a total of 8 side entry-type absorber agitators. Put into operation since 4 years ago, absorber agitator has leaked ten times, seriously affecting the desulfurization system safe and stable operation.

Against this background and product status, Hebei Datang International wangtan Power Generation Co., Ltd. Joint Beijing Zhongcheng magnetic Transmission Equipment Co., Ltd., developed a leak-free magnetic drive agitator, magnetic drive structures to replace mechanical seal on the agitator gearbox to drive the impeller part of the magnetic transformation and successfully put into use, created a magnetic drive technology in the 600MW power plant wet absorber side entering agitator on the application of precedent. This article is made of magnetic drive agitator and imports mechanical sealed agitator in Wang tan power plant desulfurization equipment, while the structure of the two technical equipment, equipment installation, operation and maintenance costs, the overall cost ,mixing functions and different characteristics were compared.

1 System Introduction

Wang tan power plant desulfurization systems begined in the design and construction , four agitators were installed to prevent sediment slurry in each absorber.

General mechanical seal agitator is a stirrer, electrical, absorber flange, absorber flanges, brackets, flush pipe, couplings and drive components..

2 Introduced magnetic drive technology

2.1 Magnetic drive principle

Magnetic drive technology is based on the basic theory of modern magnetic, use a magnetic material or an electromagnet that creates a magnetic force, to achieve non-contact force or torque transmission, the new device to achieve this technology, called magnetic actuator devices.

Magnetic actuators were made up of the inside and outside magnetic rotor and isolated sets, the inside and outside magnetic rotor is isolated completly by isolated sets (ie the inside and outside magnetic rotors do not touch) .outside magnetic rotor is driven by a motor, inside magnetic rotor is driven by magnetic coupling characteristics of the magnetic rotor rotation, complete non-contact torque transmission, the magnetic rotor and shaft and mixing impeller into one, to achieve the purpose of stirring.

Shown in Figure 1, isolated units and the agitator chamber is static seal, slurry seal are within the isolated units. outside magnetic rotor rotation driven by the motor ,though magnetic drive, magnetic field lines penetrate isolated units, driving the inside magnetic rotor rotation, the magnetic rotor drive the bearing and impeller rotation at last. Simply put: the isolated set is fixed, turn the outside magnetic rotor with the motor, through the role of magnetic drive, the inside magnetic rotor began to move, while the bearing and the impeller inside also started to move. Combined with the selection of materials, leakage and corrosion can be guaranteed.

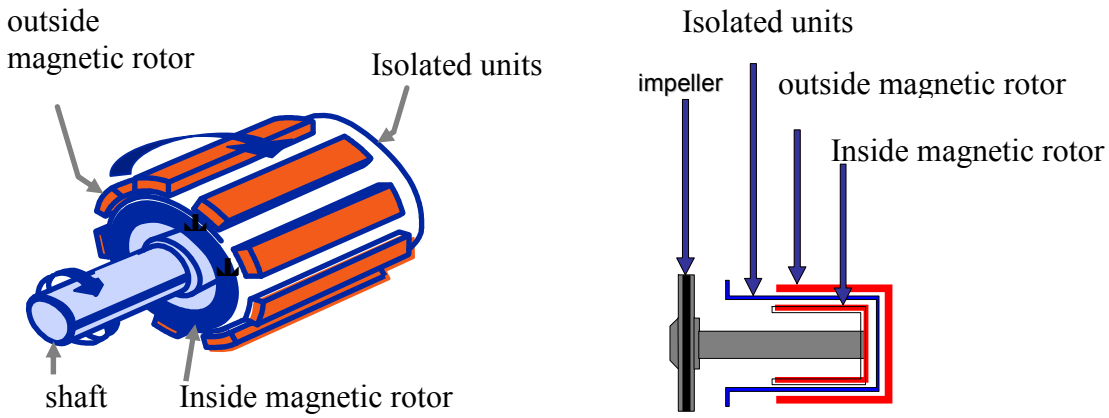

Figure 1：Magnetic drive principle

Isolated sets is a non-rotating parts, plays the role of seals and pressure,isolated sets cut off the inner from outer magnetic rotor and slurry completely , form a closed sealed chamber with the absorber, so that the slurry is entirely closed ,to the absorber, which can be achieved purpose of sealed, high pressure, no leakage. A fundamental solution to the mixing problem such as drip, leak.

2.2 Characteristics of magnetic drive

1). No Leak: static sealing ,solve the mechanical agitator drive shaft failure and leakage;
2). Energy: Non-contact transmission, can reduce the mixing of about 20% power loss;
3). Noise: equipment running smoothly, small vibration and low noise.

2.3 The structure of magnetic drive agitator

the magnetic drive agitator is made up of stirrer, magnetic drives, absorber flanges, brackets, drive components.

2.4 Key components of the choice of materials

Magnetic agitator material flow parts can meet the requirements of corrosion and wear, spindle and sealed barrels select material 1.4529 or higher, selected materials of isolated sets are 304 or higher usually, bearings for the SiC (silicon carbide) or WC (hard Carbide).

Magnetic actuator is a magnetic material in the body, directly related to the merits of their performance to the performance of magnetic actuator, which directly determines the reliability of the process of running. Permanent magnet material used for torque transmission requires three conditions: First, have a high residual magnetic flux density in order to obtain larger magnetic and magnetic moment; the second is to have a high coercive force, or energy product permanent magnet material is not easy demagnetization; third is to have good temperature stability. Magnetic Curie temperature is reflected in the performance parameters, the Curie temperature permanent magnet to the complete loss of magnetism. NdFeB or SmCo is generally used as Magnetic agitator material.

3 Mechanical seal and magnetic drive agitator comparison

3.1 Structural comparison

3.1.1 Structural characteristics of the mechanical seal agitator

1）, agitator: agitator and shaft coupling, own impeller nut fastening structure to promote the agitator.

2）, absorber flanges: the role of connecting and positioning agitator.

3）, bracket: one side of bracket connected to the reducer,and the other side of the bracket connected with the absorber。

4）, absorber Flange: absorber flange cover equipped with mechanical seal chamber, seal use mechanical seal, the seal should be maintained at the normal hour of about 5 ml of the leakage. the bearings was Installed in the mechanical seal (ie, mechanical seals take the role of bearing body), the formation of agitator spindle positioning in the mechanical seal and mechanical seal located in the bearing, so that bearing and mechanical seal interaction each other, one damage and the other party will also damage. the bearing is rolling bearing.

5）, Bearings: Rolling bearing, the number one.the shaft length is 1200mm.

6）, Coupling: The claw coupling connections, need to adjust the coupling concentricity.

7）, Drive units: driven components to bolt directly fixed on the fixed support, and after the demolition drive components shall be inspected by hanging from the blender.

3.1.2 Structural features of magnetic agitator：

1）, agitator, absorber flanges and brackets, etc. basically the same with mechanical agitator

2）, Bearings: Plain bearings, number two, axial length of 1000mm.

3）, absorber flanges: the body of the Bearing was installed in the tower flange cover, two sets of sliding bearing before and after the body, agitator shaft positioning in the bearing, bearing located in the bearing body, the force generated by mixing are passed directly on the absorber。

4）, Cancel couplings and mechanical seals, but more than mechanical agitator within the outside magnetic rotor, inside magnetic rotor and isolated sets。

5）, Drive components: the structure consistent with the mechanical agitator.

Comparison of two significantly different structure: 1), the bearing in the mechanical agitator is a single rolling bearing, the point contact, the axis length is 1200mm. Bearing radial force is big, installation of mechanical and strength of the bearings need high precision. Magnetic agitator with two sliding bearings for surface contact, axial length of 1000mm. Bearing radial force is small, mechanical strength and installation of the bearing is relatively low accuracy requirements; 2), magnetic agitator without the mechanical seals, to achieve zero leakage fully

3.2 comparison of Mechanical agitator and magnetic agitator installation

Mechanical agitator installation required by professional trainers, you need professional installation tool, the bearing clearance, shaft straightness and other requirements are very high. (Import agitator requires measurement of the new bearing clearance, the new bearing clearance in the 0.12-0.25mm, jacket and bearing no circling phenomenon. axial deviation of not more than 0.10mm, straight off the greatest degree of shaft center distance of 1mm / m)

Magnetic stirrer overall installation, without requiring deviation，the installation work is mainly connected flange bolts, without professional training. Installation tools such as chain hoists and general tools wrenches, without special tools, installation is fast, a small amount of work。

3.3 Operation and maintenance costs compared

Mechanical agitator bearing the required temperature is not higher than room temperature 50 ℃, the maximum temperature not to exceed 75 ℃. Bearing box with dry grease lubrication, replacement of the grease the first 2,400 hours running time, after the replacement of grease every 3600 hours running time, half a year at least once. From time to time as the operation of mechanical seal replacement, mechanical seal failure of wangtan power Plant: The three-year period 2008-2010, a total of 8 mechanical agitator leak 10 times, second in the individual units repeated several times within a year. replace a mechanical seal imports need more than ￥100 0000, high costs。

Magnetic agitator without mechanical seals, mechanical seals do not change the workload, the bearings lubricated with water cooling, cooling water into the slurry, carbide bearings, high hardness, small friction, thermal properties, and normal operation of the life of more than five years. Therefore, within the operational life of the bearing, magnetic stirrer to achieve maintenance-free operation and maintenance cost is zero

3.4 Imported mechanical seal agitator and domestic magnetic drive agitator Cost Comparison

The price gap between domestic magnetic drive agitator and imported mechanical seal agitator is significantly. Example of wangtan Power Plant, the installation of the mechanical agitator (motor power 45KW), supporting import reducer, stirring slurry impeller and contact with 1.4529 steel components, the overall cost about ￥500 0000. Magnetic drive agitator, supporting imported reducer, slurry mixing impeller and the contact parts are 1.4529 steel, the overall cost about ￥400 0000. If you have installed agitator, just modified transmission components between the impeller and reducer, the cost is lower

From the perspective of the plant into account, even if the two agitator the same price, the magnetic agitator is suitable, after all, operation and maintenance costs are very low, only 5 years to replace a bearing

4 Conclusion

A mechanical agitator transformed into magnetic drive agitator at September 2010 in Hebei Datang wangtan International Power Generation Co., Ltd. ,it was put into operation since more than 4 months, Remarkable achievements。

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