
Test-run and Production Operation of Rotary Kiln

1. Test-run

Test run is the general inspection for the quality of manufacturing, installation and commissioning of the rotary kiln. Therefore, the test run of the equipment after installation is a very important part of equipment management.

1.1 Preparation before test-run of rotary kiln

1.1.1 The elevation of each riding ring should be measured and checked again. If the variation exceeds the standard, it must be re-adjusted before test-run.

1.1.2 Check whether the oil supply of the reducer, transmission gear and bearing bush is normal, the oil pressure of the deceleration cycle, and whether the oil quantity of the roller's shaft is evenly distributed.

1.2 Test-run

The test-run shall be carried out according to the following regulations:

The auxiliary motor drives the rotary kiln for 2 hours, and then make the main motor to drive the rotary kiln for test-run.

Generally, it should be operated continuously for more than 72 hours as qualification. If there is no problem during test-run, test-production can be conducted in succession.

1.3 Inspection during test-run.

1.3.1 Check the movement of the shell body. If the kiln body moves continuously in one direction, it should be adjusted as the kiln movement direction, and pay attention to keep record.

1.3.2 Check the kiln body if there is crack or fissure, and the kiln body should have no vibration.

1.3.3 Check the seal ring of the kiln head and kiln tail, they should not be worn.

1.3.4 The contact length between each roller and riding ring should not be less than 70% of the riding ring's width. Check whether there are cracks or

abnormal noises in the riding rings and thrust roller.

1.3.5 Check the stress condition of each roller and the movement of the shell body, and adjust the position of the roller in time.

1.3.6 Adjust the oil supply of the hydraulic station and push the hydraulic thrust roller for convenience of the shell body's movement upwards and downwards.

1.3.7 Check the engagement condition, swing range of the girth gear and pinion.

1.3.8 Check whether the subplate of riding ring and T-shaped fixing plate are tightened.

1.3.9 After the test-run stops, the grinding surface of the supporting roller bearing and the shaft neck should be checked, and the gear working surface should have no defects such as pitting, crack or blackspot.

1.3.10 Make original records on time, maintain kiln head instruments, and keep the site tidy.

2. Operation of Rotary Kiln

2.1 Kiln Ignition

2.1.1 Make preparations for normal operation before kiln ignition

Before kiln ignition, check carefully whether each part of the kiln body and electrical equipment is in good condition, and whether there are any obstacles at the movement parts, and then notify the mechanic and electrician to check the operation equipment and electrical equipment. After confirmed that they are in good condition, the kiln can be ignited.

Open one or two cover plates at the top of settling chamber or the surface cooler, to make a certain negative pressure in the kiln body.

Ignite and heat the kiln, operations should be in strict accordance with the *"Safety and Environmental Protection Operating Regulations for Natural Gas Use"* or relative local natural gas operation and using regulation.

2.1.2 The kiln body is required to rotate during the heating-up process. The

specific rotation situation is:

Interval rotation after ignition: the kiln should rotate half-circle or one circle and a half every 30 minutes;

The temperature raised to 300°C; the kiln body is required to rotate continuously and slowly;

After feeding: increase the speed appropriately according to the situation;

Under normal circumstances, the kiln body rotate speed is controlled at about 100s/r.

2.1.3 When the kiln is heated up, the heating plan should be strictly implemented, the temperature data is based on the kiln tail part, the total heating time is about 70h.

When the temperature is below 150°C, rises ~5°C each hour, and the heating time will be about 16h;

Maintain the temperature at 150°C for 8h;

At 150°C~250°C, the temperature rises ~10°C each hour, and the heating time is about 10h;

Maintain the temperature at 250°C for 8h;

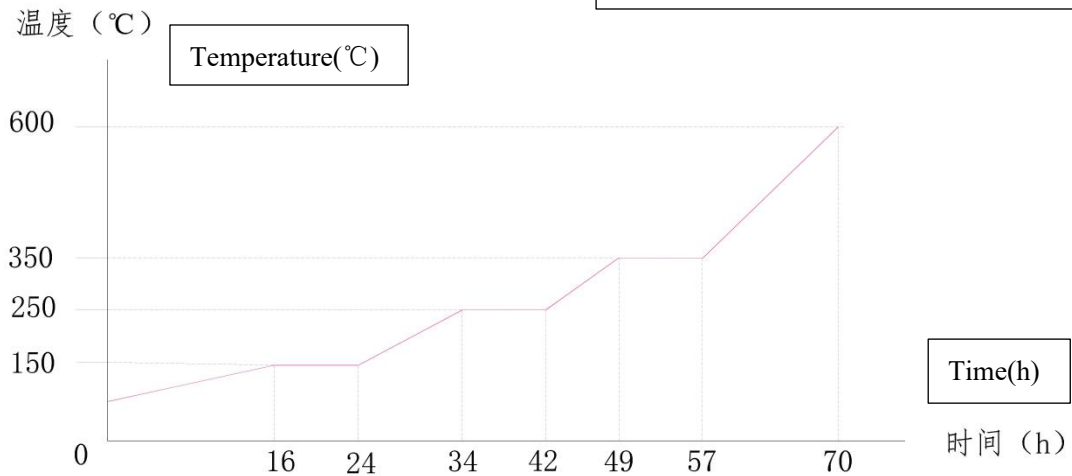
When the temperature is 250°C~350°C, the temperature rises ~15°C each hour, and the heating time is about 7h;

Maintain the temperature at 350°C for 8h;

When the temperature is 350°C~600°C, the temperature rises ~20°C per hour, and the heating time is about 13h.

回转窑升温曲线图

Temperature rise curve of rotary kiln



During the heating process, the gas should not be increased or decreased too rapidly to prevent the lining from bursting. When the kiln lining is red and the tail can be seen clearly, and the temperature of the kiln tail is $\geq 450^{\circ}\text{C}$, feeding can start.

2.1.4 When feeding material, 5t ~ 10t coal should be fed to raise the temperature first, and then the mixture should be fed. At the initial stage of feeding, the coal/raw material ratio should be appropriately higher, and then gradually adjust the coal/raw material ratio of the mixture until it becomes normal. When the material is 7m~8m away from the kiln head, insert the high pressure air pipe into the kiln to perform forced air blasting, and start the ID fan, meanwhile close the covers at top of settling chamber and the surface cooler duct, and gradually reduce the amount of natural gas depending on the reaction in the kiln. After the tail temperature stabilizes at about 600°C , everything comes to normal production.

2.1.5 During the ignition of the kiln, carry out an itinerant inspection of each part of the kiln body every 0.5h, and problems shall be managed in time.

2.2 Normal production operation

2.2.1 Constantly observe the condition of the kiln and ensure stable blow-air pressure, kiln tail temperature and negative pressure at the kiln tail according

to the reaction in the kiln. If there is any abnormality, communicate and deal with it in time to ensure that the kiln condition is stable and normal.

2.2.2 Operate strictly and carefully, put the high pressure air pipe in the proper position, so as to make the materials turn well, to lead better chemical reaction. Pay attention to the proportion of coal, back material and raw material, the size of feeding, the rotate speed the operation situation of the kiln. While completing the feed capacity, ensure that the quality of zinc oxide and the zinc content of the slag meet required requirements.

2.2.3 Break the adhesive blocks of kiln head in time to maintain the proper size of the kiln outlet. Big pieces of rings, balls formed in the kiln should be moved outside in time.

2.2.4 The kiln head high pressure air pipe should be replaced in time when it is burnt or bent.

2.2.5 Check the kiln body for cracks and if overheated.

2.2.6 Check the wear condition of roller, riding ring, and stop ring at kiln head and tail, and pay attention to whether there are cracks or abnormal noises.

2.2.7 Check the stress condition of each riding ring and the up-down movement of the shell, adjust the position of the roller in time, adjust the oil supply of the hydraulic station, and push the hydraulic thrust roller to work so that the shell can move up and down freely. It is required to push the kiln twice per shift.

2.2.8 Check the engagement and the swing range of the girth gears and pinions.

2.2.9 Check whether the subplate of riding ring and T-shaped fixing plate are loose.

2.2.10 Make original records on time, maintain kiln head instruments, and keep the site tidy.

2.3 Shutdown of rotary kiln

2.3.1 Before shutdown of the kiln, all the materials in the feed bin must be fed

in. After most of the valuable metals in the materials volatilized, the air pipe can be moved out, then dust collection and the ID fan should be stopped. Close the observation hole of the kiln head and the cleaning door of the hood, seal the kiln, and let it cool naturally to prevent the lining from bursting.

2.3.2 After feeding stopped, before the kiln lining has cooled down, the kiln must continue to rotate at a slow speed. When the tail temperature drops to 100°C, the kiln can be stopped and the power supply can be cut off.

3. Operation in case of malfunction

3.1 Operation at no material fed

3.1.1 Operation within 1h without material being fed:

Reduce the blow-air pressure in the kiln, rotate the kiln to the slowest speed, and continue to rotate slowly to prevent deformation of the shell body; reduce the rotate speed of the ID fan, and the opening of which should be less than 5%.

3.1.2 Operation at more than 1h without material being fed;

Reduce the blow-air to zero, and remove the air pipe; stop the ID fan or reduce the opening degree to zero; the kiln body should be rotated at intervals, and the kiln is rotated once every 20 minutes. Pay attention to the stop position should be symmetrically of the previous stop position.

3.2 Shutdown operation of rotary kiln in urgent situation

3.2.1 Stop blowing air into the kiln and remove the high pressure air pipe.

3.2.2 Stop feeding.

3.2.3 The negative pressure at the kiln tail and the rotate speed of the kiln should be maintained as normal operating process standards.

3.2.4 After all materials out, the kiln speed should be decreased to slowest.

3.2.5 When the kiln tail temperature drops below 300°C, stop the ID fan.

3.3 Operation for heat preservation of rotary kiln

3.3.1 Stop feeding into the kiln and cover the feeding chute/pipe.

3.3.2 Stop blowing into the kiln and remove the high pressure air pipe.

3.3.3 Stop the ID fan.

3.3.4 When rotates the kiln at interval, pay attention to the stop position should be symmetrically of the previous stop position.

3.3.5 Seal each operation door hole of the kiln head.

3.4 Operation during temporary power failure or breakdown of electrical equipment

In the event of a temporary power failure or breakdown of electrical equipment, the electrician must be notified immediately and report to the shift supervisor.

If the kiln is stopped for more than 30 minutes, it should be reported to the factory superior to find a way to prevent the kiln body from bending and deforming.