

Regarding the Selection, Operation and Maintenance of Booster Fan

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Abstract: According to the WFGD project in TangShan Thermal Power Plant 2×300 MW units and the experiences in other WFGD project, the article discussed the selection, disposal, installation, running and maintenance of the booster fan in WFGD.

Keyword: WFGD, Booster fan, summarize

1 INTRODUCTION

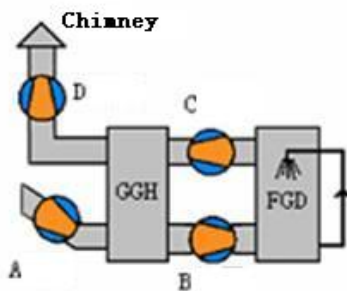
GDP in 2020 will be twice as much as 2000's in china base on the pre-analysis; the capabilities of all dynamotor will over 800 million kW. There were just 20 million kW FGD establishments which can be run and 30 kW of FGD which are constructing in the end of 2004. It still needs about 300 million of FGD to be constructed and run.

There are several hundred technologies of FGD, but it only has about 17 kinds in business application and the most popular technology is limestone/gesso wet FGD, it takes 84 percent in the market of FGD.

It needs the individual fan to resolve the resistance of FGD (absorption tower, flue and flue heater).The fan is fixed behind the boiler fan and offer the power to the FGD, so it was named as booster fan.

2 THE ARRANGEMENT OF FAN

It has 4 choices to arrange the fan, the details are at follows:



The advantage of location A is that it has little acid corrosion in the condition of high temperature flue, while the disadvantage is the fan abrasion caused by the dust in flue. And the FGD run in the condition of positive pressure, so it requires high in seal, and the location A is the highest point, so the power consumption of the fan is the highest.

The advantage of location B is that there is little leak and less power consumption; and the disadvantage is that the flue temperature will fall down to 90 °C-100 °C; it is close to the acid dew point so we need to choose the anticorrosion fan.

The advantage of the location C is that there is no leak problem because of the negative pressure, so it can simplify the configuration and save the investment. Compared to

location A, the flue temperature is much lower and the power consumption of the fan decrease about 10%.

The disadvantage is the serious acid corrosion with the moist flue. Base on the foreign experience, fan of the location C has short life cycle and heavy maintenance. The power consumption of location D is lower while the disadvantage is the acid dew corrosion and the problem of leak.

At the present, base on the safe and reliable principle in china, location A is the best choice.

3 THE TYPES OF FAN

It usually takes the axial flow fan for the booster fan used in FGD. There are two kinds of booster fan such as adjustable guide vane and stationary blade.

The spindle of adjustable booster fan was embedded into the hub and driven by link bond. The spindle has the double-support structure. It also can guarantee the operation of fan steadily because of the link of the middle axes to spindle.

The regulation of fan load is changed with blade angle, while the regulation of blade angle is promoted by the hydraulic oil controlled engineer. The lubrication and cooling of fan bearing was cooled by the two methods of wind and oil.

The adjustable guide vane has well regulation, well adaptability and energy saving. It is convenience to disassemble and change the broken blade because of the direct link of blade and adjustable bolt, but it is less steadily than stationary blade.

The disadvantage is the complex structure and large occupied area; it needs the ancillary facilities such as regulation actuator and lubricating oil station.

The bearing chock and spindle of adjustable guide vane are embedded into the hub, and the length of spindle is short, so it can increase the rotate speed of high critical, the spindle is connected blade by coupling and motor shaft, so it can run steadily as well as well transmission.

The load can be adjusted by the engine and need not other governing mechanisms.

The stationary blade is inexpensive and has simple construct; it is more steadily but less convenience than adjustable guide vane. The outstanding advantage of stationary blade is high pressure factor; it can lower a grade rotate speed and reach the same power, so it has the better wear resistance.

The disadvantage is the inefficiency of fan and adjustable characters and the lower sensitivity.

So we should consider all factors such as the ground, load stability, investment and cost of maintenance when we choice which kinds of fan.

Both kinds of fan are applied widely, and the stationary blade is used widely as its lower cost and maintenance, it also used in some middle scale units in china. But the adjustable guide vane has the better development as its quickly adjustive and high efficiency.

4 THE TYPE SELECTION OF FAN

It should be consider all kinds of margin. Base on the regulation of regulations of design and technology of FGD in thermal power plant constituted by the development and reform commission, the margin of air volume in booster fan is 10% , the temperature margin is less than 10 ° and the 20% pressure margin.

Base on the practical operation condition in FGD, the case of drop pressure less than design value has been found in many power plants with GGH. The reasons are as follows: (1) The structure type of demister is less reasonable and it had not played its role; (2) The design and structure of GGH are less reasonable. The consequence of comprehensive action is that gypsum slurry in flue scaled in the surface of GGH and caused the increasing resistance. So we should optimize the demister and the washing system and make sure the enough pressure.

The location A has the lower demand for the fan, but it could erode the fan and its accessory equipment when the baffle is not airproof and water vapors enter into the fan. So it should improve the erode-resistance of equipments such as the blade, airproof system, the exit of fan, adjustable guide vane connected with flue when we choose the booster fan.

It will Surge when fan started or operated in low-load, so we should select the fan according to the basic load of main engine and the theory stall line of fan. Gas bypass can be set between inlet box and large-pressure, and then the surge area can be effectively avoided to open the baffle near the flue.

Main points and attentions of fan fixing are as follows:

- (1) Fan fixing must be instructed by professional;

- (2) The angle of blade and booster fan blade must be uniform;

- (3) It must make sure the concentric of generator bearing and fan spindle;

- (4) There must be much less 5mm expansion when fixed the diaphragm coupling of fan bearing;

- (5) We should distinguish the measuring instrument between horizontal and vertical shake, screen the disturbing signal and rain protection measure when fixed the measuring instrument;

- (6) There are two materials to cooling the fan bearing such as oil and wind. The flue of cooling fan was closed down by armor plate to prevent foreign body, so it must be removed when fix the fan if take the wind to cool. If take the oil to cool the bearing, we must adjust the flux and pressure of lubricating oil according to the instruction;

- (7) Protect the lubricating oil and avoid the leak oil.

5 THE STARTING AND OPERATION OF BOOSTER FAN

The starting of booster fan special the first time to start should accord to the circuit-debug syllabus and the measures of debugging (see Table 1). The first inspections before fan starting are as followers:

- (1) No foreign body in the fan;

- (2) Close all manholes;

- (3) All cooling system of fan should work well;

- (4) The import and export baffle work well and can be remote controlled;

- (5) The protection system should work well;

- (6) All electrical facilities including 6KW high voltage control system should work well;

- (7) The accident button should work well;

- (8) The adjusting device of fan load should work well;

- (9) The host and the internal of FGD have the condition of flue.

We should pay attention to the operation parameter of fan as follows; we also observe the exit parameters to make sure the steady operation (The data base on the adjustable guide vane).

Table 1 The adjustable guide vane for the operation of fan

| instruction | range | units | number | max | action |
|----------------------------------|-------|-------|--------|-----|-----------------|
| temperature of fan bearing | | □ | 0-90 | 90 | alarm |
| | | | | 110 | stop |
| Temperature of generator bearing | | □ | 0-90 | 90 | alarm |
| | | | | 95 | stop |
| Temperature of generator Stator | | □ | 0-130 | 130 | alarm |
| | | | | 135 | stop |
| Cooling fan fault | | | | | alarm |
| Fan shake | | mm/s | 0-6.3 | 6.3 | stop |
| | | | | 11 | stop |
| Low temperature of oil tank | | □ | L | 25 | Open the heater |
| Oil level | | | L | | Alarm |

| | | | | | |
|-----------------------------------|---------|-------|---------|------|---------------------------|
| Lubrication oil flux | | L/min | L | 3 | alarm |
| High temperature of oil tank | | □ | H | 35 | Close the heater |
| shake | | | | | Alarm, decrease the angle |
| high pressure different of filter | | MPa | H | 0.35 | alarm |
| Oil pressure | 0.8-3.5 | MPa | 0.8-3.5 | 3.5 | alarm |
| | | | | 0.8 | Alarm, start the pump |

6 CONCLUSIONS AND SUGGESTIONS

The booster fan is one of the most import equipment and offers the power for FGD system. The investment and maintenance are high because the fan is direct linked to main system, the operation status influences the stability of boil host, so the type of fan and the operation status must be based on the specific condition of power plant.

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