Common Problems of 600MW Grade Thermal Power Plants

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Abstract. By investigating production reports and operations of many 600MW grade thermal power plants in Northwest China. The results show that some general urgent problems are exist during the operation of power plant and urgent to be solved. The study conclude these problems and give some reasonable suggestions.

1. Introduction

Electricity is an important energy source of national economic development, is the first to social development. The thermal power enterprise is an important part of the power industry. In china, the electric-power is developing rapidly and the thermal power installed capacity continue to increase. Since the “Ninth Five-Year Plan” launch in 1995, 600MW grade thermal power plants by virtue of its advantage has become the most general Plant [1]. They involves in many advanced technologies, many problems still exist during the operation of power plant. These problems cause bad consequences, such as lower economy, and if thermal power plant allow these to continue, the results of safety may lead to more serious. By investigating production reports and operations of many 600MW grade thermal power plants in Northwest China, The results show that some general urgent problems are exist during the operation of power plant and urgent to be solved. The study conclude these problems and give some reasonable suggestions. This study has the important significance for get out the gap and raise the competitive power time after time.

2. Statistical calculation of boiler efficiency

In 600MW grade thermal power plants, the computational method of boiler efficiency using indirect balance methods has some errors:

2.1. The Value Point Error

a) In 600MW grade thermal power plants, humid oxygen value at the inlet of the economizer is used to calculate excess air coefficient. But it is wrong. Actually, the dry basis oxygen value in outlet of air heater should be taken to calculate excess air coefficient.

b) In 600MW grade thermal power plants, gas temperature at the inlet of induced draft fans is used to calculate gas heat loss. But it is wrong. Actually, gas temperature in outlet of air heater should be taken to calculate gas heat loss.

2.2. Calculation Formula Error

Some calculation formula of boiler efficiency is wrong in many 600MW grade thermal power plants. For example, the calculation methods of radiating loss come from GB10184-88 Performance test code
for utility boiler. Because the calculation methods is invalid, the calculated value is remarkably larger than design value. It is suggested to take the design radiating loss value.

2.3. Single Point Value
It is suggested to take average value of AB side instead of single point value to calculate boiler efficiency. For example, dry basis oxygen average value of AB side in outlet of air heater instead of A or B side dry basis oxygen should be taken to calculate excess air coefficient.

2.4. Use Air-dried Basis to Calculate the Theoretical Air Volume
In 600MW grade thermal power plants, air-dried basis carbon content and sulfur content are commonly used to calculate the theoretical air volume, It's obviously wrong. The fixed carbon content is remainder after moisture content, ash content and volatile content have been deducted from 100%. There are some carbon many Hydrocarbons and a little CO2 in ash. The air-dried basis fixed carbon content is smaller than received basis carbon content and air-dried basis sulfur content is smaller than received basis sulfur. So received basis carbon and received basis sulfur instead of air-dried basis fixed carbon and air-dried basis sulfur should be taken to calculate theoretical air volume.

2.5. CO Content is 0
Usually, CO content of dry gas in outlet of air heater is very low and is set to 0. It is one of the main reasons of higher calculated boiler efficiency value.

3. Running load
Many 600MW grade thermal power plants frequently operates under the low load operation, exists the questions of low down the economy in thermal system.

![Figure 1. The Openness of Cold Air Damper and Hot Air Damper.](image)
4. Mill and pulverized coal preparation system
The openness of cold air damper and hot air damper of mill exist unreasonable phenomenon in many 600MW grade thermal power plants. Usually, the openness of cold air damper is larger and the openness of hot air damper is smaller in full load, as shown in Fig.1. The heavy use of cold air in pulverized coal preparation system will decrease boiler efficiency. The small openness of hot air damper will cause higher power consumption of primary fan and lower economy. It is suggested to optimize ratio of air to coal.

The latest data showed that primary air main pressure much higher than air pressure at inlet of mill. The main reason may be hot primary air pipe blockage or imprecise measurement of pressure gauge. It is suggested to check primary air pipe and pressure gauge for exceptions. If it's no problem, primary air main pressure should be turned down.

5. Air heater
Inaccurate demarcation of oxygen content at inlet or outlet of air heater is universal phenomena in many 600MW grade thermal power plants. It is suggested to check the accuracy and the installation position of the oxygen meter in order to ensure accuracy.

The larger air leakage is universal phenomena in many 600MW grade thermal power plants. It make much more output, higher electric current, higher power consumption and lower economy of primary fan, forced draught fan and Induced draft fan.

The pressure difference between inlet and outlet reflect the cleanliness of air heater. In many 600MW grade thermal power plants, the pressure difference of an air heater is higher than the other one obviously. It is suggested to soot blowing for the air heater with higher pressure difference.

6. Air preheater
In many 600MW grade thermal power plants, air preheater is basically manual operation. The air preheaters are put into operation under relatively low temperature. It is suggested to put into operation when the temperature at inlet of air heater is lower than the design temperature.

7. Fan
In many 600MW grade thermal power plants, fan selection is larger or smaller than the selection actually needs. It is suggested to reduce capacity of these fan with excessively large selection and optimization efficiency these fan with slightly large selection.

8. Conclusion
By investigating production reports and operations of many 600MW grade thermal power plants in Northwest China, The results show boiler efficiency basic may achieve expected value. Sometimes, boiler efficiency decrease with the increase of combustible content in fly ash due to low oxygen in partial load conditions. In most of these 600MW grade thermal power plants, Energy management based on manual method and calculation method of boiler efficiency exist some errors. Energy management system has strict limits of output interval. It is suggested to update the old SIS system and improve energy management system and add function of weighted average method according to DL/T904 method in order to improve the production level. Most boilers have been rigorously combustion optimization tested by professional institutions, but a range of issues have not been fundamentally resolved and the thought of optimal operation has not been built. Particularly awareness on importance and lack of experience on control strategy of low NOx pulverized coal combustion. It is suggested to enhancement training and raise understanding.

References
[1] Nana Wang, Xiaojun Bian, Yunjuan Cao, Comparison of the Technical Features Between 600 MW Supercritical and Subcritical Pressure Boiler, ZHEJIANG ELECTRIC POWER. 6 (2003) 21 - 28.