The Brief Description of Energy-saving Measures and Suggestions of Industrial Boiler

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Abstract. With the national industry developing, the usage amount of industrial boiler keeps increasing. Under the circumstances of that the main combusting measure of industrial boiler is layer combustion, the need of energy has rapidly increased. The pointcut of this article is the purpose to improve the thermal efficiency of industrial boiler, and set forth the energy-saving measures and suggestions of industrial boiler, in order to provide experience of actual processing and technology remodeling for industrial boiler.

Introduction

Nowadays the layer combustion type of industrial boilers are being widely used nationwide. The designed thermal efficiency of this kind of industrial boilers is usually set as 70\%~80\%. But in the actual processes, because of its own defects, improper operations or the aging of the device and application of energy or some other reasons, usually it can only produce 60\% to 70\% of the thermal efficiency, some of the industrial boilers produce less than 50\% of the thermal energy\cite{1}. And as the thermal efficiency of industrial boilers declined, the heat from the combustion of energy sources cannot be transmitted into the medium, it usually cause the deformation of smoke tubes, the swell and bulge of boiler tubes, the fall of boiler wall, deformation and stuck of the chain. So to improve the thermal efficiency means a lot.

Energy-saving and Remodeling

Add and Install Coal Feeders

Usually when coals are burning in the industrial boilers, they fall from coal chute to coal scuttle through gravity. Before they enter the boilers row they have already formed into coal layers with larger density by being condensed, and pulverized coal and lump coal spread out of order. Pulverized coal at the bottom fall into the bottom of the boilers through the gap, causing coal leakage. Burners will be formed at the place where coals group because of too much ventilation, while due to the lack of ventilation, coals don’t get enough burning at the place where scattered coals group, which makes large quantity of scattered coals blender in with coal cinder, increasing the carbon contents of the coal cinder, and decline the thermal efficiency.

In order to overcome the defects of the coal feeders, it is important to use Double roller type layered coal feeders (Fig.1). Layer combustion is a domestic proprietary technology
which has been fully developed. To remodel the current industrial boilers we can install type ZSFG Double roller type layered coal feeders produced by Liaoning Institution of Boilers Technology. In the Double roller type layered coal feeders, combined with Coal roller and sifter and through the change of mechanical feeding measures to achieve the goal of the stratification of coals. The specific process: By double switch the coal roller, making the coals slide to the inclined Screening mechanism, and continue to slide after screening, and the horizontal direction be exactly opposite to the direction of motion of the boilers row. Because of boilers row setting the coal rollers in motion, coals fall onto the sifter through coal monitoring board. In the motion of the row, the rolling radius of larger masses of coal is big and always be at the front and are the first ones spreading on the row, moving with the row. The upper layer and the middle of the bottom are always large mass, middle mass, little mass and Pulverized coal. Thus, the coals spread on the row according to the particle size. The coal layer is even and loose, and the breath ability will be greatly improved, the ventilating resistance will be reduced, and reinforce the mix of wind and coal and greatly improve the burning condition, making the coals burning thoroughly, and improve the thermal efficiency.

Figure 1. The sketch map of double roller layer coal feeder and furnace arch.

**Remodeling the Furnace Arch**

The exhaust gas outlet of general industrial boiler has a lot of resistance force and positive pressure combusting defects, so we need to remodel it into Double fork arch. After remodeling, the front and the back arch’s fraction of coverage will be reasonable. And a Reflux swirl will be formed in order to ignite, blender and Settle fly ash, also alleviate the multiple function of positive pressure combusting area, so that we can improve thermal efficiency(Fig.1).

The essential parameters of the remodeled furnace arch is: the active length of the row is 6.8m, the length of the front arch is 1.8m, the height of the front arch is 1.5m, the length of the back arch is 4.1m, the height of the back arch 1.15m, the speed of exhaust gas outlet of the back arch is 14m/s.

**Operations**

**Ventilating Reasonably, Reinforce the Combustion**

During the burning process the rationality of ventilation has great influence to boilers’ efficiency. Too much ventilation will enlarge exhaust smoke level, not only consume more
power, but also waste a lot of heat. While if the ventilation is not enough, burning with the lack of oxygen will appear, and the fuel cannot burn enough, even the stall of combustion chamber. Not only do we need the right ventilation, if the boilers’ room needs segment ventilation, all the segments needs to match correctly, the general principal is the small middle with two big ends. The combustion of coals is probably a kind of procedure that heat and dry, the compound escapes and form into cokes, the escaped compound burns, the cokes burn, all burned and turned to ash. Among them only the burning of escaped compound and coke need a huge quantity of oxygen, usually take 3/4 of the boilers. Too much ventilation at the front will make the burning premature, and damage the combustion chamber and the Coal gate, so the combustion should be started behind the Coal gate about 30-50cm. Too much ventilation at the back will increase the lose of smoke heat and fly too much ash into the air. The operators should experiment as many times as they can according to the different textures and features of different fuel, in order to find out the best ventilation and openness, and control strictly in the actual process[2].

Improve the Management of Water Quality and Anti-Scale

The scale of the boilers is consist of carbonates, sulfates and silicate. Different scale is consist of different compounds and inner pore fracture, so they have different conductivity for heat, and different influence towards boilers. In general, if the heat plate of the boiler get 1mm of scale, 3%-5% of fuel will be wasted. If it got worse, it could create possibilities that the plate overheated and deformation and the fall of the wall. So the operators must add chemicals regularly, and keep the water’s HP between 10-12, and drain away regularly, follow the rules that always drain, drain less, and keep a balance. Get rid of the sediment in time so that we can prevent scaling.

Clean the Dust in Time, Keep the Heating Plate Clean

The thermal resistance of the ash is 600 times to that of iron, has huge resistance to the transmit of heat. Under high temperature ash will melt down and stick to the iron, increase the difficulty of cleaning, so it is necessary to clean the boilers in time. For boilers with blower, it is acceptable that blow the dust regularly while it is being operated. And for small boilers without blowers, stop the operation and clean regularly is important, and the cycle time is depend on the quality of the fuel, usually it is 3-4 months. Some coal of poor quality needs to be shorten, while wood and other things have much ashes in them so they should be cleaned in 1 or 2 months.

With the Development of Technology, Monitor Gas Management and Precaution Strictly

Begin Technology Research, Facilitate the Precautions

In order to satisfy the need for security, we cooperate with institutions and other units, start the projects of Determination of ventilation resistance, Gas migration law, upgrade the monitoring system, solve the related puzzles, improve the ability of disaster prevention and anti-disaster.

Improve the Ventilation System and the Security Issues

According to the layout, drilling condition and geology structure, take measures to reduce the resistance, upgrade the layout, expand the fracture, reduce the lines, use parallel ventilation, in order to justify the distribution of the wind, and improve the ability of anti-disaster.
**Improve Technology Management, and Use It as a Guardian**

Set partial ventilating machine as Three special two lock up, take measures to improve the explosion-proof rate and intact rate. Impose the use of cement and blasting cap. Complete the monitoring system of the well, get a full monitor and control to the wells, send specialists to check and take charge of maintenance to make sure the security of the system[3].

**Implement Security Tech Precautions and Gas Emissions Work**

**Clarify the Job of Gas Emissions**

Gas emissions work needs unified command, specific kind of job, stand sentry work, gas emissions and concentration monitoring, turn on or off the power and device caring, security precaution implementation, well shifting, etc.

**Choose the Right Way of Emission**

According to the actual condition, we can use tube bundle, method of increasing resistance of fan, gradual discharge. One wind blow is forbidden. Make sure the concentration of gas and CO₂ as the whole wind blender is less than 1.5%, other noxious cannot go beyond the regulations.

**Clarify Power Cutting and Range of Withdraw**

Before the emissions, all the alleys and work places which are influenced by gas must be cut out of electricity, and withdraw all the staff. Set up signs and fences to the alleys accessible to this area. Send special guards and prohibit any one unrelated to enter. Send specialists to the substation and distributing point and cut the power at the same time, and set up signs and guardians.

**Security Checking after the Emissions**

After every emissions, specialists should be sent to examine the system and make sure everything is alright. The gas in the alleys should be less of 1.5% of concentration, and oxygen more than 20%, after 30min stabilizing and no change of gas, then start the Artificial restoration.

**Epilogue**

There is not much difficulty in operating all those measures and precautions, and the cost is low, but have obvious effects to some low efficiency boilers. With full marketization, the energy-saving measures save not only the fuel, but also decline the cost, raise the competence on the market.

**References**

