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Review Paper on Different Losses and Efficiency for Combined Type Water Tube and Fire Tube Industrial Boilers

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Abstract: Now a days energy demand in INDIA increased and finding the optimum method for energy saving in industry. so we can save the energy and utilized the same in industrial sectors by identifying the different losses including both major and minor causes in combined water tube and fire tube boilers. Mean time we can increase the efficiency of different component like boiler, economizer, air pre heater utilized in an Industry .In this paper author reviewed a no. of paper and identified different methods which can be utilized to improve the productivity and efficiency.

I. REVIEW METHODOLOGY

A. Shuhas R Bamrotwar,[1],2014

Boiler tube failure is the prime reason of forced outages at coal fired thermal power plants. With ever increasing demand for electricity, it is very necessary for the power plants to generate electricity without forced outages. This paper illustrates cause & effect analysis of boiler tube failures.

- 1) The data pertaining to boiler tube failures for one of Thermal Power Plant in Maharashtra State of last ten years was referred. Out of total 144 failures, 43 failures were observed in economizer zone.
- 2) Economizer is the main part of the boiler in the furnace second pass. It is the medium for transportation of the feed water to boiler drum. It helps to increase the boiler efficiency.
- 3) Economizer is placed in the flue gas path, to absorb the heat from the flue gas and increase the temperature of the feed water. Factors contributing for Economizer tube failure include stress rupture, fatigue, erosion, water side corrosion, fire side corrosion and lack of material quality.
- 4) Out of these factors erosion is the prime factor contributing for tube failure . Factor influencing the erosion is the velocity of flue gas, the temperature of flue gas, the mineral content in coal, the arrangement of pressure parts and deviation from design condition.
- 5) Amongst these factors velocity of flue gas ash particle has the predominant effect on erosion of economizer tubes. Boiler tube failures results in loss of 465 Million Of Units (MU) in power generation.
- 6) Moreover the severe service condition in coal fired thermal power plants causes failures such as the effects of high temperature, erosion, stress, vibration and corrosion combined resulting in failure of the boiler tubes thus it is extremely important to determine and correct the root cause to get boiler back on line and reduce or eliminate future forced outages.

B. Madhav et al.[2],2013

Steam generators are widely used in industries for several purposes like power production, processing, heating etc. In industry steam generators are the major fuel consumers. In a normal steam generator about 4% of hot water is wasted as blow down. Due to this, a large amount of heat energy is wasted. This project aims to bring a heat recovery system to prevent heat losses, so that a large savings can be made. A heat recovery system was designed to minimize the losses. Blow down water carries thermal energy in the form of steam that can be reused and boiler can be improved. Blow down heat recovery system may provide significant savings to the boiler plant and total energy saved.

C. Song et.[3],2013

Biomass has attracted more and more attention in the world as renewable energy. Biomass direct-fired technology is a relatively mature technology with wide application in China. Due to the high content of alkali metals and chlorine in the biomass fuel, biomass direct-fired power plant suffers from ash-deposition and corrosion problems of low-temperature heating surface in boiler, accordingly affecting the security and economy of boiler. Based on the literature survey, on-site detection, as well as EDXRF

experimental analysis, reasons which resulted in ash-deposition and corrosion problems of air preheater were analyzed for 2×50MW CFB (Circulating Fluidized Bed) boilers in Zhanjiang Biomass Direct-fired Power Plant by Guangdong Yudean Group. Suggestive measures to prevent ash-deposition and corrosion were proposed by the analysis of biomass combustion characteristics, ash-deposition and corrosion formation mechanism. This paper studied the chlorine mechanism in biomass direct fired power plant to solve the corrosion problems during the process of biomass combustion.

D. Kumar and Rao,[4],2013:

The results from the energy audit of KOTHAGUEDEM Thermal power station, Andhra Pradesh has been presented in this paper. The scope of any energy audit in a thermal power plant should include the study of the coal flow, air and flue gas flow, excess air factors and oxygen in the flue gas; study of the heat transfer, effectiveness, proportioning of heat and pressure drop in the heat-exchangers of the water-steam circuit; study of the auxiliary power consumption; the overall performance evaluation such as the gross and the net overall efficiencies, boiler efficiency, boiler feed pump efficiency, air compressor efficiency, evaporation losses and blow down losses of cooling tower etc. Results from such a study at a 500 MW power plant were presented in this report. A detailed analysis of the effect of the fuel on the boiler efficiency, the dry and the wet flue gas loss, combustion characteristics, the start-up and the shut-down losses, the radiation losses and the heat losses due to hydrogen in fuel, moisture in fuel, carbon monoxide in fuel were explained. Factors leading to the deterioration of the boiler efficiency by direct method and indirect method and evaporation losses and blow down losses of cooling tower were also presented.

By comparing the actual values of the Boiler losses with the reference or design values it was clearly concluded that:

- 1) All the boiler losses were within the limit except the heat loss due to hydrogen present in the fuel.
- 2) The reference values were taken for controlling heat loss due to hydrogen present in fuel, the supply of fuel should have less content of hydrogen and the surface moisture of the coal can be reduced by proper maintenance of coal shed.
- 3) The boiler losses reduce if gross caloric value of coal is high.
- 4) Further for improvement of boiler efficiency the flue gas outlet temperature should be in within 140 to 150 degree C.
- 5) Excess air can be controlled by keeping combustion system in auto to maintain 3.5% of Oxygen and excess air below 20%. For achieving energy savings variable frequency drives were used to control speed of boiler feed water pump.

E. B. Jinjala,[5],2013

Jinjala worked on variable speed drives used for energy saving in industries. Industrial energy use can be reduced using variable speed drive in motor operated system, high efficient motors, efficient nozzles in compressed-air system, waste heat recovery system in boilers. Energy saving by management including energy audit, training programs and housekeeping beside some energy management practices in the world was reviewed.

It was found that in industrial sectors, a sizeable amount of energy and emission can be saved using these methods. It was concluded that:

- 1) VSD is a good option in energy conservation in a boiler as rating of the motor increases, the energy saving also increases.
- 2) VSD installation helps in controlling following factors.
 - a) Control excess air.
 - b) Controls stack temperature air.
 - c) Air/fuel ratio control.

D. Muhaisen and Hokama,[6],2012

This paper is about calculating boiler efficiency. Efficiency has a key role in determining the overall effectiveness of the whole system within the power station. For this calculation, a visual-basic program was developed, and a steam power plant known as El-Khmu's power plant, Libya was selected as a case study. The calculation of the boiler efficiency was applied by using heating balance method. The findings represented how the maximum heat energy which is produced from the boiler increases the boiler efficiency by increasing the temperature of the feed water, and decreasing the exhaust temperature along with humidity levels of the of fuel used within the boiler.

The findings of this research are summarized as follows:

- 1) There are many parameters which affects efficiency of boiler. The efficiency levels were based on the changes of the temperature of the used feed water for the boilers along with the changes of the temperature of the exhaust gases.

- 2) The humidity levels of the used fuel within the boiler are also being considered. This research had also indicated that the efficiency of the steam power plant would increase and showing higher level of effectiveness when applying good and more reliable working conditions.

E. S.P.Nangare,[7],2012

The economic activities in our country over last four decades have resulted in continuous rise in demand for power in spite of phenomenal growth rate achieved by the power sector. Mainly all the thermal power projects are satisfying it and the considered opinion of the experts in our country that the power shortage is here to stay in foreseeable future. The growing energy demand and the steep depletion of fossil fuels have directed the engineers and technologists to explore the possibilities of developing alternative sources of energy particularly from conventional nonrenewable energy source. Study reflected that 600MW power can be produce from bagasse of all running sugar factories of Maharashtra. Continues analysis is required for economical balance of input and output power.

F. Lv Tai Ist,[8],2012

The heat of waste gas emitted to the atmosphere can be recovered to increase efficiency of boiler. For power plant boiler, if the exhaust gas temperature decreases by 15~20°C, the boiler thermal efficiency increases about 1%. In this study a waste heat exchanger was added, so that large amount of waste heat in waste gas was recycled.

II. CONCLUSION

Author describe the various method for efficiency improvement for industrial component like coal fired boiler which is combined water tube and fire tube type. So improved economic balance of input and output power[7].VSD helps in controlling excess air, controls stack temperature air and Air/fuel ratio control[5].

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