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A review on the performance analysis of boiler

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Abstract - One of the most important components of the Power plant is the Boiler. The Boiler performance evaluation is necessary to find out variation of boiler efficiency related to its various operating parameters. Hence, it is necessary to do the performance analysis of boilers. When the production of steam is most important to the thermal efficiency, the efficiencies of the boilers are low. Nowadays, many of the boilers have efficiencies that are less than 60%. If the potential energy will improve, we get the more profits and cost savings. This paper presents the performance analysis of boilers for increasing the thermal efficiency of the boiler by means of reduction of losses.

Keywords: Boiler, Coal, Fuel energy, Steam flow, Thermal energy.

I. INTRODUCTION

Boiler is a closed vessel in which used to produce the steam. It converted to water or other fluid into steam. When the boiler is heated by external sources such as like coal, fuel, wood, etc. In this case the coal and fuel is more expensive and also that efficiency is high. Wood is cheapest resources but its requirement is high. So it only for using the small industry. The boiler is classified into the many types such as water tube boiler, fire tube boiler, cast iron boiler, hydronic boiler, etc. Water tube boiler is one of the most using boiler. Because the water is passed through the inside the tube and water is heated by the surroundings fire. Fire tube boiler is also one of the most using boiler industry. In this case the water is heated by the fired tube. Boiler is produce the steam due to the heat for the thermal efficiency. When the production of the steam is passing through the turbine. It can able to rotate the turbine. So the energy will produced. In this energy is transfer by transformer and power grid. nowadays many of the boilers efficiencies

that are less than 60%. If the potential energy will improve, we get the more profits and cost savings. More research have been carried out to overcome the issues related to low performances in the boilers.

II. LITERATURE REVIEW

The literature survey has been done to study the details regarding boilers, their performances and the affecting parameters.

Zhelin Liu et al. [1] presented the boiler drum level Control and Protection systems. This paper explain the Float type/ magnetic instrument may replace either control or protection functions in the future, but that will not reduce the total number of instruments needed.

Jan Taler et al. [2] presented the method for determination of thermo-flow parameters for steam boilers. The proposed computer system ensures economical and safe operation of the boiler in steady states and during load changes.

Jun Si et al. [3] presented the several years running there are a lot of incident reports for T23 tubes especially the breakage of weldment in the ultra-supercritical power plant. In this paper explain the failure of a T23 tube weldment has been investigated after only one year's operation. Inner wall cracks were found at the butt-jointed seam region.

Zhelin Liu et al. [4] presented the boiler drum water level measurement has long been the source of questionable results. The result is the different pressure transmitter eliminates the differences in temperature and density between the constant head leg and the water inside the drum.

Habib et al. [5] presented by a multimode

model is developed to investigate the performance of an economizer under all conditions. A multimode model is developed to investigate the performance of an economizer under all conditions.

GOLDSTEIN et al. [6] presented the corrosion failure of a test tube due to "caustic gouging" and explain about the discovery of an unusual effect of deposits on boiling characteristics are described.

HAMED MORADI et al. [7] presented the boiler unit operation, dynamic variables such as drum pressure, steam temperature and water level of drum must be controlled to achieve an appropriate performance. To obtain economic operation of power plant steam generators, output of mechanical energy must be balanced with the electrical load while maintaining the internal variables within desired ranges.

Satu Tuurna et al. [8] presented the steam oxidation has become an important issue for power plants as operating temperatures increase from current to 650°C and even higher temperature and pressure. The advantage of using supercritical water systems for power generation is based on the increased thermodynamic efficiency when operating at higher temperature and pressure.

Chudnovsky et al. [9] presented the high restrictions in environmental requirements have led to modifications of the both coal type and firing mode. In order to prevent a different faults in boiler operation and as a result a reliability reduction, special monitoring and diagnostic techniques is required for engineering analysis and utility production management.

Skrifvars et al. [10] presented the petroleum coke firing in a circulating fluidized bed boiler has sometimes been reported to be associated with cyclone deposit problems and return leg plugging. In this paper, we present data which indicate that some of these problems may be due to the calcium-rich bed material used during the firing. We have earlier shown that calcium oxide may react with the flue gas components SO₂ or CO₂, causing neck growth between the solid particles.

Geng Liang et al. [11] presented the boiler combustion control system with combustion ratio optimization by using the software measurements. In the control system is based by the analogue instruments with dashboard are still widely used. But the level of

automation in boilers is relatively low. Manually find out the heat supply with measurement and control account for nearly 50%.

Ayhan Demirba [12] presented the biomass and pulverized coal pulverized coal were used for co firing test. The test of co-firing of coal and biomass were carried out in a bench scale bubbling fluidized bed combustor. The biomass is the renewable sources for coal co firing and it was successful with up to a 20% biomass mix boilers.

III. CONCLUSIONS

From the above literature survey, the following conclusions are obtained.

1. The biomass and coal co-firing could be used in 20% mix boilers.
2. The unusual effects of deposits could be studied by caustic gouging.
3. Special monitoring and diagnostic techniques should be used to prevent faults.
4. System operated at higher temperature and pressure increases the thermodynamic efficiencies.

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