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# Optimization of Boiler Operation using Air Pre-Heater

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**Abstract:** Air pre-radiator and economizer are heat move surfaces in which air temperature and water temperature are raised by exchanging heat from other media, for example, vent gas. Tourist is important for fast burning in the heater and furthermore to dry coal in processing plants. So a basic kettle frill which fills this need is air pre-radiator. The air pre-warmer isn't fundamental for task of steam generator, however they are utilized where an investigation of expense demonstrates that cash can be spared or productive burning can be acquired by their utilization. The choice for its selection can be made when the money related favorable circumstances is weighed against the capital expense of radiator. The productivity of the kettle increments with the expansion in the temperature of the ignition air utilized in the heater. This is accomplished by the expanded temperature of the pipe gas noticeable all around preheater and economizer zone. This paper manages the diverse approaches to get the most extreme warmth from the vent gas voyaging through the air preheater and the economizer zone to enhance the evaporator effectiveness.

**Keywords:** Air Preheater, Heat Exchangers, Economizer, Seal Leakages, Heat Conductivity, Flue Gas, Optimum Air.

## I. INTRODUCTION

Air is an essential segment in heaters and boilers. In every one of these types of gear, the surrounding air should be warmed up to high temperatures. Preheating the approaching air to a great extent enhances the warm proficiency of the framework, in this way expanding the vitality funds of the business and results in lower working expenses. Truth be told, each 220C ascent in ignition air temperature builds the evaporator proficiency by about 1%. Warmth exchangers can be utilized to recoup the warmth from different procedures to preheat the air. In any case, the warmth exchange coefficient of air is low and thus, blades or broadened surfaces are utilized to upgrade the warmth exchange [1]. It is a typical mechanical practice to use the warmth of fumes gases or vent gases and procedure steam to preheat surrounding air. Air pre-warmer is the most normal gear in charge of weakening in kettle proficiency and increment in assistant power utilization in ID (Induced draft), FD (Forced draft), and PA (Primary air) fans. In this paper distinctive parts of air pre-warmer execution has been talked about, for example, the parameters to be checked, circumstances and end results of poor execution of the air pre-warmer and how the air pre-radiator execution influences the kettle productivity. A few proposals to enhance the air pre-warmer execution are additionally talked about in this paper

### A. Specification Of Air Preheater

Type: 27-VI-72 (T) 74

Where, 27 is the ostensible breadth of rotor in feet

VI represents vertically raised downstream air pre-radiator

72 is the stature of rotor in inches

74 is the stature of packaging in inches

This air preheater is separated into 3 parts of 72, 108 and 180 degrees. Pipe gas is permitted to pass start to finish vertically through the 180 degree part. Essential air is permitted to go from base to top upward through the 72 degree part and comparatively optional air passes upwardly through 108 degree part. The rotor is separated into 12 parts by vertical stomach plates. Warming components are orchestrated in these segments in 3 layers, the best layer hot end, middle and the base layer-cold end. Warming components at hot end and transitional end are indistinguishable. The best and base sides of the stomach plates are mounted with 12 sets of outspread seals each and the vertical sides of the rotor are mounted with 12 sets of pivotal seals.

### B. Seal Spillages

Seals are given at the two finishes of the air preheater to limit spillage between the air sides what's more, the gas side of the pre radiator. The seal plates are comprised of uncommon erosion safe composite known as Corte steel. Essential and auxiliary air escape

in such a large number of approaches to the pipe gas side like pivotally, radially and circumferentially. The seal spillages are brought about by various reasons. The essential pneumatic force is the most astounding of the three streams and being the high weight stream, there is immediate spillage from the essential air segment to the gas and optional air side. There is additionally immediate spillage from the auxiliary air side to the gas side. The amount of air spillage from the essential air side to the optional side is just a exchange from a higher weight source to a lower weight source [2]. The spillage prompts the air ingress which decreases the air required for burning of fuel and high oxygen content in the vent gas [3].

### C. Effects Of Increased Seal Leakage

- 1) If the seal leakage at the hot end increases
  - a) Air outlet temperature decreases.
  - b) PA and FD fan power consumption increases.
  - c) ID fan power consumption increases.
- 2) If seal leakage at the cold end increases
  - a) Flue gas outlet temperature decreases.
  - b) PA and FD fan power consumption increases.
  - c) ID fan power consumption increases.

### D. Low Heat Transfer

Low heat transfer is one of the problems faced by the rotary air preheater. The air preheater have the heating elements of surface area 19 m<sup>2</sup>. The heat transfer is directly proportional to this surface area. But the heat transfer area is reduced due to the erosion and corrosion of the heating elements. The heat transfer is also reduced because of the clogging of dust particles over the heating elements at the cold ends. Hence the heating elements are kept clean by proper soot blowing with steam. Poor heat conductivity results in high flue gas outlet temperature and low air outlet temperature which results in reduction of boiler efficiency [4].

### E. Remedies

- 1) Invert the hot end baskets during overhaul period if the element thickness reduces by 30%.
- 2) Interchange the hot end baskets with the intermediate baskets when the element height starts reducing.
- 3) Double undulated baskets can be used in cold ends also to increase the heat transfer.

The dry and wet misfortunes are the real misfortunes which is straightforwardly corresponding to the vent gas outlet temperature [5]. So by diminishing the vent gas temperature after air preheater the evaporator proficiency can be expanded. The Air preheater outlet temperature is represented by the vent gas gulf temperature to air preheater, air channel temperature to air preheater, warm execution of air preheater and air preheater seal spillage.

## II. CONCLUSION

In this paper the execution of the air preheater has been concentrated based on the ignition air going through it. The right streamlining of the ignition air can expand the heater proficiency by 2-3%. It additionally guarantees less fuel utilization. By decreasing the air preheater spillage the assistant power utilization is additionally decreased. Subsequently the fuel is spared which prompts an extensive measure of benefit

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