**Improvement of Boiler’s Efficiency by Auto Combustion Control using Ratio Control**

**Abstract:**

Efficiency, Safety and Eco friendliness are of paramount importance in any combustion process. Especially in large scale combustion units like boilers they are of utmost importance. This research is conducted to improve the efficiency of a water tube boilers, enhance the safety of Boilers and to reduce the emission of SOx, NOx and COx gases there by making them eco-friendly in nature. We have employed a ratio controller to control the Air-Fuel Ratio based on the oxygen content in the flue gases in the stack. Air-to-fuel ratio defines the amount of air needed to burn a specific fuel. For any combustion process there is a balance sought between losing energy from using too much air, and wasting energy from running too richly. The optimum Air- Fuel Ratio for Natural gas is identified as 9.53m3 Air to 1m3 Fuel. The best combustion efficiency occurs by continually choosing the right air-to-fuel ratio based on the current combustion parameters. In most scenarios, a liquid and gas fuel burner achieves this desired balance by operating at 105% to 120% of the optimal theoretical air. This results in an excess oxygen level of 2%. In the combustion zone, it is difficult to measure excess air. In the stack, however, it can be easily measured using Oxygen analysers.  When operating with 5%-20% excess air, it would correspond to a 1% to 3% oxygen measurement in the stack. We have employed a Zirconium Oxygen Analyser for this purpose which will adjust the Air Ratio with respect to the Oxygen content in the Stack. Implementation of this project in Gas Fired Boilers at Essar Steel India Ltd., Hazira Facility resulted in an increased efficiency of 3.2%.

**Key Words:** Combustion Control, Ratio Control, Boiler, Oxygen Analyser**,** Air-Fuel Ratio

**Group Members:**

Mr. K. Samuel Morris, 17071D8803, M.Tech –II, Dept. of EIE, VNR VJIET, Hyderabad, [samuelvrs@yahoo.co.in](mailto:samuelvrs@yahoo.co.in)

Dr. K.Sudha Rani, Associate Professor, Dept. of EIE, VNR VJIET, Hyderabad, [sudharani\_k@vnrvjiet.in](mailto:sudharani_k@vnrvjiet.in)

Mr. Lalit Rout, Sr. Manager, Dept. of Power Infrastructure, Essar Steel India Ltd., Hazira, Gujarat, [Lalit.Rout@essarsteel.co.in](mailto:Lalit.Rout@essarsteel.co.in)