

## Air-Preheaters- Helping the environment and the economy at the same time in India

Arnav Bansal

### INTRODUCTION

Every topic covering climate change or global warming always starts with the problem of coal. The amount of heat it releases, the smoke that it emits and the drastic changes that it causes to the environment makes it to go to the top of the pecking order, but what many of us fail to comprehend, is the importance of coal to our growing economy. <sup>1</sup>As William Stanley Jevons(1865) rightly states “ It is shown, in fact, by the mechanical theory of heat, that the work done by coal, in a good engine of the present day, does not exceed about one-sixth part of what the coal is capable of doing”.I completely agree with the fact that coal causes immense environmental problems, however, at the same time, I am inclined to be content with the importance that it holds in India’s economy. Therefore, we need a

device which can counter environmental difficulties, at least provisionally, and on top of that help contribute to our growing economy. Luckily we already have such a device, the air preheater(APH).<sup>2</sup> According to Ghodsipour(2002), the APH lowers the temperature of the gasses released after combustion of coal, reduces Carbon Dioxide emission and increases the efficiency of the industrial boilers(p.571), therefore it covers all points and factors that we desperately need.

The introduction of these pre-heaters will have a tremendous impact on the environmental problems that we are facing today and on top of that, will, in no manner, affect our economy. My particular work is unique because I have created a clear relation between a single device and an entire country’s economy, therefore being a

---

<sup>1</sup> *The Coal Question: An Inquiry Concerning the Progress of the Nation, and the Probable Exhaustion of Our Coal-Mines* by William Stanley Jevons (1865)

---

<sup>2</sup> *Experimental and Sensitivity Analysis of a rotary air pre-heater for the flue gas heat recovery* by N. Ghodsipour, M. Sadrameli \* (2002)

correlation between macro and microeconomics. We all need to understand that change can come from the smallest of things and inventions, and the APH can prove to be a game-changer.

## 1. INTRODUCTION TO AIR-PREHEATER AND ITS USES

<sup>3</sup>An air-preheater or an APH is a device that is used to utilize the heat released from the flue chamber thereby increasing the efficiency of the boiler by 2% to 3%. <sup>4</sup>It increases the overall plant efficiency without producing unwanted gas substances pressure drop. The temperature of the flue gas, that is flowing to the chimney, also reduces.<sup>5</sup> The preheated air can therefore then be used in a thermal boiler or a heater. It allows control over the temperature of the exit gas. With an exit air temperature being 180-degree Celsius,

---

<sup>3</sup> *Installation of Air-Preheater and Economizer in Boiler / Thermic Fluid Heater Installation of Air-Preheater and Economizer in Boiler / Thermic Fluid Heater A Case Study by Buereau of Energy Efficiency of India*

<sup>4</sup> *Assessment of Air Preheater Effects on Power Plant Efficiency*

<sup>5</sup> *Rakesh Kumar & Sanjeev Jain , "Performance Evaluation of air pre heater at off design condition", Dept of Mech Engg, IIT, New Delhi*

the air preheater can tone down it to an extent of 200-degree Celsius.

Combustion air can increase boiler efficiency by 1% by every 40F increase in temperature. Therefore an APH, simply, is a device which pre-heats the air during combustion of any fuel and therefore increases boiler efficiency and then decreases the temperature of the gas leaving through the chimney. A simple conclusion that can be drawn, is that APH devices lower the temperature of the air leaving the boiler and also reduce the amount of Carbon Dioxide emissions from the combustion of coal.

<sup>6</sup>However, there seems to be a problem with the efficiency of the APH itself, thankfully a team from the University of Pune has presented a unique solution to this problem. The main problem that the current model faced was of leakage, and with the higher content of ash in

---

<sup>6</sup> *To optimise air preheater design for better performance P.N.SAPKAL, P.R.BAVISKAR, M.J.SABLE, S.B.BARVE. NEW ASPECTS of FLUID MECHANICS, HEAT TRANSFER and ENVIRONMENT.*

Indian Coal, this further became an even bigger problem. But the team came up with a solution that particular size of the APH may be able to function as efficiently as it can and also assist in lowering the temperature of the gas that is going to exit from the exhaust tube.

## 2. IMPORTANCE AND UTILISATION OF COAL

Coal is one of the most important resources that a developing country can possess. <sup>7</sup>It has brought about considerable changes in the economic situation of a nation ranging from America's emergence as a global power to Germany's industrial progress since the Industrial Revolution. The IEA's Coal Advisory Board (2009) has even stated that the use of coal in the future is inevitable, especially for the development of poorer nations. But at the same time, clean coal and carbon-efficient technology, at least for India, is of equivalent and paramount importance.

The Indian Government has pledged cheap electricity and energy with no adverse environmental effects; to do this, the efficiency of thermal powered plants is critical. According to a survey conducted in 2005, the most efficient thermal plant had a percentage score of 96% and the lowest had that of 46%. One of the most prominent reasons for this might be the existence and utilisation of cheap resources such as coal. Therefore, we can conclude that since coal is so popularly used, it is better to look for methods to utilise it properly and efficiently, while preventing the environmental consequences as well.

## CONCLUSION

From giving examples to giving uses and advantages of the APH to even signifying the use of coal in this generation, this paper has covered everything. All that is left to cover is the utilisation and implementation of these processes and policies especially in India since it houses the Coal India Limited(CIL), the world's largest coal mining company. It is time for India, a developing

---

<sup>7</sup> INDIA 2020- Energy Policy Review by The International Energy Agency

country, to use the resources in the most efficient way possible. The APH will be and has to be the future in every coal using industry until we find a suitable and a comparatively more useful alternative.