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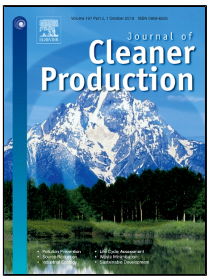

Energy Integration in Boiler Section of Thermal Power Plant

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ENERGY INTEGRATION IN BOILER SECTION OF THERMAL POWER PLANT

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Abstract:

In the present work systematic analysis is carried out for retrofitting of boiler section of the conventional thermal power plant of 250MW capacity with the aim to recover maximum amount of waste heat available in it. Lignite coal is used in this plant as a fuel. For the existing system, pinch point, minimum hot and cold utility requirements are found as 972˚C, '0'MW and '11.09'MW, respectively. Pseudo-pinch point is also found at 272˚C and heat flow through it is 9.11MW. It is observed that in the existing plant exit temperature of flue gas through the stack is restricted by dew point of SO_x to prevent corrosion in the stack. Dew point of SO_x in flue gas is predicted as 122˚C. Further, heat from boiler blowdown can also be extracted. Considering waste heat of flue gas as a result of dew point as well as boiler blowdown six different energy integration options are proposed for retrofitting of boiler section. Detailed design and economic analyses are carried out for all these options. Different criteria such as location of additional heat exchanger, amount of flue gas and exit temperature, environmental aspects, %energy savings and maximum temperature across additional heat exchangers are envisaged to choose best retrofitting option. Results of the best option are compared with that of published work.

Keywords: Energy integration, Boiler section, Thermal power plant, Dew point, Economic analysis

1. Introduction

At present, energy conservation is the main concern of industries as energy producing sources such as coal, natural gas, oils, etc. are decreasing continuously. Coal is predominant fuel source for power generation in India. According to the Central Electricity Authority of India, 59% of total power produced is generated through coal based thermal power plants (TPP) in India (www.cea.nic.in/reports/monthly/installedcapacity/2017/installed_capacity-07.pdf). However, combustion of coal in power plants leads to lower flame temperature, higher exhaust losses, lower thermal efficiency and higher emissions of carbon dioxide, which are unfavorable factors for efficient utilization of coal. Therefore, energy conservation is an important national policy in India