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Experimental analysis of thermal power plant operating Efficiency Improvements

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Abstract

Boiler efficiency "The percentage of the total suction heating value of the output steam to the total supply heating value."

The main objective of thermal power plants is to meet the energy needs of the market and meet these requirements; Factories need technical availability with parts reliability and maintenance strategies.

The current energy situation in India strongly supports the economic security, stability and future development of the country and the social and economic well-being of the people, all of which depend on the wise use of available domestic resources and imported energy. Increasing energy demand. Our future lies in taking extreme measures to combat energy waste caused by the use of inadequate equipment and poor work practices.

The industrial and commercial sector of any economy is its pillar. Since they are the main energy users and are few in number, they are easy to approach and target. Thus, they offer a significant opportunity to save considerable energy in their operations by implementing appropriate energy efficiency measures. However, we must not forget that this is a nursery school for developing energy efficient skills as a nation. Moreover, it should not be forgotten that innovation is the key to growth and success. Therefore, we as a nation must think ahead and quickly to utilize the alternative energy sources that exist in our country to utilize our conventional energy sources and use innovative technologies.

It is true that boilers are highly desirable for efficient operation / reducing production costs, saving energy and reducing unwanted emissions. If possible, immediate replacement of inefficient boilers should be considered.

Here is a review of the following aspects:

- Basic Priority Boiler Efficiency and Area Management
- Estimate the energy performance of earth boilers and calculate the efficiency.
- Factors affecting boiler efficiency
- Identification and rational use of alternative renewable energy sources

It contains relevant theoretical material and information and is a practical guide for students to identify and implement energy efficiency and savings opportunities in steam boilers.

Our project is concerned with determining the current operating efficiency of boilers and calculating the main losses of boilers in thermal power plants. Then determine the reason for the decline in productivity. It also improves boiler efficiency. Boilers are widely used in power generation, chemical and processing industries. This project attempts to explore available methods to maintain and improve boiler efficiency.

Keywords: Economic security; Energy; Conventional energy sources; Power generation; Innovative technologies

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1. Introduction

Reducing electricity consumption is essential to reduce global warming caused by fossil fuel consumption. To achieve this goal, we need to develop technologies that require less electricity (while increasing productivity) and recover waste heat. By the way, the cleanest energy is the one that is never wasted. In particular, current efficiency trends predict that US data center energy consumption will reach 100 billion kWh by 2011, representing an annual cost of approximately $7.4 billion. At the current growth rate of data centers and energy consumption, data centers will consume all the electricity available in the United States by 2050, assuming that energy production increases by 1% annually. Ironically, this crisis has so far not been on the "radar screen" of politicians or the media.

Objectives

The object to satisfy this are

- To conduct energy analysis of the overall plant and determine the efficiencies and energy losses of all the major components on the power plant.
- Select and develop the areas where energy losses are being experienced.
- Determine the costs and payback periods for the new technologies suggested for efficiency improvement.
- To understand the working principal of Boiler.
- To demonstrate the different parts of a Boiler.
- The goal is to create conditions that generate the smallest possible amount of flue gas at the lowest possible temperature. This results in increased boiler efficiency. Think about it; the boiler draws in cool air, heats it up, and sends it out the stack.
- To release the energy in the fuel as efficiently as possible.
- To transfer the released energy to the water, and to generate steam as efficiently as possible.
- The more efficient that your boiler is, the less you will spend on fuel.

2. Methodology

The project is going to cover the following areas:

- A description of the facilities and their principal operation on the plant.
- A discussion of all major energy consuming systems.
- A description of all recommended Energy Conservation Measures (ECMs) with their specific energy impact.
- Energy and exergy analysis of the whole plant.
- A review on the implementation costs, benefits and payback period.
- Specific conclusions and recommendations.

2.1. Study by example

2.1.1. General exposure

For example, the blade is brought by data centers that use on-chip cooling to cool their servers. The extracted heat is distributed to power plants to increase their efficiency. The power plant is a thermal regenerative Rankine cycle consisting of a boiler, high and low pressure turbine, condenser, low and high pressure feed water pump and feed water heater. The feed water heater is heated by steam after the high pressure turbine. The optimum steam injection pressure will be calculated to obtain the maximum thermal efficiency in each simulation. Waste heat from the data center will be introduced into the Rankine cycle after the condenser and before heating the feed water through the primary heat exchanger (MHE). The effect of this heat exchanger (!) will be determined later.

2.1.2. Factors Affecting the Efficiency of the thermal Cycle

Fuel cycle efficiency is affected by following:

- Initial vapor pressure
- Initial steam temperature.
- Whether or not heat is used, heating pressure if used, and
- Temperature.
- Condenser pressure.

- Reheating feed water.

2.2. Ways to Improve Energy Efficiency

As one of the most important sources of energy in modern society, electricity accounts for a large amount of modern energy consumption. During the methods of power generation, fossil fuel thermal power generation is one of the earliest methods of large-scale power generation. this popularity in modern society comes from its stability and control. Considering the widespread use of electricity worldwide, increasing the efficiency of thermal power plants would be an effective way to reduce overall energy consumption and protect the environment. The article discusses the determinants in each stage of energy production, and recommendations to improve the efficiency of energy transfer and the efficiency of thermal energy production.

3. Results and discussion

3.1. Reducing air emissions, including carbon dioxide

From the energy analysis, the overall plant energy loss is calculated as 81.72%. The comparison of energy losses between different components.

It is observed that the maximum energy loss (47.79%) occurred in the condenser, this is due to the reason of heat energy expulsion from the condenser.

Thus the energy analysis diverts our attention towards the condenser for the plant performance improvement. Approximately half of the total plant energy losses occur in the condenser only and these losses are practically useless for the generation of electric power.

Thus the analysis of the plant based only on the First law principles may mislead to the point that the chances of improving the electric power output of the plant is greater in the condenser by means of reducing its huge energy losses, which is almost impracticable.

Hence the First law analysis (energy analysis) cannot be used to pinpoint prospective areas for improving the efficiency of the electric power generation. However, the Second law analysis serves to identify the true power generation inefficiencies occurring throughout the power station.

3.2. Future scope

I have tried to cover a detailed engineering analysis of thermal power plant operations in efficiency improvement of boiler. Directly and indirectly the boiler have vast probability towards saving of fuel consumption.

Although during the experimental analysis and detailed study many better options operating procedure for same. In India or globally this sector has lot of scope of fuel consumption saving opportunity. Subsequently major part falls under boiler and thermal power plant and In India government initiatives has been started firstly with lighting in system and now they have emerge with water.

The amount of water required to keep the turbines somewhere at the proper temperature appears excessive. Thermal power plants emit enormous volumes of smoke and pollutants, they have an impact on the environment. The power plant's overall efficiency was approximately poor. The expense of upkeep seems to be high.

Less fuel consumption scheme. The main requirement persisted in future is capacity building which is utmost need of hour .The energy saved will be increased partially without altering the requirement of the system.

A detailed study for the internal part has been already done but if during operation the parts is studies in real time analysis under Condition based monitoring technique then more possibilities can emerge in scene for energy saving. This concept of working in inward closed working system to reduce demand termed as demand side management in terms from ministry of power Gazzete. Demand side management in municipal corporations has lot to do in existing system.

In a gist the saving potential is huge which can help the authority to save on its part which will reduce the carbon foot print on the earth and henceforth towards green energy and economy corridor.

3.3. Latest in boiler technology

With the new Viessmann boilers, they have a control that monitors the outdoor temperature. So modern boilers will actually run the proper hot water temperature corresponding with the outdoor temperature.

4. Conclusion

Coal-fired power plants are analyzed as an application for waste heat. Aspects such as energy consumption, energy recovery, carbon footprint and power plant efficiency are examined.

Better results are achieved when the waste heat from the data center is recovered by a coal-fired power plant, considering the vapor compression cycle. For PP efficiency, an increase of up to 6.5% was observed when considering the "best match" between power plants and data centers and VC cycles. Liquid pump cycles show that for the same data center size, larger and less efficient power plants are needed.

Compliance with ethical standards

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