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To Increase the Power Output of Thermal Power Plant by Monitoring Various Components of Power House.

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ABSTRACT

In thermal power plant various types of call are used. Low quality call is lignite then medium quality call is vitamin and higher quality call is anthracite. In India the power plant does not have enough quantity of anthracite call their phone India is mainly depended upon Australia and Indonesia for the supply of call has maximum efficiency of 98% therefore in super critical boiler please call is used as of fuel. Therefore in supercritical boiler steam is directly generated at 374 degree Celsius and there is no need of any steam drum to separate water particles from this team. So anthracite call can increase the power generation rate by reducing the number of heavy components in thermal power plant. There are number of power plants that are installing super critical boiler to increase the efficiency of power plant and reduce the wastage of heat.

Keywords: Electricity generation, Atmospheric temperature, Heating time, Heat loss, Cooling cycle, Ease Heating Flue gases.

Introduction.

High quality fuel is required for better generation of electricity and also this power plant has to provide continuous and emergency power supply to the required place. In metro city and industrial area whenever power requirement is at the topmost condition at that time peak load must be satisfied otherwise production of the plant may be stopped and it will effect on the economical condition of the plant in overall area of the manufacturing unit.

Electricity is produced at an electric power plant. Some fuel source, such as coal, oil, natural gas, or nuclear energy produces heat. The heat is used to boil water to create steam. The steam under high pressure is used to spin a turbine. – For this reason, a power generating station has to not only take care of efficient generation but also the fact that the power is transmitted efficiently over the entire distance and that's why, the transformer switch yard to regulate transmission voltage also becomes an integral part of the power plant.

At the centre of it, however, nearly all power generating stations has an AC generator or an alternator, which is basically a rotating machine that is equipped to convert energy from the mechanical domain (rotating turbine) into electrical domain by creating relative motion between a magnetic field

and the conductors.

1.1 Types of Power Plants

A power plant can be of several types depending mainly on the type of fuel used. A power generating station can be broadly classified in to 5 types mentioned below. (1) Thermal Power Plants (2) Diesel Engine Power Plants (3) Gas Turbine Power Plants (4)Nuclear Power Plants (5) Hydro Electric Power Plants.

Thermal Power Station A thermal power station or a coal fired thermal power plant is the most conventional method of generating electric power with reasonably high efficiency. It uses coal as the primary fuel to boil the water available to superheated steam for driving the steam turbine. The steam turbine is then mechanically coupled to an alternator rotor, the rotation of which results in the generation of electric power. Generally in India, bituminous coal or brown coal are used as fuel of boiler which has volatile content ranging from 8 to 33% and ash content 5 to 16 %. To enhance the thermal efficiency of the plant, the coal is used in the boiler in its pulverized form.

In coal fired thermal power plant, steam is obtained in very high pressure inside the steam boiler by burning the pulverized coal. This steam is then super heated in the super heater to extreme high temperature. This super heated steam is then allowed to enter into the turbine, as the turbine blades are rotated by the pressure of the steam. The turbine is mechanically coupled with alternator in a way that its rotor will rotate with the rotation of turbine blades. After entering into the turbine, the steam pressure suddenly falls leading to corresponding increase in the steam volume. After having imparted energy into the turbine rotors, the steam is made to pass out of the turbine blades into the steam condenser of turbine. In the condenser, cold water at ambient temperature is circulated with the help of pump which leads to the condensation of the low pressure wet steam.

Now-a-days batteries are used for the electric vehicles and this kind of batteries is very suitable for the electric vehicle. Companies are trying to make the batteries which are extremely efficient and they can give the higher range at the time of working. Tesla is a very well-known company who is making electric cars from many years but Tesla is also facing number of issues when our company is launching their electric car in the developing countries in the market of Asia.

Nomenclature

SU Super heater

Wall tem Temperature of Boiler wall

AC Alternative current

CL Water Cooling of water

Ct time. Current generating time

Eff BL. Boiler efficiency

Vol de Voltage decrement

Con Temp Temperature of Condenser.

Cool-BL = Boiler cooling rate

2. Power House Cycle

Temperature of water is extremely higher after condensation of water. Therefore this water is sent to cooling tower to reduce the temperature of fluid. Steam which is passing through the is fed to the condenser for the conversion of steam to water. Various types of condenser are available in the thermal power plant. Surface condenser and non surface condenser are applied in thermal power plant. In non surface condenser hot fluid and cold fluid both are separated with the help of heat exchanger therefore mixing of two different fluids can be avoided.

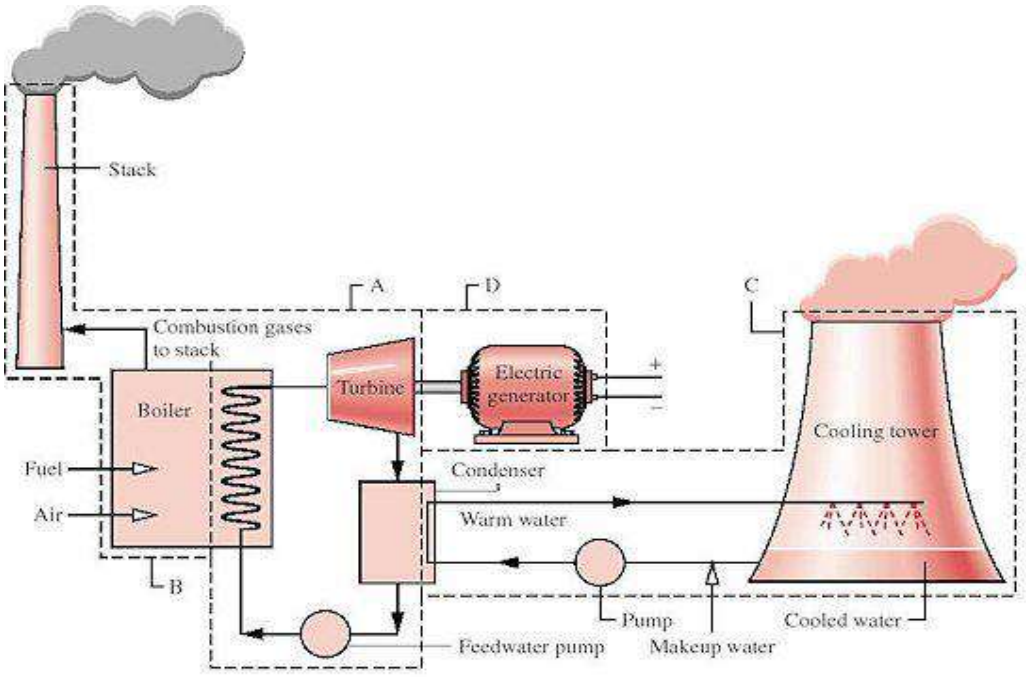

Figure 1 Layout of TPPE.

As in Thermal power plant for continuous power supply the boiler must run 365 days, but stand by unit is implemented and it is used at the time of maintenance. To find out efficiency of the power plant, total quantity of coal supplied to the boiler and total power generated are considered.

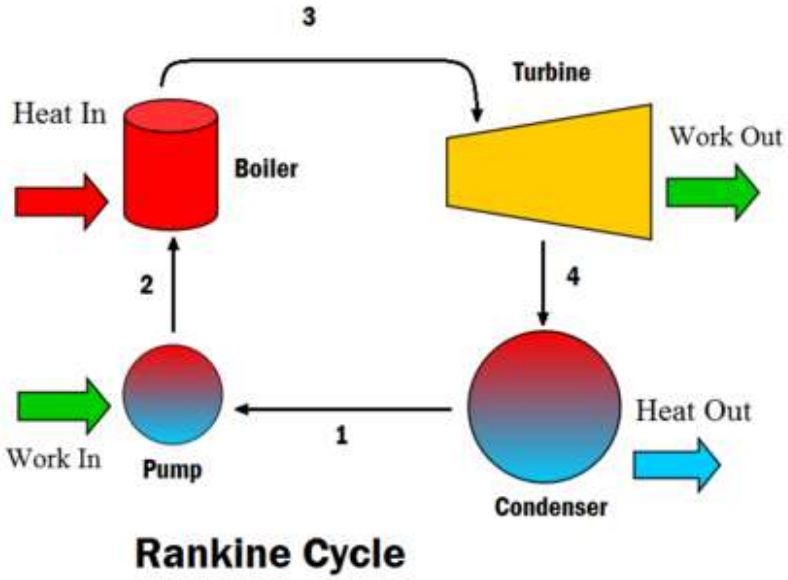

Figure 2 Working of Rankine cycle.

There are four processes in the Rankine cycle. The states are identified by numbers (in brown) in the T–s diagram.

Process 1–2: The working fluid is pumped from low to high pressure. As the fluid is a liquid at this stage, the pump requires little input energy. In other words Process 1-2 is [Isentropic compression] Process 2–3: The high-pressure liquid enters a boiler, where it is heated at constant pressure by an external heat source to become a dry saturated vapour.

The input energy required can be easily calculated graphically, using an enthalpy–entropy chart (h–s chart, or Mollier diagram), or numerically, using steam tables. In other words Process 2-3 is [Constant pressure heat addition in boiler]

Process 3–4: The dry saturated vapour expands through a turbine, generating power. This decreases the temperature and pressure of the vapour, and some condensation may occur. The output in this process can be easily calculated using the chart or tables noted above. In other words Process 3-4 is [Isentropic expansion] Process 4–1: The wet vapour then enters a condenser, where it is condensed at a constant pressure to become a saturated liquid.

3. Power House Components

Supercritical Boilers

B&W's supercritical and ultra-supercritical boiler designs offer the flexibility and reliability to meet the most demanding steam generation needs of our customers. At supercritical pressures, steam turbine efficiency improves significantly compared to the typical subcritical cycle. Ultra-supercritical steam conditions provide even greater efficiency improvements. The combination of utilizing supercritical throttle pressures along with an increase in throttle temperatures results in cost reductions in fuel usage and handling, flue gas treatment and ash disposal. B&W's supercritical and ultra-supercritical boilers are designed to take full advantage of variable pressure turbine operation.

Boiler is used to burn the call at rated quantity full stop various boilers are used for power generation like fire to boiler water tube boiler horizontal boiler vertical boiler single tube boiler multi tube boiler low pressure boiler medium pressure boiler high pressure boiler etc. In modern time super critical bowler is used for maximum power generation with less time range of pressure in super critical bowler is 221 bar. This is extremely higher pressure and it is mainly responsible for higher steam generation right. Boiler genre steam at 100 degree Celsius but this team has no water particles and their for there will be no issue of corrosion in the bloods of turbine. One should not that whenever steam is generated inside the boiler it is not directly send to return because there are always water particles inside this team that are mainly responsible for the corrosion of turbine bloods. There for superheater is always arrange between the boiler and turbine which will super hit this team at 400 degree Celsius and it will make this team completely dry and superheated. So there will be no water particles in the steam.

Super Heater

Super heater is used to super hit this team up to 400 degree celsius. In thermal power plant in steam is superheater than thermal efficiency of power plant is increased therefore congestion of call is reduced drastically and price of overal cost is reduced. Thermal efficiency of power plant is increased then construction of coal will be reduced and there will be less requirement of call from the Indonesia and Australia. Price of call is extremely higher therefore recovery of heat that is generated by the combustion of call is very important aspect. Is superheater will super hit this team at critical range there for there will be no issue of corrosion in the turbine full stop as there are number of water particles in this team which is generated at 100 degree Celsius so this what's team can damage the number of costly particles in the thermal power plants but super heater increase the temperature of that words in up to 400 degree Celsius and it is completely making dry and superheated so this team will not make corrosion to any of the component in the thermal plant. In this super heater is very important accessory for the better efficiency of thermal power plant and it is always arrange between the boiler and turbine for the production of various components in the power house.

Condenser

A condenser is designed to transfer heat from a working fluid (e.g. water in a steam power plant) to a secondary fluid or the surrounding air. The condenser relies on the efficient heat transfer that occurs during phase changes, in this case during the condensation of a vapor into a liquid. Inside the condenser, the refrigerant vapor is compressed and forced through a heat exchange coil, condensing it into a liquid and rejecting the heat previously absorbed from the cool indoor area. The condenser's heat exchanger is generally cooled by a fan blowing outside air through it.

The function of the condenser is to condense exhaust steam from the steam turbine by rejecting the heat of vaporisation to the cooling water passing through the condenser. The temperature of the condensate determines the pressure in the steam/condensate side of the condenser . The main difference between the compressor and condenser is indicated by their names, respectively. In a nutshell, the compressor compresses and the condenser condenses. ... Keep in mind, the refrigerant is a gas as it travels through the compressor – still a gas, yet slightly altered in order to be made into liquid vapor.

Economizer

It is used to recover the heat from waste flue gases. Economizer helps power house to increase the efficiency of the plant by 30 %. Different materials are preferred to make the economizer. Generally steel pipes are preferred but some time C I is also used as per the condition and requirement of the plant,

On the basis of economizer surface:-

- Bare tube coiled economizer are more common. The economizers can have an inline or cross-flow configuration. These economizers are efficient and occupy very little space.
- Finned economizer has welded fins on the outside surface of the economizer tubes. Finned economizers are more sensitive to flue gas environment. So, finned economizers are not recommended when the flue gas is coarse. Also, cleaning the surface of the finned economizer is a concern.

On the basis of boiler efficiency-

- Non condensing economizers are the most common variety. They are placed in the flue gas duct near the exit of the boiler.
- Condensing economizers are used in natural gas fired boilers. Condensing economizers reduce the temperature of the flue gas below its dew point. The flue gas condenses moisture and allows the use of latent heat and sensible heat for heating the water. Condensing economizer can help improve efficiency of the boiler by 10-15%. It can be used only when the flue gas does not have sulphurous, nitrous, or particulate corrosive matter.

Working principle of the economizer

An economizer is a tubular heat exchanger used to preheat the boiler feed water before it enters the steam drum. The flue gas exiting the boiler carries a lot of heat. The economizer utilizes this heat to heat the water entering the boiler. The water is preheated in the economizer in the liquid phase at elevated pressure.

Different function performed by Economizer.

- The economizer helps to improve the efficiency of the boiler. It helps to lower the temperature of the flue gas. Adding an economizer can improve boiler efficiency by 3-5%.
- Increasing the boiler efficiency can help reduce operating costs of the boiler by reducing fuel costs. The economizer helps you to get a faster return on investment.
- It reduces the chances of thermal shock due to fluctuating water temperature in the steam drum or furnace walls.

Conclusion

Power plant efficiency can be increased by proper combustion of coal. Proper combustion will also reduce the amount of pollution and oxides of nitrogen and sulphide etc. Only other side super heater economic are also various accessories which has to increase the efficiency of power plant by reducing the consumption of call. Blood of turbine also affect the efficiency of power plants at high speed and steam power can be extracted in proper way. Power of team must be extracted properly so design of blades should be proper. Pressure and temperature of steam also affect thermal efficiency of power plant. If temperature of steam is not sufficient than it will not increase the thermal efficiency. To absorb power from the steam arrangement of low medium and high pressure turbine in such a way that single line with proper pressure reduce management system.

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