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Co-Generation Power Plant for Better Future.

Rathod Sumit [a], Sirsath Himani [b], Detroja Shreya [c], Patel Sanjay [d], Suthar Abhay [e], Patel Deep [f], Thakor Anil [g], Prajapati Devarsh [h]

[a,b,c,d,e,f,g,h] LDRP-ITR, Gandhinagar-382015, India

A B S T R A C T

Co Generation plants are very effective way to produce energy from fuels. Pollution and other toxic gases are generated due to uneven combustion of fuels and shortage of required oxygen. Steam and Gas base power plants are introduced to get benefit of co generation and achieve required target within less time. Also production of unwanted gases are reduced. Various heat recovery systems are applied to the co generation plants for the recovery of heat. HGSR system is most effective systems in this regards, till number of parameters are considered at the time of ignition of the fuel in the systems.

Keywords: Co Power generation, Turbine Rotation, Heating time, Energy loss, Expansion of steam, Compressor Operation and flow of fluids.

1. Introduction.

Topping cycle plant is primarily produce electricity from steam turbine. The exhaust steam is the condensed and low temperature. Heat released from the condenser is utilised for example, district heating or water desalination. Bottoming cycle plants produce high temperature heat for industrial processes and then a waste heat recovery boiler feed and electrical plant. Bottoming cycle. Plants are only used when the industrial process requires very high temperature such as furnaces for glass and metal manufacturing so the are you less common. Large cogeneration systems provide heating water and power for an industrial site or an entire town common combined heat and power Plants types are (I) Gas turbine CHP plants using the waste hits India flue gas of gas turbines. The fuel used is typically natural gas. (II) Gas engine CHP plants use a reciprocating gas engine which is generally more competitive than a gas turbine up to above five MW. The gaseous fuel used is normally natural gas. These plants are generally manufactured as fully packed unit that can be installed within a plant room or external Nalli, plant compound with simple connections to the site is gas supply and electrical distribution and heating systems. (III) Bio-Fuel engine CHP plants use an adopted reciprocating, gas, engine or diesel depending upon which boy feel is being used and or otherwise very similarly in design to a gas engine, CHP plant. The advantage of using a bio fuel is one of reduced hydrocarbon fuel Kaami substance Tas reduce carbon emission which plants are generally manufactured as fully packed unit that can we install with a plant room or external plant compound with simple connection to the sites, electrical distribution and heating systems another variant in the wood gasifired CHP plant where by a wood palette for wood chips biofuel is gasified Ina zero oxygen, high temperature and were made the resulting gas is then used to power the gas engine.(IV) Combined Cycle power plants, adapted for CHP. (V) Steam turbine CHP plants that use the heating system is the system condenser for the steam turbine. (VI) molten carbonate fuel cells and solid oxide fuel cells have a hot exhaust very suitable for heating. (VII) Nuclear power plants can be fitted with tips after the turbines to provide steam to heating system. (VIII) Some cogeneration plants are fired by bio mass or industrial and municipal waste. (XI) smaller cogeneration unit may be used as a reciprocating engine or Stirling engine. The heat is removed from the exhaust and radiator. The systems are popular in small sizes because small gas and diesel engine or less expensive. Then small cash or oil fired steam electric plants.

1.1 Combined cycle power plant

Combined cycle plants work on the principle that the exhaust from one hit engine works of the other to produce electricity or drive mechanical processes. The combination of multiple thermodynamics cycle result in increased efficiency and lower fuel cost income point cycle plant electric power is produced using to heat engines. In the tandem as prime movers. The heat discharge from one hit engine is not waste into surroundings, but search as the source for the next heat engine that is it makes the possible to utilise the maximum input energy enhance thermal efficiency of the combined plant is much greater than that of part two engines operating separately. For example, a gas turbine engine, approximately 29 percentage of the heat input is used for power and 71 percentage is lost due to exhaust with a cogeneration are combined cycle plant. 40% to 60 percentage of the exhaust is usually recoverable.

Nomenclature

SU Super heater

Cy tem Temperature of cycle

Cy. T Time of cycle

Gas Pre. Pressure of Gas

WT time. Waiting time

Eff GT. Gas Turbine efficiency

Loss.Ene. Loss of energy

BG Temp Temperature of Boiler .

Cool-TB = Turbine cooling rate

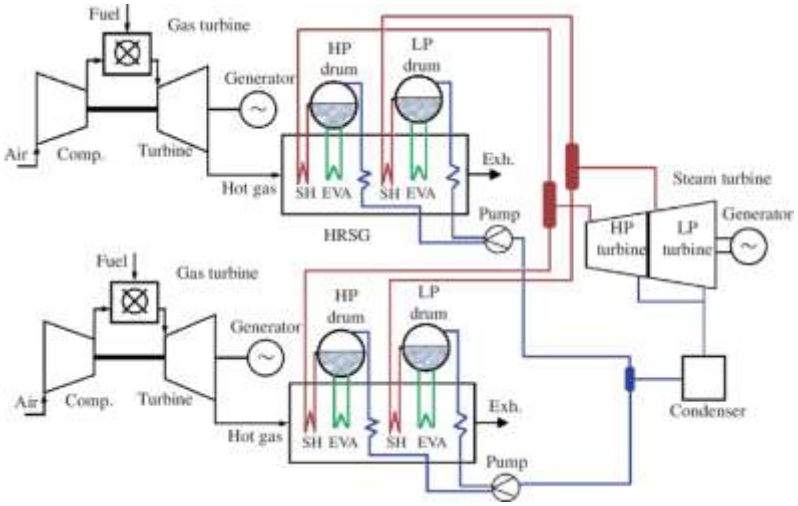

Figure 1 Combined cycle power plant.

Waste energy of heat engine is recovered with help of waste, heat, recovery system or waste heat recovery boiler or heat recovery steam generator waste heat recovery is co-generation system technology. It turns excess heat into clean electricity and use the full steam. The difference is that it captures the waste hit manufacturer is already emitting rather than providing all of the energy from scratch waste heat recovery boiler contains a series of Fulfilled. tubes placed throughout the area where heat is released when temperature high heat meets those tubes. a vapour is produced which is turn powers. A turbine that creates electricity. This process is similar to that of other fired boilers. But in this case waste heat replaces a traditional film as the initial source of energy new fossils are used in the process, metal glasses, pulp and paper silicon and other production. Plants are typically locations where waste heat recovery can be efficient.

2. Advantages of Combined cycle power plant.

(1) High overall plant efficiency: the efficiency of the combined cycle plant is better than simple, gas, turbine or steam turbine cycle. It can be possible up to 52 percentage with new gas turbine technologies.

(2) Simplicity of operation: the combined cycle power plants generally operated fully automatic Ali hence it is suitable were operating staff is less experienced.

(3) Great operating flexibility: the combined cycle power plant makes it possible to start up and shut down the plant quickly with less start up losses.

(4) Less water required: the amount of cooling water requires is only about 40 to 50 percentage of that of steam power plant.

(5) Less environmental impact: gas-based combine cycle power plant may be suitable for use in heavy populated area due to their eye efficiency and low emission levels of pollutants. Since it is produced very less NOX and only 40 percentage CO2 produced compare to coal-fired steam plants.

(6) Dual applications: come mind cycle power plant is highly suitable for cogeneration of heat and electricity.

(7) Low investment costs: the capital cost of combined cycle power plant, slightly higher than the simple gas, turbine plant and much below those of steam power plant.

3. Steam and gas turbine combined cycle plant

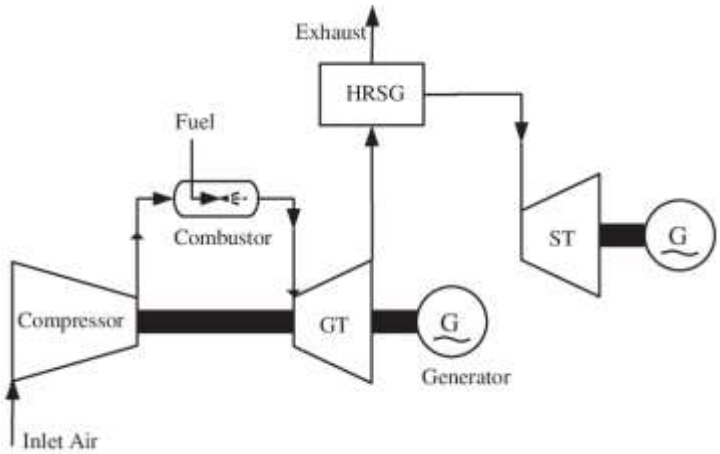

Figure 2 Steam and gas turbine combined cycle plant

The gas turbine plants are generally used for supplying peak loads with other types of power plants because gas turbine plant has a quick starting and good response characteristics. The temperature of gas turbine exhaust lies between 400 to 500C and contains about 16% 02 and 70% of initial quantity of energy carried away by the exhaust gases. Due to large exhaust loss the gas turbine plant has a low thermal efficiency. Also in gas turbine costly fuel is used, therefore cost of power generated by a gas turbine plant for utility system is high. To overcome its low cycle efficiency, a gas turbine may be used in conjunction with a steam turbine plant in an utility based load station to offer the advantages of gas turbine as quick starting and stopping, and permit flexible operation of the combined plant over wide range of loads. In the combined cycle power plant, gas turbine exhaust gases heat energy is recovered by Heat Recovery Steam Generator (HIRSG) to generate steam which can be further used to drive steam turbine.

The combined cycle power plant as shown in Fig. the gas turbine and steam turbine coupled in series, the topping plant operating on Brayton cycle and bottoming one operating on Rankine cycle as shown in the Figure. After the expansion of gases in gas turbine the exhaust gas passes through HRSG that generates steam at one or more pressures. The steam is fed to steam turbine that drives an electric generator. In these arrangements the gas turbine can be decoupled from the operation of the steam turbine, allowing for steam turbine shutdown with continued gas turbine. The gas turbine, HRSGs and 'steams turbine can be arranged in many different combinations depending on size of the gas turbine and the electrical generation requirements.

4. Conclusion

In co Generation plants Carbon dioxide, Carbon Monoxide and other harmful gases emission can be reduced up the mark level so number of industries are installing co generation plants. Other main advantage is reduction in fuel consumption. Amount of fuel used is decreased compare the conventional firing systems, so overall efficiency of the plant is increased. Various techniques are also applied to reduce the exhaust emissions which are the main focus for today's environmental issues. Flow of air through the system is also important factor for complete combustion of the fuel. Excess air may result in lower quality combustion. Ratio of oxygen and fuel has to maintain for proper ignition of the firing system.

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References

[1] (2015) The Wikipedia website. [Online]. Available: http://en.wikipedia.org/wiki/Electricity_sector_in_India

[2] (2013) The BEE website. [Online]. Available: http://www.beestarlabel.com/Content/Files/Schedule2_TFL.pdf

[3] Hal Link, "Operational Experience Of The Co-Opted Experiments At Nelha", ASME Annual Solar Energy Division Conference, pp. 2-5, 1989

[4] A book of Electronic circuit: Discrete and Integrated By Donald Schillings and Charles Belove, third edition

[5] J Y Q Kong, W J Wang, X W Huang, L J Yang, X Z Du,and Y P Yang 2017 Direct dry cooling system through hybrid ventilation for improving cooling efficiency in power plants Applied thermal engineering: Design, processes, equipment, economics vol 119 5 June pp 254-26879

[6] A book of Industial and Power electronics By G K Mithal and Dr Maneesha Gupta, Nineteenth edition.

[7] Augusto Di Gianfrancesco 2016 Materials for Ultra-Supercritical and Advanced Ultra-Supercritical Power Plants Woodhead Publishing

[8] Energy Audit, " Meridian Corporation, Falls Church, VA, July 1983.

[9] Energy resources" 1964-1972, " NSF/ RANN/SE/ GI34979/TR/ 73/5, Univers ity of Massachusetts, Amherst, March 1973.