WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Look Out on various Non Renewable and Non Polluting Trending Energy Sources.

Solanki Sahilkumar Maheshbhai [a], Panchal Mrutyunjay [b], Hemal Patel [c], Neel Munjalbhai Joshi [d], Swapnil Suresh Kumar Solanki [e], Dhananjay Joshi [f], Kathiriya Maulik Gabharubhai [g], Prof. Ankit A Darji [h]

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

A B S T R A C T

Number of energy sources is available but issues are related with pollution. Fossil fuels are very effective but it create carbon dioxide, carbon monoxide, various oxides of Nitrogen. So these fossil fuels are not effective for future power generation and automobile fuels transportation. So European countries are focusing on renewable energy sources to generate electricity and cope up with various energy requirement in the industries and the societies. In new energy development trends non polluted energy sources are used like open cycle OTEC, closed cycle OTEC, MHD power generation, wave energy technology etc.

Keywords: Electricity production , New trends in energy development, OTEC cycle, MHD cycle, Biogas generation, Wave energy technology.

1. Introduction.

Fossil fuels (coal, oil, gas) have, and continue to, play a dominant role in global energy systems. But they also come with several negative impacts. When burned they produce carbon dioxide (CO2) and are the largest driver of global climate change. They are also a major contributor to local air pollution, which is estimated to linked to millions of premature deaths each year. As low-carbon sources of energy – nuclear and renewables – become readily available, the world needs to rapidly transition away from fossil fuels.

1.1 Various new trends for generation of energy

Non renewable energy sources are mentioned below :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.

The power plants produce electricity through the combustion of fossil fuels, nuclear reactions, or other energy sources. which is then transmitted to customers through a power grid. Different nations meet their electricity needs from a combination of different types of power plants. The below chart shows the electricity generation in India across different power plants in the year 2018. There are several types of power plants that generate electricity using various sources such as fossil fuels, nuclear energy, hydroelectricity, and renewable sources like solar and wind. Some common types include coal-fired, gas-fired, nuclear, hydroelectric, geothermal, biomass, and solar power plants. Each type has its advantages and disadvantages, and the choice depends on several factors such as cost, location, and availability of resources.

1.2 Thermal Power Plant

A thermal power Plant is a power station that uses heat energy to produce electricity. The heat source in a thermal power plant can be the burning of fossil fuels such as coal, natural gas, or oil, or from nuclear reactions in a nuclear power plant. In general, the heat energy is used to produce steam, which drives a turbine connected to a generator to produce electricity. The steam is then cooled, typically in a cooling tower or by exchanging heat with a large body of water, and the process is repeated. Steam is condensed in a condenser and then sent back into the boiler after going through the steam turbine.

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.

Nomenclature

MT Medium temperature

Wall Thk Wall thickness

Air CL Air cooling

CL Air Cooling of Air

CT. Current time

Eff WF. Wind mill efficiency

Vol de Voltage decrement

Con Temp Temperature of Condenser .

Cool-WD = Cooling rate of wall and drum

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.

Nearness to the load centre: The power plant should be as near as possible to the load centre to the centre of load .So that the transmission cost and losses are minimum. This factor is most important when Dc supply system is adopted. However in the case of AC supply when transformation of energy from lower voltage to higher voltage and vice versa is possible power plants can be erected at places other than that of load provided other conditions are favourable. Boiler needs large amount of coal and generates pollution by combustion of coal. ESP is used to minimise the pollution by removing oxides of various poisonous gases. As new techno power tools helps engineers to protect environment from the unwanted particle.

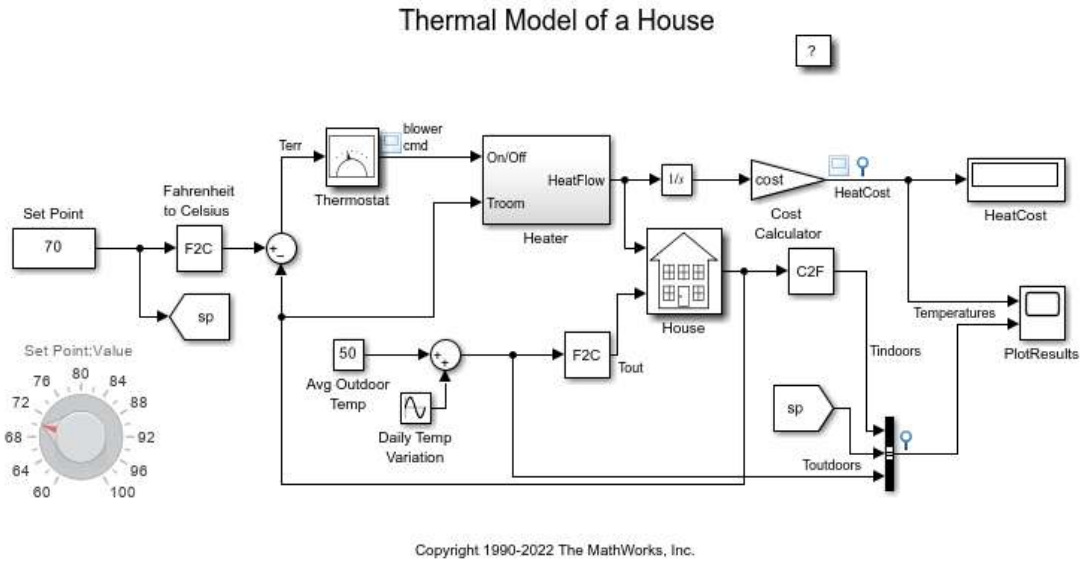

Figure 1 Layout of TPPE.

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.

Thermal energy is the major source of power generation in India. More than 60% of electric power is produced by steam plants in India. India has large deposit of coal (about 170 billion tonnes), 5th largest in world. Indian coals are classified as A-G grade coals.

➢ In Steam power plants, the heat of combustion of fossil fuels is utilized by the boilers to raise steam at high pressure and temperature. The steam so produced is used in driving the steam turbines or sometimes steam engines couples to generators and thus in generating electrical energy.

➢ Steam turbines or steam engines used in steam power plants not only act as prime movers but also as drives for auxiliary equipment, such as pumps, stokers fans etc.

➢ Steam power plants may be installed either to generate electrical energy only or generate electrical energy along with generation of steam for industrial purposes such as in paper mills, textile mills, sugar mills and refineries, chemical works, plastic manufacture, food manufacture etc.

➢ The steam for process purposes is extracted from a certain section of turbine and the remaining steam is allowed to expand in the turbine. Alternatively the exhaust steam may be used for process purposes.

➢ Thermal stations can be private industrial plants and central station.

Thermal power stations are mainly used in India as coal is available but issue is that thermal power plant has lower efficiency compare to Nuclear power plant. Nuclear power plant requires large amount of Thorium, Uranium and other Isotopes. India is trying to make various Isotopes to run Nuclear power plant because this plant has less maintenance.

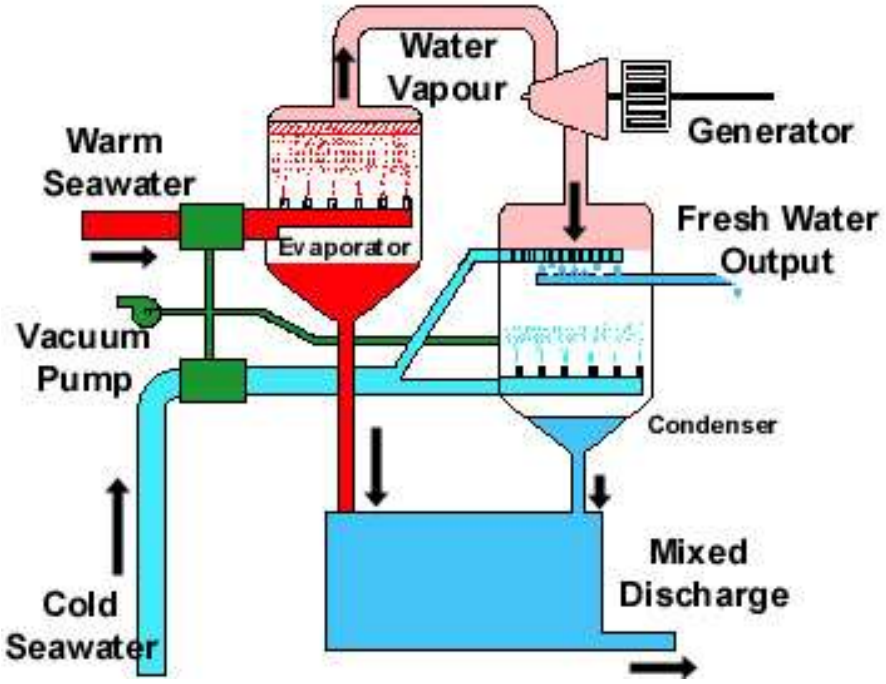

Figure 2 Open cycle OTEC system

Open cycle OTEC starts by flash evaporating the warm seawater in a partial vacuum, of pressures around 1% to 3% of the atmosphere. [2] Then the expansion of the steam through the turbine generates the electricity after which the vapor condenses as it contacts the cold seawater. [2] Finally, any condensate and residual noncondensable gas is compressed and discharged. [2] The reason this process is called open cycle OTEC is due to the discharge of the steam after only one pass through the cycle. [2] The majority of the parasitic power consumption comes from the initial evacuation of the system and other operations performed by the vacuum compressor along with the seawater and discharge pumps. [2] There are two different types of condensers that can be implemented into the open cycle OTEC design,direct contact condenser (DCC) and surface condenser. The DCC is responsible for dispensing cold seawater over the water vapor and is inexpensive and efficient due to the direct contact between the different temperature fluids. [2] The surface condenser is more expensive and harder to maintain since it operates using a physical separator between the warm and cold water, but the byproduct it produces is fresh water. [2] Some of the disadvantages of open cycle OTEC systems is that operating at partial vacuum conditions is vulnerable to "air-in-leakages" and promotes the production of noncondensable gases. [2] As a result, some power is consumed to pressurize and remove these gases. [2] Furthermore, the low steam density requires a larger volumetric flow rate to produce a unit of electricity. [2] Let's now calculate the seawater flow rate (Q) for the 255kW open cycle OTEC plant in Hawaii that is operated by PICHTR.

3. Open cycle MHD system

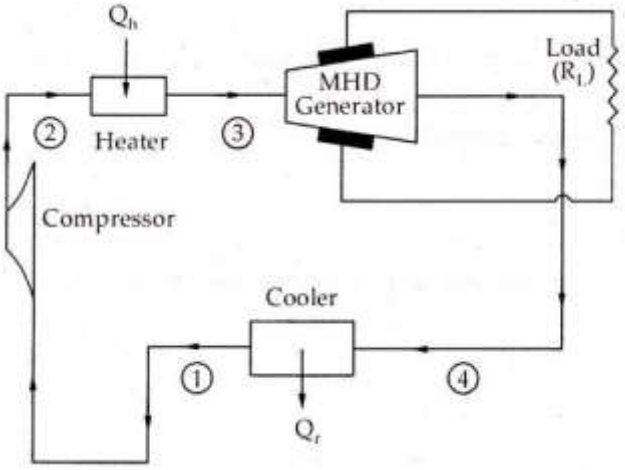

Fig. 3 Working of Open cycle MHD

The atmospheric air is compressed to a high pressure in an air compressor. Thereafter, compressed air is heated in the low temperature and high-temperature air preheaters up to a temperature of about 1100oC and fed to the combustion chamber. The fuel is burnt in the presence of hot air in the combustor. The hot gases so produced are seeded with 1% alkaline potassium to increase the electrical conductivity of the gases.To increase the velocity of hot gases, they are passed through a nozzle. These high velocity and high temperature (about 2300oC to 2700oC) gases are fed to the MHD duct. Here, some part of the internal energy of the gas (plasma) is directly converted into DC power. The exhausted gases from MHD duct are used in air preheater to heat the air. Then these gases are used to produce steam from feed water in a heat exchanger (steam generator).The surplus heat of the gas is used for heating the compressed air in the low-temperature preheater. Hot gases then pass through a seed recovering unit (electrostatic precipitator). This unit removes seeded alkaline potassium from gases. The clean hot gases are expelled to the atmosphere through the chimney. In some systems, they can be recycled by compressing again.

Conclusion

It is predicted that in the year 2040, the world will consume 820 quadrillion Btu of energy. [1] More renewable energy methods will have to be integrated into our society in order to meet energy needs as our supply of fossil fuels runs out. Ocean thermal energy conversion is one method for producing renewable energy. A common concern with developing OTEC is the impact on the environment. For smaller scale OTEC plants, reports by the NOAA have concluded that the environmental impact is small but that there is not enough evidence to determine the magnitude of the environmental impact from commercial OTEC plants. [3] More information on the environmental impact of OTEC will be discovered once more large scale OTEC plants are operational. As seen in Fig. 1, OTEC is not just a great way to produce electrical energy but can also be used to desalinate seawater, provide cold water for air conditioning and irrigation, as well as provide nutrient rich water for mariculture.

Acknowledgements

We are thankful to of Team members and staff of our Institute for helping us in this article. The team member of other team also helped us for the preparation of the paper and guided us about the same. There is also a great support from the various lab assistants from the Institute and other technical staff for this paper publication work.

References

1] Drbal, L., Westra, K., & Boston, P. (Eds.) 2012 Power plant engineering. Springer Science & Business Media

[2] Messerle, H. K., & Messerle, H. K. 1995 Magnetohydrodynamic electrical power generation. Chichester, UK: Wiley.

[3] Hong, C.-S., & Lee, E.-B. (2018b). Power Plant Economic Analysis: MaximizingLifecycle Profitability by Simulating PreliminaryDesign Solutions of Steam-Cycle Conditions. Energies, 11(9), 1–21. https://doi.org/10.3390/en11092245

[4] Albright, L., Angenent, L., & Vanek, F. (2015). Stationary Combustion Systems. In Energy Systems Engineering (2nd ed., pp. 161–167). McGraw Hill..

[5] William D. Jackson and G. Ralph Strohl 2016 Encyclopædia Britannica, Encyclopædia Britannica, inc., Date Published: March 21, URL: https://www.britannica.com/technology/magnetohydrodynamic-power-generator, Access Date: Sept. 08, 2020

[6] K L Xu, Y H Xiong, H 2015 Pan Reheat Pressure and Feed-water Enthalpy Rise Optimization of Double Reheat Unit Turbine Technology vol 57 chapter 10 pp 371-373

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

[8] D. K. Yadao, Thermal Engineering, Khanna Publishers, Dehli, India, 1999

[9] Rosa, R. J., Krueger, C. H., & Shioda, S. 1991 Plasmas in MHD power generation. IEEE transactions on plasma science 19(6) pp 1180-1190.