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THERMAL POWER PLANT

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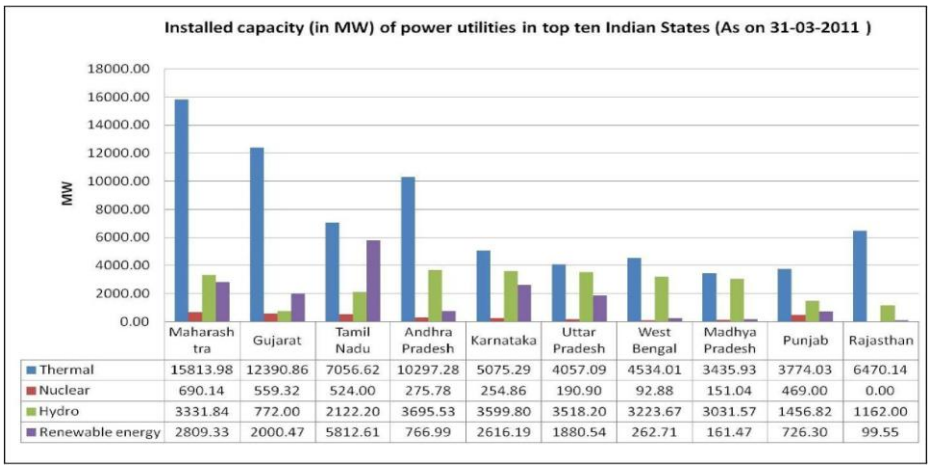
ABSTRACT

A thermal power plant comprises a thermal prime mover and a supercharged gas generator for generating producer gas from coal which, following separation of fly ash and sulphur, serves as fuel for the power plant. A charging group for the gas generator consists of coupled air compressor and gas turbine units, the compressor unit providing compressed air for operating the supercharged gas generator and the gas turbine unit being driven by unburned producer gas from the output of the supercharged gas generator, and a dry dust collector for the fly ash is incorporated in the flow path of the producer gas either ahead of the charging gas turbine or just after the first row of its moving blading. In order to also remove the sulphur content from the producer gas, an injector for a reagent which chemically binds the sulphur is provided in the flow path of the producer gas between the supercharged gas generator and the dry dust collector whereby the chemically bound sulphur is then removed from the producer gas together with the fly ash in the dry dust collector.

I. INTRODUCTION

A thermal power plant converts heat energy of coal into electrical energy. Coal is burnt in a boiler which converts water into steam. The expansion of steam in turbine produce mechanical power which derive the alternator coupled to the turbine. Thermal power plants contribute maximum to the generation of power for any country. Thermal power plant constitute 75.43% of total installed captive or non captive power generation in India. In thermal generating station coal, oil, natural gas, etc. Are employed as primary source of energy.

II. TOC GRAPHICS OF POWER STATIONS



	Maharashtra	Gujarat	Tamil Nadu	Andhra Pradesh	Karnataka	Uttar Pradesh	West Bengal	Madhya Pradesh	Punjab	Rajasthan
Thermal	15813.98	12390.86	7056.62	10297.28	5075.29	4057.09	4534.01	3435.93	3774.03	6470.14
Nuclear	690.14	559.32	524.00	275.78	254.86	190.90	92.88	151.04	469.00	0.00
Hydro	3331.84	772.00	2122.20	3695.53	3599.80	3518.20	3223.67	3031.57	1456.82	1162.00
Renewable energy	2809.33	2000.47	5812.61	766.99	2616.19	1880.54	262.71	161.47	726.30	99.55

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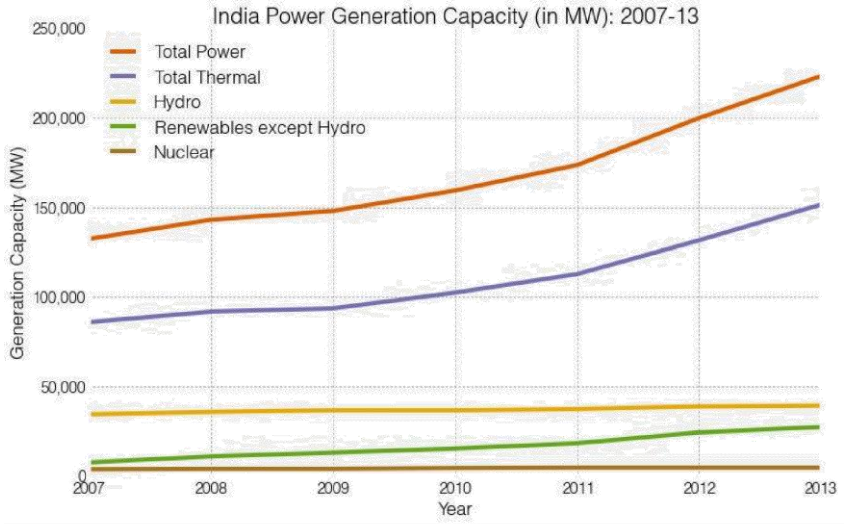

III. WORKING OF A THERMAL POWER PLANT COAL

In a coal based thermal power plant coal is transported from coalmines to the generating station. Generally, lignite, bituminous coal or brown coal is used as fuel. The coal is stored in either 'dead storage' or in 'live storage'. Dead storage is generally 40 days backup coal storage which used when coal supply is unavailable. Live storage is a raw coal bunker in boiler house. The coal is cleaned in a magnetic cleaner to filter out if any. Iron particles are present which may cause wear and tear in the equipment. The coal from live storage is first crushed in small particles and then taken into pulverizer to make it in powdered form. Fine powdered coal undergoes complete combustion, and thus pulverized coal improves efficiency of the boiler. The ash produced after the combustion of coal is taken out of the boiler furnace and then properly disposed. Periodic removal of ash from the boiler furnace is necessary for the proper combustion.

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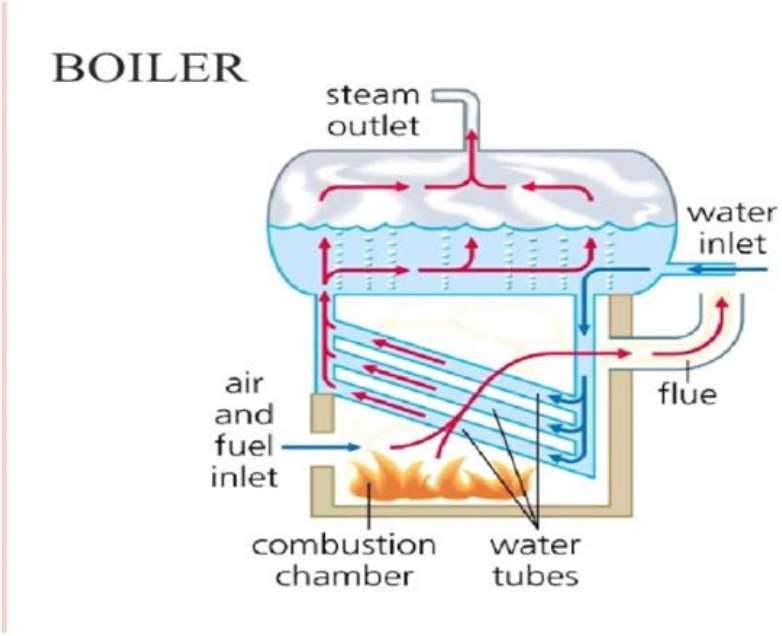
VI. BOILER

The mixture of pulverized coal and air (usually preheated air) is taken into boiler and then burnt in the combustion zone. On ignition of fuel a large fireball is formed at the center of the boiler and large amount of heat energy is Radiated from it. The heat energy is utilized to convert the water into steam at high temperature and pressure. Steel tubes run along the boiler walls in which water is converted in steam. The flue gases from the boiler make their way through super heater, economizer, air preheater and finally get exhausted to the atmosphere from the chimney.



V. STEAM TURBINE

High pressure superheated steam is fed to the steam turbine which causes turbine blades to rotate. Energy in the steam is converted into mechanical energy in the steam turbine which acts as the prime mover. The pressure and temperature of the steam falls to a lower value and it expands in volume as it passes through the turbine. The expanded low pressure steam is exhausted in the condenser

VI.CONDENSER

The exhausted steam is condensed in the condenser by means of cold water circulation. Here, the steam loses it's pressure as well as temperature and it is converted back into water. Condensing is essential because, compressing a fluid which is in gaseous state requires a huge amount of energy with respect to the energy required in compressing liquid. Thus condensing increases efficiency of the cycle.

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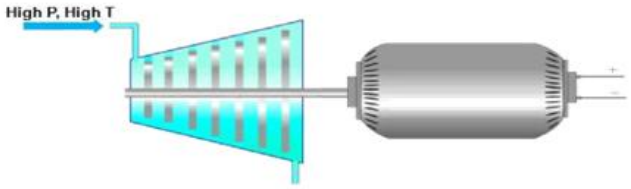
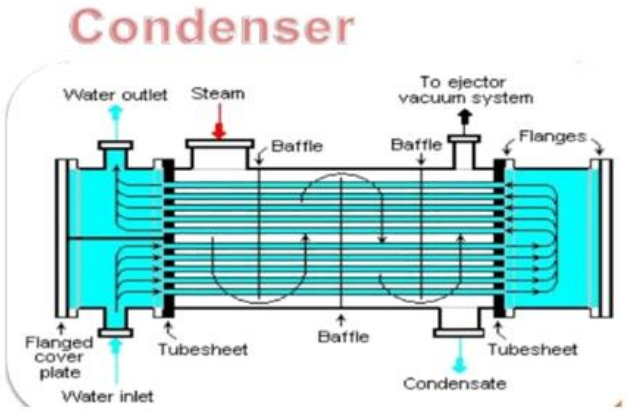




VII. SUPERHEATER

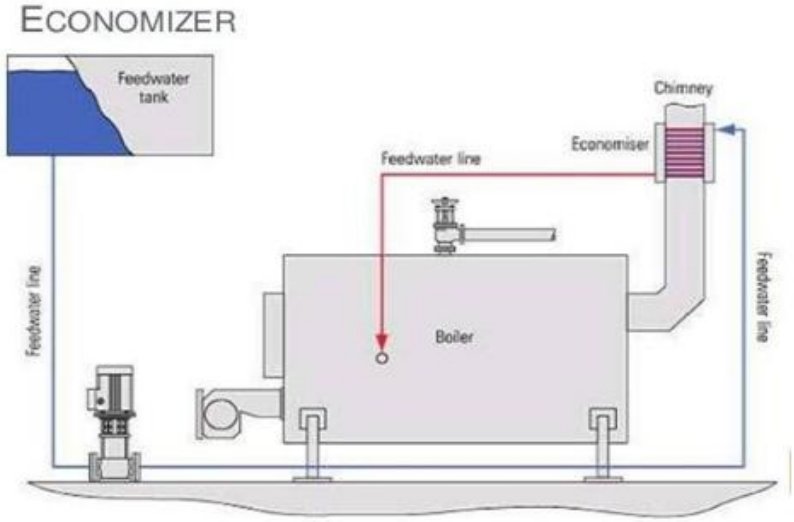
The super heater tubes are hanged at the hottest part of the boiler. The saturated steam produced in the boiler tubes is superheated to about 540 °C in the super heater. The super heated high pressure steam is then fed to the steam turbine.

VIII. AIR PRE-HEATER

The primary air fan takes air from the atmosphere and it is then warmed in the air pre-heater. Pre-heated air is injected with coal in the boiler. The advantage of pre-heating the air is that it improves the coal combustion.

IX. ECONOMIZER

flue gases coming out of the boiler carry out lot of heat. An economizer extract a part of this heat from flue gases and use it for heating feed water and save coal consumption.



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X.COOLING TOWERS & PONDS

• A condenser needs huge quantity of water to condensed the steam.

•Typically a 2000 MW plant needs about 15000 gallon of water.

•Most plant use a closed cooling system where warm water coming from condenser is cooled and reused and in a small plants use spray ponds.

•Height of cooling tower is 150m and diameter of base is150m.

XI.CONCLUSION

Thermal power plant are industrial goods that produce electricity. Moreover, these plants are important to customers and are presumed to have a service life of greater than 20 years. Accordingly, the reliability of a power plant is considered most important followed by the sale service and economic efficiency. As demand the for electrical power increases throughout the world.

REFERENCE

- Online material related to thermal corporation of India.
- Report on environmental health, safety guidelines from thermal power plant.