**TPP Report – PS1**

**By- Mudit Srivastava**

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**Basics of TPP**

A thermal power station may be a power plant during which the first cause is steam driven. Water is heated, turns into steam and spins a turbine which drives an electrical generator. After it passes through the turbine, the steam is condensed during a condenser and recycled to where it had been heated. The greatest variation within the design of thermal power stations is thanks to the various fuel sources. A large a part of human CO2 emissions comes from fossil fuelled thermal power plants continuous efforts are being made to scale back these.

Despite of the disadvantages thermal power plant has its own advantages i.e. its maintenance is easier, since coal is the main fuel and is quite cheaper than petroleum products so the generation cost is less, less requirements for a good location. A coal based thermal power station converts the energy of the coal into electricity. This is achieved by raising the steam within the boilers, expanding it through the turbine and coupling the turbines to the generators which converts energy into electricity.

**Rankine Cycle**

Rankine cycle is the theoretical cycle on which steam power plant works. It is a liquid vapour cycle. There are two variations of Rankine cycle namely the Reheat cycle and the Regeneration cycle. As the name suggests in reheat cycle the steam is heated twice which leads to an increase in the temperature at which heat is added and keeps the boiler hot which further in1creases the efficiency off the cycle. In case of regenerative cycle feed water is heated from the recent well of condenser by interchange of heat within the system thus improving the efficiency of the system.

**Efficiency**

Efficiency of a thermal power plant is calculated as the ratio of heat equivalent of electric power generated to the heat produced due to fuel combustion. The efficiency of a typical power plant is generally low b/w 20-30 %.

**Study of Report Analysis**

The plant used in Vikram Cement Works consists of the following major equipments i.e. Boilers, Turbines and Distributed Control System. Fuel which is used is a specific combination of Pet coke from Reliance and Saudi , Indian Coal and lignite.

Before a detailed study was conducted a report for current performance was made to notice the changes in the performance after the improvements were suggested by ABB were followed. Plant performance was then recorded for 2 different units of the plant. The improvements were the same as implemented in Rajshri Cement Works. After implementing suggested improvements about 14 benefits were experienced.

They were :

1. Avoid the need of frequent etuning to manual mode
2. Better combustion
3. Electrical Energy saving
4. Improvement in boiler efficiency
5. Reduction in excess Oxygen consumption, etc.

**Modern Technology**

Thermal Power is the main source of electricity generation in India. It stands at 230.6 GW out of which 198.5 is from coal alone. According to the new standards thermal power plants are expected to cut emissions and usage of water measurably. It is not clear what the penalties for failure might be, especially in the short-run. One of the biggest challenges in the thermal power sector is variance. The coal power plants vary in age, technology, size, location, ownership, load factor, etc. The Hirono No. 5 Thermal Power Station of Tokyo Electric Power Company is a coal-fired thermal power plant has adopted the ultra-super critical (USC) conditions of 24.5 MPa × 600/600°C, the highest level in the world. This coal-fired thermal power plant has the efficiency of 43% at generator terminal.

**APC : Automatic Process Control**

Today’s power plants are highly automated. All subsystems of large thermal power plants can be controlled from a central control room. One subsystems area is the electrical auxiliaries for the unit transformer, the grid connection, excitation, synchronization, generator/unit protection, auxiliary transformers. To this day, horizontal communication between electrical devices is still hardwired. Traditional power plant control systems focus on controlling the process operation of the power plant. The power plant control system controls the different processes to achieve maximum power output at lowest operational cost. In the past, these electrical devices were all hardwired to the DCS and I/O’s. With the introduction of intelligent electronic devices (IEDs) in the auxiliary power system and the generator auxiliary systems, these systems provide much more information, which can be utilized for cost efficient operation and maintenance.

Today’s modern technology-based power plant control systems allow integrating both process and electrical control into one consistent system providing a couple of benefits to generation companies:

* One user interface
* Access to all data from screens
* Data recording and archiving
* Lower training cost
* System administration
* System security, etc..

With benefits it has its own requirements which needs to be fulfilled

* Monitoring
* Manual Operation
* Automatic Operation
* Recording
* Plant wise sequence of events
* Asset Management
* Engineering, etc..

**Source: Available links and pdfs on google.**