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PERFORMANCE OPERATION ANALYSIS DIAGONIS AND OPTIMIZATION OF 210MW BOILER FEED PUMP

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Abstract

Power generation plays a vital role in the development of the nation. In India the gap between power demand and power supply is always increasing. Even through the total installed capacity of power generation viz. thermal, hydel, gas turbine, nuclear and wind mill etc., is more, the demand could not be met out due to many reasons such as transmission loss, inefficient management, poor planning, theft of energy, unit outages etc.

In India major portion of the power demand is met out by thermal power generating stations. Hence the thermal power stations should function effectively and efficiently for uninterrupted and adequate power supply.

The detailed study on the performance of main equipments and auxiliary equipments should be carried out and optimized for the efficient and effective operations of the unit. The Boiler Feed Pump is the major power consuming equipment in the thermal power stations. Hence a study on the performance and optimization of Boiler Feed Pump is most important to reduce the auxiliary power consumption and to keep continuous running of units with out any forced outages of pump. All the above factors led to conduct a study on the performance of the boiler feed pump and its optimization in 210MW Thermal Power Station at mettur Dam.

Keywords: Power generation; Boiler Feed Pump; Analysis of feed Pump.

1. Introduction

PUMPS

Pumps are the devices for transferring quantity of liquid from one place to another. In a thermal power station its main purpose is to pump oil and water.

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Classification of pumps

Reciprocating pump

1. Axial design piston pump-high pressure/low pressure bypass system oil supply unit.
2. Radial design piston pump.
3. Bent axis piston pump.
4. Swash plate piston pump.

Positive displacement pump

1. Centrifugal pump
2. Gear pump
3. Lope pump
4. Screw pump

APPLICATION OF PUMPS

1. Thermal power plants
2. Nuclear power plants
3. Oil and gas industry
4. Paper, sugar, cement plants
5. Marine industry
6. Waste supply
7. Agricultural purpose
8. Desalination industry

VARIOUS PUMPS USED IN THERMAL POWER PLANT

Centrifugal pump

- Boiler feed pump
- Condensate extraction pump
- Cooling water pump
- Stand by lube oil pump
- Emergency lube oil pumps

Gear pump

- BFP lube oil pump
- Heater drip pump centrifugal

Screw pump

- Jacking oil pump

Reciprocating pump

- Phosphate dozing pump
- Hydrogen dozing pump

Lobe pump

- Turbine clean oil tank pump

APPLICATION OF PUMPS IN THERMAL POWER STATION

1. Boiler Feed Pump is used for pumping the hot feed water from feed water tank to boiler drum through high- pressure heaters and economizer.

2. Condenser extraction pump for pumping condensate from condenser hot well to the feed water tank through low-pressure heaters, main ejectors gland steam coolers, vent condenser and Dearator.

3. Cooling water pumps for circulating cooling water from cooling water fore bay to the condenser tubes for condensing the steam and then to cooling tower.

4. Starting oil pump for governing of turbine during start up of the turbine.

5. Emergency oil pump for the lubrication of turbine bearings during emergencies.

6. Gear pump for the lubrication of boiler feed pump bearings.

7. Main oil pump for governing of turbine, supply of lubricating oil and sealing oil for hydrogen sealing in generator.

8. Reciprocating pumps are used for dozing chemical viz hydrogen, phosphate to the boiler.

2. LITERATURE REVIEW

Hu Si-ke etal 2011 was discovered According to the characteristics of utility-type generator set in variable load sliding-pressure operation, the paper comprehensively analyzes the features of feed-water system, in which variable-speed main feed-water and power frequency booster-pump connect first in series and then in parallel. It puts emphasis on fitting characteristics equation of feed-water pump under different operations, determining characteristics of feed-water pipeline under sliding-pressure operation, corresponding resistance coefficient, and finally deducing the equation of lift, efficiency and rotating speed when different loads and different sliding-pressures are adapted only by main feed-water pump variable speed adjusting. It takes one power plant 600MW supercritical unit for example to compare the energy consumption of different operation modes, and thus puts

forward a more suitable operation mode under different loads, providing theoretical basis for the practical application of project.

M H Rashid etal 2012 was found according to The report addresses the real-time condition monitoring of technical state and automatic diagnosis of auxiliary equipment for bearings supports vibration, for example, control of the feed-pump operating modes of thermal power stations. The causes that lead to premature birth and development of defects in rolling bearings are identified and the development of activities ensuring safe and continuous operation of the auxiliary equipment of thermal power stations is carried out. Collection and analysis of vibration parameters of pumping units during their operation at the operating modes of the technological process are realized by means of real-time technical condition monitoring. Spectral analysis of vibration parameters of one of the pumps showed the presence of frequency components, which mark violations in the operating practices of the pump, the imbalance development and, as a consequence, the development of defects in the bearings by long-term operation of the unit. Timely warning of the personnel on the operation of the unit with the "INTOLERABLE" technical state and automatic warning issuance of the need to change the technological process allowed torecover the estimated pump operation mode in due time and prevent further development of defects in equipment.

V N Kostyukov etal 2013 was found according to For all accelerators and many research and industries, excellent vacuum conditions are required and the highest possible pumping rates are necessary. For most applications the standard ion sputtering pump (ISP) meets these requirements and is optimal for financial point of view also. The physical principle of the ISP is well known and many companies manufacture variety of ISP. Most of them use dipole magnetic field produced by permanent magnet and electric dipole field between the electrodes in which tenuous plasma is created because of interaction of between the relatively fast electrons slow residual gas atoms. Performance of an ISP depends basically on the electron cloud density in between the titanium electrodes but in the available present configurations no consideration has been given to electron confinement which needs a mirror magnetic field. If this is incorporated it will make a robust ISP surely; furthermore, the requirement of constant feeding of high voltage to electrodes for supplying sufficient number of electrons will be reduced too. A study has been performed

Comparing the current performance of BFP with the text data. The present performance is found to be good. The pump efficiency is maximum at rated output of 400T/hr. the requirement of feed water is mostly at the rate of 350T/hr per feed pump and a total of 700T/hr.

Occasionally the unit requires 400T/hr during the emergencies only.

Hence the same available pump can also be used if the unit capacity is up rated to some extent.

BOILER FEED PUMP MAJOR PROBLEMS AND REMEDIES:

S.NO	Problems	Causes	Remedies
1	Inadequate discharge flow.	1.Suction strainer choking. 2. Worn out wearing rings of BFBP/BFP	1.Cleaning of suction strainer 2.Overhauling of BFBP/BFP
2	Failure of mechanical seal	Worn out seal parts	Replacement of seals

3	Cooler puncture	Cooler tube puncture	Plugging of punctured tube/replacement of tube nest
4	High vibration	1.Misalignment. 2.Bearing loosenes	1.Realignment 2.Tightening the bolts

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3. SUGGESTIONS FOR OPTIMIZED PERFORMANCE

Boiler feed pump:

Periodical overhauling of catridge as per recommended service hours of 40,000 will result in less power consumption and it will also avoid failure of catridges.

Boiler feed booster pump:

Periodical overhauling of boiler feed booster pump as now being carried out is sufficient. This will improve the performance of pump.

Hydraulic coupling:

Since much trouble is not noticed in hydraulic coupling, the periodical overhauling procedure now carried out is sufficient.

Mechanical seals:

The service hours of mechanical seals vary with make and based on different operating conditions of pump. The seals which served long period of service should be inspected and replaced during annual overhaul of unit to avoid failure of seals during unwanted time.

Lube oil and working oil coolers:

The lube oil cooler and working oil cooler tubes are now being replaced by the cupro nickel tubes from the existing admiralty brass tubes. This will improve the performance of cooler and also frequent puncture of tubes will be reduced. At present the rectification work of attending tube puncture in coolers takes half a day due to congested

layout of cooling water return lines. If the cooling water return line lay out is modified, it will be easier to attend tube puncture work within short time.

Reducing oil consumption:

At present an average of 3 barrels of lubricating oil, servo torque 10,is consumed per pump annually. Avoiding oil leakage through oil glands and oil coolers can further reduce this consumption. Whenever the mechanical seal failure occurs, the total oil is replaced due to mixing of water with oil. Replacement of mechanical seals before failure will reduce consumption of lube oil.

4. CONCLUSION

A detailed study on the Boiler Feed Pump type FK 6D30 in Mettur power station was carried out in this project titled ‘’Performance, Operation Analysis, Diagnosis and Optimization in 210MW Boiler Feed Pump’’.

The performance of 2 pumps was compared with the test data supplied by the original equipments manufactures and found to be almost same.

The study reveals that power consumption of BFP can be reduced by periodical overhauling of BFP cartridge.

A close monitoring of mechanical seals and oil coolers will reduce oil consumption and more availability of pump.

The optimized performance of boiler feed pump can be attained by continuous monitoring of parameter periodical and preventive maintenance of BFP and its auxiliary equipments.

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