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# POWER PLANT MAINTENANCE INNOVATIONS AND BEST PRACTICES IN CHADRAPUR SUPER THERMAL POWER STATION

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#### ABSTRACT:

The primary goal of the paper was to understand the critical role of electrical maintenance in ensuring the reliability, safety, and efficiency of thermal power plant operations. Through direct exposure to maintenance schedules, fault analysis, equipment handling, and system diagnostics, the internship provided valuable insights into both conventional procedures and emerging technological advancements. This paper highlights various innovative maintenance techniques, including condition-based monitoring, thermography, and automation, which contribute to minimizing downtime and enhancing system performance. It also discusses best practices such as preventive maintenance planning, safety protocols, and energy efficiency measures that align with industry standards.

#### Introduction

The reliable and uninterrupted generation of electricity is the backbone of modern society. Powerplants, as critical infrastructure, require meticulous maintenance to ensure operational efficiency, safety, and sustainability. Electrical maintenance plays a pivotal role in this process by preventing failures, enhancing system reliability, and improving overall plant performance.

The primary objective of this paper is to gain hands-on experience and practical insights into the procedures, challenges, and technological advancements involved in the electrical maintenance of large-scale thermal power units. During this period, emphasis was placed not only on routine and preventive maintenance tasks but also on exploring **innovative techniques** and **best practices** that contribute to the efficiency, safety, and longevity of plant operations.

# Power Plant Electrical Maintenance: Innovations and Best Practices

The different types of maintenance work we observed during this period are noted below:

## BSDP 01 (Ash Slurry Disposal Pump - Series B Pump)

Preventive maintenance was carried out on the motor. In preventive maintenance of motors, the first step involves measuring the insulation resistance using a Megger. A Megger is a small, compact DC generator with a spinning shaft mechanism. When rotated, it generates high-voltage DC, which is passed through the motor windings and grounded to measure the insulation value of the winding. During this process, we found the readings to be within the acceptable range, and hence, the motor was declared to be in proper working condition.



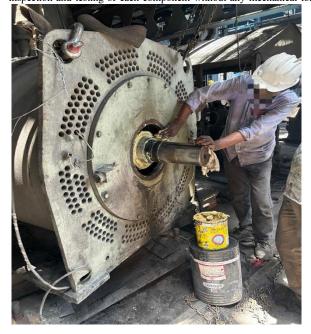
#### Circuit Breaker Maintenance and Repair:

One of the frequent and critical maintenance activities observed was the servicing and repair of circuit breakers. These devices play a vital role in managing electrical power flow, ensuring operational continuity, and providing protection to both equipment and personnel during electrical faults such as short circuits, overloads, or insulation



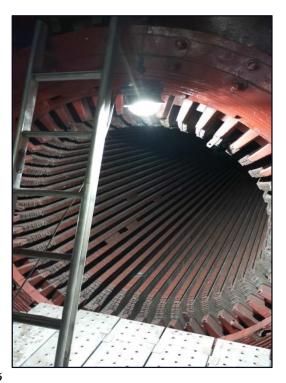
#### Coal Mill Maintenance and Decoupling Operation

Coal mill section of the plant, their important maintenance activity involving the decoupling of the motor from the gearbox unit. The coal mill plays a critical role in pulverizing raw coal into fine powder, which is then fed into the boiler for combustion. To ensure uninterrupted performance, routine maintenance of the drive system—including the motor, gearbox, and coupling—is essential. In this instance, abnormal noise and increased vibration levels were reported from one of the coal mills, indicating a potential misalignment or wear in the gearbox assembly. As a first step, the maintenance team performed a "decoupling" procedure — this involves physically disconnecting the motor shaft from the gearbox input shaft. Decoupling allows independent inspection and testing of each component without any mechanical load transfer.



#### Generator Overhaul and Stator Rotor Maintenance in Unit 9(Special Case)

The Unit 9 generator is a high-capacity, three-phase, synchronous generator directly coupled to the steamturbine



### Motor Driven Boiler Feed Pump: Unit 6

This pump is responsible for supplying high-pressure water to the boiler drum, making it an essential part of the feedwater system in a thermal power plant. The maintenance was part of the plant's regular schedule to ensure continued performance, reliability, and to avoid any unplanned downtime. The work began with isolating the BFP from the system and ensuring safety through standard lockout-tagout (LOTO) procedures.



#### Circuit Breaker Testing in Switchgear – Unit 5

SF<sub>6</sub> circuit breakers are commonly used in high-voltage power systems due to their superior arc- quenching and insulation properties. The testing activity was part of the plant's preventive maintenance plan to ensure the reliable operation of the breaker, which plays a critical role in protecting transformers, generators, and busbars from fault conditions.



Air Preheater of Unit 5 and Observation of SAC-Controlled Operation

The Air Preheater is a regenerative heat exchanger designed to recover heat from the boiler flue gas and use it to preheat the incoming combustion air. This significantly improves boiler efficiency, reduces fuel consumption, and minimizes thermal stress on the furnace. The APH in Unit 5 was a rotary-type regenerative air preheater. We observed its construction, which includes rotating baskets filled with heat-absorbing elements. These baskets slowly rotate between two air streams: hot flue gas and cold air. As the baskets rotate, they absorb heat from the outgoing flue gas and transfer it to the incoming air



Silica Gel Coal Mill - Unit7 (Ball Mill Type)



#### Conclusion:

Two special cases greatly enhanced our learning: the overhaul of the Boiler Condenser Water Pump (BCWP), where we witnessed insulation testing and mechanical reassembly; and a serious generator fault in Unit 9 caused by stator bar water leakage, leading to a Y-phase and later B-phase earth fault. The extensive repair work in Unit 9 highlighted the importance of timely diagnostics and the consequences of insulation failure in generator systems.

Beyond technical knowledge, the internship taught us the value of teamwork, discipline, and clear communication in an industrial environment. The support and guidance provided by senior engineers, junior engineers, and maintenance staff played a vital role in shaping our understanding and building confidence in applying our engineering knowledge in the field.

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