Quality Assured Maintenance Management
For
Coal Handling Plant.

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1.0 Abstract: -
Maintenance of coal handling plants (CHP) of thermal power stations has traditionally as the processes related to the performance of routine, unscheduled and emergency maintenance. It doesn't include operational factors such as scheduling, procedures, and work/systems control. The failures of equipments have led to high maintenance and operation costs. Developing Quality Assured Maintenance Management (QAMM) for CHP is very important for improving quality and reducing operating costs. This type of maintenance policy and strategy will improve performance of CHP through availability of equipment, reduction in railway costs through demurrage and further supplying constant flow of fuel to boiler to avoid failure of energy supply to consumers.
The concept of Quality Assured Maintenance Management (QAMM), discussed in this paper for Coal Handling Plant is to offer significant benefits. Guidelines for implementation of QAMM in CHP are also discussed in this paper.

2.0 Introduction: -
Almost all CHP these days implies Reactive Maintenance with some support of preventive maintenance. Generally repairs are made after the equipment is out of order and it cannot perform its normal function any longer. Under such condition, operation persons call on the maintenance persons to rectify the defect. The maintenance department checks the defects and makes the necessary repairs.
Maintenance is the coordinated integration of the operations, maintenance, engineering support, training, and administrative areas of any process in order to increase the efficiency, reliability, and safety of the process. Coal handling plant should be divided into five sections for QAMM.

- Unloading Units
- Feeding Units
- Crushing and Screening Units
- Stacking and Reclaiming Units
- Bunkers

3.0 Objectives of QAMM: -
Quality Assured Maintenance Management should have ability to provide assurances for reliability. The objectives of QAMM for CHP are given below.

- Prediction of impending failures of critical plant components like Crusher Rotors, Conveyor Pulley Shafts, in real time resulting in enhanced safety, operational reliability, availability, and maintainability.
- Establishing an alarm level based on the variations of a physical parameter like vibration, power consumption, temperature etc.
- Reduction of the life cycle cost by optimization of the plant operation and maintenance schedule.
- Facilitation of design revisions as new technologies of active control and structural materials evolve.

4.0 QAMM Implementations: -
Quality Assurance maintenance management, which meets the same requirements for Equipment Reliability, is demonstrated in the ISO 9001:2000 Standard [1]. The process is

managed through QMS, which is clear on PDCA as a process method. PDCA is Plan, Do, and Check Act. Most modern maintenance management activities are not linked to QMS, which have particular management characteristics. Using these characteristics transforms modern maintenance practice into what may be the next generation of maintenance management. See Figure No 1. The steps in implementing QAMM for CHP are

- Identify the maintenance work.
- Planned the maintenance work
- Scheduled the maintenance work
- Execute the work as per schedule and record it
- Analysis of maintenance record for implementation for further improvement.

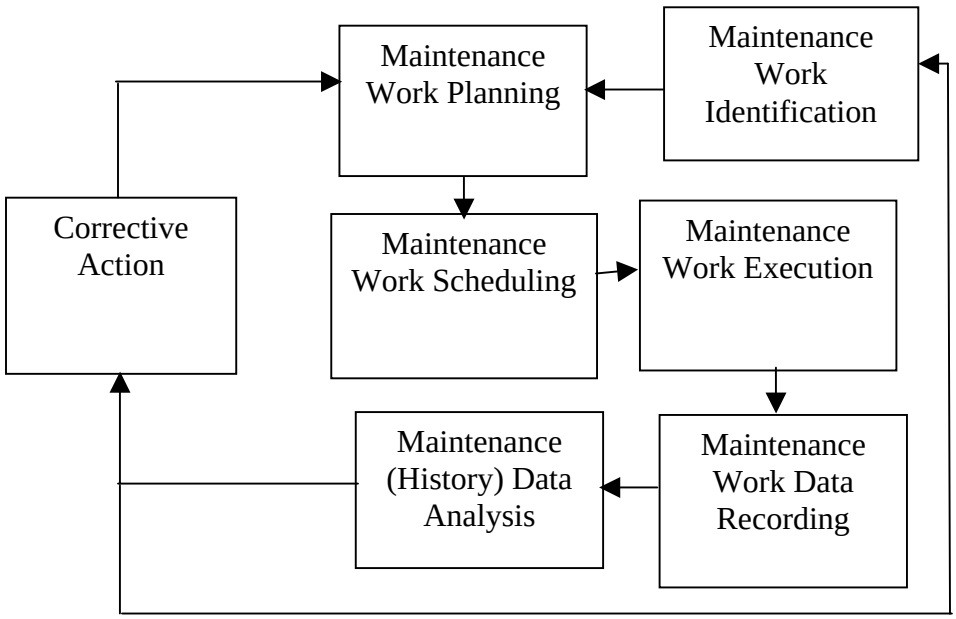

Figure No 1

4.1 <u>Maintenance Planning</u>: -

Maintenance Planning is the process of acquiring a system commencing with the identification of a need and involving the research, modification and evaluation activities. A detailed maintenance plan, which describes proposed echelons or levels of maintenance and recommended function to be performed at each echelon. The material presented under maintenance plan must cover

a) Definition of task: detailed tasks are identified to cover all acquisition function like research, modification and evaluation activities.
b) Scheduling of tasks: using Gantt chart, PERT chart, and CPM chart etc.

This planning include

a) A plan for the basic maintenance, which is built by the best combination of preventive, predictive and proactive maintenance.

b) A plan for the acquisition of test and support equipment and handling equipment.
c) A supply support plans to cover the acquisition of spares and repair parts.
d) A technical data plan to include system maintenance procedures i.e. servicing, inspection, calibration and overhaul instructions.
e) A personnel and training plan to cover system operator training and maintenance training.
f) A plan for Scheduled shutdowns should provide unique opportunities to a maintenance department not normally available during standard operation or even during short shutdown periods. Lost capacity can be restored to an overtaxed facility during an extended shutdown. Major equipment overhauls can be performed to help prevent future unscheduled shutdowns. Government mandated inspections and repairs could be accomplished during a shutdown, bringing a plant into better compliance.

4.1.1 Objective Of Maintenance Planing: -

A plant is a place, where men, materials, money, equipment, machinery, etc., are brought together for manufacturing products. Today in modern industry, equipment and machinery are a very important part of total productive effort that was the case years ago. Moreover, with the development of special purpose and sophisticated machines, equipment and machinery cost a lot more money and therefore their idle or downtime becomes more expensive. For this reasons, it is vitally important that the plant machinery should be properly maintained. The aggregate of direct and supporting actions that detect, preclude or mitigate the degradation of system or component functionality, or restore that function to an acceptable level of performance following failure. Coal handling plants Maintenance plan should be developed in order to maximize equipment availability and utilization by following points. [2]

- Adjusting planned maintenance start times due to changes in Railway schedules.
- Taking advantage of shift change over down time.
- Ensuring preventive maintenance on critical equipment is carried out.
- Ensuring equipment is available for maintenance when planned

Coal handling Plant Maintenance planners need enhanced skills in job planning (as distinct from job scheduling), and Maintenance Supervisors need enhanced skills in Leadership and Management, and that all Maintenance personnel need enhanced skills [3] in Failure Investigation and Analysis. In general terms, Maintenance management process can be considered as having seven phases, as shown in Figure No

This can be recognized as being similar to the familiar control loops, where plans are put in place, actions take place, and then the outputs are compared with the original plan and appropriate action taken.

4.2 Maintenance Scheduling: -

Scheduling is the function of coordinating all of the logistical issues around the issues regarding the execution phase of the work. This can also uncover some areas of planning deficiency, which needs to be captured.

Scheduling is best performed in a capacity-scheduling manner, whereby the following takes place. Most modern systems have the capacity to output data to spreadsheets or similar. This is where the majority of scheduling work needs to occur.

* Overhead labor hours such as safety and toolbox meetings, break times and training times are to be gathered, along with holidays and scheduled as standing works orders for future analysis of these.
* Hours for PM completion to be deduced form data. This focuses on ensuring the equipment is maintained to its best levels.
* Addition of corrective and approved improvement actions as dictated by the prioritization system and operations plan. These are to be Planned works orders only. A guide could be: Age of works orders against priority (As a measure of the priority systems effectiveness)

The combination of corrective, preventative and improvement work needs to total the levels set for planned / scheduled work. Although this does constitute the most effective use of labor and resources, there are advantages to planned/unscheduled works.

5.0 Development Of Maintenance System For QAMM: -

The combination of all these methods will develop a system for coal handling plant maintenance.

It is the activity that most determines the success. It can forecast with some degree of certainty that we will be able to achieve the schedules that we have established. This, in turn, has a direct impact on equipment availability, utilization, and operating and maintenance costs.

5.1 Basic Maintenance Program: -

In addition to preventive maintenance the predictive maintenance technology will be practical approaches to enhance solutions to maintenance problems. As this program is based upon the combination of two methods, it is desired to follow first preventive maintenance and then carry for predictive maintenance technology. But it is not sufficient for this type of plant, so it is required to follow up for proactive maintenance. See Figure No 2

5.1.1 Preventive Maintenance: -

A better method than reactive maintenance is to create a maintenance schedule based on plant data and breakdown history. The schedules are created for routine check and replacement of components whose lifetime is estimated over time based upon the life span of previous components of the similar type. The approach to preventive maintenance may become inefficient because some parts are no where near breaking but are replaced with new parts, although, they can still serve without problems.

The “mean” is to be defined for preventive maintenance this mean is decided after the data, which is received from maintenance history. Otherwise less mean time is costly and more mean time will be harmful. Much of the success of preventive maintenance is dependent upon inter-departmental relationships other wise mechanical department planned for same machine and other department like electrical testing, instrumentation &control, electrical maintenance will plan for other day. This will fail preventive maintenance schedule. Continuous feedback is required for improvement of preventive maintenance.

5.1.2 <u>Predictive Maintenance</u>: -

This system measures and detects the onset of a degradation mechanism thereby allowing casual stresses to be eliminated or controlled prior to any significant deterioration in the component physical state. Results indicate current and future functional capability.

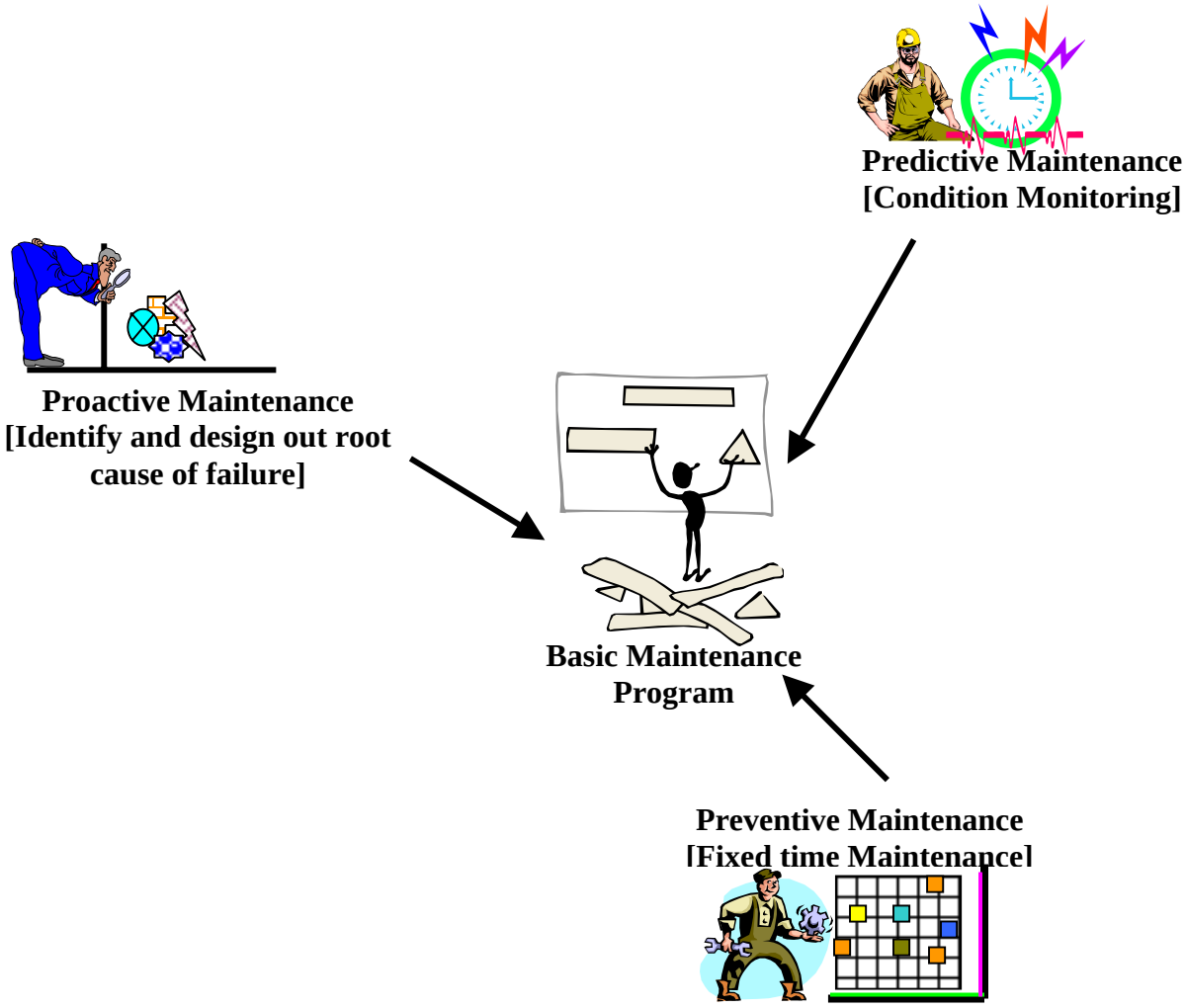

Figure No 2.1

5.1.3 <u>Proactive Maintenance</u>: -

Proactive Maintenance is based upon reliability criteria with priority given to the most critical components. It determine types of failures are likely to occur with focus on preventing failures whose consequences are likely to be serious.

It requires careful analysis of failure modes and effects. And identify effective maintenance tasks or mitigation strategies. This helps integration into the existing maintenance system.

6.0 Conclusions: -

By applying QAMM it will allows to plan shutdown before severe damage occurs and reduce reactive maintenance practice.

The transition to QAMM for CHP will require a substantial investment. The return on this investment will be dependent on the effectiveness of its implementation and the commitment of all personnel.

Effective use of QAMM offers will benefits in plant availability, optimized use of resources, reduced downtime, which reduce railway demurrage and further insure smooth and interrupt coal flow for boilers.

7.0 References: -

1 An article received on “Maintenance Management As a Quality Process” by Jeffrey Lewis President, QMS Consulting, Inc from website http:/www.maintenanceworld.com

2 A Conference Paper on “Optimizing Production Scheduling for Maximum Plant Utilization and Minimum Downtime. -The Reliability Revolution” presented at the Dollar Driven Mining Conference - Perth, Western Australia

3 “Maintenance Processes - A Framework for World Class Maintenance” an article received from electronic library of http:/www. maintenanceresource.com