



TPM IMPLEMENTATION ON CASE STUDY OF COAL WASHERY

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Abstract

This Paper aims to reduce unplanned stoppage, breakdowns accidents and losses obstructing equipment effectiveness. In most of Indian industries maintenance is considered as evil activity. Therefore by implementing TPM the industries can increase their equipment effectiveness and productivity. In BPSL coal washery we implement two pillars of TPM which makes differences.

Key Word:- TPM, Breakdown, Coal Washery.

Introduction

The concept of TPM in Industries is the critical missing concepts in successfully achieving not only world class equipment performance, but also it is a powerful new means in improving overall company performance. The present research mainly deals with the principles and concepts of Total Productive Maintenance based on literature review and assess the existing maintenance activities of the Bhushan Steel and Power Limited in line of TPM increase production while, at the same time, increasing

employee morale and job satisfaction. The dual goals of TPM are zero breakdowns and zero defects; This obviously improves Equipment efficiency rates and reduces costs. Generally the study will focus on assessing the existing maintenance system of the BSPL coal washery to investigate potential area of improvement so as to develop and implement the Total Productive Maintenance to the best achievement of the objective and the best performance of all the activities. John S.et.al The goal of TPM focuses on improving corporate culture through improvement of human resources and plant equipment. The Japan Institutes of Plant Maintenance (JIPM) has put forward the five goals of TPM which are the minimum requirements for the TPM development [1]. Venkatesh.J. Equipment effectiveness is a

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measure of the value added to production through equipment. This goal is to increase equipment effectiveness so each piece of equipment can be operated to its full potential and maintained at that level [2]. Statistical process control (SPC) has been proposed firstly by Dr. Shewhart in 1931 and then, many SPC charts have been developed and improved to use for different process data. In its basics form, a control chart compares process observations with a pair of control limits [5]. SPC is widely used to monitor, control and improve quality in many industrial processes [6].

Overall Equipment Efficiency (OEE)

OEE is a tool that combines multiple manufacturing issues and data points to provide information about the process. To measure of the production process (i.e., availability, performance and quality)—and used to measure actual improvements on 5S, Lean Manufacturing, TPM, Kaizen and Six Sigma. When using OEE with these management systems the benefits become tangible and noteworthy [2].

Problem Areas In BPSL coal washery-

The problem in Coal washery of BPSL is loss of production due to unplanned failure of machines due to which the costing of spares are also increases ,if the production is low and spares parts consumption is high the the spares consumed per MT of production will increase. There is also many operation faults due to less

dedication by operators and employees .some loss of production found due to careless of operators. The spares quality will also effecting due to which continuous failure of some spares parts of machine occurs due to which maintenance time increased and down time also increasing. the capacity of Coal washery is 600 tph but production of plant doesn't achieving the target of production's planned work order for coal washery 18hrs /day is for production and 6hrs/day is for maintenance .but according to this in month 18 hrs/day then 540 to 558 hrs plant should have to run as planned but plant is not running as planned production hrs and also loss of production found due to production under capacity.

Over All effectiveness of BPSL coal washery is low as calculated by collected data of month August 2013-

$OEE=0.85*0.826*0.82=0.57*100=57\%$. Very low and needs immediate improvement.

Costing report of month April (2013) 42.23 Rs/tonnes as shown in report collected from Coal washery Heavy Media cyclone. According to this report the Spare consumption costing **17.38 Rs/tones**, which shows the low production high breakdowns of spares.

Production of month August -131900 Mt and target of that month was 250000 Mt which shows that the target is not achieved and low production ineffective manpower.



Fig. 1 Coal Washery

Objective of the Paper

The general objectives of the paper are:

- To assess the existing maintenance system of the company to identify the problem and the key potential area for the improvement of the system.
- To provide better maintenance system along with its implementation model for the company by developing the implementation of the Total Productive Maintenance.
- Critically examine and investigate the problems of the existing maintenance system.
- Identifying the causes of the existing problems.
- To propose developed maintenance system and implementation model for the company.

Methodology implementation of two pillars in six levels

Level One Implementation of two pillars of TPM

The following activities of the selected pillars of TPM are carried out in this level

1) Autonomous Maintenance Activity

- Provide basic training to operators of the industry about safety, and equipment structure and functions of machines such as weaving, raising and stitching beam winder.
- Make cleaning plan for each parts of the above mentioned machines.
- Removing unnecessary articles around the above machineries of the industry
- The initial clean up include fiber dust, oil, etc. and has to be removed and minor defects of the machineries should be detected by touching for example the belt and other components of coal washery.

2) Planned Maintenance Activity

- Executing operation of the selected model equipment from each department.
- Running of the selected machine.
- Developing the early discovery of interior situation and rapid report remedy system of the machine.
- Executing breakdown maintenance system

- Performing to restore the unplanned failure of the selected machine.
- Identifying frequently observed unplanned breakdown of the machine.
- Identify equipment where frequent breakdown occur and carried out like gripper head and belt.
- Determine and track the frequency of the unplanned failure.

Level 2 Implementation of 2 pillars of TPM

1) Autonomous Maintenance Activity

In this step hard to access area should be improved and causes of forced deterioration should be eliminated from the machineries of the industry. Taking action at the source of problems observed in level one of autonomous maintenance. This action includes avoiding of recurrence of the accumulation of fiber dusts on the equipments by solving the problem at the foundation and eliminating the causes. In this second level of the autonomous maintenance implementation, temporary procedures or manual for cleaning, lubrication, retightening and checkups developed. *2) Planned Maintenance Activity*

In this level of the planned maintenance implementation, the above level will be continued to be executed for the additionally selected weaving machines in this level. And also the following activities accomplished for the success of the implementation. Identifying equipment where preventive maintenance is to be carried out. belt, pumps, gear boxes, press, vibrating screens etc. Develop check list of preventive maintenance inspection for the above mentioned parts. Determine preventive maintenance interval for the above equipments of the industry.

Level 3 Implementation 2 pillars (Planned Maintenance Activity, Autonomous Maintenance Activity)

1) Autonomous Maintenance Activity

- Tentative standards of cleaning will be set for the machines. For example three times a day for pumps, hammer mills
- Mastering the inspection skill of the operators of all machines.

2) Planned Maintenance Activity-

Keeping and using maintenance records for the selected pumps, crusher and screens machine.

Identify the type of maintenance required and develop the form of maintenance records.

Identify the contacts of the maintenance report and Ensure all the required information included in the record. Make sure the maintenance report well kept. Evaluate the performance of PM and improve the PM system.

Level 4 Implementation of 2 pillars of TPM

The process of executing the TPM implementation for the whole equipment is performed as per the above implementation steps. Additionally, the following activities are included in this level.

1) Autonomous Maintenance Activity

General inspection: to understand the structures functions and principles of equipment. Coal washery and learn their optimal conditions. Train the operators of the machines in the industry how to carry out the inspection. Find and restore slight defects through general inspection like the breakage of belts in pumps and belts in screens, carbon shafts in screens. Evaluate inspection skills provided in the previous levels and provide training in deficiency areas.

2) Planned Maintenance Activity-

Executing condition based maintenance system

- Train maintenance personal on use of condition monitoring instruments.
- Measure the performance of the condition based maintenance system.

Level 5 TPM Implementation

1) Autonomous maintenance

Autonomous inspection: To maintain the machineries of the industry deterioration and restoration condition implemented in levels.

- Review cleanup, lubrication and general inspection criteria for the machines in the industry.
- Preparation and implementation of autonomous inspection checks sheets for the machineries in the industry.
- Review equipment and human factors clarity abnormal conditions.
Organize the surrounding of machinery.

- Reducing material searching time by organizing material around the equipment and workplace.

2) Planned maintenance-

- Automate the operation system.
- Identify the activities of the next operation.
- Identify types of reports required.
- Simplify the work procedure based on the above study conducted in level four of the TPM implementation process.
- Critically study hardware and software.
- Measure performance of the software and hardware.
- Train the maintenance personnel on use of the system.
- Implement the system.

The Last Level of TPM Implementation (level6)

1) Autonomous maintenance

- Standardization: ensuring maintenance and management of these activities and at expanding the operator roles to work related to the equipment and areas around it.

2) Planned maintenance

- Automate the operation system.
- Based on the above study, initially review the type of hardware and software available in the market

Result And Discussion

Concerning the autonomous maintenance much to be done to shift the maintenance concept from maintenance department to the production department. The equipment operators should be given training on basic inspection and cleaning methods of the equipment.

From the planned maintenance point of view the company policy is not based on preventing the occurrence of failure. Maximum time the equipment breaks they fix it. Here the problem is not only changing the equipment or maintaining the equipment to its original working condition but also it may cause the other equipments to fail. The planned maintenance program of the maintenance department is not as per the manual of the equipment manufacturer. They do not even predict when the failure may occur. This

problem may lead to unplanned stoppage of the machineries and due to this the production losses may occur for the long period of time.

Table 1. Implementation Results

Comparison	After TPM October report	Before TPM August report
Total production	220906 MT	131911 MT
Total breakdown	207 hrs	260 hrs
Total available planned running hrs	540 hrs	540 hrs
From collected data-		
1)Availibility Rate	94.2%	85 %
2)Quality Percentage	94.7%	82%
3) performance rate	94.7 %	82%
Now OEE=	84%	57 %
Costing/ton	24.60 RS/MT	42.27 RS/MT (APRIL)

This research has been conducted and written in relation to the implementation of two pillars of Total Productive Maintenance System in BPSL coal washery. The study aims initially at scrutinizing the maintenance system of the industry and categorically concluded that the high rate of unplanned failure reigns in the Industry. This can be attributed to the condition

of equipment, due to negligence of the operator and shortage of good quality spare parts. Production is also increased after implementation as production report of month Oct attached along its **220906** tonnes achieved **88.36%** target .production is increased as on below report-

Table 2 Comparison of report

Comparison of data	Before implementation(AUGUST)	After implementation	RESULT Observations-
Production-	131911 MT	220906 MT	Increased
Total Downtime hours	260 hours	207.45 hours	Decreased
OEE	58.2 %	84%	Increased
COSTING REPORT	Before Implement APRIL	After Implement	
COMPARISION/MT	42.27 RS/MT (APRIL)	24.60 RS/MT	Decreased
Spare Consumed	17.38 RS/MT (APRIL)	9.89 RS/MT	Decreased

Conclusion

The following recommendations are-

1. The companies should involve achieving the company goal through the implementation of operator initiated daily maintenance consisting of cleaning, adjustment, and regular inspections, as well as improvement activities and minor restoration of equipment.

2. Empowering the operators and maintenance men through training should be given due attention and conducted in sustainable manner to maximize the efficiency of the equipment in eliminating the operators' mistake and improper repair.

The industries need to introduce Kaizen them the concept of continues improvement. The industries should implement the Overall

Equipment Effectiveness as a performance indicator to track the efficiency of equipment in order to achieve higher target. Implementing TPM 8 pillars in the various levels would help the industry to completely change the culture of its employee.

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