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Eliminating Obstacles in TPM Implimentation In Sugarmill Industry

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ABSTRACT

In the dynamic scenario of technology, many technological innovations are available to contribute in the analysis of Equipment Efficiency, minimized input v/s optimized output, minimizing the overall consumption, effective use of machineries and finally increase in production rate by expenditure and consumption of sources. Since the starting of technological era, Scientists/ Researchers have put mammoth efforts to increase production rate. To embark with, many small inadequacies of equipments and machines can lead to the huge losses in small to medium scale industries. Implementation of TPM in various industries has contributed its effective role but not much work available with small to medium scale sugar mill industries in India. In Ajnala Cooperative Sugar Mill, Amritsar, the author has contributed that the mill management avoid doing the changes with traditional approaches of productivity for example changes in setup and maintenance scheduling. So to remove the obstacles, the author has suggested several steps to bring the minimum but necessary changes in maintenance and repairs. The author made an attempt to increase the Overall Equipment Efficiency and to decrease the high rejection rate, downtime, and setup time to compete with others similar industries by applying Total Productive Maintenance in the small scale industry by eliminating the upcoming obstacles successfully.

Keywords: *Steam Engine; Semiconductor; Renewable Energy.*

1.0 Introduction

Maintaining a trustworthy manufacturing process is a key success factor to satisfy these requirements which can be achieved through implementing a proper maintenance strategy. Any operation or process done on machine or its parts to enhance the efficiency of machine before or after the breakdown is called maintenance. In order to be successful in today's world-class manufacturing environment companies have to fulfill several requirements. In the recently released European Standards regarding maintenance, maintenance is defined as "the combination of all technical, administrative and managerial actions during the life cycle of an item intended to retain it in, or restore it to, a state in which it can perform the required function".

An efficient maintenance strategy not only reduces the probability of breakage of machine elements or shutdown of machines which hinders the production's schedule, but also such a strategy enhances the competence and life-span of machines, process quality and labor force productivity (Shahanaghi and Yazdian, 2009). In today's bloodthirsty environment, companies want to get the payback of the diverse techniques, which are being used, in the product processes.

They have implemented total quality management (TQM), just in time (JIT) manufacturing. Maintenance should be notified as a budding source of quality problems - in other words it is a potential source of great improvement. Maintenance should be taken into consideration in standard quality discrepancy recording practices as one of the key categories (Ollila and Malmipuro, 1999). In the last few years the maintenance was traditional activities where all companies applying it exclusive of knowing its importance, but after the improving in production strategies and improve the flexibility of production line to produce a wide range of different products, the need for good maintenance strategy becomes larger, and in the current times especially, due to automation and large- scale

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mechanization, higher plant availability, better product quality and long equipment life had been assumed considerable significance (Sharma et al., 2006).

The main thought behind the maintenance is to craft the parts and machine ready to do what are required within the moment in time and sizes allocated and do it with smaller number of resources. To manage the budget in organizations, downsizing is mostly adopted which reduces the availability of personnel for spontaneous work. Furthermore next to the energy costs, maintenance costs can be the principal part of any operational funds. So timely maintenance actions are mandatory which will minimize the incidence of such failures, and increases the trustworthiness of machines and equipments through the effective management of maintenance function (Pophaley and Vyas, 2010). Now many companies have shifted their focus to optimize their assets, and use equipments more effectively, and one of the main parts of the company which has a sturdy influence on the assets is the maintenance department or the employees responsible for maintenance (Almeanazel, 2010).

1.1 Total productive maintenance

TPM describes a relationship between production and maintenance, for continuous improvement of product quality, capacity ,operational efficiency, assurance and safety (Ollila and Malmipuro, 1999). the concept of Total Productive Maintenance was introduced and developed by Japanese, in response to the maintenance and support problems encountered in manufacturing environment. Another goal behind the development of TPM is an aggressive strategy focuses on actually civilizing the function and design of the production equipment (Ollila and Malmipuro, 1999). TPM was planned to achieve- Zero Product Defects, Zero Equipment Unplanned Failures and Zero Accidents (Tsarouhas, 2012).

Table 1: 5 'S' in Total Productive Maintenance

5'S (Japaneese)	Explanation
Seiri	Sort out unnecessary items from necessary and discard them
Seiton	A place for everything and everything its place. Arrange necessary items in good order before operation/working
Seisio	Clean and Check the work place is free from dirt and dust
Seiketsu	(Confirmation) Maintain high standard of housekeeping and workplace organization at all times. Healthy and hygienic conditions should be explored
Shitsuke	(Custom and Practice) Get into the habit of doing right thing at work place and abiding norms and conditions of the organization

1.2 Focus of tpm

The overall focus of TPM (Vander Wal and Lynn, 2012) is the elimination of waste and is characterized by six types of losses which are given as:

(1) Breakdown losses occur due to failure of equipment.
(2) Set-up and adjustment losses.
(3) Idling and minor stoppage losses.
(4) Reduced speed losses are the difference between design speed and actual operating speed.
(5) Quality defects and rework are losses in quality caused by malfunctioning production equipment.

Start-up losses are losses that occur during the early stages of production

2.0 Processes and Procedure

For obtaining a goal of reliable maintenance plan for medium scale industry, some changes are needful in different manufacturing processes of the case company.

There are various workstations/ processes which can be studied in various medium scale industries depending upon the critical area those must be entertained on the priority basis. In Ajnala co-operative Sugar Mill Bhala Pind, Amritsar, author found that these workstations/ processes are as:

a) Unloader Workstation,
b) Shredder Workstation,
c) Milling 1 Workstation,
d) Milling 2 Workstation

For Implementation of Total Productive Maintenance and to remove the obstacles, we must

follow these steps to rectify the obstacles in above stated workstations/ processes by obtaining the necessary data for experimental purposes. Overall Equipment Effectiveness (O.E.E) = Availability* Performance Rate * Quality Rate (1)

2.1 Availability

The availability is calculated as the required availability minus the downtime and then divided by the required availability. This can be written in the form of formula as:

Availability = Run time * 100/planned production time (2)

Run time = planned production time –stop time

2.2 Performance rate

The performance rate can be defined as the ideal or design cycle time to produce the item multiplied by the output of the equipment and then divided by the operat ing time. This will give the performance rate of the equipment. The formula to calculate the performance rate can be expressed as:

P.R.={(Design Cycle time* O/p *100)} Operating Time (3)

Fig 1: O.E.E. Comparison

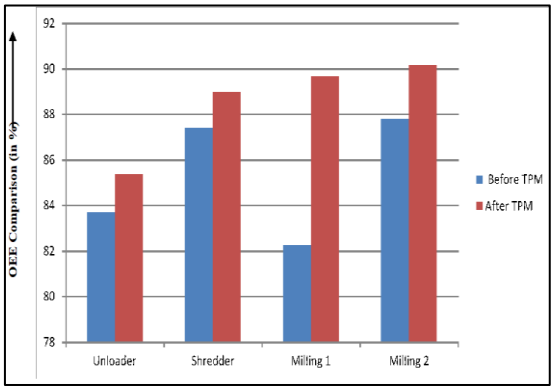


Fig 2: Downtime Comparison

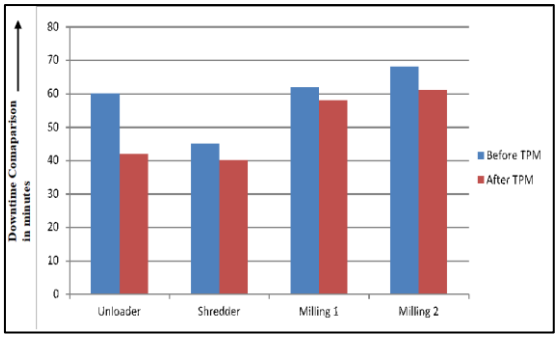


Fig 3: Rejections Comparison

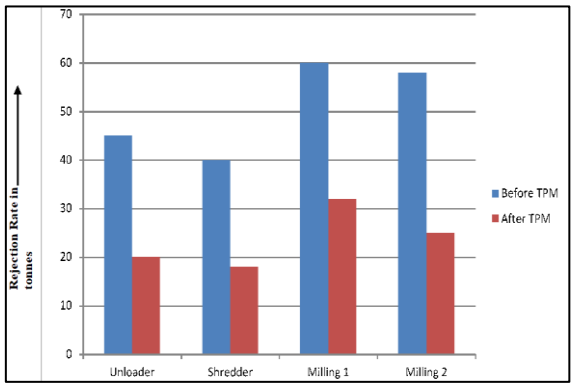
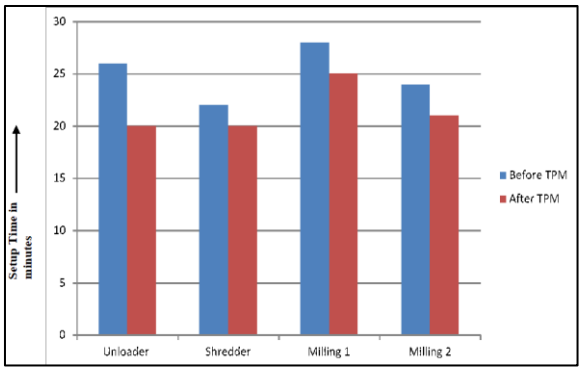


Fig 4: Setup Time



2.3 Quality rate

The quality rate can be expressed as the production input into the process or equipment minus the volume or number of quality defects then divided by the production input. The quality rate can be expressed in a formula as

Quality Rate = (Input (or total items) – Quality defects)* 100 Production input (4)

2.4 Down time

The down time can be measured by summation of planned downtime/day, unplanned downtime due to failure and unplanned downtime due to short stoppages. It can be expressed by formula as

Down time = Planned downtime + unplanned downtime (failures) + unplanned downtime (Short stoppages) (5)

2.5 Rejection rate

It can be expressed as rejections per day multiplied by total no. of working days in a week. It can be expressed by formula as

Rejection Rate = No. of rejected products/day * No. of working days/ week ……. (6)

2.6 Setup time

It is based on the simple data collection and particularly for this research work it doesn't require any other specialized formula. The time noted for the setup until the machine starts working is known as Setup time.

3.0 Result and Discussions

Above stated information depicts that the implementation of Total Productive Maintenance (TPM) has significantly increased the effectiveness of equipment as observed by the author from 2 to 8 percent.

TPM also helps to decrease the downtime of associated workstations from 7 to 22 minutes. The rejection rate of all workstations slightly reduces to 22 to 33 ton per day and setup also came down to 2 to 6 minutes per day.

4.0 Conclusions

TPM is a vital concept and basic technique for achieving considerable profits. TPM can be considered as the only thing that stands between success and total failure for some companies. It is real strategy that actually works.

Employees must be trained for proper implementation to maintain an autonomous flow of maintenance as a serious activity for improving equipment effectiveness.

Everyone should contribute his/her part of duty and avoid making tiny mistakes in routine work.

References

[1] S Ahmad, MH Hasan, Z Taha. State of implementation of TPM in SMIs: A survey study in Malaysia. Journal of Quality in Maintenance Engineering, 10, 2004, 93–106.

[2] IPS Ahuja, JS Khamba. An evaluation of TPM implementation initiatives in an Indian manufacturing enterprise. Journal of Quality in Maintenance Engineering, 13, 2007, 338–352.

[3] IPS Ahuja, JS Khamba. An evaluation of TPM initiatives in Indian industry for enhanced manufacturing performance. International Journal of Quality & Reliability Management, 25, 2008, 147 – 172.

[4] IPS Ahuja, JS Khamba. Assessment of contributions of successful TPM initiatives towards competitive manufacturing. Journal of Quality in Maintenance Engineering,14, 2008, 356 – 374.

[5] IPS Ahuja, JS Khamba. Justification of total productive maintenance initiatives in Indian manufacturing industry for achieving core competitiveness. Journal of Manufacturing Technology Management,19, 2008, 645–669.

[6] OTR Almeanazel. Total Productive Maintenance Review and Overall Equipment Effectiveness Measurement. Jordan Journal of Mechanical and Industrial Engineering, 4, 2010, 150-171.

[7] G Anand, PT Ward, MV Tatikonda, DA Schilling. Dynamic capabilities through continuous improvement infrastructure. Journal of Operations Management, 27, 2009, 444–461.

[8] KC Arora. Production and Operation Management. University Science, Press, New Delhi, 2004, 597-620.

[9] CJ Bamber, JM Sharp, MT Hides. Factors affecting successful implementation of total productive maintenance. Journal of Quality in Maintenance Engineering, 5, 1999, 162–181.

[10] BS Blanchard. An enhanced approach for implementing total productive maintenance in the manufacturing environment. Journal of Quality in Maintenance Engineering, 3, 1997, 69-80.

[11] ATB Bon, N Karim. Total Productive Maintenance application to reduce Defects of Product. Journal of Applied Sciences Research, 7, 2011, 11-17.

[12] R Cigolini, F Turco. Total productive maintenance practices. Journal of Quality in Maintenance Engineering, 3, 1997, 259–272.

[13] A Garg, SG Deshmukh. Maintenance management: literature review and directions. Journal of Quality in Maintenance Engineering, 12, 2006, 205– 238.

[14] A Jain, R Bhatti, HS Deep, SK Sharma. Implementation of TPM for Enhancing OEE of Small Scale Industry. International Journal of IT, Engineering and Applied Sciences Research, 1, 2012.

[15] F Ireland, BG Dale. A study of total productive maintenance implementation. Journal of Quality in Maintenance Engineering, 7, 2001, 183 – 192.

[16] RS Jostes, MM Helmes. Total Productive Maintenance and Its Link to "Total Quality Management. Work Study, 43, 1994, 18–20.

[17] O Kwon, H Lee. Calculation methodology for contributive managerial effect by OEE as a result of TPM activities. Journal of Quality in Maintenance Engineering, 10, 2004, 263 – 272.

[18] HM Lazim, T Ramayah. Maintenance strategy in Malaysian manufacturing companies: a total productive maintenance (TPM) approach. Business Strategy Series Emerald Article, 11, 2010, 387-396.

[19] O Ljungberg. Measurement of overall equipment effectiveness as a basis for TPM activities. International Journal of Operations & Production Management, 18, 1998, 495–507.

[20] **A** Ollila, M Malmipuro. Maintenance has a role in quality, The TQM Magazine, 11, 1999, 17–21.

[21] RV Paropate, SR Jachak, PA Hatwalne. Implementing Approach of Total Productive Maintenance in Indian Industries & Theoretical Aspect: An overview. International Journal of Advanced Engineering Sciences and Technologies, 6, 2011, 270 – 276.

[22] L Pintelone, SK Pinjala, A Vreecke. Evaluating the effectiveness of maintenance strategies. Journal of Quality in Maintenance Engineering, 12, 2006, 7–20.

[23] VR Pramod, SR Devadasan, S Muthu, VP Jagathyraj, GD Moorthy. Integrating TPM and QFD for improving quality in maintenance engineering. Journal of Quality in Maintenance Engineering, 12, 2006, 150–171.

[24] PW Prickett. An integrated approach to autonomous maintenance Management. Integrated Manufacturing Systems, 10, 1999, 233 – 243.

[25] D Seth, D Tripathi. Relationship between TQM and TPM implementation factors and business performance of manufacturing industry in Indian context. International Journal of Quality & Reliability Management, 22, 2005, 256–277.

[26] K Shahanaghi, SA Yazdian. Analyzing the effects of implementation of Total Productive Maintenance (TPM) in the manufacturing companies: a system dynamics approach. World Journal of Modelling and Simulation, 2, 2009, 120-129.

[27] S Singh, H Lal. Eliminating barriers in successful total productive maintenance, 2(3), 2013

[28] MW Wakjira, AP Singh. Total productive maintenance: A case study in manufacturing industry. Global Journal of Research In Engineering, 2012, 12(1-G).

[29] HM Lazim, MN Salleh, C Subramaniam, SN Othman. Total Productive Maintenance and Manufacturing Performance: Doeas Technical Complexity in the Production Process Matter. International Journal of Trade, Economics and Finance, 4(6), 2013, 380.

[30] RS Kaplan. Measuring manufacturing performance: a new challenge for managerial accounting research. In Readings in accounting for management control Springer, Boston, MA, 1983, 284-306.