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Justification of Overall Equipment Effectiveness (OEE) in Indian Sugar Mill Industry for Attaining Core Excellence

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ABSTRACT

The role of this study is to expand an understanding of Overall Equipment Effectiveness (OEE) proposals towards developing central capabilities in Indian sugar mill industries. The authors have decisively examined the implications of OEE implementation in the sugar mill sector. The study discloses that management and leadership, with their honest involvement towards execution of Japanese's maintenance practices, can appreciably add to accumulate the core competencies and sustainability. The study highlights that OEE initiatives outscore traditional maintenance practices towards improving process performance (PP). Attentive OEE implementation over a reasonable time period can extensively increase the consciousness of central capabilities in PP. The study has been carried out to establish the assistance of OEE proposals for achieving core competencies in process industries. Though, sector-wise execution of the plan for all process industries can also be achieved to evaluate the contributions of OEE in the industrial sectors. The plan of the study is to spot the impact of key OEE proposals and dimensions on managerial performance. The paper emphasizes the need to bring disciplined organizational changes in launching maintenance improvement activities for approving the enhancements in the performance of the industry. In today's highly dynamic and rapidly changing environment, the global competition among organizations has guided the maintenance activities to précised demands in the manufacturing organization.

Keywords: *Sugar mill; Effectiveness; Excellence; Industry.*

1.0 Introduction

The importance of the main activities or distinct areas involve in An activity or process done on a machine or its parts to enhance the efficiency of the 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. The maintenance concept, all alone, will not fulfill the demands for a fast-growing and rapidly changing industrial environment. 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 hectic environment, companies want to get the payback of the diverse techniques, which are being used, in the production 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

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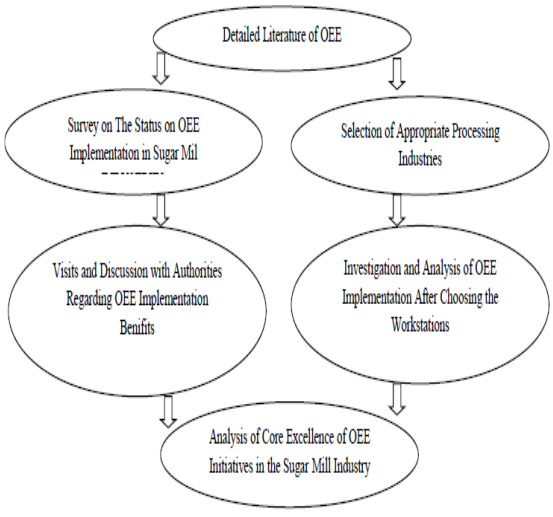
exclusive of knowing its importance, but after the improving in production strategies and improve the flexibility of production line to produce a wide range of different products, the need for good maintenance strategy becomes larger, and in the current times especially, due to automation and large- scale mechanization, higher plant availability, better product quality and long equipment life had been assumed considerable significance (Sharma et al., 2006).

2.0 Methodology Adopted

It is always tough to choose the appropriate industry for the justification of OEE implementation in process industries but, authors chose because of the limited literature integrating OEE implementation with Sugar mill industries. The directions of academicians (faculty of Universities/Colleges associated with TPM field); authorize personals (engineering staff) of the sugar industries and limited literature available to monitor the performance of the machinery of these industries guided the authors to execute OEE implementation in these set of industries.

Figure 1: Methodology Adopted for the Execution of OEE Implementation



3.0 Understanding Overall Equipment Effectiveness (OEE)

OEE depicts an association between performance and maintenance, for continuous improvement of product quality, the capacity of machinery, operational efficiency (Ollila and Malmipuro, 1999). the concept of Total Productive Maintenance (TPM) was introduced and developed, in response to the maintenance and associated problems encountered in the industrialized environment. The objective, at the back, is to develop of OEE (a metric tool of TPM). OEE is an aggressive strategy that spots the education/awareness of the stakeholders and propose the production equipment. OEE was planned to diminish the barriers in achieving excellence such as Zero Production Defects, Zero Unplanned Failures and Zero hazards (Tsarouhas, 2012). An efficient OEE implementation agenda was provided for a philosophy based upon the empowerment and encouragement of the stakeholders/personnel from all areas in the organization (Davis and Willmott, 1999). Willmott (1994) portraits OEE as a comparatively new and practical tool of TPM and TQM which aims to encourage a culture in which operators develop the sense of "ownership" of their machines, learn much more about them, and in the process realize skilled trades to concentrate on problem diagnostic and equipment improvement projects. OEE is a people-oriented concept that starts by fully harnessing the human thinking capabilities which are normally concealed in the industries. The OEE initiatives can be depicted as a set of activities for accomplishing the maintenance-enhancement improvements including autonomous maintenance; focused improvement; planned maintenance; quality maintenance; education and training; development management; and safety, health and environment.

The OEE execution scope can be broadly classified into four main categories that include:

a. Top leadership and management for maintenance organization.
b. Conventional maintenance plans.
c. OEE implementation initiatives.
d. Attaining and sustaining of focused results through holistic OEE implementation.

4.0 Processes and Workstation For OEE

To obtain an objective of reliable maintenance and performance-enhancement plan for core excellence in a medium-scale process industry, several changes are needful in different processes/activities of the case company. There are

various workstations that must be studied in various medium scale industries depending upon the critical area that must be entertained on a priority basis. At Ajnala co-operative sugar mill, Amritsar, authors found that these workstations as follows:

a) Un-loader Workstation,
b) Shredder Workstation,
c) Milling 1 (Course-Milling) Workstation,
d) Milling 2 (Fine-Milling) Workstation

For the implementation of OEE and to remove the obstacles, we must follow these steps to rectify the obstacles on workstations by obtaining the necessary data for experimentation purposes.

Overall Equipment Effectiveness (O.E.E) = Availability Rate* Performance Rate * Quality Rate

4.1 Availability rate

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 .

4.2 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 operating 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

4.3 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)

4.4 Downtime

The downtime 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 :

Downtime = Planned downtime + unplanned downtime (failures) + unplanned downtime (Short stoppages) (5).

4.5 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)

Figure 2: Downtime Comparison

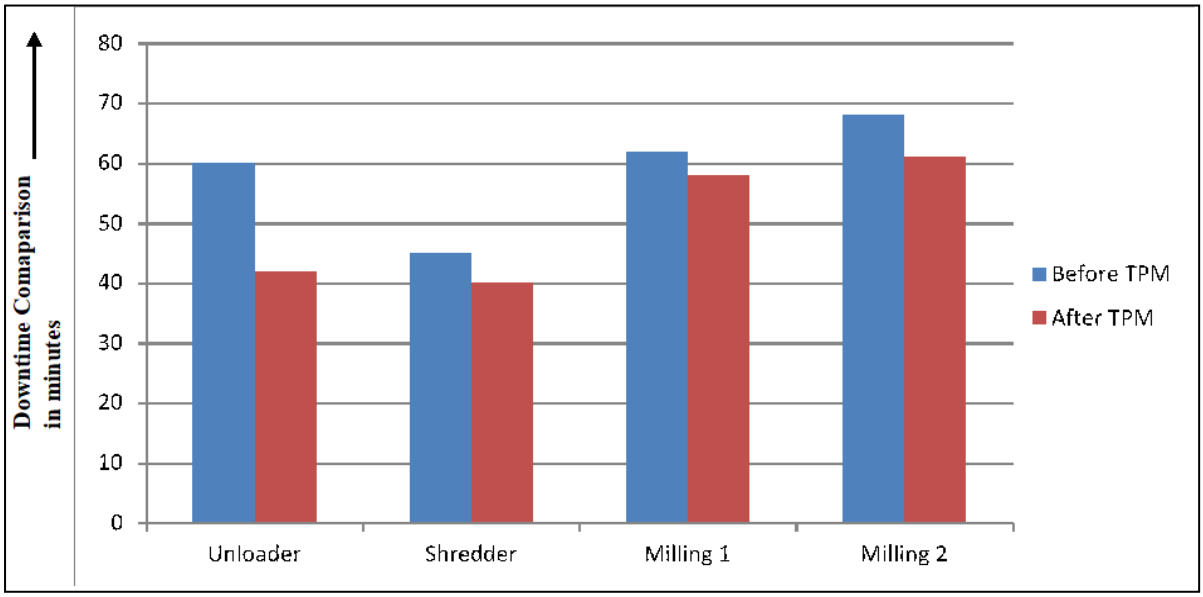


Figure 3: Rejection Rate Comparison

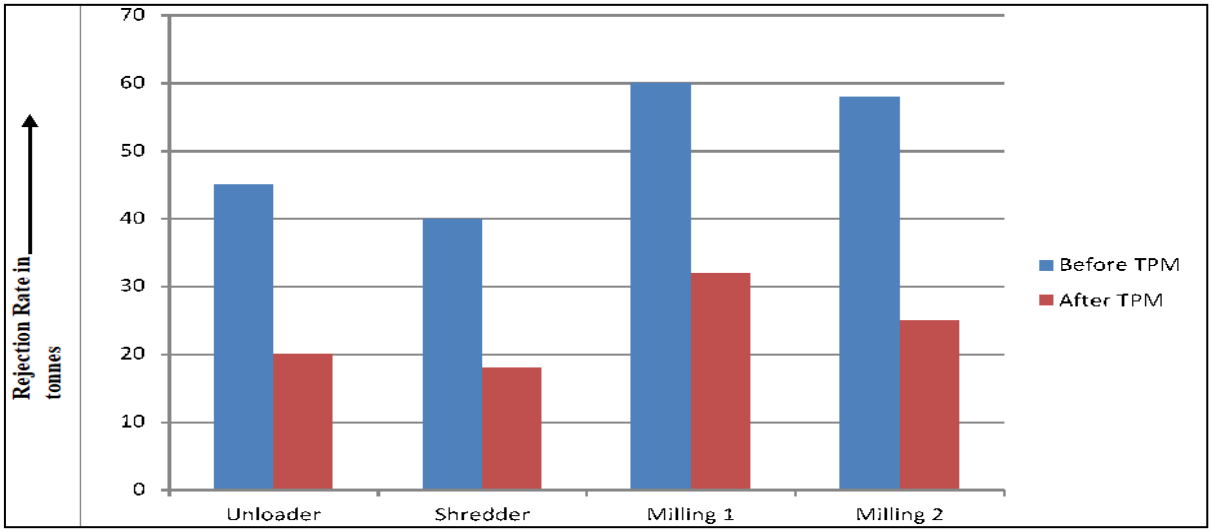


Figure 4: Setup Time

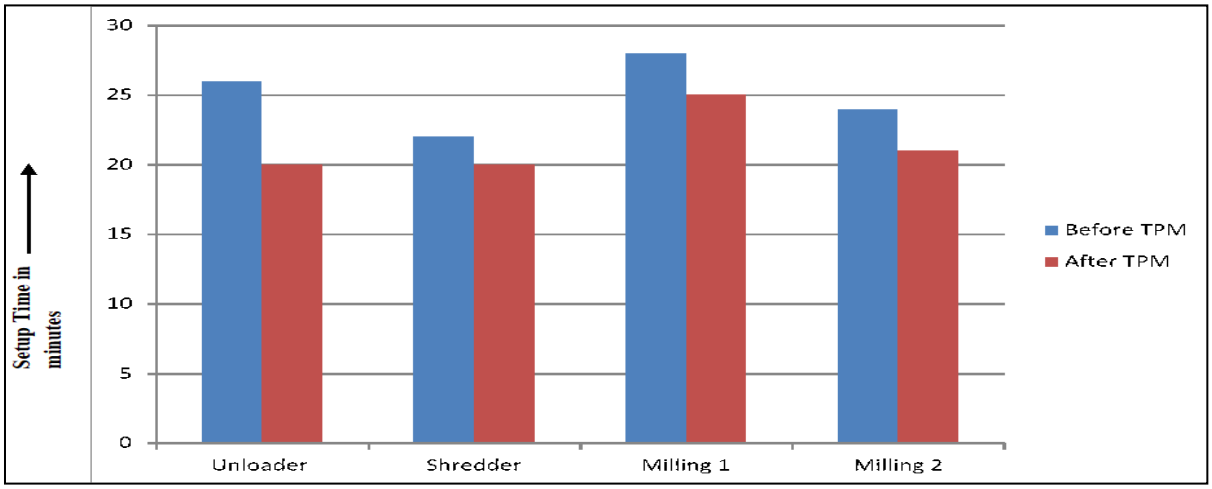
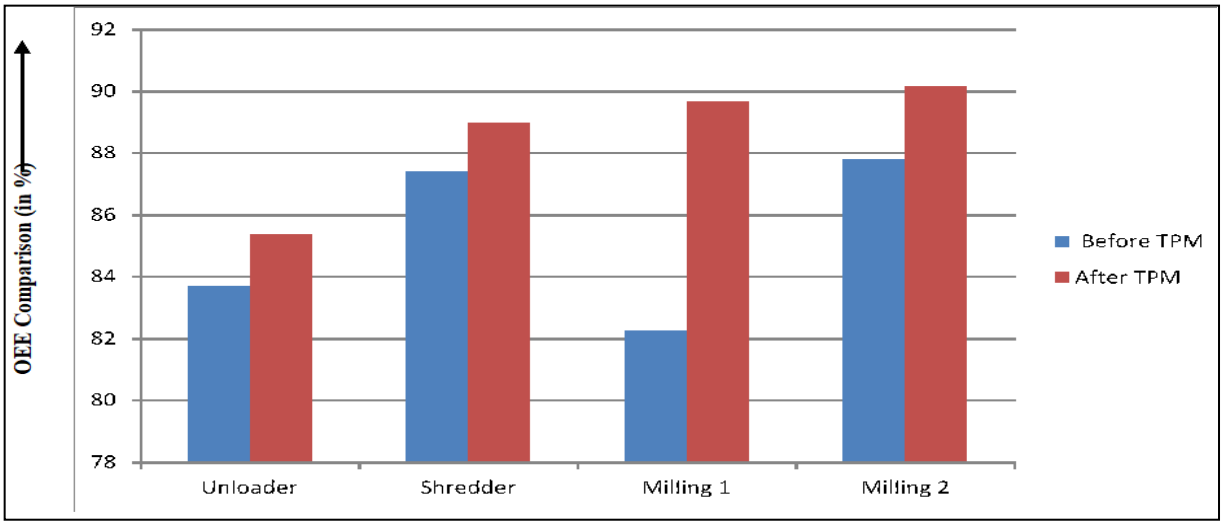


Figure 5: O.E.E. Comparison



4.6 Setup time

It is based on 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.

4.7 Results and discussions

The above-stated information depicts that the implementation of OEE has significantly increased the effectiveness of machinery of the four workstations as observed by the authors from 2 to 8 percent. The successful OEE implementation 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 tons per day and the setup time of these workstations also came down to 2 to 6 minutes per day. From the above discussions, it is obvious that successful OEE execution in the sugar mills can bring positive changes in the processing sector. The development of industries is only possible when the management will space and honestly implement performance-enhancing strategies such as OEE.

5.0 Conclusions

OEE is a vital concept and a basic technique for achieving considerable profits. OEE can be considered as the only metric tool for the machinery that stands between success and total failure for some companies. It is a genuine approach that really solves the purpose. The employees must be taught for proper OEE implementation from the bottom to the top in the execution of an autonomous flow of maintenance as machine operators are the main linkage to perform simple maintenance and fault finding tasks (UK Essays, 2015). Everyone should contribute his/her part of duty and avoid making tiny mistakes in routine work.

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