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INCREASING OVERALL EQUIPMENT EFFECTIVENESS BY IMPLEMENTATION OF TPM TO REDUCING LOSSES

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***Abstract*—** The most prevalent and well-liked techniques are those that measure the overall effectiveness of the device. Total productive maintenance is a frequent strategy utilized. In this project, we'll use TPM to compute OEE and work through issues specific to a chosen industry. We gather machine shop data from the various industries, and after that, we determine the maximum OEE. The ideal OEE value is around 96%.

***Keywords*—** Total productive maintenance, Implementation, OEE

I .INTRODUCTION

Putting into practice comprehensive productive maintenance to raise OEE A medium-sized business called Niraj Enterprises in Malad West has been chosen for this purpose. It is a market leader in producing the pin, roller, and pulley parts required in packing machines. Management needs to gather all relevant information so that it can respond quickly to supervisors' concerns about issues including poor machine maintenance, inadequate tool quality, and inherited flaws. The management has a significant impact on the education and training of all untrained employees. Therefore, they offer unskilled workers training programmers before appointing them to desired positions. It is necessary to employ statistical techniques to determine when training has finished. Here are a few key points made clear.

i. CAPABILITY: It is actual input minus the reference input.
ii. CONVINCINGNESS: Over reference output is actual output.
iii. YIELD: The real output triumphs over the real input. (Amount of finished goods produced per worker)
iv. TOTAL QUALITY MANAGEMENT**:** The manufacturing sector primarily employs 5 principles.

- Generate superior work.
- Pay attention to the customer
- The strategic approach to improvement.
- Constantly becoming better
- Promote respect for one another
- Team effort

POROPOSED METHODOLOGY

Measurements data is collected according to shown below points:

a. Amount of items
b. Faulty item
c. Production time anticipated
d. Unplanned downtime

EXPRESSIONS USED TO CALCULATE OEE:
An essential technique utilized in industries is determining overall equipment efficacy.
Methods as follows:

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i. For a month monitor OEE (including availability, performance and quality) for the target equipment. Ensure that the results are organized by shift.

ii. Evaluate each shifts performance, keeping track of each employee's top performance for availability, performance and quality across all shifts.
To determine the "Best of the Best" OEE score, multiply the best individual performances collectively.

The stretch goal for availability, performance, and quality is represented by the "Best of the Best" OEE score, which is generated from the best results actually attained throughout the month.

Expression used for calculation:

- Accessibility = $\frac{Planned\ production\ time - Unscheduled\ downtime}{Planned\ downtime}$
- Performance= $\frac{Ideal\ cycle\ time\ x\ parts\ produced}{Available\ time}$
- Quality= $\frac{Total\ units\ started - Defective\ units}{Total\ units\ started}$

OEE = (Accessibility x Performance x Quality)

OEE is a measurement of machine potential that is applies when an industry needs to boost productivity. For the purpose of determining the maximum OEE, TQM tools are implemented. The collecting of data is vital for the manufacturing process turn into usable knowledge for productivity enhancement. Machine tools that turn raw materials into finished goods in order to boost OEE are used when better productivity is anticipated. Machine availability with the least amount of downtime is a component of reliability, which calls for failure data analysis and root cause investigation. A TQM tool is a technique that measures product quality and price improvement while also automatically increasing productivity.

CALCULATION

In a Machine Roller Equipment Efficiency as a Whole calculating a machine's pins

$$\text{Accessibility of Roller} = \frac{49200-3600}{43250} \times 100 = \mathbf{92.6\%}$$

Where,
Planned production time= shift Length- Breaks= 43550-3600= 39650 min

$$\text{Performance of Roller} = \frac{7.3 \times 90}{720} \times 100 = \mathbf{91\%}$$

Where,
Ideal cycle time = (6x60x12) min per (600) piece = 4320 min per 600 piece= 7.2min/piece Parts produced= 90 piece
Accessible time= 12x60= 720 min

$$\text{Quality of Roller} = \frac{545}{600} \times 100 = \mathbf{91\%}$$

Where,
Total number of pieces= 600
Non defective Pieces = Total units started − Defective units = 600- 60=540 pieces OEE=0.92 x 0.91 x 0.91
OEE=76.18 %

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OEE FOR A MACHINE'S ROLLER AFTER TPM IMPLEMENTATION CALCULATION:

Accessibility of Roller = $\frac{43550-3600}{43550} x$ 100= **92.67%**

Where,

Planned production time= (shift Length- Breaks) = (43200-3600) = 39600 min

Performance of Roller = $\frac{6.9}{720} x$ 100 x 100= **96.25%**

Where,

Ideal cycle time = (6x60x12) min per (630) piece = 4320 min per 630 piece= 6.8min/piece Parts manufactured = 100 piece

Accessible time = (12x60) = 720 min

Quality of Roller = $\frac{606}{630}$x 100 = **96.25%**

So,

Total number of pieces = 630

Non defective Pieces = Total units started − Defective units = 630- 30=600 pieces OEE=0.9267 x 0.9625 x 0.9625

OEE=85.85 %

The roller is the product, and the CNC is the machine with the lowest cost, according to the math. OEE (74.25%). This machine is referred to as a TPM model machine since TPM will be used to increase its OEE. After TPM deployment, OEE is computed for the Model machine, and the results reveal an increase in OEE from 76.18% to 85.85%.

RESULTS AND DISCUSSION

The outcomes of the TPM model machine implementation were based on the methods used in the previous chapter. After TPM implementation, OEE for the model machine is also recalculated. Now, the OEE of the roller obtained prior to and following the deployment of TPM is contrasted with the one prior to and following implementation with graphical results being shown.

Table1. Comparison of OEE before and after TPM implementation

Sr.no.	OEE Factor	Before Implementation	After Implementation
1.	Accessibility	92.6	92.6
2.	Performance	91.00	96.25
3.	Quality	91.00	96.25
4.	Overall OEE	76.18	85.85

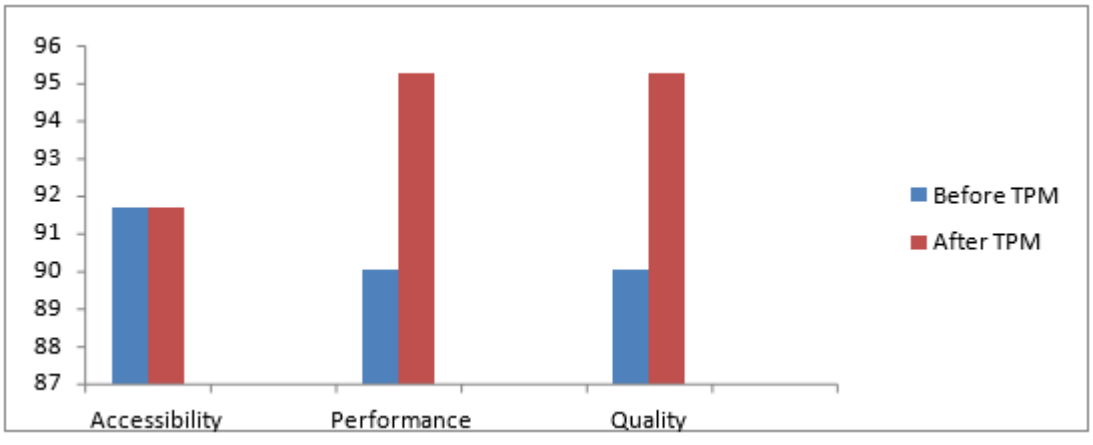

Figure .1. Comparisons of Accessibility, Performance & Quality

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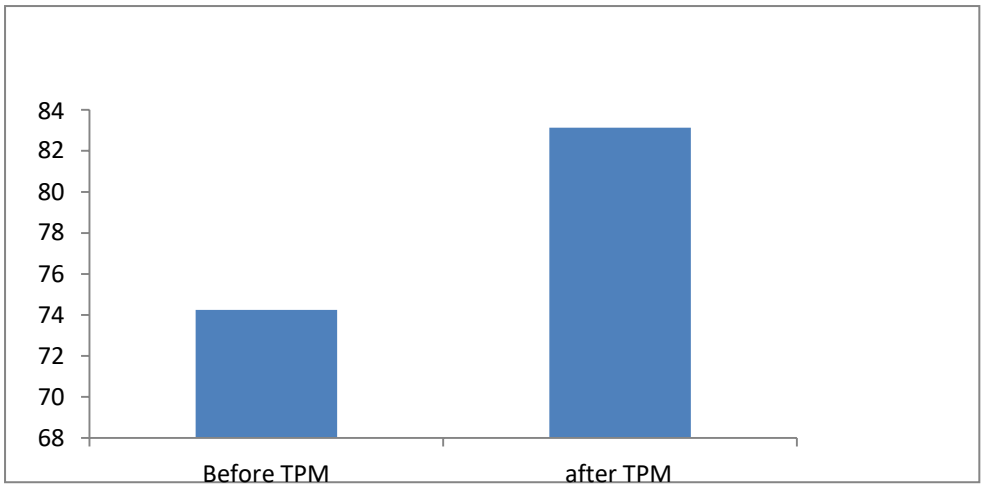

Figure 2. Comparison of overall OEE

It is obvious from the above result that OEE has been adjusted. The model machine that shows improvements in OEE of Roller product at the same scheduled production time while decreasing the quantity of rejected pieces and increasing the quantity of created products following TPM adoption.

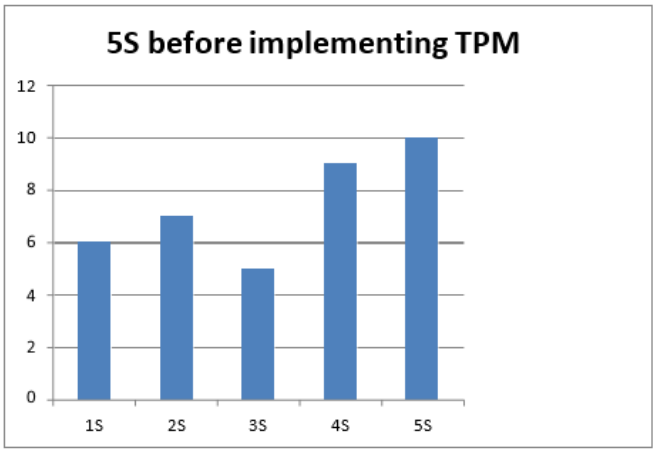

Figure 3: 5S audit following TPM adoption

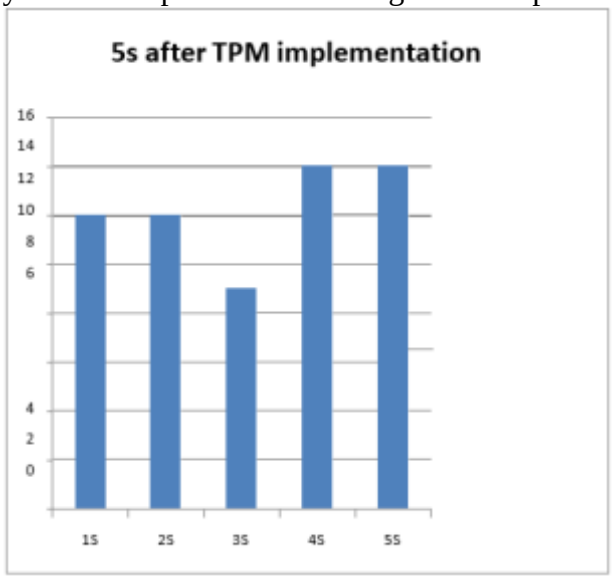

Figure 4. 5S audit after TPM implementation

From the aforementioned findings, it is evident that the 5S audit sheet and graphical scoring representation decrease losses and raise OEE both before and after the deployment of TPM

CONCLUSION

Adoption of TPM improves OEE and reduces losses. OEE is a crucial component for increasing productivity in the sector. OEE is a crucial component for increasing productivity in the sector. This study examines a medium-sized manufacturing industry to assess equipment effectiveness and machine maintenance. To improve the important machine, the numerous issues such as production delays, setup losses, machine losses, idleness, failures, and performance losses are assessed. Step-by-step TPM implementation is then carried out.

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