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Applying Total Productive Maintenance in Auto Sector: A Case Study with Sona Koyo Group Gurgaon

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ABSTRACT: The manufacturing industries have gone through significant change in the last two-three decades and the competition has increased very rapidly. The main focus of the customers is on product quality, product delivery time and the cost of product. The cost of operation and maintenance should be economical. The cost of operation and maintenance can make or break a business, especially with today's increasing demand on productivity, availability, quality, safety and environment Total productive maintenance (TPM) is a maintenance program which involves a newly defined concept of maintaining plants and equipments. TPM is a methodology that aims to increase the availability of existing equipment hence reducing the need for further capital investment. .It sets out to achieve these goals by analysis of previous historical records of product defects, equipment failure and accidents. A detailed case study on the journey of TPM in an auto-sector industry namely Sona Koyo Steering Systems Limited, Gurgaon is done. Normally the TPM implementation is a three to four years process and in Sona Koyo Steering, Gurgaon it implemented in 2000. Sona Koyo Steering, Gurgaon initiated TPM implementation through a consultant with an aim to implement all the eight pillars of TPM in a phased manner. The objective of this thesis is to study the implementation plan followed by Sona Koyo Steering, Gurgaon and find out the tangible as well as intangible benefits derived at different stages. The objectives, targets and implementation method of all the eight pillars are studied and enumerated. The case study can give insight and help the other industries in implementing TPM successfully in an efficient manner.

1. INTRODUCTION

TPM is an evolving process worldwide starting from a Japanese idea that can be traced back to 1951, when preventive maintenance was introduced into Japan from the USA.TPM refers to a management system for optimizing the productivity of manufacturing equipment through systematic equipment maintenance involving employees at all levels. Under TPM, everyone is involved in keeping the equipment in good working order to minimize production losses from equipment repairs, assists, set-ups and the like. TPM has the following goals: improvement of personnel effectiveness and sense of ownership, reduction of operational costs, reduction of throughput, times and customer satisfaction down the road. TPM has 8 pillars of activity, each being set to achieve a "zero" target. These 8 pillars complete a TPM House and are:

1) Jishu Hozen (Autonomous Maintenance) – It means "Maintaining one's equipment by oneself". There are 7 Steps in & Activities of Jishu Hozen.
2) Kobetsu Kaizen (Focused Improvement) – Continuously even small steps of improvement.
3) Planned Maintenance – It focuses on Increasing Availability of Equipment & reducing Breakdown of Machines.
4) Hinshitsu Hozen (Quality Maintenance) – Quality Maintenance is establishment of machine conditions that will not allow the occurrence of defects & control of such conditions is required to sustain Zero Defect.
5) Initial Flow Control – To establish the system to lunch the production of new product & new equipment in a minimum run up time.

6) Education & Training – Formation of Autonomous workers who have skill & technique for autonomous maintenance.

7) Safety, Health, & Environment Pillar – The main role of SHE (Safety, Hygiene & Environment) is to create Safe & healthy work place where accidents do not occur, uncover & improve hazardous areas & do activities that preserve environment.

8) Office TPM – To make an efficient working office that eliminate losses Some organizations also add pillars according to their work place like quality management tools, information technology & more.

TPM is designed to maximize equipment effectiveness by establishing a comprehensive productive – maintenance system covering the entire life of the equipment spanning all phases – planning, use, maintenance, etc. and with the participation of all employees from top management down to shop – floor workers to promote productive maintenance through motivation management. The aim of TPM activities is to improve the Productivity, Quality costs, Cost of products, Delivery and movement of products Safety of operations and Morale of those involved (PQCDSM).

2. OBJECTIVES OF CURRENT RESEARCH

After studying various research papers, problem formulation was done and various objectives for this research are:

- Identify and study the elements of TPM and its guidelines for overall improved plant performance.
- To study the impact of TPM on productivity, quality improvement, employees development and organizational change.
- To analyze the past and current status of TPM on manufacturing measurements.
- To study the TPM implementation methodology in a large mechanical manufacturing industry.
- Through a case study to show the time – by – time achievements made during the TPM deployment process.

A. Company Profile

Sona Koyo Steering Systems Ltd is the flagship company of Sona Group founded in 1985 as Sona Steering Systems Ltd. The company entered into technical collaboration agreement with Koyo Seiko Co. Ltd., Japan for manufacturing of manual steering gear assemblies and steering column assemblies. Maruti Udyog Ltd., the largest car manufacturer in the country picked up 10% equity giving Sona-Koyo the status of a joint venture company.

The products of Sona Koyo Steering are:

a) Tilt steering column
b) Intermediate shaft for column type electric power steering (CEPS)
c) Telescopic shaft for steering column
d) Telescopic-shaft for CEPS
e) Hydraulic power steering gear
f) Steering gear for CEPS system
g) Electronically controlled power steering system (ECPS)
h) Steering electronic control unit and electric power assist module

B. Need for TPM Initiative

Various researchers who analyzed for implanting TPM at Sona Koyo Steering Company are:

- The "Up Time" of Sona Steering Plants was much lower than desired levels due to various production losses.
- Increase in input costs due to government administered prices of power, fuel etc.
- Labour cost was continuously increasing.
- Work force- mismatch with skill requirements.
- Due to lack of standardization in process & tool design, lead time for new product introduction was high.
- Due to increase in customer complaints and in-process defects.
- High Capital Cost-constraint to expand capacity.
- Ever increasing expectation of customers on cost, just-in-time delivery and zero defects.
- Material cost was ever increase and there was an urgent need to optimize material utilization.
- Sudden increase in market demand exceeds plant output rates.
- Due to poor ergonomics and unbalanced Plant layout, line operating efficiency was low.
- There was high set up time- mismatch with market requirements of "Low volumes and High varieties" / Daily deliveries.
- There were unstable and unreliable operations due to Materials, Machines, Methods and Men.
- There was pressure from various regulatory mechanisms to maintain safety, health and environmental norms.

C. TPM Development and Implementation

Sona Group management decided in 2000 to implement 'Total Productive Maintenance' (TPM) in its all plants. The need of TPM was derived form of their vision statement that is “TO CREATE A COMPANY THAT INDIA IS PROUD OF”. After analysing the existing conditions Sona group set the goals that were result oriented, specific, measurable, attainable and realistic. For this Sona Koyo Steering established TPM policies, objectives, targets, organizational structure as well as all necessary procedures so that the set goals should be very much clear to everyone involved in TPM implementation.

D. Company TPM Policy

With all employee's participation, aim

- To develop employees competency to utilize their full potential.
- To effectively utilize resources such as raw materials, tools, consumables and energy.
- To create safe, visual, hygienic and environment friendly workplace.
- To create well-engineered equipment and processes and achieve operational reliability, maintainability, flexibility, operability and safety.
- To maximize overall equipment effectiveness by minimising breakdowns, defects and other losses considerably.

D.1. TPM Targets

- Product inventory-reduction by 50%.
- Material/Document retrieval (traceability)- Less than 30 seconds.
- Kaizens-Ten folds increase.
- Overall equipment effectiveness- greater than 85%
- Zero accidents/Zero pollution cases/ Zero customer complaints.
- Cost of operation-reduction to 20%

- Delivery to customer-100% and on time.
- New product development time-reduction by 50%.

- **Table for Tangible Results Achieved:**

S.No.	Attributes	Before TPM	After TPM	Improvements
1	Profit	150 Millions of Rupees	300 Millions of Rupees	100%
2	Sales Turnover	1000 Millions of Rupees	1600 Millions of Rupees	60%
3	Production Cost	69% of sales	60% of Sales	9%
4	Plant OEE	62%	90%	28%
5	Plant Labour Productivity	80%	90%	10%
6	Breakdown Frequency	28%	7%	21%
7	Defect Rate	6%	2%	4%
8	Customer Complaints	850	55	93%
9	Delivery Rate	81.6%	97%	15.4%
10	Inventory	250 Crores of Rupees	125 Crores of Rupees	50%
11	Labour Accident	2	0	200%

The case study on TPM implementation in Sona-Koyo Group indicates that TPM is a strong contributor to an organization's competitiveness and manufacturing performance. In fact TPM is a world class maintenance strategy deployed for improving productivity by making processes more reliable and less wasteful. In Sona-Koyo Steering implementation remained successful in achieving the following goals.

- Improving delivery rate by 15.4%
- Reducing customer complaints by 87%
- Improving equipment effectiveness by 28%
- Improving profit of the group by 100%
- Improving sales turnover by 60%
- Reducing breakdown frequency by 21%

Intangible Result Achieved

- Increase in team spirit and group behavior in operators and staff.
- Development of clean, dry, bright, visual and likely work places.
- Appreciation from customers and other visitors during plant visits.
- Multiskill abilities done by operators.
- Increase in the ownership of equipment and workplace by the operator.
- Increase in confidence of their ability to perform complex jobs/problems by operators and staff.

Sona Group Got Challenge TPM Excellence Award, In 2007. The significant improvement in productivity, quality and morale of employees, and a good decrease in labour /maintenance/inventory costs are the prime benefits which the company achieved in the target period. The philosophy of TPM is based upon continuous improvement which means never getting complacent with the focus on how to become the best in the world in business.

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