

Application of Total Productive Maintenance (TPM) in the spinning mill

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Introduction

In today's highly competitive market, cost effectiveness of an enterprise plays a vital role in manufacturing process. Textile industry is the second largest industry in the world next to agriculture. The effective utilization of manpower and resources in the manufacturing sector leads to low manufacturing cost, which is necessary for survival in present scenario. Total Productive Maintenance (TPM) is also a cost reduction tool used in industry particularly in spinning mills, where maintenance activities are key to the smooth running of the textile mill. The main aim of this paper is to give broad outlook and practical hints about the TPM in a spinning mill.

Practice of maintenance function

In the table.1 the industrial statistics shows the maintenance activities were carried out by conventional maintenance system. Six major loss areas in any plant are:

1. Planned downtime loss.
2. Unplanned downtime loss.
3. Idling and minor stoppages.
4. Slow down.
5. Process non conformities.
6. Scrap.

Maintenance Activity				
	Operator	Maintenance Dept.	Project	Sub contractor
Routine Inspection	38%	62%		
Periodic Inspection	5%	93%		2%
Minor Repair	1%	85%	4%	10%
Shutdown	2%	83%	4%	11%

In traditional maintenance system, the loss will be more in the above aspects due to non-involvement of production people in basic maintenance activities, leading to frequent machine breakdown, efficiency and utilization loss. This ultimately results production loss and increases the manufacturing cost of the product. TPM – Total Productive Maintenance is a tool used to overcome all the above said difficulties in a cost effective manner in any manufacturing process.

TPM - Definition

TPM is a low cost people intensive system for maximizing equipment effectiveness by involving entire company in a preventive maintenance program.

- ❖ **TOTAL** - All encompassing by maintenance, production individuals working together.
- ❖ **PRODUCTIVE** - Production of goods, services that meet or exceed customer's expectations.
- ❖ **MAINTENANCE** - Keeping equipment, plant in as good as or better than the original conditions at all times.

Objectives of TPM

- ❖ Avoid wastage in a quickly changing economic environment.
- ❖ Producing goods without compromising product quality.
- ❖ Reduce cost.
- ❖ Produce a low batch quantity at the earliest possible time.
- ❖ Goods sent to the customers should be without defects.

TQM vs TPM		
Category	TQM	TPM
Objective	Quality (Output and effects)	Equipment (Input and cause)
Means of attaining goal	Systematize the management	Employees participation
Target	Quality	Elimination of losses and wastes.

Different modules in the implementation of TPM in a spinning mills

Preparatory module

STEP 1 - Announcement by Management about TPM introduction in the organization: Proper understanding, commitment and active involvement of the top management are needed for this module. Management must inform their employees through formal presentation on the concepts, goals and expected benefits of TPM.

STEP 2 - Initial education and propaganda for TPM: Educating and training of employees helps in improving the morale and also softens the resistance to change. Training is to be arranged based on the need. Take people who matters to places where TPM already successfully implemented.

STEP 3 - Setting up departmental organization to promote TPM: Promoting TPM organizing committees is the next step in the TPM implementation activity, which is more important for the support and successful development of TPM.

TPM includes improvement, autonomous maintenance, quality maintenance etc., as part of it. When committees are set up it should take care of all those needs. Groups can be created by assigning leadership responsibility to section leaders and group leaders on the shop floor.

STEP 4 - Establishing the TPM Policies and goals: It is important to establish one basic management policy committed to TPM and concrete TPM development procedures. It should specify the target of what should be achieved, how much quantity to be achieved and when should be it achieved. For example the utilization level of Ring frame department is 95%, it can be planned to 98% for a long term plan say for three years.

Introduction Module

This is a public occasion and we should invite suppliers, customers and employers. Suppliers as they should know that we want quality supply from them.

Customers will get the communication from us that we care for quality output. Employers should get awareness and importance of TPM.

Practical Hints

Implementation module

In the Implementation module, improving equipment effectiveness is the first step in the implementation of TPM on the effectiveness of each part of equipment experiencing a loss. At the initial stage it is better to focus team efforts on equipment suffering chronic losses during operation. The overall equipment effectiveness could be calculated as detailed below.

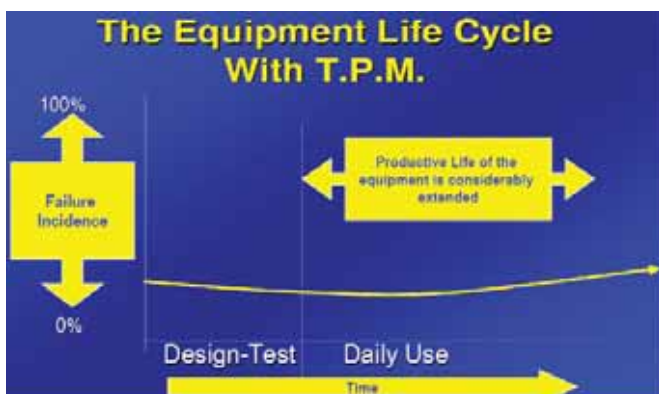
OEE = Availability X Performance Efficiency X Rate of Quality Products
 For example, in a draw frame machine utilization = 95%;
 Production efficiency = 90%; Quality slivers produced = 80%
 $OEE = (95/100 \times 90/100 \times 80/100) \times 100 = 68.40\%$

Though the availability of the Drawing machine is 95%, the overall equipment effectiveness is 68.40% only. Similarly calculate the OEE for other equipment also.

Causes of OEE

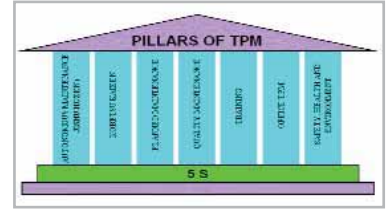
OEE Overall Equipment Effectiveness		
Losses		
Availability	Caused by:	Major Breakdowns Setups Adjustments of the Tooling, etc.
Efficiency	Caused by:	Minor Stoppages Wrong Scheduling or Expectancies
Quality	Caused by :	Waste/Rework Rejects Slow start of Shift/Lot

Equipment Life Cycle: Traditional Vs TPM



At this stage, eight activities are carried which are called eight pillars in the development of TPM activity. These eight pillars are given as under:

The pillars over which the TPM implementation is developed are:



- Autonomous Maintenance** - Autonomous maintenance is one of the unique features of TPM, which believes that individuals should be responsible for their own equipment and have to perform autonomous maintenance. Autonomous maintenance consists of cleaning, lubrication, retightening and inspection.
- Kaizen** - Gradual, incremental and constant improvement in process by involving everyone in an organization. It is a continuous program to improve quality and increase productivity. It is said that Kaizen has been one of the key ingredients in Japan's competitive success in the world market.
- Planned Maintenance** - A planned maintenance schedule should be planned for timely replacement of components which is must for the effective operation of equipment and long life. This has to be followed by the maintenance team. In spinning mills, components like card wires, top roller cots require timely grinding and buffing respectively to keep them in good condition for the production of good quality slivers and yarns.
- Quality Maintenance** - It is aimed towards customer delight through highest quality through defect free manufacturing. Focus is on eliminating non-conformances in a systematic manner, much like Focused Improvement. Transition is from reactive to proactive (Quality Control to Quality Assurance).
- Education and training** - Education and training are investments in people that yield multiple returns. Operative in each department must be trained, in such a way that they must improve the understanding about functions of their machines, early detection of abnormalities, ability to do improvements, on machines operated by them.
- Office TPM** - Office TPM must be followed to improve productivity, efficiency in the administrative functions and identify and eliminate losses. This includes analyzing processes and procedures towards increased office automation.
- Safety, Health and Environment (SHE)** - In this area focus is on to create a safe workplace and a surrounding area that is not damaged by our process or procedures. This pillar will play an active role in each of the other pillars on a regular basis. The target of SHE is Zero accident, Zero health damage and Zero fire.
- 5S - 5S is the foundation for all the pillars** - Cleaning and organizing the workplace helps the team to uncover problems. Making problems visible is the first step of improvement.

Conclusion

Today, with competition in industry at an all time high, TPM be the only thing that stands between success

Japanese Term	English Translation	Equivalent 'S' term
Seiri	Organization	Sort
Seiton	Tidiness	Systematize
Seiso	Cleaning	Sweep
Seiketsu	Standardization	Standardize
Shitsuke	Discipline	Self - Discipline

and total failure for some companies. It can be considered as the medical science of machines. One of the most important advantages of TPM is the improvement in the Leadership environment. The level of satisfaction and morale among the personnel raises and a feeling of "ownership" develop towards the equipment, the product and the company. ♦