Basics of TPM

Mahesh Mutthusamy
Session objectives;

• Background to TMP
• Learn the basics of TMP
• Learn the Totality of TPM
• Enhance the understanding of TPM
TPM Supports World Class Manufacturing

Customer Delight

Total Productive Maintenance

Reduce breakdowns and defects to zero

Just in Time

Reduce defects to parts per million

Total Quality Control

Empower and Involve Everyone

Reduce Inventory and Lead Times

Continuous Improvement

Management Support and Commitment
Operation and Maintenance – Two Wheels of a Vehicle.

The main responsibility which the operation department must take on itself is the fundamental role of maintenance, that is, its responsibility is to prevent deterioration takes place, it becomes possible for Specialized maintenance department to carry out the effective maintenance.

Operation division
(Carry out the activity to prevent deterioration)

Maintenance division
(Increasing the efficiency through specialized maintenance steps)
T.P.M the definition

Total Productive Maintenance
Which Also Means
Total Profit Management
Through
Total Perfect Manufacture
Through
Total People Management
<table>
<thead>
<tr>
<th>Category</th>
<th>TQC</th>
<th>TPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>Improvement of corporate culture</td>
<td>Realisation of ideal production operation</td>
</tr>
<tr>
<td></td>
<td>(Improvement in actual performance, creating a cheerful working environment)</td>
<td>-Hardware oriented-</td>
</tr>
<tr>
<td>Object</td>
<td>Quality</td>
<td>Equipment</td>
</tr>
<tr>
<td></td>
<td>(Output side, Effect)</td>
<td>(Input side, Cause)</td>
</tr>
<tr>
<td>Means to achieve the end</td>
<td>Systematise the management</td>
<td>Realisation of ideal production operation</td>
</tr>
<tr>
<td></td>
<td>(Systematisation/Standardisation)</td>
<td>-Hardware oriented-</td>
</tr>
<tr>
<td></td>
<td>-Software oriented-</td>
<td></td>
</tr>
<tr>
<td>Cultivation and education</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Education focusing mainly on the management technique</td>
<td></td>
</tr>
<tr>
<td>employees</td>
<td>(QC technique)</td>
<td></td>
</tr>
<tr>
<td>Small group activities</td>
<td>Voluntary circle activities</td>
<td>Integrating the activities based on job description and by small group circle</td>
</tr>
<tr>
<td>Target</td>
<td>Quality for PPM order</td>
<td>Through elimination of losses and wastes (Aiming at achievement of zero loss)</td>
</tr>
</tbody>
</table>
TPM’s Origin

TPM had its inception at NIPPONDENSO CO., LTD., as well known manufacturer of automobile parts in 1971.

Japan Institute of Plant Engineers (JIPE), the forerunner of the present Japan Institute of Plant Maintenance (JIPM) provided thorough support for TPM movement and spared no effort to spread and promote TPM ever since.

TPM activity, born in Japan and intended for Production Divisions in the past, has recently been extended to the whole company, the whole industry and then to the whole world. TPM activity has been extended not only to plants in Japan, but also to plants overseas.
Progress of Maintenance Activity in Japan

- **Breakdown Maintenance**
  - 1950
- **Preventive Maintenance**
  - 1951
- **Corrective Maintenance**
  - 1957
- **Productive Maintenance**
  - 1960
- **Total Productive Maintenance**
  - 1971 TPM

Timeline:
- 1950
- 1960
- 1970
- 1980
- 1990
Three main features of TPM

1. It guarantees dramatic results
2. It visibly transforms the work place.
3. It raises the level of knowledge and skill of employees
T.P.M Analogy

- Analogous to Maintaining Body health.

Daily routines Brushing Teeth; bathing etc etc = Jishu Hozen

Sickness - approach the Specialist Doctors like
- Optalmist; Cardiologist; Dentist
- Nurologist Etc etc

= Plant Maintenance.

Meditation; Yoga; Playing; Exercise = Kobetsu kaizen.
TPM includes these meanings

**T : TOTAL**

① Maximization of total efficiency
② Entire lifecycle of Production System
③ Covers All Departments and participation by all employees

**P : PRODUCTIVE**

To pursue for the maximization of efficiency of the production system. This does not only mean to pursue for productivity, but also to make all losses zero. In other words, Zero-Accident, Zero-Defect, Zero-Breakdown are the real meanings of maximization of efficiency.

**M : MAINTENANCE**

Maintenance is used here in a wider sense covering the entire lifecycle of Production System. It refers to maintenance of individual processes, plants and production management system.
TPM is Not About Traditional Maintenance

<table>
<thead>
<tr>
<th>Traditional Maintenance</th>
<th>Total Productive Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Functional organisation</td>
<td>-Productive team</td>
</tr>
<tr>
<td>-Demarcation</td>
<td>-Multi-skilled and operator</td>
</tr>
<tr>
<td></td>
<td>maintenance</td>
</tr>
<tr>
<td>-Reactive to breakdowns</td>
<td>-Preventive maintenance</td>
</tr>
<tr>
<td>-Equipment is the</td>
<td>-Operator ownership and pride</td>
</tr>
<tr>
<td>Maintenance Department’s</td>
<td>in equipment by everyone</td>
</tr>
<tr>
<td>responsibility</td>
<td></td>
</tr>
<tr>
<td>-Necessary evil</td>
<td>-Vitally important</td>
</tr>
</tbody>
</table>
TRADITIONAL MANUFACTURING

- Breakdowns
- Maintenance
- Setting
- Adjustment
- Defects
- Misc. stoppage

8 hrs.

MANUFACTURING WITH TPM

- Operator meet
- Full output of defect free products - 7 hrs. 40 min.
- Equipment cleaning/checking

8 hours.
Objectives of TPM

(1) Radical Reforms of Personnel
1. Operator should possess ability to perform Self Initiated Maintenance
2. Maintenance man should possess ability to do maintenance of all types of equipments
3. Production Engineering man should acquire the ability to design such equipments which shall not require any maintenance.

(2) Improvement of Equipment
1. Aim at improvement in overall efficiency through improvement of equipment in use at present.
The Overall Goals for TPM

1. Cleaning becomes checking
2. Checking becomes discovery of abnormalities
3. Abnormalities become things to be restored or improved
4. Restoration and improvement become positive effects
5. Positive effects become pride in the workplace

Programme of Activities

Motivation
- Department leaders
- Pride in one’s work

Changing the equipment

Effects
- Reduction of defects and breakdowns

Changing the people

Changing attitudes
Breakdowns and defects should be seen as an embarrassment

Changing attitudes
Breakdowns and defects should be seen as an embarrassment

Effects
- Achievement of “zero defect” and “zero breakdown” goals

Changing (invigorating) the workplace

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8 Pillars of **TPM** Development

1. Individual Improvement for the maximization of Equipment efficiency (Maximization of Production efficiency—Reduction of losses)
2. Establishing an autonomous Maintenance system/Program (Promote autonomous maintenance focusing on operators by following 7 steps method)
3. Establishing a Planned Maintenance System by Maintenance department (Maintenance Department)
4. Education and training to increase operation and Maintenance skills (Skill Development Department)

Continued →
Establishing a system to control equipment at initial stage (Production Engineering Department must design a maintenance free equipment at the design stage and Product Engineering Department must stabilize the operation of new equipment at the earliest).

Establishing a Quality Maintenance system/Program

Establishing a System/Plan for maximization of efficiency of Indirect Department

Establishing a Safety and Environment Management System/Plan
# The Effectiveness of TPM

## Tangible Effect (3 to 4 years)

<table>
<thead>
<tr>
<th>(P) Productivity</th>
<th>Results from successful TPM companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Reduction in Number of Breakdown Failures</td>
<td></td>
</tr>
<tr>
<td>- Overall Equipment Efficiency</td>
<td>1/50 of current level</td>
</tr>
<tr>
<td>(Q) Quality</td>
<td>1.5 to 2 times</td>
</tr>
<tr>
<td>- Reduction in Process Defects</td>
<td>1/10 of current level</td>
</tr>
<tr>
<td>(C) Cost</td>
<td>Reduced by 30%</td>
</tr>
<tr>
<td>- Manufacturing costs</td>
<td></td>
</tr>
<tr>
<td>(D) Delivery</td>
<td>Reduced by 30% to 50%</td>
</tr>
<tr>
<td>- Inventory</td>
<td></td>
</tr>
<tr>
<td>(S) Safety</td>
<td>Reduced to zero</td>
</tr>
<tr>
<td>- Time off work for accidents</td>
<td></td>
</tr>
<tr>
<td>(M) Morale</td>
<td>5 to 8 per month per employee</td>
</tr>
<tr>
<td>- Implemented employee suggestion</td>
<td></td>
</tr>
</tbody>
</table>
Intangible Effect (3 to 4 years)

• Ownership of equipment by operators through Autonomous Maintenance

• “Zero failure”, “Zero defect” and “Zero accident” conditions gives employees self-confidence

• Clean working conditions makes cheerful chemistry among employees and management

• TPM leads to successful order receiving and delighted customers
### TPM Target Measurable

<table>
<thead>
<tr>
<th>Letter</th>
<th>Category</th>
<th>Target/Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Productivity</td>
<td>OEE 85% min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Challenge lunch times</td>
</tr>
<tr>
<td>Q</td>
<td>Quality</td>
<td>Zero defects</td>
</tr>
<tr>
<td>C</td>
<td>Cost</td>
<td>Manufacturing cost reduction by 10% min.</td>
</tr>
<tr>
<td>D</td>
<td>Delivery</td>
<td>100% schedule adherence</td>
</tr>
<tr>
<td>S</td>
<td>Safety</td>
<td>Zero accidents</td>
</tr>
<tr>
<td>M</td>
<td>Morale</td>
<td>Two fold increase in employees’ suggestions</td>
</tr>
</tbody>
</table>

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INTANGIBLE EFFECTS OF TPM

• Excellent morale of employees, who are now more confident
• Pleasant physical working environment which is neat and clean
• Sense of ownership and participation by employees
• Ability to work as a team
• Knowledge and experience sharing
• No rigid boundaries between departments
• Good image and impression created on customers/visitors
Loss Elimination through TPM?

Equipment

- Available time
- Available operating time
- Actual operating time
- Effective operating time

Six Big Losses

1. Breakdowns
2. Setup / adjustment
3. Idling / minor stoppages
4. Speed
5. Defects in process and rework
6. Start up losses
Overall Equipment Effectiveness

- Availability
  - Breakdown
  - Setup and Adjustment
  - Reduced Speed
  - Idling and Minor Stoppage

- Performance Rate
  - Defects and Rework
  - Startup

- Quality Rate
  - Minimise

Target
- Zero
- Minimise