Total Productive Maintenance / Total Profit Management

KSA-TPM OJT Guidance

Best Practice and Highest Performance!

KSA 한국표준협회
TPM•Production Innovation Team
Plant Innovation by TPM

- Make-up of environment for innovation
- Motivation for positive action of employees
- Improvement in corporate culture by TPM
  - Innovation of equipment productivity
  - Visual change in overall production plant
  - High efficiency of manufacturing manpower
  - Change in employee’s innovation mind
Correlation of Innovation Activities

Profit Management
- Productivity-up (output)
- Cost-down (input)
- Profit-producing activities

Plant Innovation for Management Goal

MBO
- Setting of TPM goal
- Departmental goal
- Control & assessment

TPM
- Removal of plant losses
- Improvement of system
- Improvement of capability
Direction for Production Innovation

Features for Modern Plant
- High dependence on the equipment
- Necessity for the high productivity, the low cost, and the profit management.
- Cleanliness and equipment condition are important to product quality

As-Is in TPM
- 3 worst (scatter, leakage, clogging) removed
- Launching stage in TPM activities
- Set-up stage of production innovation mind
- Raise-up stage of employee’s mind
- Necessity for inborn TPM in fiber glass

TPM Activities

To-Be
- Challenge to loss zero
- Breakthrough of limit
- Equipment productivity
- Quality defect ratio
- Production cost ratio
- Drastic innovation activities
- Change of equipment
- Change of personnel
- Improving productivity
- Reduction of cost
Sphere of TPM Activities

Attaining TPM goal in each department
- Systematic diagnosis
- Periodical consulting
- Evaluation & Monitoring

Autonomous implementation system
- Autonomous maintenance
- Individual improvement
- Planned maintenance
- Education & training

Implementation & maintenance of 5S activities

TPM circles by all participation
Direction of TPM Activities

- Loss removal by individual improvement
- Improvement action for cost composition causes
- Improvement action for profit producing
- Set-up of autonomous and planned maintenance
- Implementation for equipment clean-up
- Up-raise of output by increasing the availability and productivity.
- Mind improvement by TPM education and training
- Improvement of standard implementing capability
- Autonomous competition for TPM implementation
- Periodical diagnosis, evaluation, and conference
TPM Activities Direction for Increasing Profit

Not only TPM activities based on clean-up and environmental improvement but also TPM activities as a tool to attain the management goal, cost reduction, improvement of productivity, quality, and production control system are the main purposes.
Purpose of TPM Activities

Equipment changed, and then Personnel changed! And finally Corporate culture improved!

Change of equipment:
- Maintaining the cleaned-up condition
- Restoration of mal-function, removal of dirt sources, prevention for failure occurrence
- Producing the effect by improvement action

Change of personnel:
- Mind raise-up by the verification of result
- Self-confidence in improving activities
- Challenge-mind, positive mind

Change of culture:
- Profit-producing management
- Adaptation to the change
Goal of TPM Activities

For profit-producing TPM activities, TPM goal setting to be performed at the preparation stage before TPM kick-off. (Below bench-marking model showed)

- Production cost ratio: 5% down/year
- Overall equipment efficiency: 5% up/year
- Labor productivity: 10% up/year
- Equipment failure time: 30% down/year

Claim "0"
Customer satisfaction

Profit improvement
Cost innovation
## Progress of TPM Activities

<table>
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<tr>
<th>Direction</th>
<th>Set-up of innovation base</th>
<th>Systematic approach of all activities</th>
<th>Consolidation and improvement</th>
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<tr>
<td>TPM team</td>
<td>Preparation</td>
<td>Preparation for TPM initial sys Diagnosis and consulting</td>
<td>Assisting to all TPM activities / R &amp; D for TPM activities Bench marking for excellent companies in TPM</td>
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<td>Autonomous maintenance</td>
<td>Campaign</td>
<td>Initial clean-up</td>
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<td>Individual improvement</td>
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<td>Planned maintenance</td>
<td>Workshop</td>
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<td>Autonomous Maint. system</td>
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<td>Education &amp; training</td>
<td>Master plan</td>
<td>Autonomous control</td>
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<td>Initial control</td>
<td>TPM manual</td>
<td>TPM elementary course</td>
<td>TPM practice course</td>
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<td>Quality maintenance</td>
<td>Goal setting</td>
<td>TPM manual/Maintenance text</td>
<td>TPM application course</td>
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<td>TPM in office</td>
<td>Kick-off</td>
<td>Systemization of MP information</td>
<td>Equipment manual for each process</td>
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<td>Mind education</td>
<td>Preparation of MP manual</td>
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<td>5S activities</td>
<td>Removal of problem sources causing the quality defects</td>
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**Countermeasures for losses and supporting the activities for autonomous maintenance**

**Removal activities for minor losses such as failure, quality defects, and process losses, etc.**

**Equipment evaluation**

**Present status grasping**

**Deterioration restored**

**Weakness improvement**

**Maint. information sys**

**Periodical maint. system**

**Predictive M. system**

**Evaluation PM system**

**TPM elementary course**

**TPM practice course**

**General inspection manual**

**MP design activities & initial control for model project**

**MP design activities & initial control for all projects**

**Removal of problem sources causing the quality defects**

**Removal of quality defects loss and minor problems**

**Quality maintenance for quality defect-zero**

**5S activities in office**

**Document filing sys.**

**Facility in charge cleaned**

**Activities for job efficiency**

**Cost down activities**
TPM to be implemented after set-up of organization based on all member’s participation and consensus, identification of departmental duties, responsibilities and roles.

### TPM organization and role

**TPM Committee**
- **Top**: President / Director
- **Staff**: Maintenance manager
- **Member**: Each Dept. manager

**TPM Team**
- **Leader**: Manager / Maintenance
- **Staff**: One assistant, section chief

**Implementation Dept.**
- **Each manager**
- **TPM small groups**: Circles/TFT (Prod., Maintenance, etc.)

**Points of success**
- Personnel in charge of TPM job to be nominated.
- Consensus among departments

**TPM consulting & education**
- TPM Promotion specialists
- TPM consultants

**Order**
- Report

**Education / OJT**
- Offer of information

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**Organization of TPM Activities**

- Determination of policy
- Process control
- Diagnosis by top

- Set-up of master plan
- Support of all TPM activities
- Education & training

- Set-up of TPM annual & step plan
- Implementation
- Feedback of result
- TPM circles activities
Education for the Departmental TPM Staffs

OJT Consulting and education will be followed to the key men to perform TPM activities in each department and the TPM staffs to lead the company-wide TPM.

* The ability for setting-up of TPM implementation plan and program.
* The checking ability for the TPM performance.
* The setting-up ability for the problem-solving and countermeasures.
* The ability to diagnose the completion of step activities.
* The ability to educate and to train the departmental TPM activities.

Related person

* The company-wide leading TPM staffs and the departmental TPM staffs

Interval

* One time per a month, for 2 or 3 hours.

Method

* Periodical analysis of TPM activities, education and discussion.
## Key Points for the Major TPM Fields

<table>
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<tr>
<th>Division</th>
<th>Purpose</th>
<th>Key points of TPM activities</th>
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</thead>
</table>
| Autonomous maintenance        | * My machine & area * Observance of equipment condition (Cleaning, oiling, retightening) | * Sequential activities with step-by-step autonomous maintenance.  
* Motivation to the my area and my machine spirit.  
* 0ST(Preparation and 5S activities), 1ST(Initial cleaning), 2ST(Countermeasures for the sources of problem), 3ST(Preparation of tentative cleaning, oiling and inspection standard), 4ST(General inspection), 5ST(Process inspection), 6ST(Autonomous maintenance system), 7ST(Autonomous control).  
* Preliminary education and training for step implementation manual. |
| Individual Improvement & Cost Reduction | * Upraising of overall equipment efficiency by removing the 6 major equipment losses  
* Reduction of production cost ratio | * Countermeasures for the causes of dirt equipment and the hardness to clean (1~3 step), removal of hidden losses(4 step and after).  
* Activities for attaining TPM goal by loss reduction.  
* Activation of small group activities such as TPM circles, TFT.  
* Scientific analysis and drastic removal of trouble-causing sources.  
* TPM small group activities to reduce the production cost.  
* Cost reduction activities in accordance with individual improvement techniques. |
| Quality maintenance           | * Setting and control of equipment condition not to cause the various defects | * Phase 1 : Countermeasures for the causes of quality-defects.  
* Phase 2 : Small group activities to reduce the defect losses.  
* Phase 3 : Quality maintenance activities to attain the zero-defect by PM and know-why analysis. |
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<tr>
<td>Planned maintenance</td>
<td>Availability raise-up by technical periodical maintenance and predictive maintenance</td>
<td>* Activities with step-by-step planned maintenance (from 1 to 6 step).</td>
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<td></td>
<td>* Major contents; Goal-setting of technical maintenance, equipment rank, failure rank,</td>
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<td>maintenance record, drawing revision, supporting of autonomous maintenance, maintenance</td>
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<td>standardization, maintenance interval and TBM, maintenance information system, materials,</td>
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<td>lubricating, tools, precision, maintenance budget, CBM, and the availability improvement.</td>
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<td>* Reduction activities of failures and troubles.</td>
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<td>* Check and maintenance system for the optimistic equipment condition.</td>
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<td>* Timely maintenance and repair of B grade assembly and equipment.</td>
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<td>Education &amp; training</td>
<td>Improvement of TPM mind and maintenance skill</td>
<td>* Education and training for TPM activities know-how (managers, key men, leaders, workmen in sequence).</td>
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<td>* Maintenance techniques (fundamental elements, general inspection of equipment, all sorts of equipment in charge).</td>
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<td>* Study by one point lesson (OPL) sheet.</td>
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<td>* Multi-skill education for operators and maintenance men.</td>
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<tr>
<td>MP design &amp; Initial control</td>
<td>Practical MP design for new plant and equipment</td>
<td>* Decision for investment priority by economic engineering analysis.</td>
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<td>* Set-up of initial control system for MP information, MP design standard, debugging system</td>
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<td>from import to trial test of equipment.</td>
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<td>TPM in office</td>
<td>Improvement in office productivity and office environment</td>
<td>* Simplification of job processing sequence and method, realization of creative office.</td>
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<td></td>
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<td>* 5S in office, filing system, raise-up of office efficiency, set-up of TPM-related standard.</td>
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</table>
To attain the annual management goal, departmental and stratified goals to be settled and to be evaluated periodically - monthly and quarterly. TPM activities are performed as the method or tool of the management goal attaining.
Activities for Autonomous Maintenance

**Autonomous Maintenance System**

0 STEP
- **5S activities**

1 STEP
- **Initial Clean-up**

2 STEP
- **Problem Sources removal**

3 STEP
- **Tentative standard**

4 STEP
- **General inspection**
  - **Understanding the elements of equipment**
  - **Understanding the equipment in charge**
  - **Improvement of poor process**

5 STEP
- **Process inspection**
  - **Process quality assurance**

6 STEP
- **Autonomous M. system**
  - **Settlement of auto. M**

7 STEP
- **Autonomous control**
  - **My-area Act.**
    - **- Tidiness**
    - **- Cleaness**
    - **- Visualization**
  - **My-machine Act.**
    - **- Cleaning & inspection**
    - **- Minor repair & maintenance**
  - **Short insp. & cleaning time**

- **Autonomous Maintenance System**
  - **- Equipment optimization**
  - **- Logistics optimization**
  - **- Observance of operator’s role**
  - **- Quality maintenance**
  - **- Education & training of equipment manual**
Individual improvement to be performed by TPM small group (TFT, TPM circle) to attain the management goal such as production cost ratio, labor productivity after the loss analysis of production cost and plant efficiency.

**Activities for Individual Improvement**

**TFT’s activities**
- Analysis of production cost or plant efficiency
- Grasping of major losses
- Analysis of loss structure
- Registration of major themes
- Improvement activities
- Verification of effects

**TPM circle’s activities**
- Grasping of sub-losses
- Registration of TPM circle’s themes
- Sharing of individual task
- Improvement activities
- Verification of effects
- Spreading to others

**Consulting TFT activities**

- **Themes**
  - Typical themes capable of spreading
  - Themes easy to spread
  - Theme contributing to cost-down
  - Themes attaining the management goal
  - Themes related to job interface

- **In charge**
  - Managers or engineers (TFT)
  - TPM circle (all member’s participation)

- **Interval**
  - For 2 or 3 months per each theme (In case of A grade)

- **Method**
  - Analysis, countermeasures, education
  - Typical modeling manual
  - Consulting one time per a month
Activities for Planned Maintenance

Planned Maintenance System

0 STEP
- 5S activities
  - Goal-setting
  - Equipment rank, failure rank

1 STEP
- Equipment evaluation, Present status grasping
  - Deterioration restored, Weakness improvement

2 STEP
- Information control sys
  - Failure reduction
  - Drawing revision
  - Supporting of autonomous M.

3 STEP
- Periodical M. system
  - Maintenance information sys.
  - Maintenance materials
  - Lubricating system
  - Maintenance interval & TBM
  - Maintenance standardization
  - Maintenance record
  - Tools, precision
  - Maintenance budget
  - CBM (Condition-based Maint.)

4 STEP
- Predictive M. system
  - System & PM goal
  - Supplements of PM
  - Support of autonomous M.

5 STEP
- Evaluation PM system
  - Settlement of PM
  - Challenge to higher goals

6 STEP
- PM system settled
  - Information system
  - TBM system
  - CBM system
  - New TPM techniques

- Fundamental PM
  - Set-up of PM
  - PM foundation
  - Equipment repaired
    - Big troubles
    - Failure analysis & countermeasures

- Planned Maintenance System
  - Maintenance information sys.
  - Maintenance materials
  - Lubricating system
  - Maintenance interval & TBM
  - Maintenance standardization
  - Maintenance record
  - Tools, precision
  - Maintenance budget
  - CBM (Condition-based Maint.)
Activities for Skill-up Education and Training

Essential and fundamental education and training for mechanical element, driving and transmission, lubricating, hydraulic and pneumatic, electric and instrument to be performed to prevent the frequent and major troubles.

Grasping of required skill

- Functional skill
- Classified skill
- Self evaluation

Training system

- Assembled Training
- On-the-Job Training
- Off-the-Job Training
- Off-Company Training

Evaluation

- Periodical evaluation
- Temporary evaluation
- Opening of result
- Effect job-distribution

<table>
<thead>
<tr>
<th>Description</th>
<th>PHASE I</th>
<th>PHASE II</th>
<th>PHASE III</th>
<th>PHASE IV</th>
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<tbody>
<tr>
<td>Operator</td>
<td>Fundamental</td>
<td>Elementary</td>
<td>Intermediate</td>
<td>Superior</td>
</tr>
<tr>
<td>Maint. men</td>
<td>Fundamental</td>
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KSA-TPM OJT Supporting Scheme

☆ The purpose of TPM OJT supporting by KSA
To attain failure-zero, defect-zero, accident-zero effectively by the rapid settlement of TPM system and the activation of TPM activities through OJT and education in the problem-solving techniques periodically.

☆ The necessity of TPM OJT supporting by KSA
▶ Bringing-up of the effective problem-solving abilities
   * The lack of manpower to study TPM techniques to be released.
   * The TPM duration by preventing the trial and error to be reduced.
   * The communication problem between bottom and top to be released.
▶ The active stimulus to the workers and foremen to be offered periodically.
▶ The opportunity to learn the TPM know-how and TPM techniques to be offered.

☆ The sphere of TPM OJT supporting by KSA
▶ The all parts of TPM system.
   * All parts of TPM system such as planning, use, technical maintenance, and support fields of equipment.
▶ The production and facility innovation techniques
   * Maintenance techniques, statistical methods, process control, RCM, reliability, etc.
KSA-TPM OJT Supporting Procedure and Method

Before TPM kick-off and implementation stage, TPM preparation activities (about for 2 months) to be necessary as follows.

**Preparation stage**

- **Grasping of Present status**
  - *Set-up of major improvement items and targets through the analysis of production and equipment efficiency.*
  - *Analysis of production losses and equipment losses.*

- **Set-up of TPM plan**
  - *Set-up of yearly and monthly TPM plan.*
  - *Set-up of yearly and monthly TPM target in each department.*

- **Preparation of TPM program for Vetrotex**
  - *Preparation of TPM manuals matching to each sphere and each department.*
  - *Implementation manual will be prepared through discussion between consultant and key-men.*
  - *Education to be offered to key-men for TPM techniques.*

**Implementation stage**

- **OJT & Education**
  - *Set-up of TPM consensus by education of TPM manual.*
  - *Check-up and consulting of the departmental preparation items.*

- **Implementation**
  - *OJT and education for the practical implementation know-how.*
  - *Consulting TFT activities to remove the big losses and problems.*
  - *The checking and supplementary supporting for TPM step activities monthly.*

- **Output appraisal and level-up**
  - *Analysis and countermeasures of TPM output monthly and quarterly.*
Feature for KSA-TPM OJT Supporting

- Profit-producing effective OJT supporting by the theoretical, empirical and practical TPM deploying know-how
- Supporting for set-up of improvement methodology in problem-solving of major production and equipment losses by TPM OJT consultants’ careers
- Supporting for TPM deploying methodology in all sorts of manufacturing companies by the best practice in TPM intangible and tangible effects
We will response the questions and more information for the KSA-TPM OJT guidance!

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