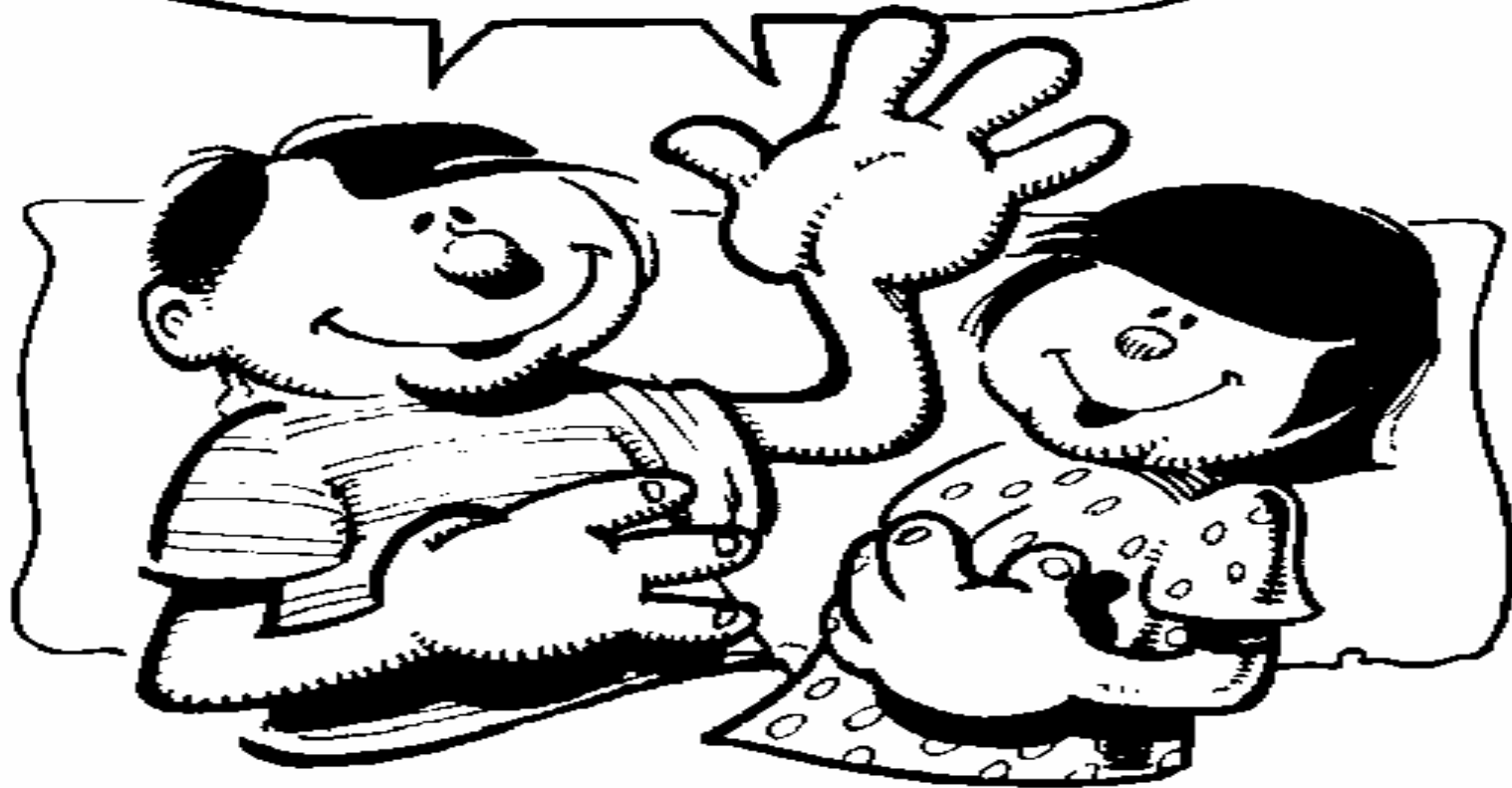


TPM OVERVIEW

Manufacturing & Administrative Excellence.



Background of TPM

- **Main manufacturing excellence approach of Toyota and other excellent Japanese companies since the 70's.**
- **TPM is foundation for JIT, FA, Poka Yoke, Lean Manufacturing, Zero Defects.**
- **TPM Reference Standard - JIPM (Japan Institute of Plant Maintenance)**
- **Comes from the best of Japanese Industrial Excellence and evolved from the heat of the continuing Energy Crisis and Globalization challenges to achieve More with Less.**

Executive Overview Of

- 1. Autonomous Maintenance**
- 2. Equipment Improvement**
- 3. Planned Maintenance**
- 4. Quality Maintenance**
- 5. Office TPM**

Logic of AM Steps

Steps 1,2,3
Improve the
Equipment
User -Friendliness

Steps 4,5,6
Improve Worker Know-
how to maintain
Equipment through
Structured Specific
Skills.

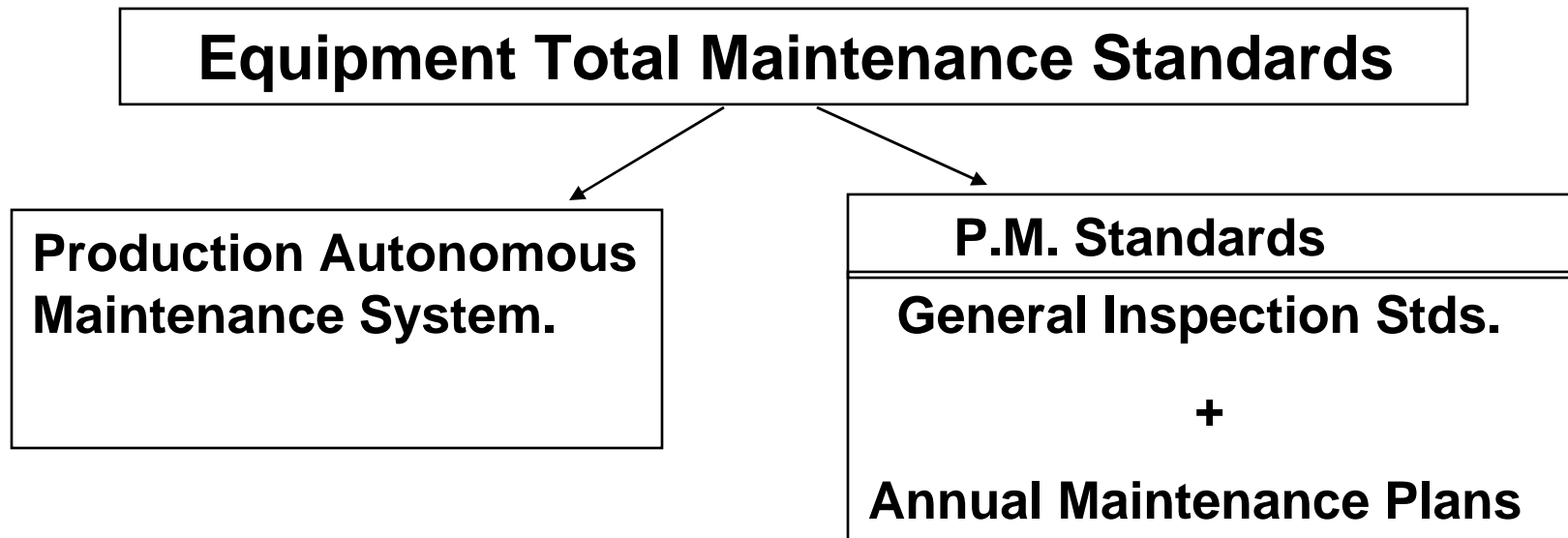
Step 7
Flattened
Organization.

AM STANDARDS

Step #	Step Goal	Standards	
Step 1	Restoration	=> 85% repair rate	
Step 2	Eliminate Sources of Contamination	=>70% successful effort	
Step 3	Improve Equipment Accessibility	=>70% successful effort	
Step 4	Initial Maintenance Standards	> 50% sudden b/d reduction	
Step 5	General Inspection Skills	> 90% sudden b/d reduction	
Step 6	Autonomous Inspection	> 95% sudden b/d reduction	
Step 7	Organise and manage workplace	TBD by management	

Goal of Planned Maintenance.

**Achieve “ZERO EQUIPMENT BREAKDOWNS”
by implementing systems of
“parts replacement before failure” through
TBM and CBM.**



Planned Maintenance Activities:

- o Support Autonomous Maintenance Activities by technical support, breakdown analysis and demarcation between Production & P.M. Systems.**
- o P-M Analysis for chronic breakdowns.**
- o Time Based Maintenance items**
- o Condition Based Maintenance items.**
- o Spares Mgtm & Maintenance Day Practice.**

Role of Plant EI Team

Achieve systematic breakthroughs in equipments' 6 BIG LOSSES and establish Standards for Basic Machine Conditions.

The Basic Machine Conditions are:

- 1. Cleaning Standards.**
- 2. Lubrication Standards.**
- 3. Bolt-tightening Standards.**

Equipment 6 Big Losses

(Focus is at the Bottleneck processes.)

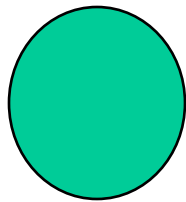
- 1. Breakdown Losses**
- 2. Speed Losses.**
- 3. Setup Losses.**
- 4. Defect Losses.**
- 5. Start-up or Yield Losses**
- 6. Minor Stoppages Losses**



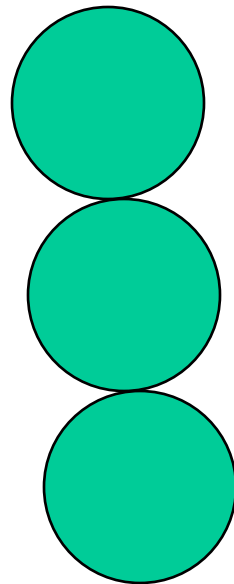
LOSSES / Maint LEVEL	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
1. Breakdown losses	<ul style="list-style-type: none"> • Have chronic B/Ds • B/d Repair time PM time. • >20% deviation of service life range. • Root-causes of breakdown not clear. 	<ul style="list-style-type: none"> • Only spontaneous breakdowns. • B/d Repair time = PM time. • Within parts service life span. • Root-causes of B/Ds are clear and addressed. 	<ul style="list-style-type: none"> • Time-based component maint. system. • D/T repair time < PM time • B/d downtime < 1% • Service life of components => upper range of specs. 	<ul style="list-style-type: none"> • Condition-based maint system • Maint staff do only PM. • AM do D/T repairs < at 0.1% of DT level. • Clear improvement in MTBF
2. Setup Losses	<ul style="list-style-type: none"> • Incomplete setup documentation. • Setup times variation >30%. 	<ul style="list-style-type: none"> • Complete set-up documentation • On-line and off-line setups are defined. 	<ul style="list-style-type: none"> • Successful efforts to convert on-line to off-line setups • All adjustments are fully clarified and standardized. 	<ul style="list-style-type: none"> • Optimal set-ups under 10 mins. • 1st time set-up produce good parts. No need to adjust any further.
3. Minor Stoppages	<ul style="list-style-type: none"> • No awareness/data. 	<ul style="list-style-type: none"> • Setup Time variation < 15% • Data on frequency, location of minor stoppages. 	<ul style="list-style-type: none"> • Reduced 1/20th of current • Root-causes of minor stoppages are clear and countermeasures in place. 	<ul style="list-style-type: none"> • Zero minor stoppages.
4. Speed Losses	<ul style="list-style-type: none"> • Equipment specs not clear. • No settings documented by different packages/ machine models & types. 	<ul style="list-style-type: none"> • Root-causes are clear • Settings documented by package / machine type. • < 5% variation between same type machines 	<ul style="list-style-type: none"> • Countermeasures for root-causes of speed losses implemented. • Revised settings with notes on quality and accuracy impact. • < 2% speed loss. 	<ul style="list-style-type: none"> • Operates at designed speed or above. • Zero Speed losses
5. Defect & Startup Losses	<ul style="list-style-type: none"> • Nothing done about chronic losses. • No results from previous actions 	<ul style="list-style-type: none"> • Chronic defects are quantified by type, frequency and volume. • Root causes for problems are identified and understood. 	<ul style="list-style-type: none"> • Countermeasures implemented effective for early in-process detection of defects. • Q-components identified and effects on quality are clear. 	<ul style="list-style-type: none"> • M-Q relationship established. • Regular audit of Q-components • Loss due to quality defects is < 0.1%

Sporadic & Chronic Problems

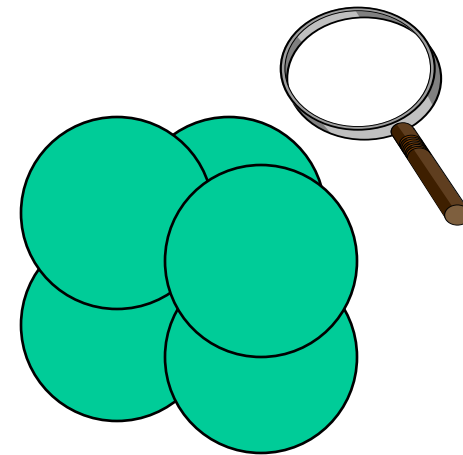
Why-Why Analysis.



For problems
with clear and
assignable
causes.



P-M Analysis.



For problems with
clear causes & no
effective counter-
measures

Why-Why Analysis & P-M Analysis

- Used with other data analysis or data collection tools.
- Emphasize on logical reasoning to fully understand the whole chain of cause-effects so as to devise holistic multiple solutions.
- All defects, breakdowns, accidents and work – problems are result of an error by Man which is the Root Cause.
- Problems are traced to all the 4Ms
- Solution Sustained by linked to the TPM systems.

Quality Maintenance:

is activities to set **equipment conditions**, based on the basic concept of maintaining perfect equipment to maintain perfect quality of processed goods. The machine conditions (**Q-Components**) are checked and measured in time-series to verify that measured values are within standard values to prevent defects. The transition of measured values is watched to **predict possibilities of defects** occurring and to take countermeasures beforehand.

Role of Plant TPM-QM

Achieve “ZERO DEFECT” by identifying all the upstream factors of Equipment causes of defects and implementing fool-proofing techniques to eliminate man and materials-caused defects.

- 1. Identify all the Q-components**
- 2. Implement fool-proofing techniques to prevent man and materials-caused defects.**
- 3. Eliminate all Chronic defects.**

ABOUT OFFICE TPM

- **Is a structured 5S program using Why-Why Analysis as a problem-solving tool.**
- **Has similar Autonomous Maintenance 5 Steps**
- **Improves “CRITICAL FUNCTIONS” of Ware-house, Storage Place, administrative areas’ through work-flow studies.**
- **Areas contributing to OEE losses are selected for Kai’zen activities.**

The 5S step-by-step program.

1 - Cleaning & Restoration.	Thoroughly restore & clean. Motivation through participation.
2 - Eliminate Stains, Mixed, Contamination.	Study Root Causes of Dirt, Mixing, Loss, damage and take actions.
3 - Improve Accessibility.	Achieve 1 minute accessibility time for documents + parts. Implement stock-management-at 1 glance.
4 – Standardization & Control of Work.	Achieve a problem-free work flow in stock inventory, data availability.
5 - Self Management	Self Managing Work Teams.