

Total Productive Maintenance Module 14

© 1996-2013, John Black and Associates LLC (modified from Hiroyuki Hirano, Productivity Press).

Total Productive Maintenance: Key Points

- ▶ TPM is productive maintenance carried out by all employees through small group activities.
- ▶ There are six big losses that limit equipment effectiveness
- ▶ Chronic losses occur repeatedly within a certain range of distribution.
- ▶ Sporadic losses are sudden outbreaks that go beyond that range.

How does TPM Work?

- ▶ TPM is productive maintenance carried out by all employees through small group activities.
- ▶ Five Goals:
 1. Maximize equipment effectiveness.
 2. Develop a system of productive maintenance for the life of the equipment.
 3. Involve all departments that plan, design, use, or maintain equipment.
 4. Actively involve all employees - from top management to shop floor workers.
 5. Promote TPM through autonomous small group activities.

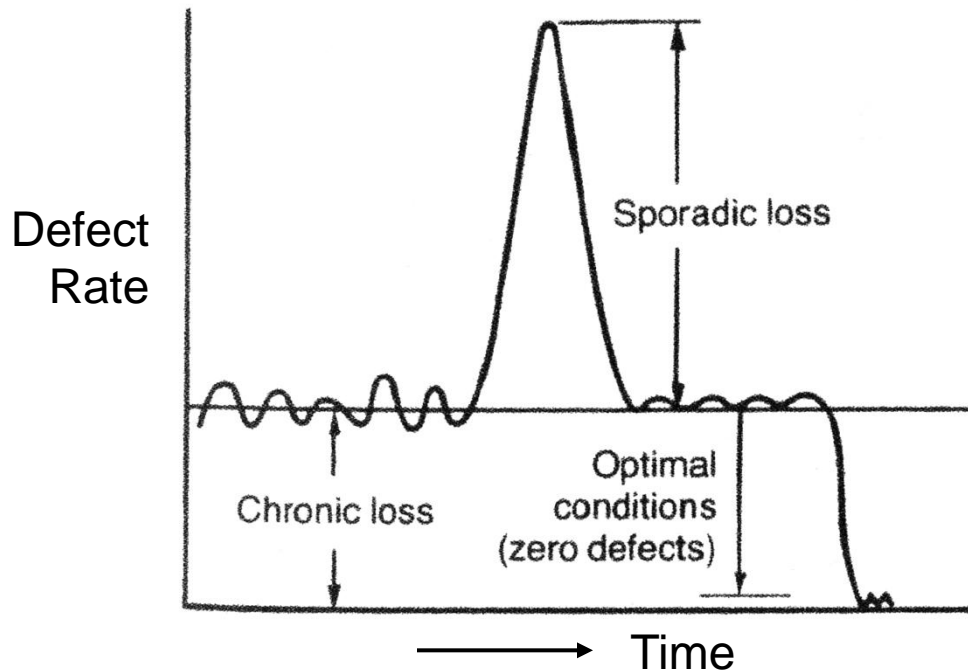
Six Big Losses

Limit Equipment Effectiveness

1. Breakdown.
 - ▶ Time loss when productivity is reduced.
 - ▶ Quality loss caused by defective outcomes.
2. Setup and Adjustment.
3. Idling and Minor Stoppage.
4. Reduced Speed.
5. Quality Defects and Rework.
6. Startup.
 - ▶ Yield losses that occur during the early stages of production.

Sporadic and Chronic Losses

Chronic usually refers to a phenomenon that occurs repeatedly within a certain range of distribution. Sudden outbreaks that go beyond this range are referred to as **sporadic**.



Source: TPM Development Program, Seichi Nakajima

Restoration is key.

- To return to previous level.

Innovation is key.

- To achieve optimal conditions.

Chronic losses become obvious when compared to optimal conditions.

Chronic Losses and Hidden Defects

- ▶ Chronic losses are caused by hidden defects.
- ▶ Chronic losses are subtle and difficult to detect.
 - ▶ They arise from conditions that are perceived as normal.
 - ▶ They often have multiple causes.
- ▶ Chronic losses become obvious when compared with optimal conditions.
- ▶ Maintenance typically addresses sporadic problems.
 - ▶ When equipment breaks, they fix it.
 - ▶ Focusing on fixing broken equipment leaves little time to address chronic losses.

Sporadic vs. Chronic Losses in Healthcare

Patients with diabetes use a meter to measure their blood sugar. This measurement tells them the right amount of insulin to take.

Sporadic:

Problem:

The meter display screen goes blank.

Result:

Biomed is called and repairs are made.



Chronic:

Problem:

The meter's internal controls are not routinely calibrated.

Result:

The patient receives an incorrect amount of insulin.



Why Chronic Losses are Neglected

- ▶ The cause is unknown.
 - ▶ No obvious fix.
 - ▶ No time for root cause analysis.
- ▶ A cause is known, but the action taken is ineffective.
- ▶ Equipment design is complex.
- ▶ Lack of training is mistaken for lack of experience.
- ▶ All stake holders are not working as a team.
 - ▶ Factory reps/engineers.
 - ▶ Facilities engineers.
 - ▶ Maintenance.
 - ▶ Staff who operate the equipment.

Reducing and Eliminating Chronic Losses

- ▶ Reduce and eliminate chronic losses by:
 - ▶ Increasing equipment reliability
 - ▶ Restoring the equipment to its original operating conditions
 - ▶ Identifying and establishing optimal operating conditions
 - ▶ Eliminating small defects that are often overlooked.



Eliminating the Six Big Losses

Breakdown Losses

- ▶ Take action against breakdowns.
 - ▶ Equipment is maintained through small group activities.
 - Factory and facilities engineers set standards.
 - Maintenance trains, repairs, and overhauls.
 - Staff inspect, clean, lubricate, and report anomalies.
 - ▶ Begin by cultivating new attitudes.
 - ▶ Replace the assumption that “all equipment eventually breaks down” with the conviction that “properly maintained equipment never breaks down.”

Eliminating the Six Big Losses

Breakdown Losses

- ▶ Five requirements for zero breakdowns.
 1. Maintain basic equipment conditions: cleaning, lubricating, and inspecting.
 1. Adhere to operating conditions.
 2. Restore deterioration.
 3. Correct design weaknesses.
 4. Improve operator and maintenance skills.

Eliminating the Six Big Losses

Breakdown Losses

Production versus Maintenance

Equipment is maintained through small group activities.

► Operators must do the following:

- Maintain basic equipment conditions: cleaning, lubrication, adjustments.
- Maintain operating conditions: proper operation and visual inspection.
- Discover deterioration through visual inspection to identify abnormalities.
- Enhance skills such as equipment operation, setup, adjustment, and visual inspection.

► Maintenance personnel must do the following:

- Provide technical support for production departments.
- Restore deterioration thoroughly and accurately using inspections, condition monitoring, and overhaul.
- Clarify operating standards by identifying design weaknesses and making appropriate improvements.
- Enhance maintenance skills for checkups, condition monitoring, inspections, and overhauls.

Eliminating the Six Big Losses

Setup and Adjustment Losses

- ▶ Eliminate adjustments, where possible.
 - ▶ To eliminate adjustments:
 - Analyze their purpose.
 - Look for root cause.
 - Evaluate methods.
- ▶ Improve unavoidable adjustments.
 - ▶ When adjustments cannot be eliminated:
 - Set fixed values.
 - Establish standard work.
 - Train to improve skills.

Eliminating the Six Big Losses

Reduced Speed Losses

Speed loss is the loss of productivity caused by the difference between the designed speed of a machine and its actual operating speed.

- ▶ Common problems related to speed losses.
 - Vague equipment specifications.
 - Specified speeds are attainable but not achieved.
 - Inadequate investigation of problems.
 - Equipment is used incorrectly.

Eliminating the Six Big Losses

Idling and Minor Stoppages

- ▶ Correct minor defects.
 - Caster on cart wobbles.
 - Drawer catches when it opens.
 - Leads on monitor are loose.
- ▶ Apply basic principles of shop floor operations.
 - Routine Inspections scheduled and assigned.
 - Maintenance schedule for each piece of equipment.
 - Ongoing training and cross-training matrix maintained.
- ▶ Identify optimal conditions.
- ▶ Identify required configuration.
- ▶ Investigate design weaknesses (should be explored last).

Eliminating the Six Big Losses

Reduce Chronic Quality Defects

Chronic quality defects occur when a healthcare system regularly produces totally or partially defective outcomes despite various improvement and control measures.

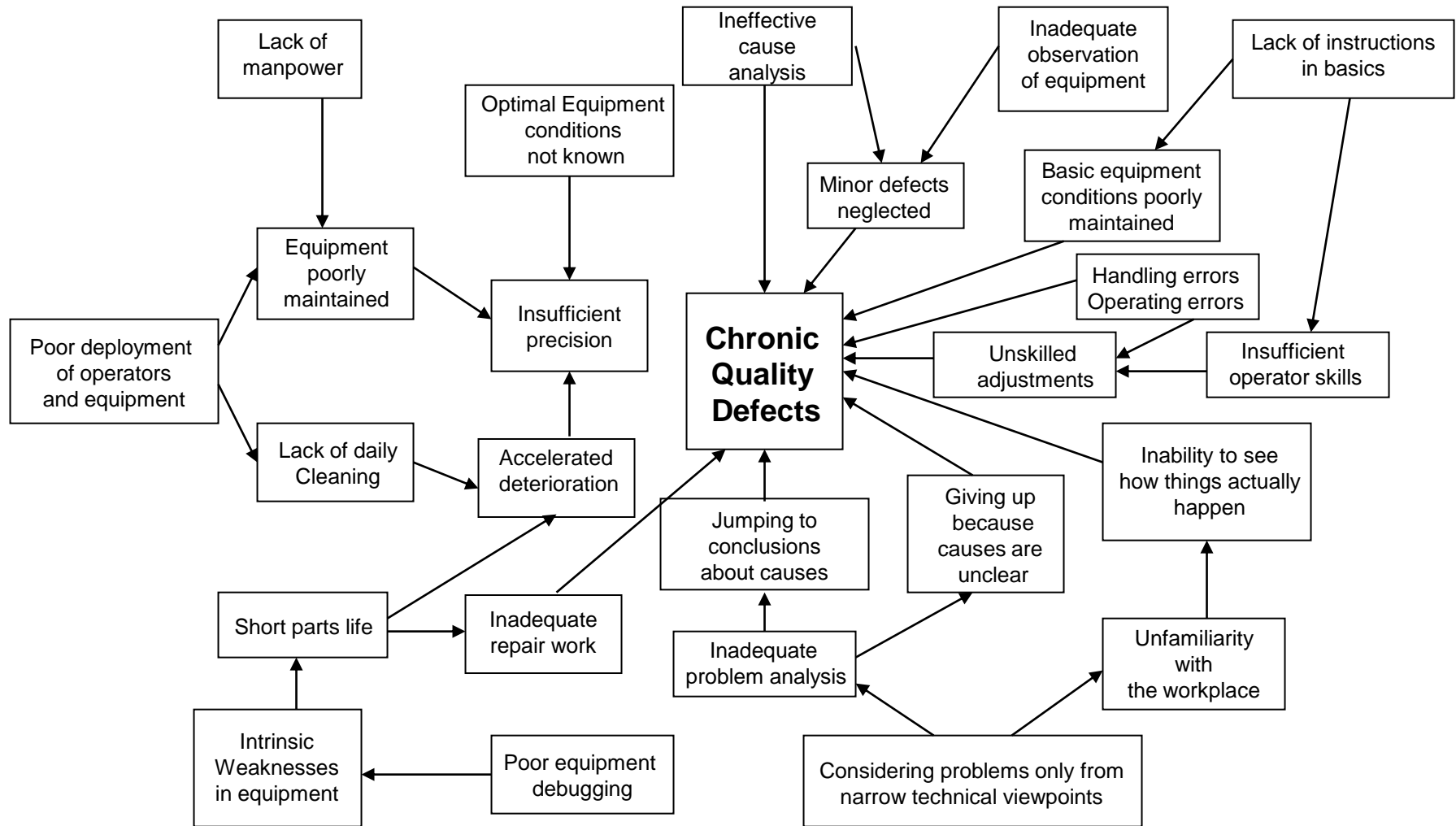
Eliminating the Six Big Losses

General Characteristics of Chronic Quality Defects

- ▶ Improvement efforts have been unsuccessful.
- ▶ Symptoms are addressed, root cause is not.
- ▶ Investigating and identifying root cause is difficult.
- ▶ Managing equipment is limited to specific technical fields, usually maintenance.
- ▶ Maintenance is caught in an unending cycle of break and repair – no time for preventive tasks.

Eliminating the Six Big Losses

Typical Causes of Chronic Quality Problems



Source: TPM Development Program, Seichi Nakajima

Total Productive Maintenance Summary

Total Productive Maintenance reduces equipment breakdowns through a team approach to managing our equipment throughout its total expected lifetime.

