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TPM e-Book Series

Title: Why-Why & P-M Analysis With 7 Case Studies (454 Pages)

Quality is a given in today's competitive environment. However, many of the traditional problem-solving tools are effective in addressing only the 'apparent' causes and neglect the 'latent' causes. No wonder, defects disappear only to re-surface again some time later.

The Why-Why and P-M Analysis are two advanced problem-solving tools that have helped the Japanese achieve their famed quality standards and are indispensable for any organization pursuing a zero-defects program or implementing Poka Yoke (Mistake-proofing). The Why-Why Analysis may be effectively used for most problems encountered in the technical or administrative areas. The P-M Analysis tool is reserve for use for the most difficult and chronic type of technical problems such as chronic defects and equipment failures.

e-Book Description

- Only Publication with both Why-Why and P-M Analysis over 187 pages of power-point lectures.
- 7 full P-M Analysis Case Studies of selected and solved Industry chronic problems.
- 454-paged e-Book Illustrated with scores of examples and actual multiple-industries experiences.
- Teaching methodology proven in scores of extremely highly-rated in-house and public seminars.
- TPM Expert's 15 years' of various Industries hands-on experiences available to you.
- Authored by Moses Tan (MSc; BIT; Dip Electr.; Dip Ed) Principal Industry Consultant of ZenPower International, Singapore.

This e-Book Learning Objectives are:

- Understand and apply the Why-Why Analysis problem-solving tool for technical and administrative problems.
- Understand and apply the P-M Analysis problem-solving tool for chronic-type of defects and equipment failure problems.

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Course Contents

1 **Why-Why Analysis Problem Solving tool.**
- 1.1 The five-steps in Why-Why Analysis.
- 1.2 Step 1: Verifying the 3 Actuals.
- 1.3 Step 2: Express the problem statement in Phenomenon form.
- 1.4 Step 3: Asking Why? Five times.
- 1.5 Correct and Wrong questioning techniques.
- 1.6 Step 4: Finding the Root Cause (Man is Root Cause)
- 1.7 Step 5: Generating corrective actions and preventive action (Mistake Proofing)
- 1.8 Case studies in Teams.

2 **Introduction to P-M Analysis**
- 2.1 Definition and nature of chronic defects and chronic equipment failures.
- 2.2 The interactive nature of chronic problems.
- 2.3 The overview of7-Steps in P-M Analysis.

3 **Learning P-M Analysis through a Practical Hands On Simulated Mechanism. (Each team will be given the simulated mechanism with a chronic problem)**

3.1 **Step 0: Physical Analysis to understand background of problem.**
- Process and mechanism perspective.
- Proper Operation to avoid the Phenomenon.
- Identify operation step where/when the mis-operation took place.

3.2 **Step 1: Phenomenon statement of problem.**
- Facts of What, where, when, who.
- Avoidance of How and Why.
- The 1-sentence guideline.
- Focusing on the physical place of mis-operation.
- Defining the Necessary Conditions for no mis-operation.

3.3 **Step 2: Physical View (Hypothesis) of problem.**
- Getting the whole picture of the mis-operation.
- Tips to proposing the Physical View (hypothesis)
- The 1-sentence guideline.

3.4 **Step 3: Contributing Conditions and possible interactive relationships.**
- Confirming the Necessary conditions.
- Tips on Identifying the Contributing Conditions.
- Usual range of number of Contributing Conditions.
- Defining and Determining the Temporary Decision Criteria.
- Defining and improvising of measurement methods and tools.
- Conventions used in the P-M Analysis format.

3.5 **Step 4: 1st level 4Ms, 2nd level 4Ms, 3rd level 4Ms..... etc.**
- Recognizing assembly and sub-assembly relationships.
- Identify areas of interaction and perform optimization

- Learning to recognize potential interactions.
- Practical and useful rules for designing an optimization experiment based on Taguchi Methods and principals.
- Coupling DOE with P-M Analysis for effectiveness.

3.7 **Step 5: Finding the Root Cause and Action Plans.**

- Zero-defects Philosophy that all problems are man-made.
- What is a Mistake
- Poka Yoke concepts and practice.

3.8 **Step 6: Verifying the results.**

3.9 **Step 7: Standardization and Continuous Improvement System.**

- Concept of a Production System.
- Concept of Autonomous Maintenance
- Concept of Planned Maintenance.
- The basic machine conditions as the basis for sustaining improvements.

<u>Brief Description Of P-M Analysis Case Studies In This e-Book:</u>
(The solutions are meticulously documented step-by-step for your ease of learning)

Case 1: Die-Attach Epoxy Insufficient Coverage chronic defect. (39 Slides)
This is a Semiconductor Assembly Industry chronic defect. The project successfully reduced the defect level from 360 PPM down to the low 30's PPM. A 90% reduction!

Case 2: Current-to-Pneumatic Converter Electrical Trips – chronic equipment failure.
This is an electro-pneumatic chronic equipment problem. The current-to-pneumatic electrical module trips frequently at the rate of about … times per month. The project successfully reduced the tripping incidences to ---

Case 3: Abnormal High Main-Motor Torque – chronic equipment failure.
This is a complex automated processing equipment failure problem. Something(s) in the huge and complex linked-automated conveyor system is giving abnormal load to the main drive motor. A few hundred components and sub-assemblies could be the reason(s). Which are the troublesome parts? The project successfully demonstrated the systematic logical-reasoning approach in P-M Analysis which quickly and precisely pinpointed the causes. The motor torque value was successfully reduced to the normal value.

Case 4: Paper Slitter Overlapped – chronic equipment failure.

Over the years, the quality, performance and lifespans of the disc cutting blades of paper slitters had deteriorated to 15 burr cases/month, lifespan of a reworked blade to only 2 days and 5 cases of slitter overlapped (jumped) / month. Productivity and quality were severely

compromised. What went wrong? The project successfully reversed the trend and reduced burr cases from 15 cases/month to zero/month; increased lifespan of reworked blades from 2 days to 4 days; and reduced the cases of slitter overlap from 5 cases to 1 case per month.

Case 5: Paper Breaks – chronic defect.

In the paper recycling process, the Paper Machine is the most complex and expensive process bottleneck – both in terms of cost as well as downtime. The factory was more than 6 years old and the Paper machine was experiencing very high downtime due to paper breaks. Each downtime was measured in terms of days to repair. Using P-M Analysis, the team of maintenance crew was able to identify the counter-measures needed to reduce the paper breaks as well as greatly improve their trouble-shooting skills at the next breakdowns.

As a result of the project, paper break cases were reduced from 10 cases / month to 5 cases /month. More dramatic is the reduction of MTTR (mean time to repair) from 3 days to only 30 minutes.

Case 6: Ink Marking Defect – chronic defect

In the high-tech and fiercely-competitive Semi-conductor assembly industry, the Ink Marker process is used to mark the identification symbols and numbers on the top surface of ICs (Integrated Circuits). Even though the process has been highly fine-tuned with most sporadic problems under control, there has been a certain level of marking defects over the years. The average marking defect level has been determined to be 687 PPM (parts per million). A team was formed to drive this defect level down towards zero using P-M Analysis. The team was able to pin-point several important controls that needed to be put in place and eventually reduced this defect level down to 176 PPM.

Case 7: Damaged Leads at Trim/Form Machine – chronic defect.

In the back-end of the Semiconductor Industry, metal leadframes carrying the molded ICs need to be singulated, the metal leads trimmed and formed into the required shape. The machine used is called a Trim and Form Machine utilizing cutting dies, forming punches on pneumatic presses.

The machine is fully automated with on-load and off-loading mechanisms. One the chronic defects is damaged leads when leadframes are jammed along the automated process. The baseline defect level was 300 PPM. Using P-M Analysis, the team managed to reduce this defect level down to **ZERO !!**