Kaizen

- By
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List of Topics

· Introduction to Kaizen
· Role of Kaizen in the Industry
· Elements of Kaizen
· Factors of Kaizen
· Aspects of Kaizen
  · Blitz Kaizen
  · Gemba Kaizen
  · Mini Kaizen
· Hierarchy of Kaizen
· Kaizen implementation at TVS Sundaram-Clayton Ltd.
Introduction

- Kaizen was first implemented in several Japanese businesses during the country's recovery after World War II.

- Carrying out small improvements in large numbers with total employee involvement, on a continuous basis.

- It must be achieved with 100% participation.

- It is better implemented by a person himself / herself who has created the improvement idea and carried out in his / her own workplace.
What does Kaizen mean?

= KAI = CHANGE

= ZEN = GOOD
   (FOR THE BETTER)

= KAIZEN

= CONTINUAL IMPROVEMENT
**Why Kaizen**

**CPI (Continual Performance Improvement)**
- Data Driven Methodology to Magnify Impact of Process Improvement
- Apply Control Techniques to Eliminate Erosion of Improvements
- Proceduralize/Standardize Improvements for Improved Maintenance of Critical Process Parameters

**CPI Projects Emphasize Control and Long Term Maintenance**

**Kaizen**
- Use Small Teams to Optimize Process Performance by Implementing Incremental Change
- Apply Intellectual Capital of Team Members Intimate with Process

**Kaizen Projects Emphasize Incremental Improvements**

Source: www.qualitytoolbox.com
Elements of Kaizen

Important elements & factors to consider in Kaizen.
OUT OF THIS FOUNDATION, THREE KEY FACTORS ARISE

» Elimination of waste (muda)

» The Kaizen five - S framework

» Standardization

Source: http://www.1000ventures.com/business_guide/mgmt_kaizen_main.html
Need for Kaizen
Shift Mindset

WASTE NOT DEFINED
REACT TO LARGE EXAMPLES

WASTE IS "TANGIBLE"
IDENTIFY MANY SMALL OPPORTUNITIES
-LEADS TO LARGE OVERALL CHANGE

TYPES OF WASTE
- Processing
- Transportation
- Inventory
- Waiting
- Correction
- Over-Production
- Motion
OVERPRODUCTION
- overproduction is to manufacture an item before it is actually required.
- Just in Time Vs Just in Case
  Excessive lead times, results in high storage costs, and makes it difficult to detect defects
  The concept is to schedule and produce only what can be immediately sold / shipped and improve machine changeover/set-up capability.

WAITING
- **Meaning**: Whenever goods are not moving or being processed, the waste of waiting occurs.
- **Reason**: Material flow is poor, production runs are too long, and distances between work centers
- **Suggestion**: Linking processes together so that one feeds directly into the next can dramatically reduce waiting
TRANSPORTING
- **Meaning**: Transporting product between processes is a cost incursion which adds no value to the product.
- **Reason**: Excessive movement and handling cause damage and are an opportunity for quality to deteriorate and it is often hard to determine which processes should be next to each other.
- **Suggestion**: Mapping product flows can make this easier to visualize.

INAPPROPRIATE PROCESSING
- **Meaning**: “Using a sledgehammer to crack a nut”
- **Reason**: Many organizations use expensive high precision equipment where simpler tools would be sufficient.
- **Outcomes**: This often results in poor plant layout because preceding or subsequent operations are located far apart.
- **Suggestion**: Combining steps will greatly reduce the waste of inappropriate processing.
- **Example**: Toyota.
7 WASTE

- **UNNECESSARY INVENTORY**

  - Work in Progress (WIP), raw materials and finished product are a direct result of *overproduction* and *waiting* and this also results in *no income*.

  - *Excess inventory* tends to *hide problems* on the plant floor, which must be identified and resolved in order to improve operating performance.

  - Excess inventory *increases lead times*, consumes productive floor space, delays the identification of problems, and inhibits communication.

  - **Suggestion:** By achieving a seamless flow between work centers, many manufacturers have been able to improve
7 WASTE

- **UNNECESSARY / EXCESS MOTION**
  - This waste is related to **ergonomics** and is seen in all instances of bending, stretching, walking, lifting, and reaching. These are also health and safety issues, which in today’s litigious society are becoming more of a problem for organizations.
  - **Suggestion:** Jobs with excessive motion should be analyzed and redesigned for improvement with the involvement of plant personnel.

- **DEFECTS**
  - **Meaning:** Quality defects resulting in **rework or scrap** are a tremendous cost to organizations. **Associated costs** include quarantining inventory, re-inspecting, rescheduling, and capacity loss.
  - In many organizations the total cost of defects is often a significant percentage of total manufacturing cost.
  - **Suggestion:** Through employee involvement and **Continuous Process Improvement (CPI)**, there is a huge opportunity to reduce defects at many facilities.
The Kaizen five - S framework

- Seiri- tidiness
- Seiton- Orderliness
- Seiso- Cleanliness
- Seiketsu- Standardized clean-up
- Shitsuke – Discipline

Source: http://www.shingijutsu-global.com/kaizen.html
Western Interpretation of 5s

To Sort
Eliminate what’s not absolutely necessary

To Straighten
Ensure space for each thing, and a thing for each space. No

To Sustain
Maintain continuous effort. This is a way of

To Sanitize
Improve ment of the workstation. Be organized

To Sweep
Maintain a clean and orderly space to make problems easily
<table>
<thead>
<tr>
<th>Management oriented Kaizen</th>
<th>Group oriented Kaizen</th>
<th>Individual Oriented Kaizen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tools</strong></td>
<td>Seven statistical tools</td>
<td>Seven statistical tools</td>
</tr>
<tr>
<td></td>
<td>New seven tools</td>
<td>Common sense tools</td>
</tr>
<tr>
<td></td>
<td>professional skills</td>
<td>seven statistical tools</td>
</tr>
<tr>
<td><strong>Involves</strong></td>
<td>Managers and professionals</td>
<td>Quality control circle</td>
</tr>
<tr>
<td></td>
<td>(group) members</td>
<td>Everybody (group) members</td>
</tr>
<tr>
<td><strong>Target</strong></td>
<td>Focus on the system and procedure</td>
<td>Within the same workshop</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Within one's own work area</td>
</tr>
<tr>
<td><strong>Cycle(Period)</strong></td>
<td>Lasts for the duration of the project</td>
<td>Requires four or five months to complete</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anytime</td>
</tr>
<tr>
<td><strong>Achievements</strong></td>
<td>As many as management chooses</td>
<td>2 or 3 per year</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Many</td>
</tr>
<tr>
<td><strong>Supporting System</strong></td>
<td>Line and Staff project team</td>
<td>Small group activities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>QC circles</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Suggestion system</td>
</tr>
<tr>
<td><strong>Implementation Cost</strong></td>
<td>Sometimes requires small investment to implement the decision</td>
<td>Mostly inexpensive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inexpensive</td>
</tr>
<tr>
<td><strong>Result</strong></td>
<td>New system and facility improvement</td>
<td>Improved work procedure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On-the-spot improvement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Revision of standards</td>
</tr>
<tr>
<td><strong>Booster</strong></td>
<td>Improvement in managerial performance</td>
<td>Moral improvement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Participation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kaizen awareness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Self development</td>
</tr>
<tr>
<td><strong>Direction</strong></td>
<td>Gradual visible improvement</td>
<td>Gradual and visible</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gradual and visible</td>
</tr>
<tr>
<td></td>
<td></td>
<td>marked upgrading of current status</td>
</tr>
</tbody>
</table>
Aspects of Kaizen

Evolution of Kaizen in the Industry
Gembakaizen:

- GEMBA means the place where the products are made, so GEMBAKAIZEN is KAIZEN activities that take place in GEMBA.

- GEMBAKAIZEN is to make continuous improvement at the real place, where the action is going on, and that can make your organization better.

Source: Gembakaizen, Masaaki Imai.  
http://www.gemba.com/consulting.cfm?id=112
Aspects of Kaizen

▶ Kaizen Blitz

- A Kaizen Blitz, or rapid improvement, is a focused activity on a particular process or activity. The basic concept is to identify and quickly remove waste.

▶ Mini Kaizen:

- It is part of corporate culture. It requires both conscious and sub-conscious thinking about improvements day by day and minute by minute on the part of all employees.
- It also requires that these same employees possess the skills for this type of thinking.

Source: www.strategosinc.com
Two Approaches To Progress and Innovation

- **The gradualist approach** *(favored by Japanese companies):*
- **The great-leap-forward approach** *(favored by Western companies)*

Source:
Hierarchy of Kaizen involvement

- **Top Management**
  - Innovation
  - Kaizen
  - Maintenance

- **Middle Management**
  - Innovation
  - Kaizen
  - Maintenance

- **Supervisors**
  - Innovation
  - Kaizen
  - Maintenance

- **Workers**
  - Innovation
  - Kaizen
  - Maintenance

**Innovation**
drastic improvements in current processes

**Kaizen**
small continuous improvements in current processes

**Maintenance**
activities directed to maintaining current technological, managerial, & operating standards

Source: [http://www.1000ventures.com/business_guide/im_cif_main.html](http://www.1000ventures.com/business_guide/im_cif_main.html)
The PDCA circle

- This is also known as the Shewhart cycle or Deming cycle

Source: More details on Gemba Kaizen®
7 CONDITIONS FOR KAIZEN IMPLEMENTATION

- Top Management commitment
- Top Management commitment
- Top Management commitment
- Setting up an organization dedicated to promote Kaizen
- Appointing the best available personnel to manage the Kaizen process
- Conducting training and education


Source: http://www.1000ventures.com/business_guide/cs_efficiency_kaizen_fidelity.html
Implementation

Implementation

A study of TVS Sundaram-Clayton ltd.
Steps for implementation

- Identify specific point for improvement in ones own work area.

- Analyse the root cause of the problem and develop solution.

- Implement the kaizen and quantify benefits.

- Standardise the improvement through proper documentation.

- See if there is scope for horizontal deployment. Deploy horizontally if applicable.

- Fill in the improvements in the standard format and submit for evaluation.

Source:
http://www.1000advices.com/guru/processes_kaizen_quick-ea
GUIDELINES

i. Think, Rethink and then attempt kaizen, with 100% clarity and understanding

iii. Collect all relevant data, analyze and then only think of solution.

v. Use only appropriate tools, while implementing.
Standards and Tools in TVS Sundaram-Clayton

- 7 QC tools
- One page QC story
- Quality Proving procedure
- EJO procedure
- Kaizen sheet
- Measurement graphs examples
7 QC tools
To Collect the data in a simple manner and to prevent omitting the checks
To pick up the important few problems from the trivial many.
To re-organise the factors (causes) which are influencing the problem
Presentation of data in a pictorial form for better understanding and see if the process is under stable conditions.
To see the distribution pattern compared against the standard values.
To segregate data according to contributing sources. (Suppliers, machines, operators etc)
SCATTER DIAGRAM

- To see relation between two sets of data
iv. Verify the results for consistency with EJO (Experimental Job Order) procedure.
EXPERIMENTAL JOB ORDER

Part No. Description GRN No. Reason
no. 180326 EC6 relay emergency valve

Unit: Aedr? Coff? Valve 1 / Valve-1

(Strike out which ever is not applicable)

ECN No. PCN No. Supplier:

Purpose of Tryout: Sample approval PPAP Approval
and Specific particulars Supplier part

Introduction of automatic test rig

Yes No Yes No Not applicable

Requestor Name & Dept. Comments by PED

Comments by On-Line PE

Fully automatic.
Part number selection control
Calibration made with calibration master.

Read on 19/04/2004

Conformance Sign. & date

Accepted / Rejected

Requestor PE Online PE Operations Purchase QA/Conf Others

Conformance Sign. & date

6457040-4

Revised on 21/01/2005

EJO No. PE/03/04

Date: 25/09/2004
v. Apply Quality Proving procedure (QP1, QP2 and QP3) before freezing the implemented solution.
Quality Proving (QP) is a concept of acknowledging & addressing problems in a structured & systematic manner.
QP1 STAGE - CONCEPT DEVELOPMENT AND PROVING- OFF LINE

- Identify area of improvement in Cycle time and Quality
  - Video recording
  - Prepare man-machine chart
  - Identify improvements based on the following techniques
    - ELIMINATE
    - COMBINE
    - SIMPLIFY
    - REARRANGE
    - FIX TARGET
QP1 STAGE - CONCEPT DEVELOPMENT AND PROVING - OFF LINE (cont.)

- Develop concept and Build system as off line
- Test the off line system using the Production line parts
- Collect feedback from operators for improvements
QP2 STAGE – OFF LINE FLOW
PROVING

- Construct cell incorporating all facilities together
- Check for cycle time for each workstation and the overall cell
- Adjust for line balancing and improve material from workstation to workstation
- Test the cell for the cycle time and quality of the assembled components
QP3 STAGE- ONLINE
IMPLEMENTATION AND VERIFICATION

- Prepare cell documents
- Provide OJT training
vi. Document the complete kaizen with worksheets, data, in a QC story methodology.
<table>
<thead>
<tr>
<th>S.NO</th>
<th>OPERATION NO &amp; DESCRIPTION</th>
<th>NAME OF MEMBER</th>
<th>PROBLEM IDENTIFIED</th>
<th>CORRECTIVE ACTION</th>
<th>RESPONSIBLE</th>
<th>TARGET</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Male Emergency plugger assembly and check</td>
<td>RES</td>
<td>Insufficient snap ring assembly</td>
<td>Modify SCF 9816 for consistent assembly of snap ring</td>
<td>CR</td>
<td>30.09.04</td>
<td>Completed</td>
</tr>
<tr>
<td>2</td>
<td>Male Emergency plugger assembly and check</td>
<td>WKG</td>
<td>No need tool spares</td>
<td>Provide spare 3 nos. formed tool</td>
<td>CR</td>
<td>30.09.04</td>
<td>Completed</td>
</tr>
<tr>
<td>3</td>
<td>Male Emergency plugger assembly and check</td>
<td>WKG</td>
<td>Clip tip locating bug is sticking with component</td>
<td>Modify the clip tip locator</td>
<td>CR</td>
<td>06.10.04</td>
<td>Completed</td>
</tr>
<tr>
<td>4</td>
<td>030 / Value body and base cover assembly</td>
<td>WSK</td>
<td>No locator for Loctite 542</td>
<td>Provide locator for Loctite 542</td>
<td>CR</td>
<td>30.09.04</td>
<td>Completed</td>
</tr>
<tr>
<td>5</td>
<td>030 / Value body and base cover assembly</td>
<td>WKG</td>
<td>Tightened by outside body in the fixture</td>
<td>Provide air chamber in the SCF 9816</td>
<td>CR</td>
<td>29.09.04</td>
<td>Completed</td>
</tr>
<tr>
<td>6</td>
<td>030 / Value body and base cover assembly</td>
<td>RES</td>
<td>No separate register for 3 tightening screw drivers</td>
<td>Provide separate register for 3 tightening screw drivers</td>
<td>CR</td>
<td>29.09.04</td>
<td>Completed</td>
</tr>
<tr>
<td>7</td>
<td>030 / Value body and base cover assembly</td>
<td>TEAM</td>
<td>Joint kink between base cover and body in motor of 20 nos.</td>
<td>Provide 2 alignment pins for assembly</td>
<td>CR</td>
<td>30.09.04</td>
<td>Completed</td>
</tr>
<tr>
<td>8</td>
<td>040 / Top cover, Rocking piston assembly and leak checking</td>
<td>WSK</td>
<td>No locator for Loctite 243</td>
<td>Provide locator for Loctite 243</td>
<td>CR</td>
<td>30.09.04</td>
<td>Completed</td>
</tr>
<tr>
<td>9</td>
<td>050 / value body and top cover assembly</td>
<td>WKG</td>
<td>Locating pin is tight assembly</td>
<td>Modify SCF 9820/8  00 for ease of entry</td>
<td>CR</td>
<td>29.09.04</td>
<td>Completed</td>
</tr>
<tr>
<td>10</td>
<td>050 / value body and top cover assembly</td>
<td>RES</td>
<td>Stoppage error in PLC for 13 times screw assembly in body and top cover assembly</td>
<td>Modify PLC program</td>
<td>CR</td>
<td>06.10.04</td>
<td>Completed</td>
</tr>
</tbody>
</table>

DELIVERABLES:
1. Process error proofing to be provided for identified 31 locations.
2. Cycle time of each operation should not exceed the existing.
3. Single component to be earnt.
4. Robust error proofing to customer complaints excessive pocket blockage and piston return spring sticking to be earnt.
5. Output tolerance of 7.79 nos. to be increased to 11.5 nos.

NO. OF GP PROBLEMS IDENTIFIED: 18 CHECKED: CR
NO. OF GP PROBLEMS RESOLVED: 18 CLEARED FOR GP-8: CR
vii. Fill up the kaizen sheet, as per standard format.
How to Document or present a Kaizen?

- All improvements when carried out and completed should be documented in standard format.
- Kaizen format should contain all details of the improvements preferably with visuals such as pictures, sketches, drawings, easily readable and understood. It should also show scope of horizontal deployment of the idea or concept to other areas in the plant, for multiple benefits / gains.
- Format is to be presented in standard size viz A4 sheet, font, lettering, colours, spacing, etc.
<table>
<thead>
<tr>
<th>Kaizen Theme:</th>
<th>Implemented Area:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem / Present Status:</td>
<td>Implemented by:</td>
</tr>
<tr>
<td>Define the problem (Graphical representation or Text)</td>
<td></td>
</tr>
<tr>
<td>Before improvement:</td>
<td>Result / Benefit:</td>
</tr>
<tr>
<td>(Pictorial or flow diagram)</td>
<td>(Graphical representation or Text quantitative)</td>
</tr>
<tr>
<td>Real root cause identification:</td>
<td>Standardisation:</td>
</tr>
<tr>
<td>Mention the tool used to arrive at real root cause</td>
<td></td>
</tr>
<tr>
<td>After improvement:</td>
<td>(Mention the standardisation points)</td>
</tr>
<tr>
<td>(Pictorial or flow diagram)</td>
<td></td>
</tr>
<tr>
<td>Root Cause</td>
<td>How many places this kaizen can be deployed horizontally:</td>
</tr>
<tr>
<td>Idea to eliminate root cause</td>
<td></td>
</tr>
<tr>
<td>Action taken</td>
<td></td>
</tr>
</tbody>
</table>
# Kaizen sheet

<table>
<thead>
<tr>
<th>Productivity</th>
<th>Quality</th>
<th>Safety</th>
<th>Material</th>
<th>Energy</th>
</tr>
</thead>
</table>

**Kaizen Theme:**

**Problem / Present Status:**
- **Before improvement:**
  - Define the problem
  - (Graphical representation or Text)

**Real root cause identification:**
- **After improvement:**
  - (Pictorial or flow diagram)

**Root Cause**

**Idea to eliminate root cause**

**Action taken**

**Result / Benefit:**
- (Graphical representation or Text quantitative)

**Standardisation:**
- (Mention the standardisation points)

**Font:** Arial type, size 8, black, bold

**Implemented Area:**
- Font: Arial type, size 12, black, bold

**Implemented by:**
- Font: Arial type, size 12, black, bold

**Font:** Arial type, size 12, red, bold

**Font:** Arial type, size 12, green, bold

**Font:** Arial type, size 12, black, bold
Kaizen Measurements

- Kaizen results can be measured in many ways as below:
  - Number of kaizens completed per employee per year
  - Percentage participation level of employees
  - Economic benefits in Rupees ...... ...... and as % to net sales
  - Qualitative benefits measured in terms of
    - Near miss accidents
    - Drop in ppm levels of quality
    - Delivery service level improvements, etc.
ありがとうございました

Thank you!