Implementation Manual - 3

Quality Maintenance

Qs. 1 What kind of data is required?

Ans: Quality defects – in-house and at customer end.

For customer-end data, we have to get data on

- Customer end line rejection
- Field complaints.

In-house, data related to product & processes have to be

Data related to product may include:

- Product wise defects
- Severity of the defect and its contribution – major/minor
- Location of the defect with reference to the layout
- Magnitude and frequency of its occurrence at each stage of measurement
- Occurrence trend in beginning and the end of each production/process/changes. (Like pattern change, Tundish change, ladle/furnace lining etc.)
- Occurrence trend with respect to restoration of breakdown/modifications/periodical replacement of quality components.

Data related to processes:

- The operating condition for individual sub-process related to men, method, material and machine.
- The standard settings/conditions of the sub-process
- The actual record of the settings/conditions during the defect occurrence.

Data from first and last piece inspection report and rejection analysis report are

also means to collect data on quality defects.

This data is usually compiled in a Quality loss format. For every quality defect 6W and 3H conditions are captured. For example,

Which: machine no. (032304 – Lal 2B)

What: (Defect phenomena) tool mark

Where: Location (on bore dia)

When: time (during running, tool change etc.)

Who: Operator (Mr. X)

How many: Quantity rejected:

Data needs to be tracked for trends. Therefore we need to categorize them into families, such as wheel cylinders, torque plates, carriers, housings etc. and also process-wise to know the relationships. We must know which processes contribute to which product defects. More than one process will contribute to more than one defect. Therefore we need to go down to one more level of uncovering the phenomena.

All process conditions and defects data are put on the computer. These data should be retrievable at various locations to do different forms of analysis at any time.

Based on the above data, 3M(Machine, material and Method) fuguai are identified. Countermeasures are implemented to eliminate the problem.

Why: root cause

How to do: Kaizen idea

Horizontal deployment: deploy in similar areas.

Qs. 2 How to collect data on quality defects?

Data must be collected first by the teams working on the model machines, and later by the JH circles. The data collection for defects must be comprehensive for the following data:

Type wise – product wise – process wise – cause wise – machine wise. Components individually or in combination cause quality defects. Machine and components to be both checked when defect is generated. Standards related to quality components are to be checked. Component wise phenomena have to be understood and stratification of quality defects is to be done. Then, machine components' relation to quality characteristics/defect modes is thereby established.

Facts must be confirmed after visiting 'Gemba' (work place) and 'Genbutsu' (Real things/defectives).

Operators and inspectors must be trained to observe defects and the phenomena that create the defects. They must also be explained the immediate countermeasures – phenomena-wise. (This can happen when JH team observes very carefully 'Why products are OK?')

Then circle members are ready to start recording data and taking immediate countermeasures. They must also record the countermeasures taken so that analysis can be done by the KK, PM or QM teams for taking permanent countermeasures. Data collection must address both needs – for observing effects of quick and long-term countermeasures.

There must be a daily collection of data that must get compiled to observe trends over weeks and months. Quality defect trends with phenomenon, cause & kaizen idea along with implementation date can show a full picture of how Quality losses are being eliminated.

Qs. 3 How to make the Quality Matrix chart?

Quality Matrix is one of the means to achieve zero defects by identifying focus areas. The purpose is to establish a relationship between process characteristics and quality characteristics.

Quality matrix can be made fewer than three categories depending on your company:

- Process-wise
- Operation wise
- Machine wise

The inputs to making this matrix come from:

- Product/process characteristics
- Types of defects
- Process sequence
- Product/process history - types and frequency of problems occurred with counter measures or corrective actions.

- Machine manual.
- Past record of defect modes are anlaysed to investigate the types of defects occurring in each process. Relation of product quality characteristics with each defect mode is established. Relation of defect modes with each process and sub-process is established.

Classification of defects can be by

Safety

Major characteristic affecting performance of product

Defect generated in market

A defect that will lead to customer complaint

A defect that will become apparent in following process

A defect from a previous process that becomes apparent in the current process

A team of people representing the following functions must develop this matrix:

- Quality
- Process planning
- Maintenance engineers
- Shop supervisors
- Operators

Qs. 4: How to make inspection standards to sustain zero defects?

Check points are defined in terms of conditions that don't produce defects. Such conditions are expressed in standard values. Check points can be related to 3M conditions – Method, machine & material.

1. Identify '3M' conditions to achieve zero defects
2. Assess 3M conditions
3. Identify fuguai
4. Set 3M conditions (through countermeasures/Kaizens)

5. Establish standards to sustain zero defects. These standards should contain required value, frequency of check and how to check. In case there is some special attention required for checking then that must come up in an OPL. There must be also a clear indication for 'action if not OK'.

Optimal conditions should contain the following parameters for each category of defects. E.g. 'Bore undersize'

1. Machine
2. Work head spindle
    - Sizer Head alignment
    - Vibration
    - Workhead spindle runout

3. Wheel head
    - Pilot bore run-out
    - Vibration

4. Methods

5 .Face support
    - Bore run out
    - B. Feeler
    - Diamond nose radius
    - Hole center to tip distance
    - Width

6. Material
7. Stock
8. Bore radius
9. Track size variation

For each of the specifications frequency of checks and responsibilities must be clearly indicated. Some items can be checked by JH circles and others by PM, QM KK teams etc.

Review the inspection standards periodically for defect occur

Occurence (relation analysis of defect occurrence and standard). Ensure the current situation and implement improvement activities and calibration of equipment. Continuously, based on feedback, revise the inspection standard and implement.

Develop operator's skill on the revised standards through one-point lessons, visual aids, DO's and DONOT displays to alert them. Continuously monitor dimensions by auto-gauging for critical and significant dimensions.

Qs. 5 Methodology of zero defects

1. From defect we need to go to phenomenon
2. Do a why-why analysis
3. Go to root cause
4. Solution would be of two types: Poor design or human error.

For poor design of product/process we will need to strengthen the design.

For human error we will need to implement Poka Yoke.

Full inventory of Root cause to Kaizen ideas and Kaizen actions has to be built up defect/phenomena wise. These need to be horizontally deployed.

Where problems are of Type B, why-why analysis may not be adequate to achieve zero defects, in those cases, PM Analysis is advised.

Qs.6 : Exchange the ideas for elimination and for sustaining zero defects.

- Monitor continuously the defect rate on daily, weekly and monthly basis. Conduct circle meetings periodically to confirm corrective actions and whether they are effective.
- Establish standards for machine, equipments, and monitor their accuracy. Operate at controlled tolerance to the mean limit of the tolerance.
- Develop skill of operators to stop the machines when defects are noticed.
- Maintain machine and measuring equipments to the basic condition to prevent deterioration.
- Continuously monitor the incoming product quality.

Poka Yoke and PM analysis are necessary. Many of the companies, are putting in Poka Yoke for all processes which impact safety of product or operation and where there are any customer complaints. In addition to that the following suggestions are made:

- Poka Yoke working to be inspected. This can be ensured through ha TBM calendar.
- Kaizen inspection sheets are prepared and key points are added as Quality points in the JH check sheets.
- Setting master's usage and first time right settings is done through education and training.

Manual No.3 : QUALITY MAINTENANCE IMPLEMENTATION

The TPM Club India, CII acknowledges the contribution of all the following 41 companies who added great value in sharing their experience of TPM Implementation. This manual is the third in the sequence of others to come, covering

- Kobetsu Kaizen, and
- Office TPM

in this year

1	Aditya Cement	21	Lucas TVS - FIE Division
2	Bajaj Auto Limited	22	Mahindra & Mahindra Limited – Auto
3	Bharat Seats Limited	23	MM Forgings Limited
4	Birla Tyres	24	Mother Diary
5	BPL Limited PTI	25	QH Talbros Limited
6	Brakes India Limited, Brakes Div.	26	Shriram Pistons & Rings Limited
7	Brakes India Limited, Foundry Division	27	Sona Koyo Steering Systems Limited
8	Brakes India Limited, Padi	28	Sundaram Brakelinings Limited
9	Brakes India Limited, Pollambakam	29	Sundaram-Clayton Limited
10	Clutch Auto Limited	30	Tata Cummins Limited
11	Electrosteel Castings Limited	31	Tata Metaliks Limited
12	Heavy Alloy Penetrator Project	32	The Tata Iron & Steel Co. Limited - Steel
13	Hindustan Lever Limited	33	The Tata Iron & Steel Co. Ltd. - Bearings
14	Hi-Tech Carbon	34	Thirumalai Chemicals Limited
15	Indian Oil Corporation Limited	35	TTK-LIG Limited
16	Indo Gulf Corporation Limited (Fertilisers)	36	Tube Products of India
17	Jay Yuhshin Limited	37	Usha Beltron Limited - Cable Division
18	Jindal Strips Limited	38	Usha Beltron Limited - Alloys & Steel
19	Lakshmi Auto Components	39	Usha Martin Industries
20	Lakshmi Machine Works Limited	40	Vikram Cement
21	Lucas TVS - FIE Division	41	Vikram Ispat, Salow

The TPM Club India greatly acknowledges, Mr. Yamaguchi's leadership in giving the directions for making TPM a movement. Without his support, this would not have been possible.

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