Unit-4 Defects Analysis and Reliability

Defect Diagnosis

DPMO - Defects per million opportunitiesIt is the measure of process performance

DPMO = (1,000,000 x no. of defects)/(no. of units x no. of opportunities per unit)

DMAIC - Define, Measure, Analyze, Improve and Control
- Key steps used to implement in the whole organization for improving the quality of product and process

Reliability

It is the ability of an apparatus, machine, or system to consistently perform its intended or required function on demand and without degradation or failure.

<u>Reliability objectives</u> – Design objectives that refers to an item's reliability are known as reliability objectives.

Examples:

- For telephone switching equipment: Less than two hours of downtime in 40 years.
- For submarine light guide system (TAT-8): Less than three failures requiring ship repair in 25 years.
- For an AT & T PC (around 1987): A mean time between failures (MTBF) of at least 2500 hours.

Evaluation of Reliability

- Reliability theory is the foundation of reliability engineering.
- For engineering purpose, it is defined as the probability that a system will perform its intended, function during a specified period of time under stated conditions.
- Reliability improvement can be thought of as a process, the main elements of that process:
 - Reliability strategies
 - System or product design
 - Failure modes and effects analysis
 - Reliability modeling and estimation
 - Quality assurance strategies
 - Work management and execution
 - Continuous improvement

Factors affecting reliability

1) Stresses

2) Change in temperature

3) Humidity

4) Atmospheric pressure

5) Salinity

6) Human factors

7) Generic

Building reliability in the product

Various issues forms the basis of a tailored reliability program:

- Defining a reliability program
- Developing reliability goals and requirements
- Designing for reliability
- Assessing reliability progress
- Measuring product reliability
- Ensuring reliable performance

> Engineering techniques used in reliability engineering:

- Reliability Hazard analysis
- FMEA
- Fault tree analysis
- Reliability prediction
- Weibull analysis
- Thermal analysis
- Reliability testing
- Accelerated life testing

Maintainability

It is the measure of the ease and rapidity with which a system can be restored to operational status following failure.

It deals with the duration of maintenance outrages or how long it takes to achieve (ease and speed) the maintenance action compared to a datum.

□ Military Handbook 472 (MIL-HDBK-472) defines 10-components of maintainability-

- > Elemental activities: maintenance of short duration and relatively small variance
- Malfunction active repair time: Preparation time
 - Malfunction verification time
 - Fault location time
 - Part procurement time
 - Repair time

Malfunction repair time: - Malfunction active repair time

- Malfunction administrative time
- System repair time: product of malfunction repair time and no. of malfunctions
- System downtime
- > Total system downtime: combination of the distribution
- System logistic time
- System repair time
- System final test time
- > Initial delay

Zero Defects

- Zero defects, pioneered by Philip Crosby.
- It is business practice which aims to reduce and minimize the number of defects and errors in a process and to do things right for the first time.
- Ultimate aim will be to reduce the level defects to zero.
- Most recently the concept of zero defects has lead to the creation and development of six sigma.

Advantages of zero defects:

- Cost reduction caused by a decrease in waste
- Cost reduction due to the fact that time is now being spent on only producing goods or service
- Increased customer satisfaction, improved customer retention, increased profitability
- Possible to measure the cost of quality

Disadvantages of zero defects:

Increase time and expense

Quality Circle

History of Quality circle:

- First established in Japan in 1962, Kaoru Ishikawa
- Movement coordinated by JUSE
- First circle was established at Nippon Wireless and Telegraph Company
- Then spread to more than 35 other companies in first year
- Recently, 20 million quality circles in China
- Implementated even in educational sectors in India
- Not successful in the U.S.



Objectives of Quality circle

- To contribute towards improvement and development of the organization
- To overcome the barrier so as to foster an open exchange of ideas
- To develop a positive attitude and feel a sense of involvement in decision making processes
- To respect humanity and to build a happy work place
- To display human capabilities totally and in a ling run
- To improve the quality of products and services
- To improve competence
- To reduce cost and redundant efforts in long run
- Improvement in meeting customers due dates
- Customer satisfaction

Thank you