

# **ANO-COE Book of Knowledge**

## **Module 1- Quality Methodology & Application**

### **1.0 The Quality Guru (Background & contributions)**

- 1.1 Dr. W. Edwards Deming (1900–1993)  
Deming Cycle - Plan-Do-Check-Act (PDCA) Cycle
- 1.2 Dr. Kaoru Ishikawa (1915–1989)
- 1.3 Shigeo Shingo (1919–1990)
- 1.4 Dr. Walter A. Shewhart, (1891–1967)
- 1.5 Dr. Joseph Juran (1904-)
- 1.6 Philip Crosby (1926–2001)

### **2.0 Company -Wide Quality Control Concepts**

- 2.1 What is Quality?
- 2.2 Quality is not achieved by inspection
- 2.3 Human aspects of quality control
- 2.4 Customer Focus
- 2.4 Realization of quality
- 2.5 Aspects of quality
- 2.6 Main quality activities

### **3.0 Quality Information Systems**

- 3.1 An overview of ISO standards (ISO 9001 QMS, ISO 14001 EMS & ISO 45001 OHSAS etc)
- 3.2 How does a quality information system work?
- 3.3 Planning for quality information system
- 3.4 Consideration of establishing a computerised quality information system
- 3.5 Quality Measures that are widely used in both manufacturing and service industry

### **4.0 Fundamental Concept on Management**

- 4.1 Management: Definition & Significance
- 4.2 Control: Variation, Process & Standardization
- 4.3 Purpose oriented: Total optimization & Prioritization
- 4.4 Facts: Management by facts
- 4.5 Actions: Immediate remedy, recurrence prevention & predictive actions
- 4.6 Improvement: Continual and Significance etc
- 4.7 Respect for people: Development of human resource ability, Involvement of all people & People centered Management

## **5.0 Inspection methods**

- 5.1 Inspection decision- Compliance & Non compliance
- 5.2 Types of inspection- Repeatability checks, Accuracy inspection, Product auditing & Discovery sampling
- 5.3 Inspection planning
- 5.4 The amount of inspection
- 5.5 Seriousness of classification
- 5.6 Inspection errors: Known /Unknown errors

## **6.0 Quality Audit- 4 Phases of an Audit Program**

### **Types of audit: 1<sup>st</sup> party, 2<sup>nd</sup> party and 3<sup>rd</sup> party**

- 6.1 Preparation & Planning
- 6.2 Performing an Audit
- 6.3 Reporting the Audit results
- 6.4 Debriefing Audited

## **7.0 Selecting Quality Management and Improvement Initiatives**

- 7.1 Approaches to improvements have been cited under several names
- 7.2 The selection of quality tools is based on process steps of problem-solving, pay-offs, type of data
- 7.3 4 paradigms of selection:
  - 1) Fashion setting
  - 2) Pay- off
  - 3) Strategic fit
  - 4) Organisation fit

## **Module Two- Policy and Daily Management**

### **2.1 Policy Management- Conceptual model and implementation**

- 2.1.1 Quality Functions Deployment
- 2.1.2 Set up the Mission, Value, Vision, and Strategies
- 2.1.3 Environment analysis and SWOT analysis
- 2.1.4 The development of objectives and strategies
- 2.1.5 The implementation of strategies
- 2.1.6 The frameworks of the strategy management and Hoshin Management

### **2.2 Daily Management — Concept and Implementation**

- 2.2.1 Job description and daily performance management
- 2.2.2 Work breakdown and standardization

- 2.2.3 Lean application tools for productivity and wastes reduction
- 2.2.4 The implementation of daily management
- 2.2.5 The daily performance management
- 2.2.6 Process management and improvement
- 2.2.7 The integration of performance management with reward systems

### **Module 3 – Metrology and Reliability**

#### **3.1 Metrology Measurement**

- 3.1.1 What is Metrology
- 3.1.2 Metrology Measurement
- 3.1.3 Foundation of SI Systems
- 3.1.4 Measurement Errors
- 3.1.5 Surface Characteristics
- 3.1.6 Methods used to study surface texture
- 3.1.7 Symbols Used
- 3.1.8 Surface Measurement Terminology

#### **3.2 Reliability and Autonomous Maintenance**

- 3.2.1 History of Reliability
- 3.2.2 Definition of Reliability
- 3.2.3 Inherent Reliability
- 3.2.4 Measurement of Reliability
- 3.2.5 Bath Tub Curve
- 3.2.6 Concept of Reliability
  - ❖ Reliability Activity Cycle
  - ❖ Infant Mortality Period
  - ❖ Useful Life Period
  - ❖ Wear out Period
- 3.2.7 Reliability Prediction
- 3.2.8 Failure Mode and Effect Analysis
  - ❖ Basic principle of FMEA
  - ❖ Application/ Creating An FMECA

RATING	SEVERITY	OCCURRENCE	DETECTION
1	NONE	1 in 1,500,000	ALMOST CERTAIN
2	VERY MINOR	1 in 150,000	VERY HIGH
3	MINOR	1 in 15,000	HIGH
4	VERY LOW	1 in 2,000	MODERATELY HIGH
5	LOW	1 in 400	MODERATE
6	MODERATE	1 in 80	LOW
7	HIGH	1 in 20	VERY LOW
8	VERY HIGH	1 in 8	REMOTE
9	HAZARDOUS WITH WARNING	1 in 3	VERY REMOTE
10	HAZARDOUS WITHOUT WARNING	>1 in 2	ABSOLUTE UNCERTAINTY

❖ Benefits of FMEA

3.2.9 Techniques for Achieving Higher Reliability

3.2.10 Concept of Availability

3.2.11 Reliability Testing

- ❖ Type I Censor
- ❖ Type II Censor
- ❖ Sequential Test
- ❖ Parameters in Sequential Test

3.2.12 Maintainability

**Module 4- Quality Tools and Techniques**

4.1 Problem selection and problem defining: How to set quality project and targets

- 4.1.1 Defining quality problem in operation system
- 4.1.2 Determination of data and information for problem evaluation
- 4.1.3 Formulate quality project and select project by quality perspective criteria
- 4.1.4 Defining quality project
- 4.1.5 How to develop approach for quality improvement
- 4.1.6 KPI development for process and project

- 4.2 Basics of Statistical Thinking
  - 4.2.1 Type of data
  - 4.2.2 Population and sample
  - 4.2.3 Basic statistics and their calculations
  - 4.2.4 Outliers
  - 4.2.5 Sampling and error
  - 4.2.6 Stratification
  - 4.2.7 Sampling methods
  - 4.2.8 Data Collection
  
- 4.3 Probability Distributions
  - 4.3.1 Basics of probability
  - 4.3.2 Discrete probability distributions
  - 4.3.3 Continuous probability distributions
  - 4.3.4 Linear combination of random variables
  
- 4.4.1 Statistical Inference
  - 4.4.1 Basic Terminology
  - 4.4.2 Statistical estimation
  - 4.4.3 Statistical hypothesis test
    - Procedure of test and interpreting test results
  
- 4.5 Correlation Analysis and Regression Analysis
  - 4.5.1 Basics of correlation analysis
  - 4.5.2 Estimating correlation coefficient
  - 4.5.3 Simple regression analysis
  - 4.5.4 Coefficient of determination ( $R^2$ )
  - 4.5.5 Regression diagnosis
  
- 4.6 QC Seven Tools (Seven Basic Tools of Quality) and their applications
  - 4.6.1 Pareto chart
  - 4.6.2 Ishikawa diagram (cause-and-effect diagram)
  - 4.6.3 Check sheet
  - 4.6.4 Histogram
  - 4.6.5 Scatter diagram
  - 4.6.6 Check sheet
  - 4.6.7 Control charts
  
- 4.7 Control charts
  - 4.7.1 Basic idea of Shewhart control charts
  - 4.7.2 phase I of control charts (control chart construction)
  - 4.7.3 phase II of control charts (control chart interpretation)
  - 4.7.4 Statistical Process Control (SPC)

- 4.8 Process Capability Analysis
  - 4.8.1 Basic ideas of Process Capability Analysis
  - 4.8.2 Process capability measures:
  - 4.8.3 Calculation, and interpretation of process capability measures
  
- 4.9 Measurement System Analysis
  - 4.9.1 Measurement System Analysis for Variable Data
  - 4.9.2 Measurement System Analysis for Attribute Data
  
- 4.10 Root Cause Analysis with Why-Why Analysis
  - 4.10.1 Objective of why-why analysis
  - 4.10.2 How to draw why-why analysis
  
- 4.11 New QC Seven Tools (Seven New Quality Tools, Seven Management and Planning Tools)
  - 4.11.1 Affinity Diagram
  - 4.11.2 Interrelationship Diagram
  - 4.11.3 Tree Diagram
  - 4.11.4 Matrix Diagram
  - 4.11.5 Process Decision Program Chart (PDPC)
  - 4.11.6 Prioritization Matrix
  - 4.11.7 Arrow Diagram (Activity Network Diagram, PERT)
  
- 4.12 Quality Function Deployment (QFD)
  - 4.12.1 History of QFD
  - 4.12.2 Basic structure of QFD
  - 4.12.3 Building House of Quality (HoQ)
  - 4.12.4 Interpreting QFD
  - 4.10.5 Benefits of QFD
  
- 4.13 Service Quality Model
  - 4.13.1 Basic of Service Quality
  - 4.13.2 Kano Model
  - 4.13.3 SERVQUAL & The Gaps Model
  - 4.13.4 SERVPREF
  - 4.13.5 Hard Measures of Service Quality
  
- 4.14 Design of Experiments
  - 4.14.1 Basics of DoE
  - 4.14.2 Principles of experimental design (Fisher's three principles)
  - 4.14.3 Types of Design
  - 4.14.4 Analysis of Experimental Data

#### 4.15 Acceptance Sampling

4.15.1 Basics of Acceptance Sampling

4.15.2 Type of acceptance sampling, OC curves

4.15.3 Sampling inspection plans having desired OC, JIS Z 9002, JIS Z 9003  
procedures and their application

4.15.4 Select the proper sampling procedures

4.15.5 Economics of inspection