



## CQE Training & Consultancy Plt (Reg No. : LLP 003668 LGN)

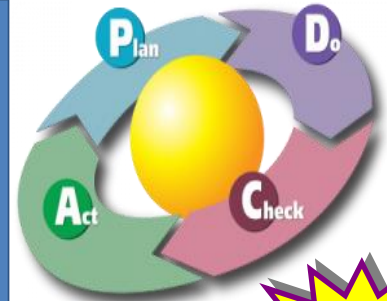
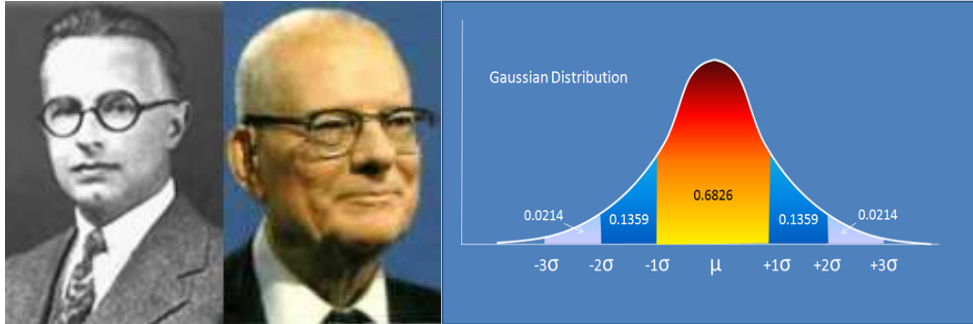
Registered Office : No. 46, Lorong Bintang, Taman Tasik Permai, 34000 Taiping, Perak. Malaysia.

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# STATISTICAL PROCESS CONTROL (SPC) (PUBLIC / IN-HOUSE TRAINING PROGRAMME)



## Introduction

Statistical Process Control (SPC) was pioneered by [Walter A. Shewhart](#) and taken up by [W. Edwards Deming](#) with significant effect by the Americans during World War II to improve industrial production. Deming was also instrumental in introducing SPC methods to Japanese industry after that war. Dr. Shewhart created the basis for the control chart and the concept of a state of statistical control by carefully designed experiments. While Dr. Shewhart drew from pure mathematical statistical theories, he understood data from physical processes never produce a "normal distribution curve" (a Gaussian distribution, also commonly referred to as a "bell curve"). He discovered that observed variation in manufacturing data did not always behave the same way as data in nature. Dr. Shewhart concluded that while every process displays variation, some processes display controlled variation that is natural to the process, while others display uncontrolled variation that is not present in the process causal system at all times. When a process is in control, it becomes very important to determine how capable of the manufacturing process is meeting the customer's requirements. Unfortunately, many questions exist about how these studies should be done, and if done correctly, what the results actually mean. This course is to clarify the above confusion. The application of relevant computer software such as [Minitab](#), [MS Excel](#) and/or [SOCPack](#) also will be covered in simplifying the statistical calculation and analysis.

**Also available as  
in-house programme**

## Learning Outcomes/Objectives

This course is specifically developed to provide participants in the manufacturing industry the basic real-time statistical techniques for process control and improvement. Participants will gain knowledge of the basic fundamentals of process improvement, concept of variation, statistical control and other simple but powerful statistical techniques. At the end of this programme, participants will be able to :-

- Identify specific area in your company where quality and productivity improvement methodology can be applied.
- In-depth understanding of the concepts underlying SPC.
- Examine necessary steps in implementing SPC methods into your company effectively.
- Knowledge of process characterization, control and improvement flow.
- Measurement of effectiveness and efficiency of SPC.



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- The application of Minitab, MS Excel and SQCPack for SPC related analysis.

### Program Contents

#### Session #1 - Fundamentals of Process Improvement



Using MINITAB  
and MS Excel

- Deming Management Philosophy.
- Definitions of Statistics, Process, Control.
- Elements of a Process.
- Concept of Detection and Prevention.
- Concept of Variation
  - ✓ Types of variation
  - ✓ Stable versus Unstable Process
  - ✓ Common/Natural versus Special/Assignable Causes
  - ✓ Behaviour of Sample Statistics
- Exercise.

#### Session #2 - Deriving Information from Data

- Histogram and Frequency Distribution Curve.
- Normal Distribution and Its Characteristics.
- Sample versus Population.
- Standardized Normal Distribution.
- Process Sampling.
- Information from Distribution.
- Measures of Location / Skewness and Dispersion / Variation.
- Exercise.

#### Session #3 - Statistical Process Control

- Concepts behind Control Chart.
- Relationship between Frequency Distribution and Control Charts.
- Type of Control Charts
  - ✓ Variable Control Charts
  - ✓ Attribute Control Charts
- Exercise.

#### Session #4 - Variable Control Charts

- Basic Variable Control Charts - Xbar-R, Xbar-S, X<sub>i</sub>-MR, Median-R, Pre-Control & Cumsum Chart
- Subgrouping Techniques.
- Identification of Critical Process Parameters and Product Characteristics for Control Charting.



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- Construction of Variable Control Charts.
- Data Collection and Calculation.
- Calculating Control Limits.
- Difference between Specification Limits and Control Limits.
- Control Charts Interpretation.
- Out-of-Control Corrective Action.
- Characteristics of an Effective Control Chart.
- Exercise

### **Session #5 - Attribute Control Charts**

- p, np, c and u Attribute Control Charts.
- Construction of Attribute Control Charts.
- Data Collection and Calculation.
- Calculating Control Limits.
- Control Charts Interpretation.
- Out-of-Control Corrective Action.
- Exercise.

### **Session #6 - Process Capability Study**

- Importance of Stability.
- Definition of Statistical Control.
- Definition of Capability Ratio and Capability Indices.
- Calculation of Capability Ratio and Capability Indices - CR, Cp, Cpl, Cpu, Cpk, Pp, Ppk and Cpm.
- Interpretation of Capability Ratio and Indices.
- Transformation of Process Capability Information into Graphical Illustration for better understanding.
- Estimating Process Yield and Rejection Rate, ie.  $Z_u$  and  $Z_l$  calculation
- Strategies to improve Process Capability.
- Exercise.

### **Session #7 – Assessment / Test**

- Preliminary Test.
- Quiz 1.
- Quiz 2.
- Quiz 3.
- Control Chart and Frequency Distribution Exercise.
- Final Test.



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### Who should attend

**M**anagers, Engineers, Executives, Quality Practitioners and any member of an organisation who is from Process, Research and Development, Quality and Production will find this course relevant and beneficial to their job function.

### Methodology

**T**he program would be conducted by using the following materials / aids :-

- Course Notes
- OHP / LCD
- Video Showing
- Case Study & Group Activities (with Minitab, MS Excel and/or SQCPack software)
- Lecturettes

### Duration

2 days

### Participants

**M**ax ~25 pax (please bring along scientific calculator, computer facilities installed with Minitab and MS Excel software)

### Customer Lists

Mabuchi Motor (M) Sdn. Bhd.  
Hume Fibre Board Sdn. Bhd.  
BenQ Technology (M) Sdn. Bhd.  
Amsteel Berhad, Bukit Raja Klang.  
Megasteel Sdn. Bhd., Banting.  
Silverstone Berhad, Kamunting, Taiping.  
CS Opto Semiconductor (M) Sdn. Bhd.  
Western Digital (M) Sdn. Bhd.  
Konica Minolta (M) Sdn. Bhd.  
Yan Jin Sdn. Bhd, Bukit Tengah Penang  
Rubberex Berhad, Ipoh Perak



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Finisar (M) Sdn. Bhd, Ipoh Perak

Camcar Textron (M) Sdn. Bhd. (now known as Textron Fastening (M) Sdn. Bhd.)

Sepang Institute Technology Corporate Learning Centre, Klang

Samsung Electronics Display (M) Sdn. Bhd.

Osram Opto Semiconductor (M) Sdn. Bhd.

Chunghwa Picture Tubes (M) Sdn. Bhd. (QEDP Training Programme)

Western Digital (M) Sdn. Bhd. (CQE Training Programme)

Texas Instruments (M) Sdn. Bhd. (QEDP Training Programme)

S.E.H. Malaysia Sdn. Bhd.

STATS ChipPAC Malaysia Sdn. Bhd.

Agilent Technologies (M) Sdn. Bhd.

Unisem Berhad

IDS Electronics Sdn. Bhd.

Carsem Semiconductor Sdn. Bhd.

and etc...

