

7 BASIC TOOLS OF QUALITY CONTROL

BTME 4006

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ME-1

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The logo of Galgottia University is a circular emblem with a stylized 'G' in the center. The 'G' is composed of several curved segments in shades of yellow, orange, and blue. The background of the emblem is a light, multi-colored gradient.

**Unit 2:
L-1**

Statistical Quality Control

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Learning Objectives

A **control chart** is a graphical tool for monitoring the activity of an ongoing process. Control charts are sometimes referred to as **Shewhart control charts**, because Walter A. Shewhart first proposed their general theory. The values of the quality characteristic are plotted along the vertical axis, and the horizontal axis represents the samples, or subgroups (in order of time), from which the quality characteristic is found.

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Quality

- According to Quality Guru Juran, Quality is fitness for use.
- Quality is a perceptual, conditional, and somewhat subjective attribute and may be understood differently by different people.
- Jim Relay defines Quality in his book 'Production & Operation' that Quality is about meeting the needs and expectations of customers

7 tools of Quality

- Check Sheet
- Histogram
- Pareto Chart
- Cause & Effect diagram
- Control Chart
- Scatter Diagram
- Flow Chart

CHECK SHEET

- The check sheet is a form (document) used to collect data in real time at the location where the data is generated. The data it captures can be quantitative or qualitative. When the information is quantitative, the check sheet is sometimes called a tally sheet.
- Simple data recording device.
- Systematically record and compile data from sources.

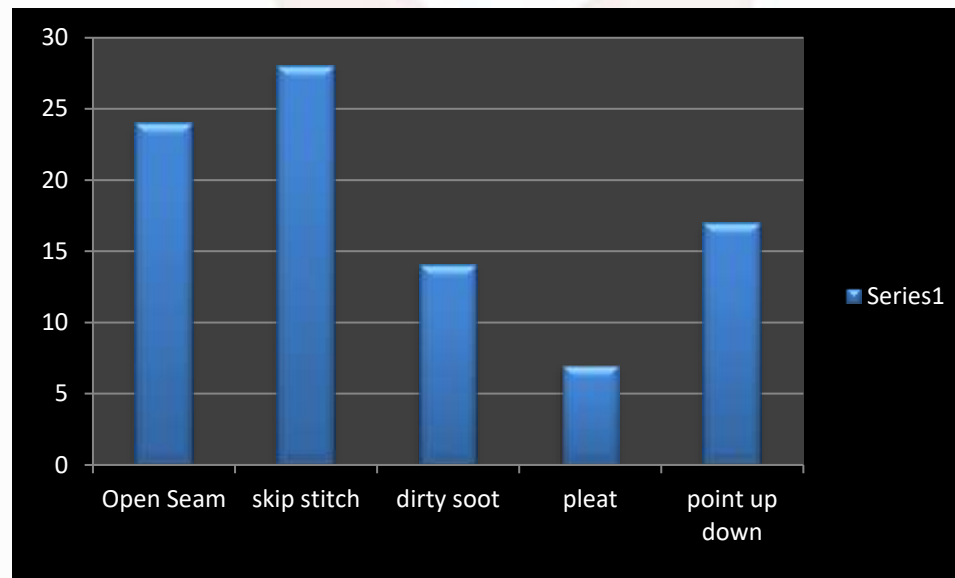
Example:

Defect	1 st hour	2 nd hour	3 rd hour	4 th hour	5 th hour	Total
Skip Stitch						28
Open Seam						24
Point Up-down						17
Dirty Spot						14
Pleat						7

HISTOGRAM

- A histogram is a bar graph that shows frequency data.
- It is used to graphically summarize and display the distribution and variation of a process data set. It provides the easiest way to evaluate the distribution of data.

Example:-



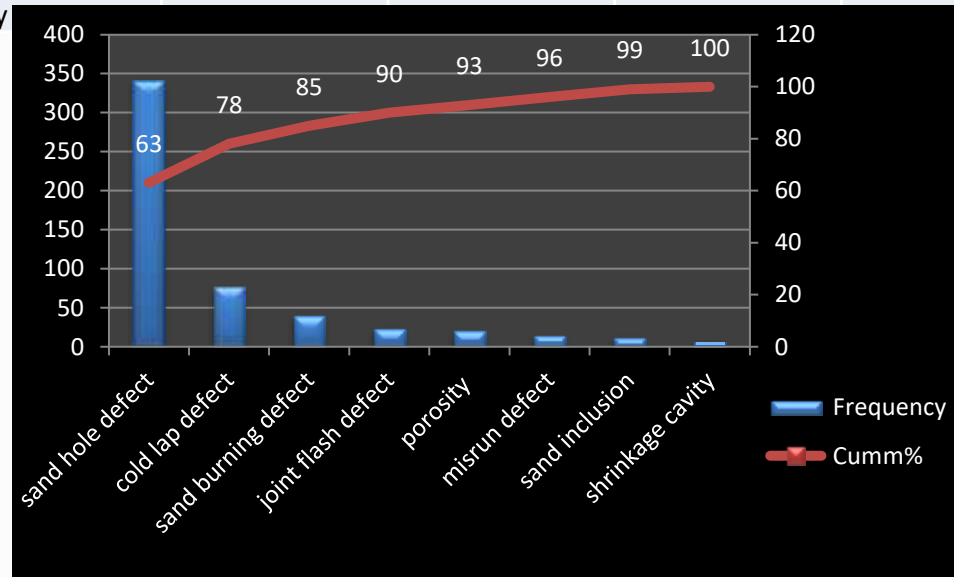
INDIVIDUAL DEFECTS

PARETO CHARTS

- The Pareto chart can be used to display categories of problems graphically so they can be properly prioritized.
- A Pareto chart or diagram indicates which problem to tackle first by showing the proportion of the total problem that each of the smaller problems comprise.
- This is based on the Pareto Principle: 20% of the sources cause 80% of the problem.

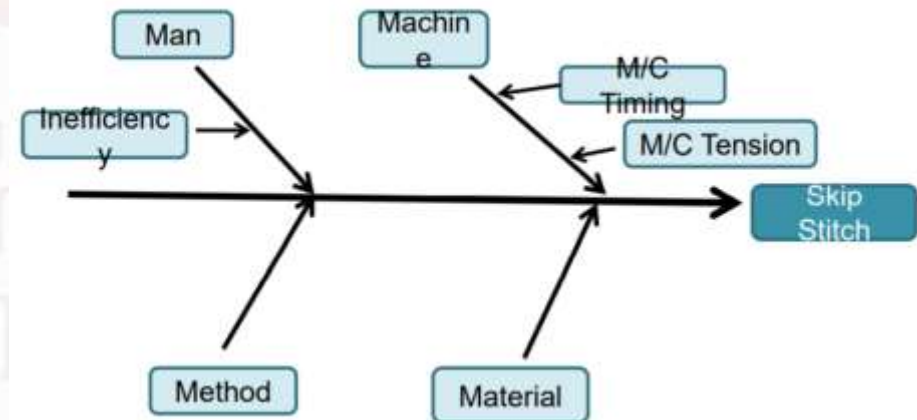
Example:-

S.N.	Defects	Frequency	Cumm.	Cumm.%	Cumm%
1	sand hole defect	340	340	63.31471	63
2	cold lap defect	78	418	77.83985	78
3	sand burning defect	40	458	85.28864	85
4	joint flash defect	23	481	89.57169	90
5	porosity	21	502	93.48231	93
6	misrun defect	15	517	96.27561	96
7	sand inclusion	12	529	98.51024	99
8	shrinkage cavity				100



CAUSE AND EFFECT DIAGRAMS

- One analysis tool is the Cause and Effect or Fishbone diagram. These are also called Ishikawa diagrams because Kaoru Ishikawa developed them in 1943.
- They are called fishbone diagrams since they resemble one with the long spine and various connecting branches.

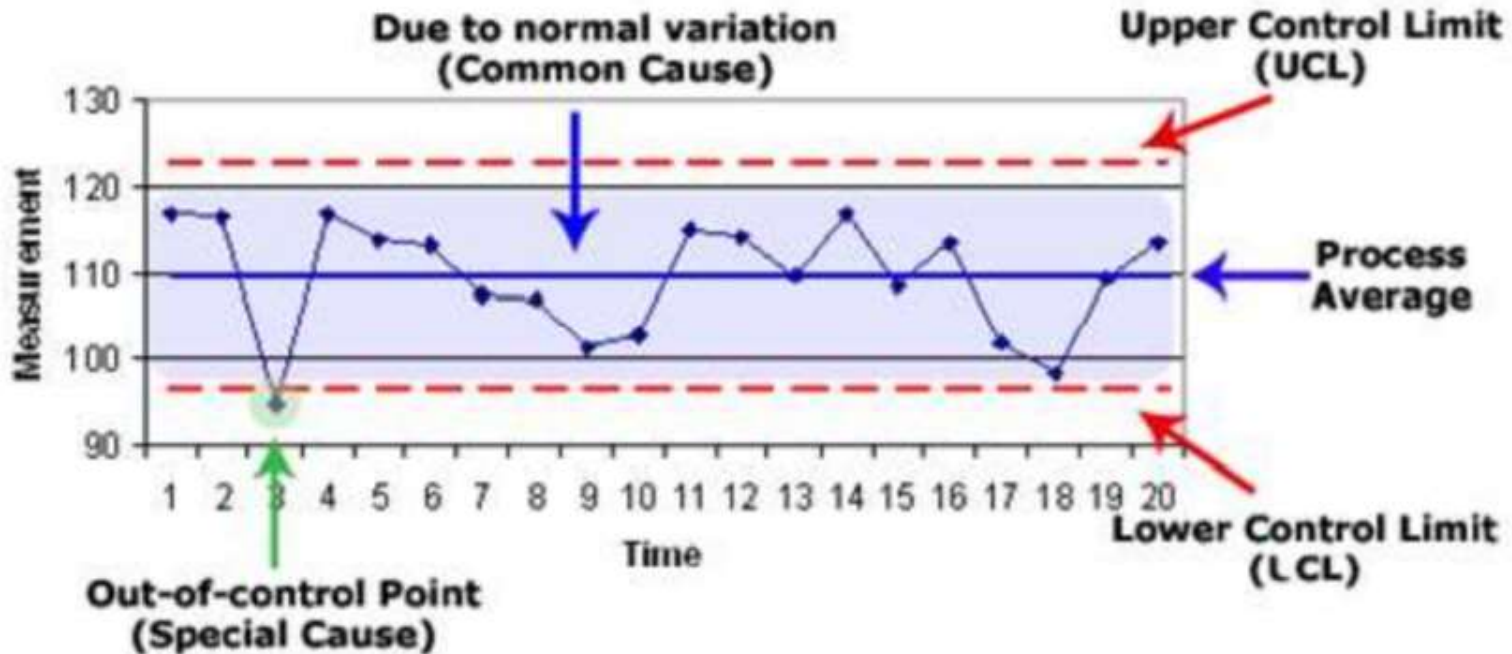


Benefits of constructing a Cause-and-Effect Diagram are that it

- Helps determine the root causes of a problem or quality characteristic using a structured approach.
- Encourages group participation and utilizes group knowledge of the process.
- Uses an orderly, easy-to-read format to diagram cause and effect relationships
- Indicates possible causes of variation in a process.
- Increases knowledge of the process by helping everyone to learn more about the factors at work and how they relate.

CONTROL CHARTS

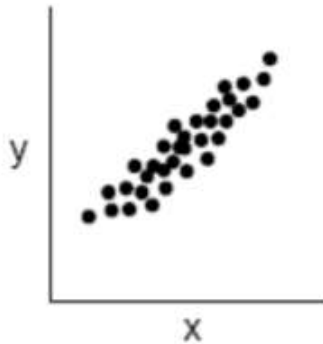
- Control charts, also known as process-behavior charts, in statistical process control are tools used to determine if a manufacturing or business



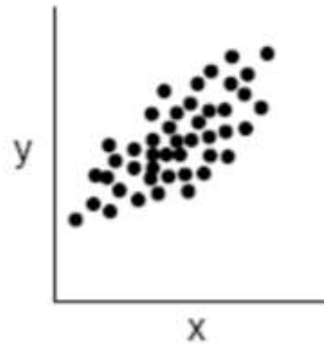
SCATTER DIAGRAMS

- A scatter diagram shows the correlation between two variables in a process.
- The scatter diagram graphs pairs of numerical data, with one variable on each axis, to look for a relationship between them. If the variables are correlated, the points will fall along a line or curve. The better the correlation, the tighter the points will hug the line.

SCATTER DIAGRAMS



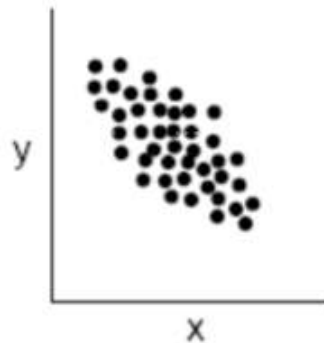
Positive correlation



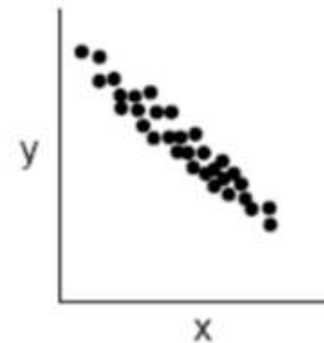
Positive correlation
may be present



No correlation



Negative correlation
may be present



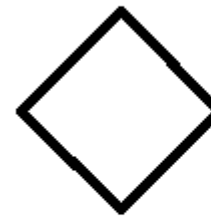
Negative correlation

FLOWCHART

- A flowchart is a formalized graphic representation of a logic sequence, work or manufacturing process, organization chart, or similar formalized structure.



Basic Processing Symbol



Decision Symbol



Flowline Symbol



Start/Stop Symbol

Summary:

This lecture has introduced the basic concepts of control charts for statistical process control. The benefits that can be derived from using control charts have been discussed. This lecture covers the statistical background for the use of control charts, the selection of the control limits, and the manner in which inferences can be drawn from the charts. The two types of errors that can be encountered in making inferences from control charts are discussed.

References:

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- ASQ(1993). ANSI/ISO/ASQ. *Statistics—Vocabulary and Symbols-Statistical Quality Control*, A3534-2. Milwaukee, WI: American Society for Quality.
- Wadsworth, H. M., K. S., Stephens, and A. B. Godfrey, (2001). *Modern Methods for Quality Control and Improvement*, 2nd ed. New York: Wiley.