

Statistical Quality Control

Statistical Quality control is a technique which is used to maintain the uniformity in the quality of manufactured product in a continuous production system.

In any manufacturing process, it is not possible to produce goods of exactly the same quality, variation is inevitable. This variation in the quality characteristics classified into two classes.

Chance or random variation:

A product shows some deviation from the desired specification of the product in spite of all care. As a matter of fact, such a variation is unavoidable. By chance variation, we mean the variation occurring in the piece due to minor causes or the variations to which no reason can be assigned, and is of random nature. This type of variation is tolerable and does not affect the quality of the articles or product. If there exists only chance variation, the process is said to be under statistical control.

Assignable Variation:

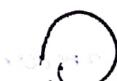
Variation due to ~~specification~~ causes like improper setting of machine, mistake of inexperienced workmen and sub standard quality of raw materials etc. are called Assignable variations. These variations are relatively large and can be identified. The causes of such variations are called assignable causes. Since variations due to assignable causes are relatively large and these causes adversely affect the quality of the product, they should be identified and removed.

The control of quality of a product manufactured by a factory can be done in two ways

Process Control:-

The process control is the procedure in any production process to control and maintain a satisfactory quality of goods to be produced. This is usually done by using control ~~charts~~ charts which ensure that the product to manufactured conforms to specification. The process control detects whether the production process is going in the desired direction. The main objective of the process control are —

- i) To keep the manufacturing process under control
- ii) To determine whether a state of control exists.



Product Control:-

This is concerned with controlling the number of defective items in a lot of manufactured product. It looks after the fact that the number of defective items in a lot is not too large. Product control is quite diff. from process control. In process control we try to control the quality of the manufactured product but in product control we try to control the number of defective item in a lot of items already produced. Thus when a production process is in a state of statistical control, it may happen that a particular lot contains too many defective items. Product control is mainly done by the method of sampling.

Rational Subgroups :-

The main idea ~~stepwise~~ behind Shewhart control chart lies in the division of observations into groups or so called rational subgroup. When the subgroup of a production process are formed in such a way that the variation within a subgroup may be attributed to chance causes only, whereas systematic variation, if at all present, can occur only between the subgroups. In other words the units belonging to a subgroup are as homogeneous as possible, whereas one subgroup differs from another indicating the presence of a systematic variation, if it exist. Such subgroup are termed as rational subgroup.

Control Chart:

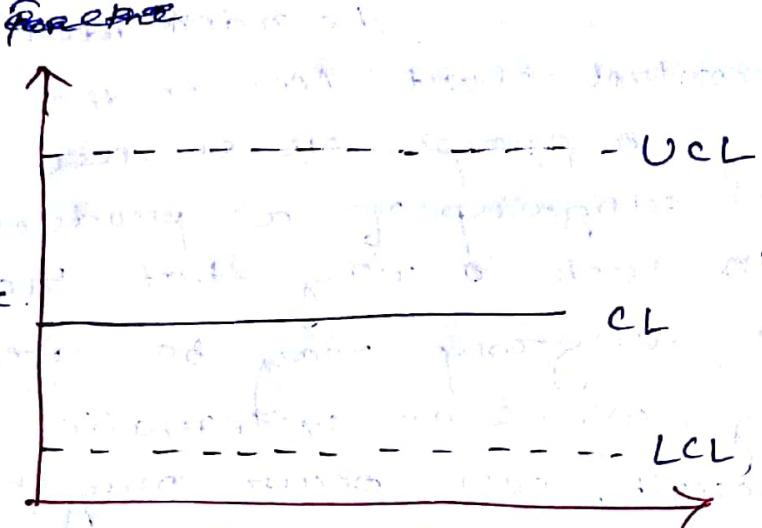
It is a graphic device of testing whether a production process is in a state of control.

The control chart consists of three horizontal lines.

- i) A central line (CL) which indicates the desired standard of the characteristic.
- ii) UCL (Upper control limit).
- iii) LCL (Lower control limit).

The horizontal scale represents the sample number and the vertical scale represents the measurement of sample characteristic. The distances of control limits from the central line are determined on the basis of probability theory. Generally, these distances are equal to three times the standard deviation of the sample statistic for which the control chart is prepared. As a result these limits are also known as ~~3-6~~ 3-Sigma control limits.

Sample
Characteristic



SAMPLE NO.

For the preparation of control charts, at regular intervals of time rational subgroup are taken during production. The associated statistic is calculated for each subgroups. These are plotted on the corresponding control chart. As long as the points fall within the control limits, the production process is said to be under control. If a point falls outside the control limits the process is said to be out of control at the moment indicating the presence of assignable causes.

Sometimes even though no points fall outside the control limits, the chart may suggest the presence of assignable causes of variation from the unusual pattern in which the points are placed.