

## Module = 04

### Quality Control

Chapter = 01

b) The most economical selling price  
of the product.

- \* The process maintaining & improving the quality of the products produced → Statistical Quality Control (SQC)
- \* SQC has its sound foundation in the theory of Sampling & improbability distribution test & significant.
- \* In applying SQC, the cost of rejections are minimised, the cost of production reduced & gd quality products are assured even before the products are produced by the industry.

→ Quality =

- \* The term 'quality' in SQ does not always mean the highest standards of manufacture, it refers to the gd quality item which conforms to the standard specified for requirement.

- \* In industry the quality means the best for the certain customers
- \* Imp factors of customer's condtions are

→ Some terminologies =

⇒ Specification limit = (S.L)

It is customary for any buyer to expect the product to any particular size, quality etc.

as length 50mm most appropriate.  
If he wants 50mm or lengths 50mm alone he may buy according to he may find that some of lengths b/w 49mm & 51mm are useful for the work. If prepared to accept such items. So in the later case the lower & upper (L.U) are 49mm & 51mm

(S.L) are distributed by the buyers. The buyers are expected to accept these items which falls within the (S.L)

The size of quality of product depends on factors like raw material, processing machinery, the personal involved, although the management is involved in producing under identical interest led in producing under identical condition a large no. of items of same size e.g. quality the products may have variation - small big.

- \* causes of variations 2 kinds - causes.

a) chance causes =

(not preventable)

Variations are random in nature, if  
are beyond the control of humans.

These variations may be reduced but  
cannot be eliminated.

The kinds → allowable variation

The causes for this kind of variation  
→ chance causes

b) assignable causes = (prevented)

The causes of certain variations can  
be identified so by taking appropriate

steps the variation can be eliminated.

for eg, if the causes for ball is

quality of an output is bound to be  
quality of an output of machine, the  
non-lubrication action is taken as variation  
elimination action is taken as variation  
is prevented. This kind of variation  
is preventive variation etc. causes

→ A. causes.

⇒ Natural tolerance limits =

It is known that variation due to  
chance causes is inherent in the  
outputs under any scheme of production  
under  $\bar{x}$  chart almost all the  
variation due to chance causes lie  
within the  $\mu \pm 3\sigma$  limits & those units  
→ N.T. limits.

The width of → Natural tolerance

(X chart shows narrow chance limits - normal)

Remark

\* If N.T. limits coincide with the working  
specification limits, all manufactured  
items are acceptable to the buyer.

→ process control & product control =

A production process is said to be under  
statistical control when the manufactured  
items lie within the N.T. limits (G.)  
the assignable cause of variation are  
elegent & process is governed by the  
assignable causes alone

(only chance causes exist assignable cause)

The process control is achieved through the  
technique of control chart pioneered by  
W.A. Shewhart

By product control we mean controlling  
the quality of product by critical examination  
at strategic points & this is achieved  
by 'Sampling inspection' plans developed by  
Dodge and Romig.

Acceptance Sampling = Sample of few units

A buyer chooses a sample to few units  
from a lot that is to be accepted by  
him if the non-defective is less.  
It is non-defective or more the  
lot is to be rejected. This technique  
of sampling inspection & decision

making  $\rightarrow$  A.S

units.

Process controls

$\Rightarrow$  types of control chart =

1) control chart for variables =

Variables are the quality characteristics of manufactured products which are measurable.

\* It can be expressed in their respective units of measurements.

\*  $\bar{x} \rightarrow$  diameter & width, capacity of tank etc., breaking strength of yarns....

represent variables.

\* This type of variables are continuous in nature

factory follow a normal distribution, for this

purpose we use 2 charts —

\* mean chart  $\rightarrow \bar{x}$ -chart

\* range chart  $\rightarrow R$ -chart

2) control chart for attributes =

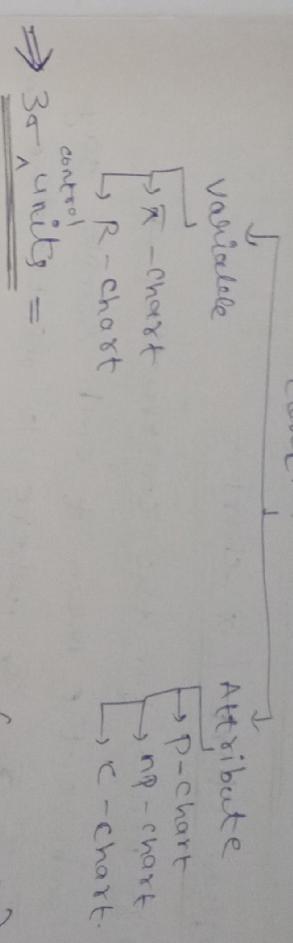
\* The quality characteristics of products which are not measurable, i.e. which can be identified by their presence/absence in the products  $\rightarrow$  attributes

\* To control the quality products which are governed by the attributes, we use

P-chart for proportion & defectives,

NP-chart for non of defectives & No

c-chart for no of defects per item



Consider the statistic  $t = t(x_1, x_2, \dots, x_n)$  a (1) & sample observations  $x_1, x_2, \dots, x_n$ .  
Let  $E(t) = \mu \approx \sqrt{t} = \sigma$ , if the statistic  $t$  is normally distributed then from

't' is normally distributed area ( $\phi(\mu)$ ) of normal distribution, we have.

$$\Pr[\mu - 3\sigma < t < \mu + 3\sigma] = 0.9973 \quad (6)$$

$$\Pr[|t - \mu| > 3\sigma] = 0.0027, \text{ here } \mu + 3\sigma$$

$\rightarrow$  lower control limit  $\approx \mu - 3\sigma \rightarrow$  upper

control limit its sample size observed for the it's sample size observed for the LCL (lower control limit) & UCL & less  $\approx 3\sigma$  a danger signal is indicated.