lecture 8
AND

classmate
Date 20/02/18
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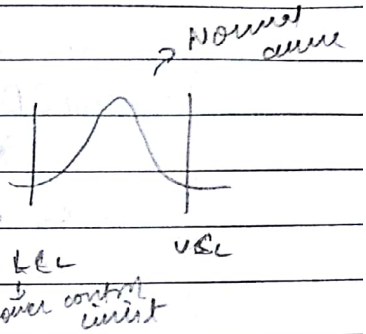
Statical quality control

Timeline

1930 Inspection
1950 SQC (statistical quality control)
1970 DOE
1980 Taguchi
1990 Quality management systems (QMS)
2000 ~~Six~~ Six sigma



SPC - Statistical process

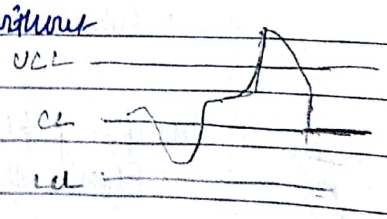
SQC

- Set of statistical tool used for ~~manufacturing~~ measuring the quality performance for acceptance/rejection decision and to initiate CA/PA (corrective action/preventive) by quality professionals.
- Statistical method to determine the extent to which quality goals are being met.
- Indicates whether or not the variations which occur in the conversion process are exceeding the limits of tolerances.

Begins with the assumption that no two products manufactured by a process are absolutely identical.

- Causes of variation in the quality can be divided into two categories :-

i) Chance or common causes of variation.
- Inherent to the process.
- Cannot be reduced/elimination without modifying the process itself.



ii) Assignable causes of variation
- Due to non-random causes.
- Due to abnormality in the input material

Three SQC categories -

i) Descriptive statistics
- Describes quality characteristics & relationship.
- e.g Mean, standard deviation, range

ii) Acceptance sampling
- Process of randomly inspecting a sample of goods and deciding whether to accept or reject. Can't catch in-process problems.
based on rules.

iii) S.P.C
- Involves inspecting the output from a process.
- Quality characteristics are measured & charted.
- Helpful in identifying in-process variations and taking corrective action.

Mean

For samples: $\bar{x} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n}$

For population: $\mu = \frac{X_1 + X_2 + \dots + X_N}{N}$

Acceptance sampling
- Helps us decide whether desirable quality has been achieved for a batch of production, whether to accept or reject the items produced.
- A SQC technique, where random lot is drawn from the lot & inspected (not 100% of it)
- Gives no idea about the process that produces them.

Sampling Plans

Plans that specify lot size, sample size, no of samples, acceptance/reject

Single sampling

Double

Multiple/sequential

Advantages of sampling

- If inspection is destructive, 100% inspection is not feasible.
- More economical and causes less damage
- Reduce inspection error.
- Provides motivation to ~~[illegible]~~ improve quality.

Disadvantages -

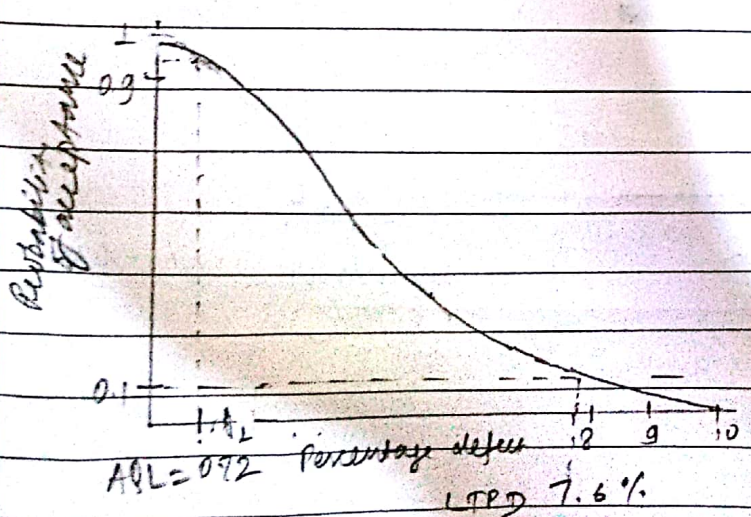
- Risk of rejecting good lots and accepting poor.
- Less info about the product
- More time & effort in planning & documentation

Producer's risk - Risk associated with rejecting good lots - Also called type I error α or alpha.

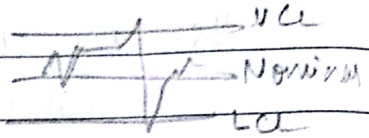
Risk associated with accepting poor lots. Also called type 2 error or beta.

AQL (Acceptable quality level) :- % of defect with which the consumer is willing to accept the lot.

RQL/LTPD (Lot tolerance percentage defect) : Upper limit of defect till which the product can get accepted.



We draw control charts to analyse using SPC.



SPC

- Invented by Walter Schewart at AT&T.
- Graphical analysis using control charts.
- No two products can be identical (can be to our eyes)

3-categories of variation

- Within-piece variation
  - One portion of surface is rougher than another portion
- A piece to piece variation
  - Vartion among pieces produced at the same time
- Time-to-time variation
  - Service given early would be different from that given later in the day.