Statistical_Quality_Control_Part2

Tuesday, June 11, 2024 5:57 PM

SQC
- QC for variables ($\bar{x}$ and R charts)
- QC for attributes
  - QC for defectives (P-chart)
  - QC for defects (C-chart)

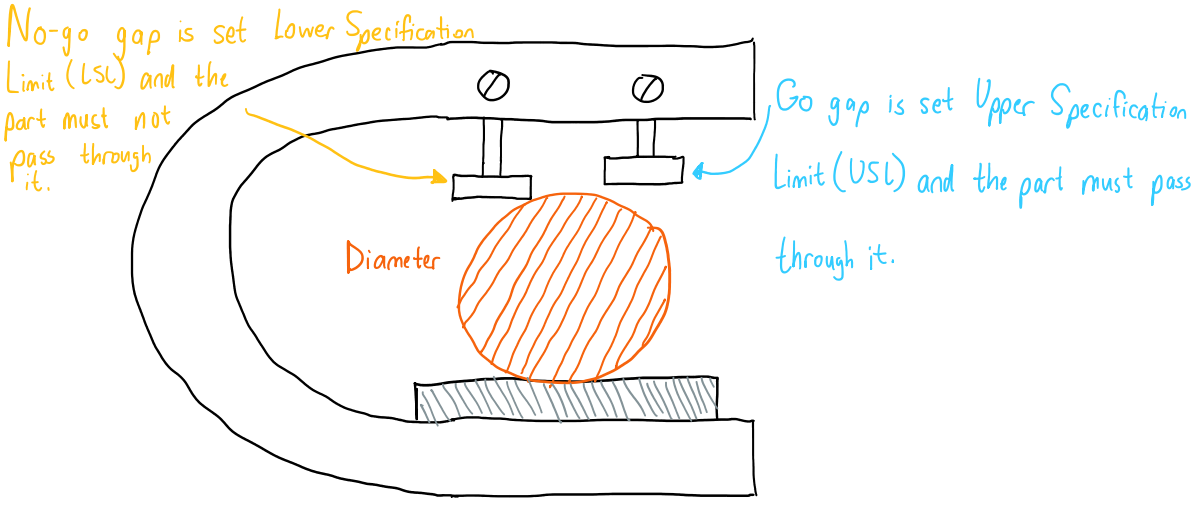
i) Does not yield a Quantitative Value

ii) We can use $\bar{X}$ & R charts, but item has five dimensions for which we must maintain $2 \times 5 = 10$ charts. So it becomes cumbersome to maintain 10 charts.
($\bar{x}$ & R; 5 ← dimension)

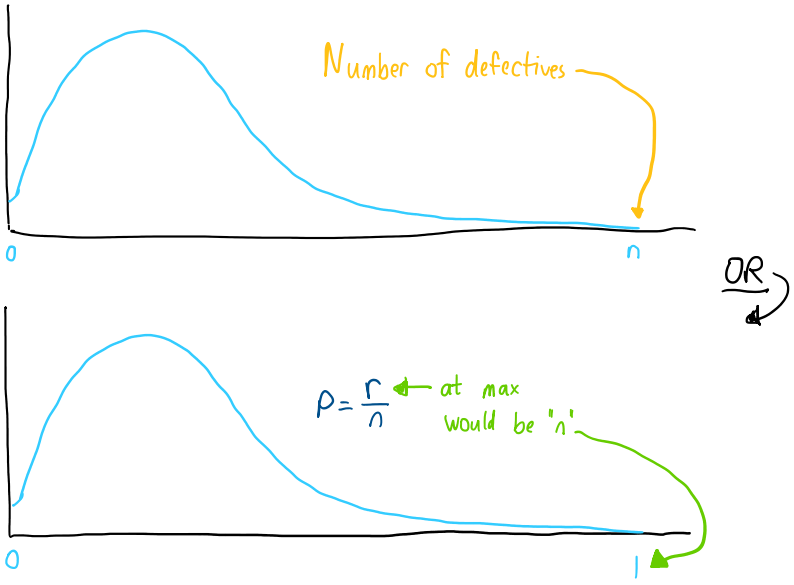
iii) We can maintain $\bar{X}$ and R charts, for reasons of convenience & difficulty in measurement we use the p-chart.
- Using the p-chart is quick & with time we measure dimensions of an item.
- With Go-Nogo gage we can check maybe 50 → 100 or more items

- With respect to second reason we won't have detailed information on items
  - Non-defective
  - Defective

- Go-Nogo gage:



- Binomial Distribution



r = Number of occurences

n = sample size

p = proportion (or proportion defective)

These distributions are identical

in terms of p and n

$$\sigma_p = \sqrt{\frac{p(1-p)}{n}} \qquad \sigma_{np} = n\sqrt{\frac{p(1-p)}{n}} = \sqrt{np(1-p)}$$

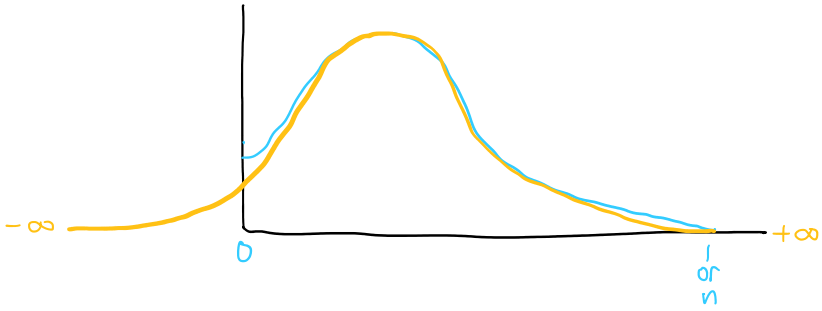
$$\mu_p = p \qquad \mu_{np} = np$$

- So, we need to maintain <u>one chart only</u>:

If we select to go with "3 sigma" limit

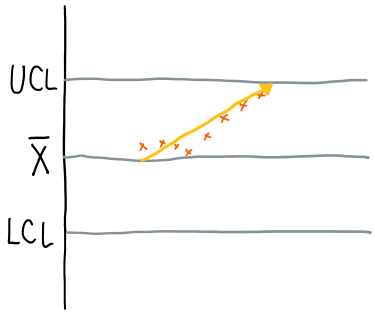
$p + 3\sigma_p$		$np + 3\sigma_{np}$	
p	OR	$\mu_{np} = np$	
$p - 3\sigma_p$		$np - 3\sigma_{np}$	

- Approximating Binomial distribution by Normal distribution



› because Normal distribution has good properties (Table) we can use

• Exact match is not required



• "n" is decided upon but where does "p" come from?

Similar to $\bar{X}$ & R charts:

1 – Aimed-at-values

2 – Estimated-values ← We favour this method

• Estimated-values method

(large)
e.g. n = 100

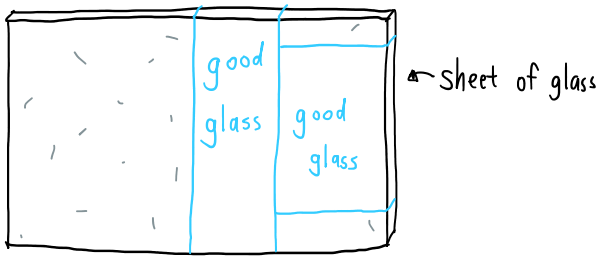
Sample #	Sample size	p_i
1	n	p_1
2	n	p_2
3	n	p_3
⋮	⋮	⋮
25	n	p_{25}

$$p_i = \frac{r_i}{n}$$

The rest is similar to $\bar{X}$ and R charts

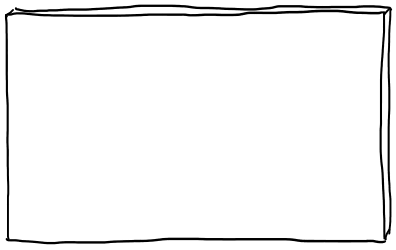
Conclusion to p-chart

- Control Chart for Defect (called c-chart)



We cannot call this sheet of glass defective.

- A sheet of glass can have infinite number of scratches or cracks



So we treat a sheet of glass as a sample size of 'infinity'