Notes:

Advanced Control Chart in Minitab

Key Learning Points

1. Describe CUSUM Charts and Short Run SPC.
2. Explain how to create advanced Control Charts.
3. Utilize advanced Control Charts in improvement projects.

Special Situations

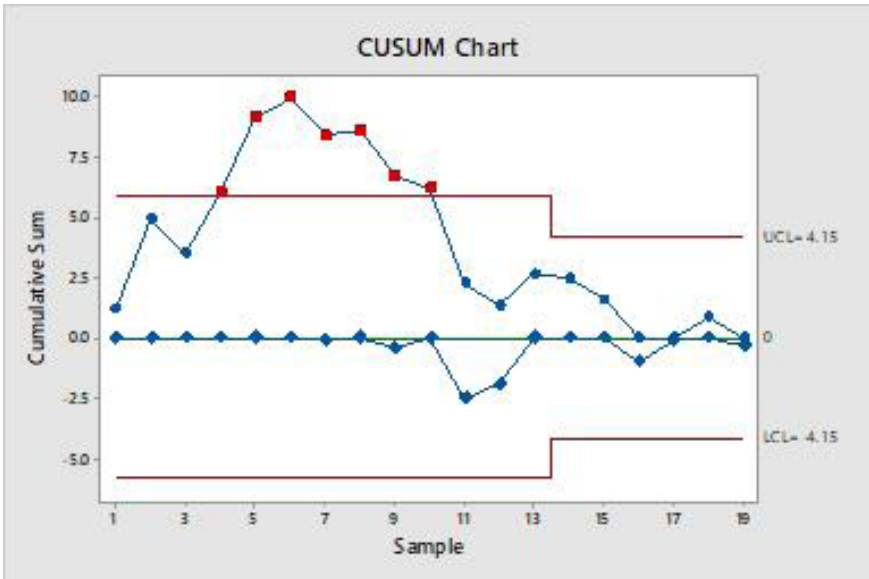
- Sometimes unusual conditions make the basic Shewhart control charts a sub-optimal choice.
- CUSUM charts are very efficient for detecting small process shifts. Use CUSUM for a process naturally expected to shift and with a desire to react to changes as small as 2s.
- Short Run SPC is used for production lines with frequent product changes. The changes in tolerances can make it impossible to get solid estimates of process parameters.

Cumulative Sum Chart (Cusum)

A CUSUM chart is a time-weighted control chart that displays the cumulative sums of the deviations of each sample value from the target value. Because it is cumulative, even minor drifting in the process mean will lead to steadily increasing or decreasing cumulative deviation values. Therefore, this chart is especially useful in detecting slow shifts away from the target value due to machine wear, calibration problems, and so on.

The plot points can be based on either subgroups or individual observations. When data are in subgroups, the mean of all the observations in each subgroup is calculated. CUSUM statistics are then calculated from these means. When you have individual observations, CUSUM statistics are calculated from the individual observations.

There are two lines presented in the CUSUM chart, one for trends above the target and one for trends below the target. In a stable process, the points should fluctuate randomly about the target.



Z-MR Chart

If small quantities of different parts or products are run on a process, there may not be enough data to produce good estimates of process parameters. The solution is to transform the data to focus on the process.

Remove any systematic changes in level and variability because of short runs of different products by standardizing individual measurement (X) by:

$Z = (X - m) / s.$

This leaves one control chart for the process: Z-MR chart.

Z-MR Charts standardize measurement data by subtracting the mean in order to center the data, then divide by the standard deviation. Standardizing allows data collected from different runs to be evaluated by interpreting a single control chart.
Z Chart: Center line = 0, UCL = +3, LCL = -3

MR Chart: CL, UCL, LCL are the same as in I-MR Chart

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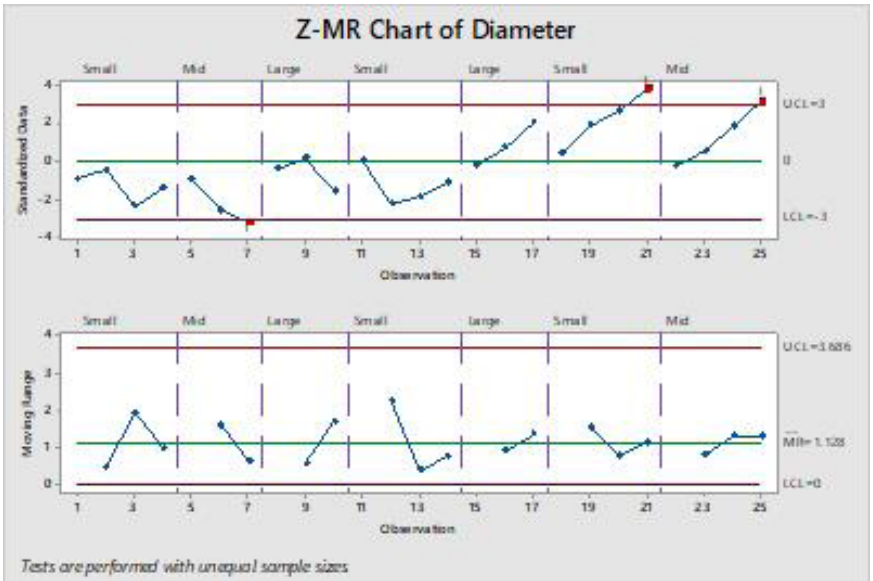

When Should A Control Chart Be Used?

- CUSUM Charts are useful for detecting small changes in the parameter being studied.
- Short-run SPC charts are used when you only run a small number of parts and ar e measuring a common characteristic on each part.

Pitfalls to Avoid

- Everyone must be well trained and periodically retrained.
- Data must be gathered and charted correctly.
- Reactions to patterns must be appropriate and clearly explained in standard operating procedures.

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