Analyze Stability Using Control Charts

A stable process produces predictable results consistently. It is in statistical control and shows variation due to common causes.

An unstable process is out of statistical control and shows variation due to special causes.

Common Stability Rules Identifying Unstable Conditions:

An unstable (i.e., out of control) condition can either be a point, set of points or trend in your data.

Control limits (1, 2, and 3 sigma lines) and stability rules are used to determine unstable conditions.

Types of Control Charts

<table>
<thead>
<tr>
<th>Attribute Charts for Counted Data</th>
<th>Variable Charts for Measured Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>defects, errors, injuries, etc.</td>
<td>length, weight, depth, time, etc.</td>
</tr>
<tr>
<td>c chart</td>
<td>XmR Chart (Individual Moving Range Chart)</td>
</tr>
<tr>
<td>p chart</td>
<td>XbarR Chart</td>
</tr>
<tr>
<td>u chart</td>
<td>XbarS Chart</td>
</tr>
<tr>
<td>np chart</td>
<td></td>
</tr>
</tbody>
</table>

Other Control Charts

- EWMA and Cusum charts for small shifts in a process
- g charts and t charts for rare events
- Levey Jennings standard deviation chart - used in healthcare labs

Choosing the Right Control Chart - see other side

Control Chart Tools in the QI Macros

Capability Suite of Six Charts

Use the Capability Suite or the X Chart Templates to Evaluate:
- Process Stability using Control Charts
- Process Capability using Histogram with Cp Cpk, Capability Plot, Values Plot
- Data Normality using Probability Plot

Create Control Charts Using the QI Macros Menu

1. Just select your data and the chart you want from the QI Macros menu. If you don’t know which chart, the QI Macros Control Chart Wizard can select the correct one for you.
2. QI Macros draws the chart and does all the calculations for you.
3. Use the Chart Menu to Add Data, Stair Step Limits, Target Lines, etc.

Control Chart Dashboard

1. Input up to 25 data sets into one worksheet.
2. Create a control chart dashboard with one click.
3. Add new data and refresh charts each period.
4. Rolling dashboards: add new data and only show the most recent X points on the chart.

Learn More at: www.qimacros.com/control-chart/

QI Macros 30-Day Trial at: www.qimacros.com
Using the Control Chart Wizard

The QI Macros Control Chart Wizard will analyze your data and choose the correct control chart for you.

1. Just click and drag over your data to select it.
2. Then click on the QI Macros Menu and Control Chart Wizard.

Choosing The Right Control Chart Yourself

Defect Data

- Defective
  - Count Defective Items?
  - Defective? Yes/No

Attribute (counted) integer: 1,2
- Defects
- People
- Events
- How many defects?
- Rate or Ratios?

Defective

Variable (Measured) decimal: 1.3
- Length
- Time
- Cost
  - Sub-groups

XbarR

Variable Data

To automate these charts, try the QI Macros for Excel. Download a FREE 30 day trial at: www.qimacros.com

QI Macros Chart Menu

Automates Chart Updates:
- Add New Data, Target Lines, or Text to a Point.
- Add Stair-Step Control Limits to Show a Process Change.
- Ghost or Delete points.
- Analyze Stability, Recalculate Control Limits
- Show/Hide Sigma Lines
- Remember Chart Format

QI Macros Sample Data

<table>
<thead>
<tr>
<th>Sample</th>
<th>Defects</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>12</td>
<td>50</td>
</tr>
<tr>
<td>S2</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample</th>
<th>Defects</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>12</td>
<td>100</td>
</tr>
<tr>
<td>S2</td>
<td>6</td>
<td>80</td>
</tr>
<tr>
<td>S3</td>
<td>6</td>
<td>80</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Roll</th>
<th>Defects in 50 Sq ft</th>
<th>Dye Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>R2</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td>R3</td>
<td>20</td>
<td>13</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Batch</th>
<th>Number</th>
<th>Viscosity</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>33.75</td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td>33.05</td>
<td></td>
</tr>
<tr>
<td>B3</td>
<td>34.00</td>
<td></td>
</tr>
</tbody>
</table>

QI Macros Control Chart Wizard

The QI Macros can analyze your data and select and run the right control chart for you.