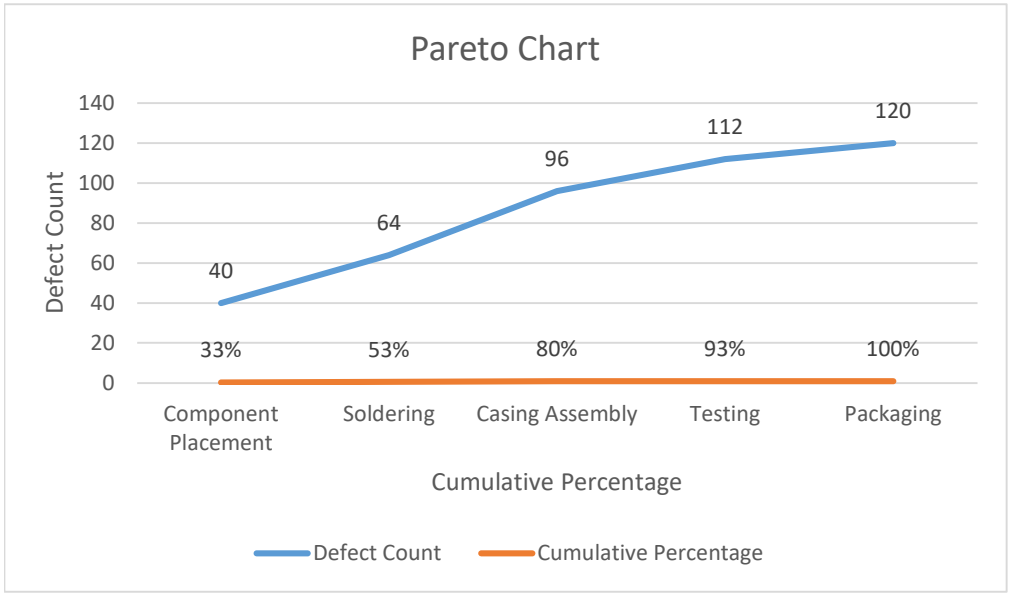
| Defect Rates (Average per Shift) | | | |
|---|---|---|---|
| Workstation | Defect Type | Defect Rate (%) | Defect Count |
| Component Placement | Misaligned/Missing Components | 5% | 40 |
| Soldering | Incomplete/Excessive Soldering | 3% | 24 |
| Casing Assembly | Improper Fitting/Damaged Casings | 4% | 32 |
| Testing | Failed Voltage/Current Tests | 2% | 16 |
| Packaging | Damaged Packaging | 1% | 8 |
| | Total= | 15% | 120 |

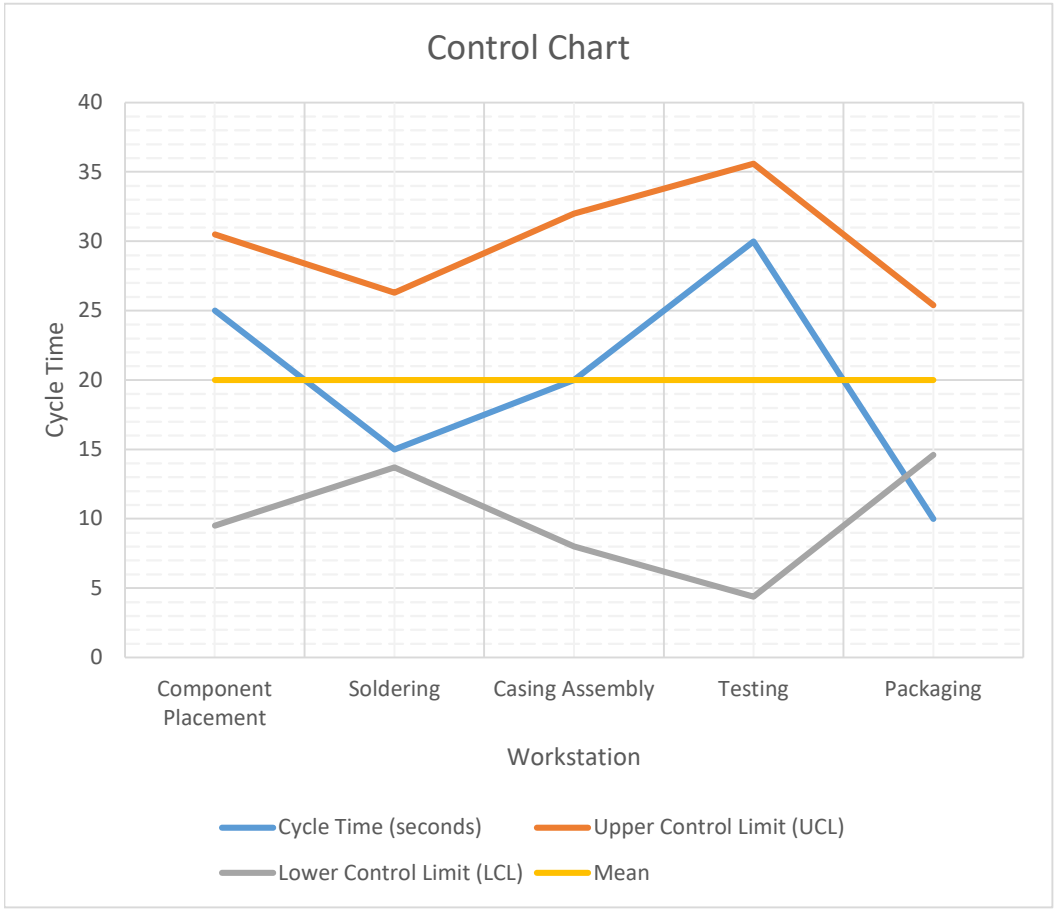
| Time Variations (Cycle Time per Unit) | | |
|---|---|---|
| Workstation | Average Cycle Time (Seconds) | Standard Deviation (seconds) |
| Component Placement | 25 | 3.5 |
| Soldering | 15 | 2.1 |
| Casing Assembly | 20 | 4 |
| Testing | 30 | 5.2 |
| Packaging | 10 | 1.8 |

| Production Outputs | |
|---|---|
| Metric | Value |
| Total Units Produced (Shift) | 800 |
| Defective Units | 120 |
| Non-Defective Units | 680 |
| First Pass Yield (FPY) | 85% |

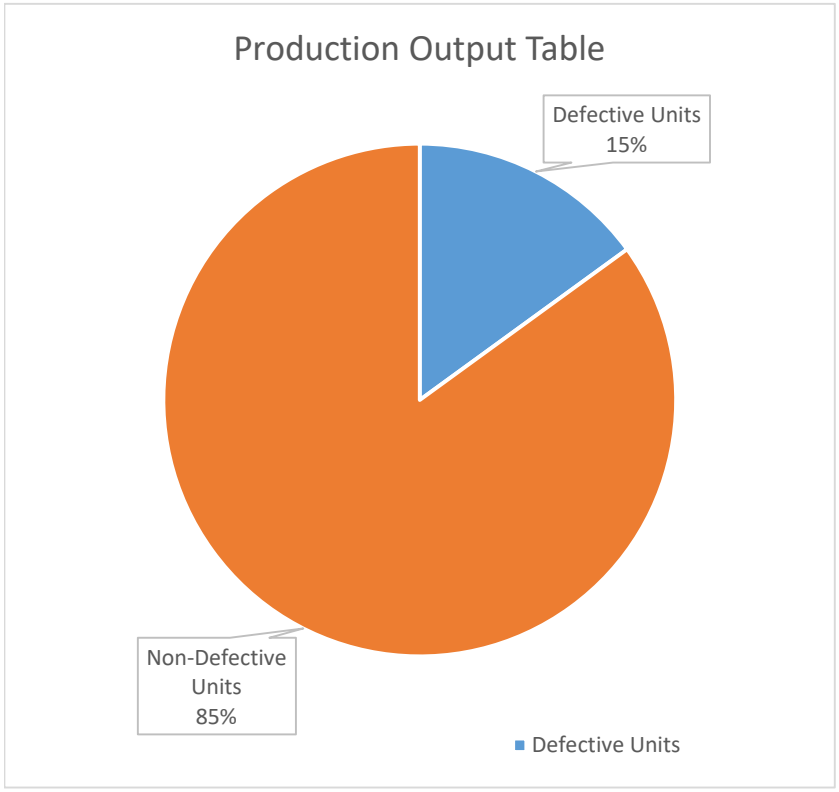
| Defect Rates Table (For Pareto Chart) | | | | |
|---|---|---|---|---|
| Purpose: | To identify which defects contribute most to the total defect rate. | | | |
| Table Structure in Excel: | | | | |
| Defect Type | Workstation | Defect Count | Cumulative Count | Cumulative Percentage |
| Misaligned Components | Component Placement | 40 | 40 | 33% |
| Incomplete Soldering | Soldering | 24 | 64 | 53% |
| Damaged Casings | Casing Assembly | 32 | 96 | 80% |
| Failed Voltage Tests | Testing | 16 | 112 | 93% |
| Damaged Packaging | Packaging | 8 | 120 | 100% |



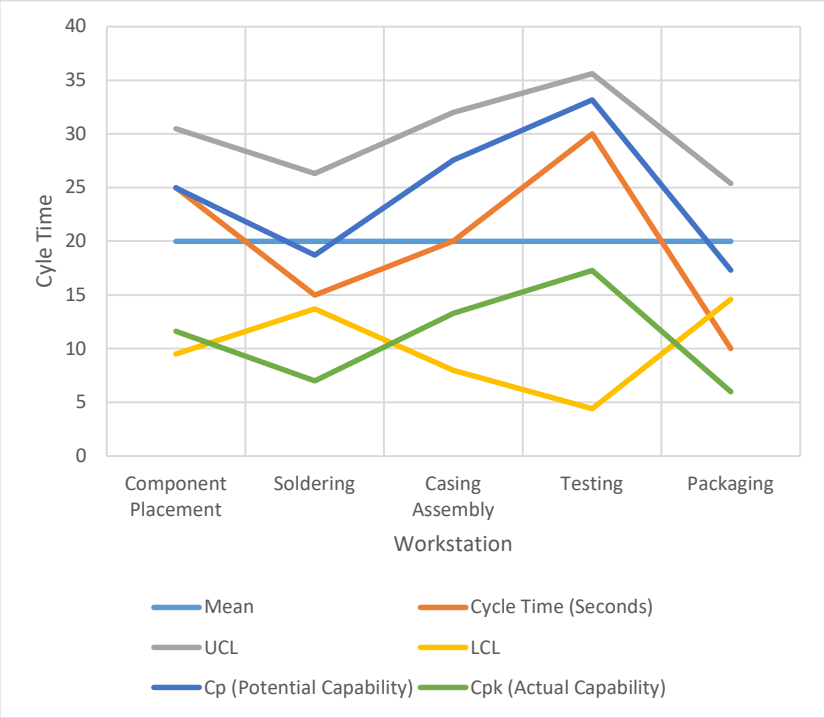
| Cycle Time Table (Control Chart) | | | | | |
|---|---|---|---|---|---|
| Purpose: | To analyze time variations and monitor process stability. | | | | |
| Workstation | Cycle Time (seconds) | Mean | Standard Deviation (seconds) | Upper Control Limit (UCL) | Lower Control Limit (LCL) |
| Component Placement | 25 | 20 | 3.5 | 30.5 | 9.5 |
| Soldering | 15 | 20 | 2.1 | 26.3 | 13.7 |
| Casing Assembly | 20 | 20 | 4 | 32 | 8 |
| Testing | 30 | 20 | 5.2 | 35.6 | 4.4 |
| Packaging | 10 | 20 | 1.8 | 25.4 | 14.6 |
| Mean= | 20 | | 3.32 | | |

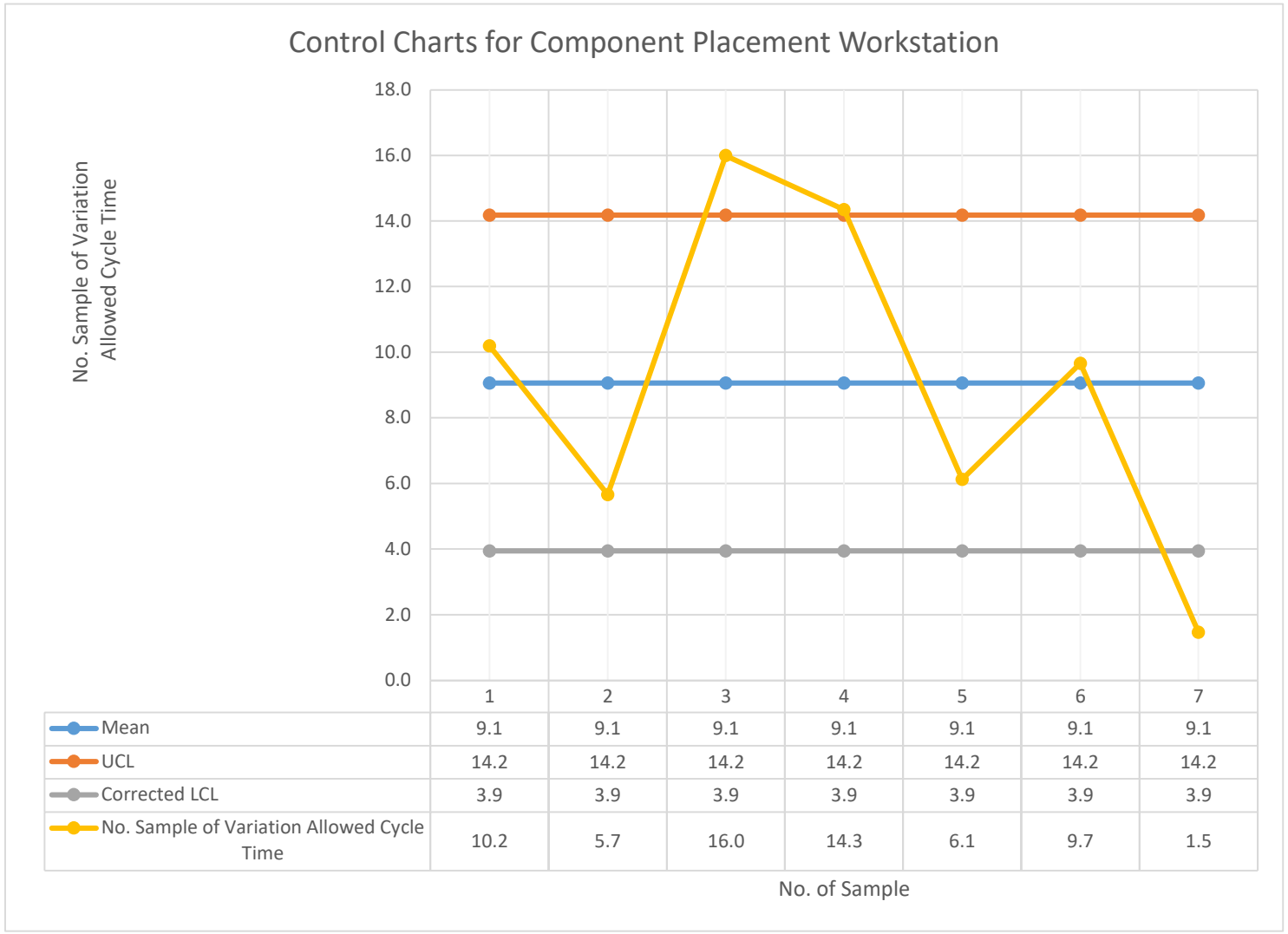


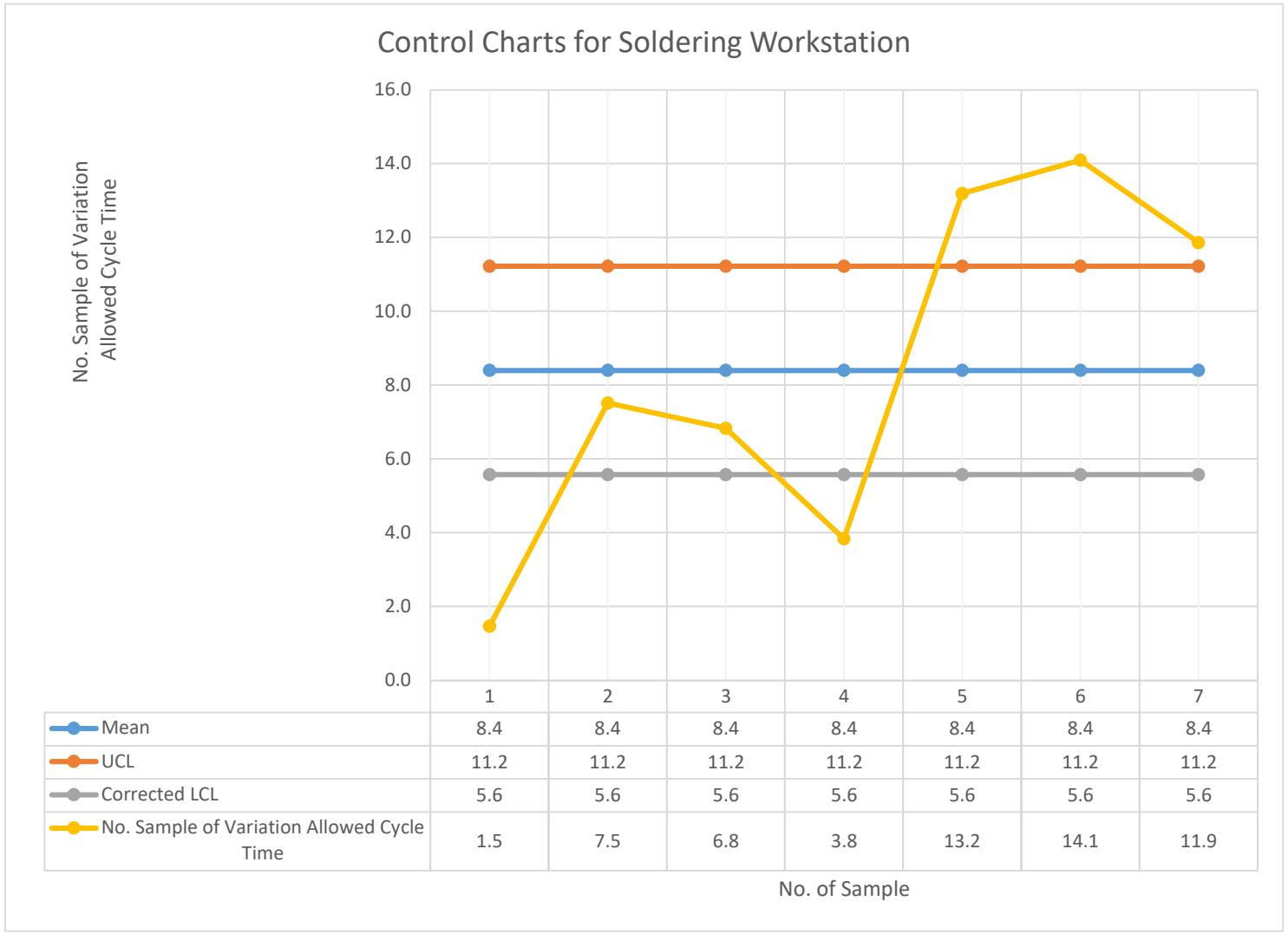
| Production Output Table (For Pie Chart) | |
|---|---|
| Purpose: | To visualize the proportion of defective vs. non-defective units. |
| Category | Count |
| Defective Units | 120 |
| Non-Defective Units | 680 |

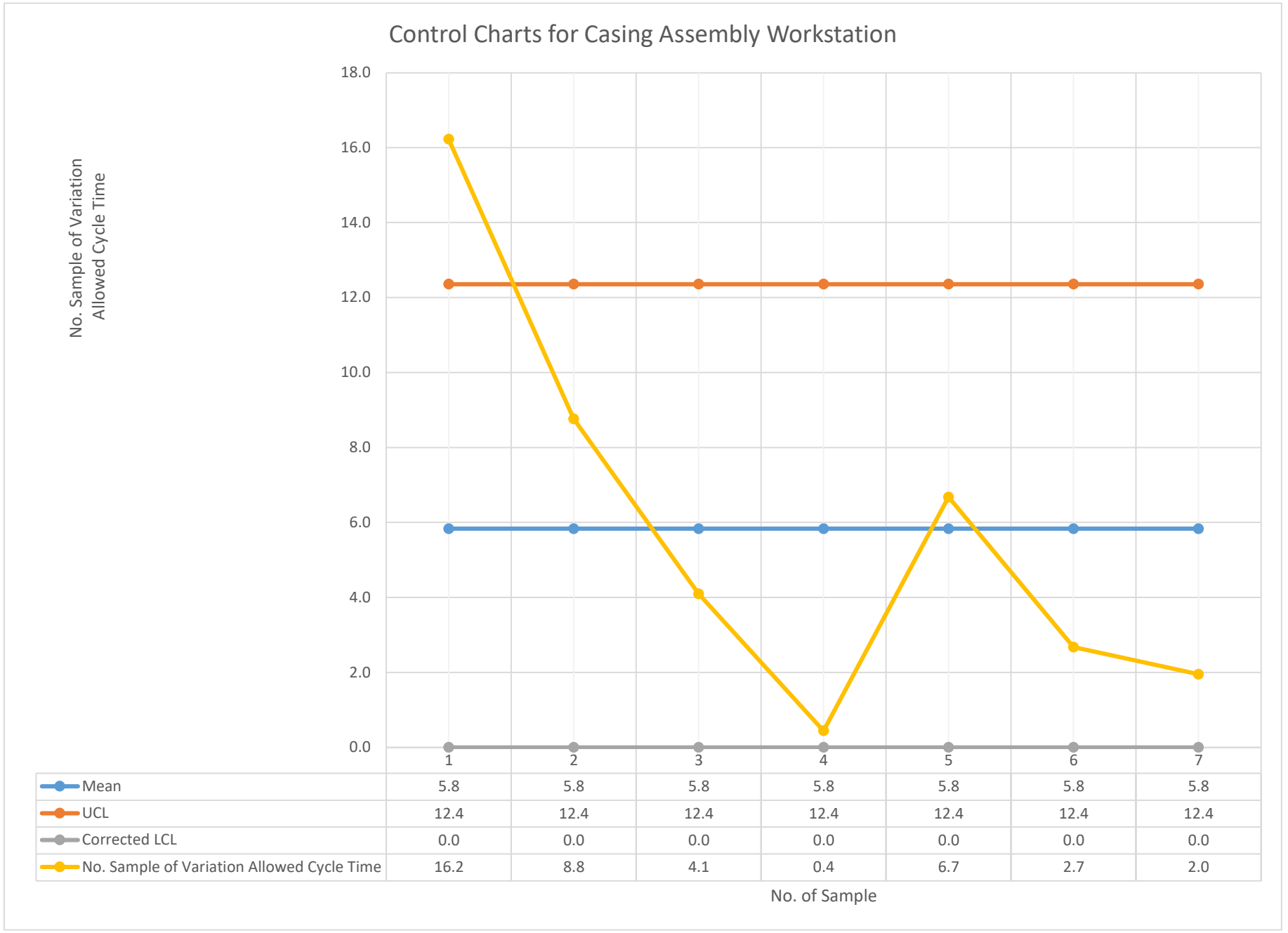


| Process Capability Table (For Process Capability Indices) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Purpose: | To determine how well the process meets specifications. | | | | | | |
| Workstation | Cycle Time (Seconds) | Mean | Standard Deviation (Seconds) | UCL | LCL | Cp (Potential Capability) | Cpk (Actual Capability) |
| Component Placement | 25 | 20 | 3.5 | 30.5 | 9.5 | 25.0 | 11.62 |
| Soldering | 15 | 20 | 2.1 | 26.3 | 13.7 | 18.7 | 6.972 |
| Casing Assembly | 20 | 20 | 4 | 32 | 8 | 27.6 | 13.28 |
| Testing | 30 | 20 | 5.2 | 35.6 | 4.4 | 33.2 | 17.264 |
| Packaging | 10 | 20 | 1.8 | 25.4 | 14.6 | 17.3 | 5.976 |
| Mean= | 20 | | 3.32 | | | | |



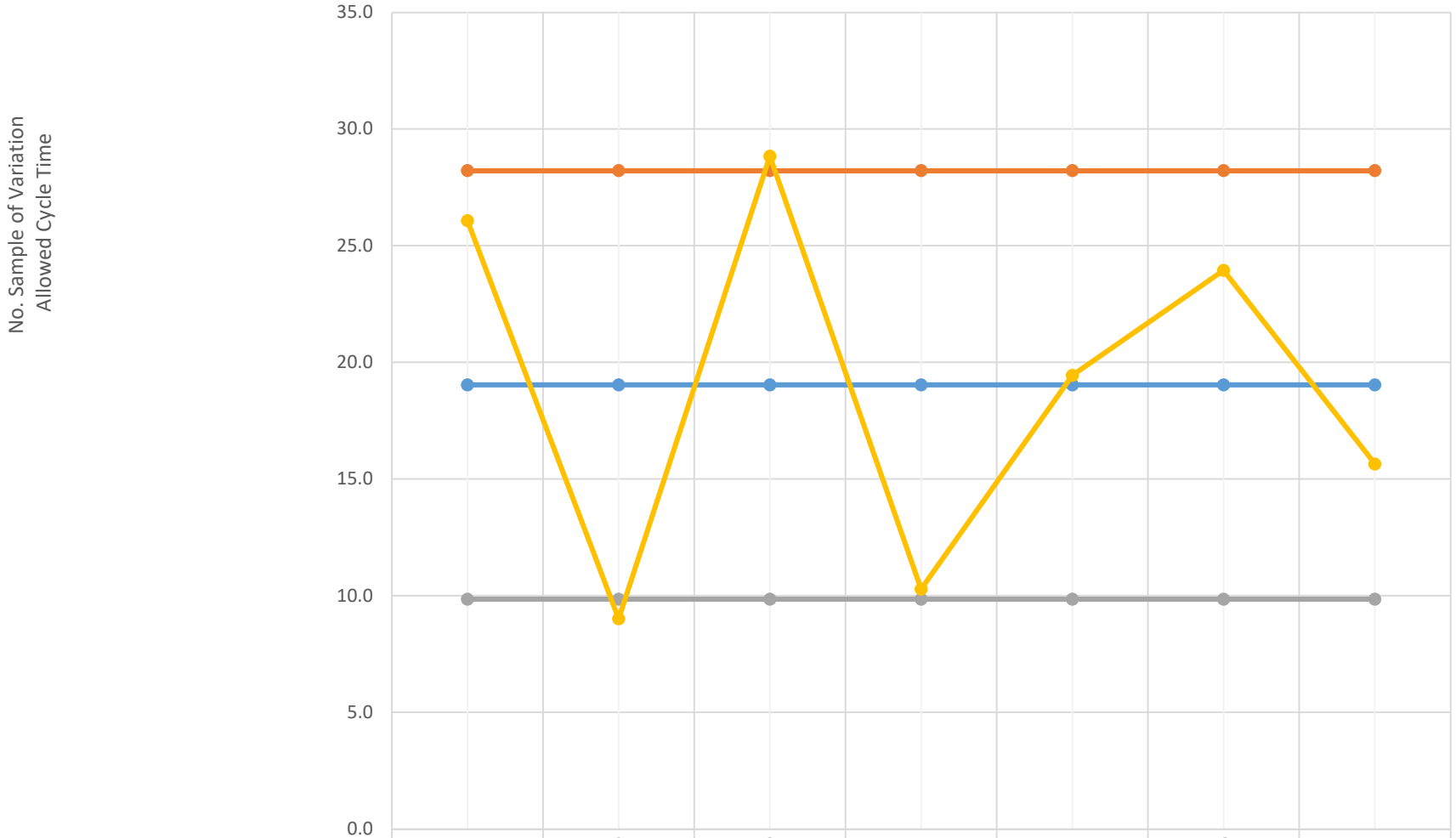

Control Charts for Component Placement Workstation
No. Sample of Variation Allowed Cycle Time
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
1 2 3 4 5 6 7
Mean 9.1 9.1 9.1 9.1 9.1 9.1 9.1
UCL 14.2 14.2 14.2 14.2 14.2 14.2 14.2
Corrected LCL 3.9 3.9 3.9 3.9 3.9 3.9 3.9
No. Sample of Variation Allowed Cycle Time 10.2 5.7 16.0 14.3 6.1 9.7 1.5
No. of Sample


Control Charts for Soldering Workstation
No. Sample of Variation Allowed Cycle Time
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
1
2
3
4
5
6
7
Mean 8.4 8.4 8.4 8.4 8.4 8.4 8.4
UCL 11.2 11.2 11.2 11.2 11.2 11.2 11.2
Corrected LCL 5.6 5.6 5.6 5.6 5.6 5.6 5.6
No. Sample of Variation Allowed Cycle Time 1.5 7.5 6.8 3.8 13.2 14.1 11.9
No. of Sample

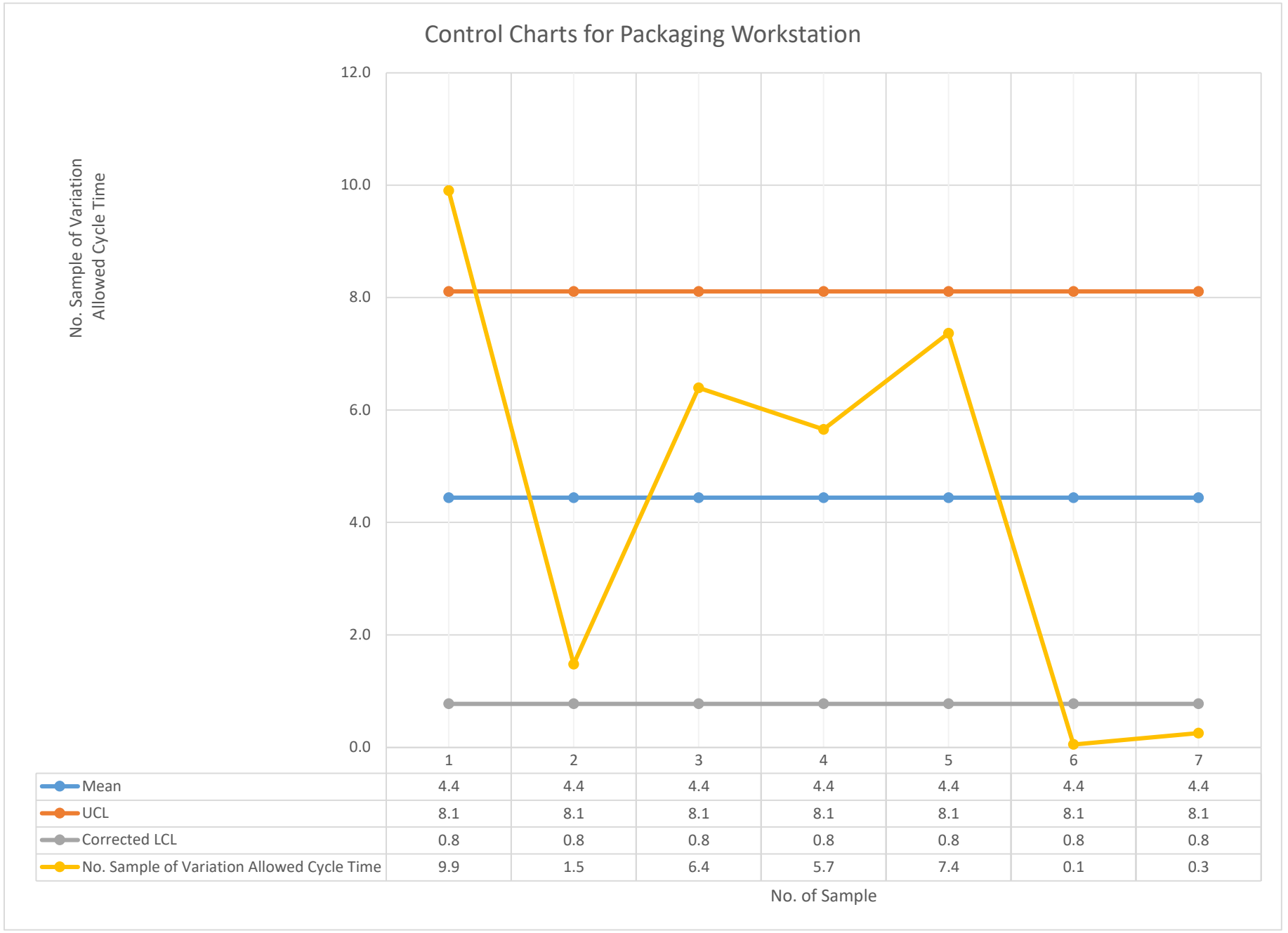



| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Mean | 5.8 | 5.8 | 5.8 | 5.8 | 5.8 | 5.8 | 5.8 |
| UCL | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 | 12.4 |
| Corrected LCL | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| No. Sample of Variation Allowed Cycle Time | 16.2 | 8.8 | 4.1 | 0.4 | 6.7 | 2.7 | 2.0 |

## Control Charts for Testing Workstation




| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Mean | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 |
| UCL | 28.2 | 28.2 | 28.2 | 28.2 | 28.2 | 28.2 | 28.2 |
| Corrected LCL | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 |
| No. Sample of Variation Allowed Cycle Time | 26.1 | 9.0 | 28.8 | 10.3 | 19.4 | 23.9 | 15.6 |


Control Charts for Packaging Workstation
No. Sample of Variation Allowed Cycle Time
12.0
10.0
8.0
6.0
4.0
2.0
0.0
1
2
3
4
5
6
7
Mean 4.4 4.4 4.4 4.4 4.4 4.4 4.4
UCL 8.1 8.1 8.1 8.1 8.1 8.1 8.1
Corrected LCL 0.8 0.8 0.8 0.8 0.8 0.8 0.8
No. Sample of Variation Allowed Cycle Time 9.9 1.5 6.4 5.7 7.4 0.1 0.3
No. of Sample

# Individual Charts for Each Workstation

| Worstation | Total Allowed Cyle Time Seconds | No. Sample Cycle Time | Total Variation Allowed Cycle Time Seconds | No. Sample of Variation Allowed Cycle Time | Mean | Total Variation Allowed Standard Deviation of Cycle Time | No. Sample of variation allowed Standard Deviation | UCL | LCL | Corrected LCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Component Placement | 25 | 7.7 | 26 | 10.2 | 9.1 | 3.5 | 0.3 | 14.2 | 3.9 | 3.9 |
| | | 11.4 | | 5.7 | 9.1 | | 2.3 | 14.2 | 3.9 | 3.9 |
| | | 7.6 | | 16.0 | 9.1 | | 2.6 | 14.2 | 3.9 | 3.9 |
| | | 11.5 | | 14.3 | 9.1 | | 3.3 | 14.2 | 3.9 | 3.9 |
| | | 14.6 | | 6.1 | 9.1 | | 1.2 | 14.2 | 3.9 | 3.9 |
| | | 2.3 | | 9.7 | 9.1 | | 1.3 | 14.2 | 3.9 | 3.9 |
| | | 6.1 | | 1.5 | 9.1 | | 0.8 | 14.2 | 3.9 | 3.9 |
| | | | Mean= | 9.1 | | Mean= | 1.7 | | | |

| Worstation | Total Allowed Cyle Time Seconds | No. Sample Cycle Time | Total Variation Allowed Cycle Time Seconds | No. Sample of Variation Allowed Cycle Time | Mean | Total Variation Allowed Standard Deviation of Cycle Time | No. Sample of variation allowed Standard Deviation | UCL | LCL | Corrected LCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Soldering | 15 | 13.8 | 16 | 1.5 | 8.4 | 2.1 | 1.2 | 11.2 | 5.6 | 5.6 |
| | | 5.2 | | 7.5 | 8.4 | | 1.9 | 11.2 | 5.6 | 5.6 |
| | | 9.1 | | 6.8 | 8.4 | | 0.2 | 11.2 | 5.6 | 5.6 |
| | | 11.6 | | 3.8 | 8.4 | | 2.0 | 11.2 | 5.6 | 5.6 |
| | | 9.6 | | 13.2 | 8.4 | | 0.0 | 11.2 | 5.6 | 5.6 |
| | | 9.9 | | 14.1 | 8.4 | | 1.1 | 11.2 | 5.6 | 5.6 |
| | | 1.3 | | 11.9 | 8.4 | | 0.1 | 11.2 | 5.6 | 5.6 |
| | | | Mean= | 8.4 | | Mean= | 0.9 | | | |

| Worstation | Total Allowed Cyle Time Seconds | No. Sample Cycle Time | Total Variation Allowed Cycle Time Seconds | No. Sample of Variation Allowed Cycle Time | Mean | Total Variation Allowed Standard Deviation of Cycle Time | No. Sample of variation allowed Standard Deviation | UCL | LCL | Corrected LCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Casing Assembly | 20 | 12.3 | 21 | 16.2 | 5.8 | 4 | 3.0 | 12.4 | -0.7 | 0.0 |
| | | 3.1 | | 8.8 | 5.8 | | 0.9 | 12.4 | -0.7 | 0.0 |
| | | 16.4 | | 4.1 | 5.8 | | 0.5 | 12.4 | -0.7 | 0.0 |
| | | 6.5 | | 0.4 | 5.8 | | 1.4 | 12.4 | -0.7 | 0.0 |
| | | 5.1 | | 6.7 | 5.8 | | 3.1 | 12.4 | -0.7 | 0.0 |
| | | 7.1 | | 2.7 | 5.8 | | 3.0 | 12.4 | -0.7 | 0.0 |
| | | 6.1 | | 2.0 | 5.8 | | 3.4 | 12.4 | -0.7 | 0.0 |
| | | | Mean= | 5.8 | | Mean= | 2.2 | | | |

| Worstation | Total Allowed Cyle Time Seconds | No. Sample Cycle Time | Total Variation Allowed Cycle Time Seconds | No. Sample of Variation Allowed Cycle Time | Mean | Total Variation Allowed Standard Deviation of Cycle Time | No. Sample of variation allowed Standard Deviation | UCL | LCL | Corrected LCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Testing | 30 | 21.8 | 31 | 26.1 | 19.0 | 5.2 | 2.9 | 28.2 | 9.9 | 9.9 |
| | | 24.8 | | 9.0 | 19.0 | | 2.8 | 28.2 | 9.9 | 9.9 |
| | | 22.7 | | 28.8 | 19.0 | | 0.7 | 28.2 | 9.9 | 9.9 |
| | | 20.7 | | 10.3 | 19.0 | | 3.9 | 28.2 | 9.9 | 9.9 |
| | | 27.6 | | 19.4 | 19.0 | | 2.9 | 28.2 | 9.9 | 9.9 |
| | | 21.6 | | 23.9 | 19.0 | | 4.9 | 28.2 | 9.9 | 9.9 |
| | | 15.5 | | 15.6 | 19.0 | | 3.5 | 28.2 | 9.9 | 9.9 |
| | | | Mean= | 19.0 | | Mean= | 3.1 | | | |

| Worstation | Total Allowed Cyle Time Seconds | No. Sample Cycle Time | Total Variation Allowed Cycle Time Seconds | No. Sample of Variation Allowed Cycle Time | Mean | Total Variation Allowed Standard Deviation of Cycle Time | No. Sample of variation allowed Standard Deviation | UCL | LCL | Corrected LCL |
|---|---|---|---|---|---|---|---|---|---|---|
| Packaging | 10 | 7.7 | 11 | 9.9 | 4.4 | 1.8 | 1.4 | 8.1 | 0.8 | 0.8 |
| | | 4.9 | | 1.5 | 4.4 | | 1.2 | 8.1 | 0.8 | 0.8 |
| | | 0.3 | | 6.4 | 4.4 | | 0.7 | 8.1 | 0.8 | 0.8 |
| | | 2.6 | | 5.7 | 4.4 | | 1.7 | 8.1 | 0.8 | 0.8 |
| | | 4.0 | | 7.4 | 4.4 | | 1.7 | 8.1 | 0.8 | 0.8 |
| | | 9.3 | | 0.1 | 4.4 | | 1.2 | 8.1 | 0.8 | 0.8 |
| | | 6.6 | | 0.3 | 4.4 | | 0.7 | 8.1 | 0.8 | 0.8 |
| | | | Mean= | 4.4 | | Mean= | 1.2 | | | |