

# Process Capability - SigmaXL<sup>®</sup> Version 6.1

● Process Capability (Normal Data)

● Capability Combination Report

● Process Capability for Non-normal Data

● Automatic Best Fit

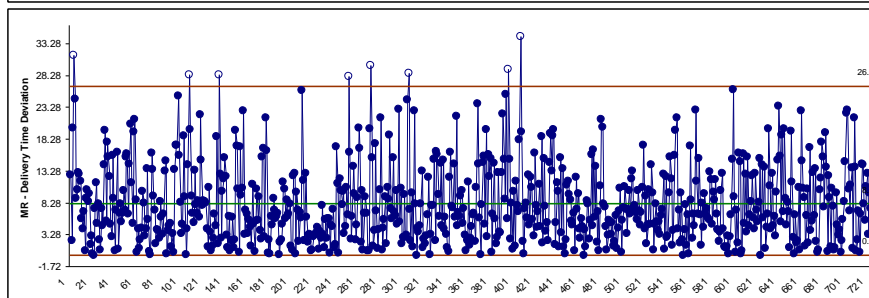
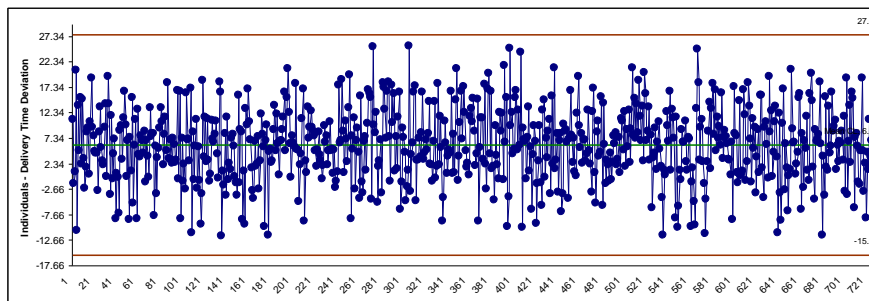
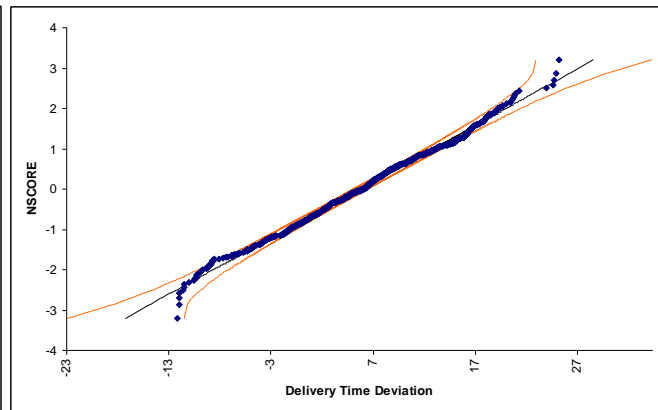
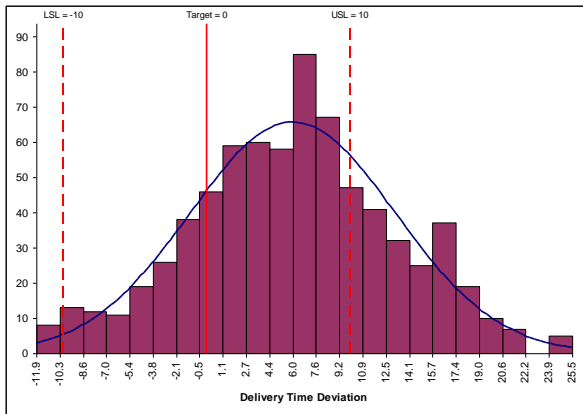
● Box-Cox Transformation



# Process Capability (Normal Data)

- Process Capability/Sigma Level Templates
- Multiple Histograms and Process Capability
- Capability Combination Report for Individuals/Subgroups:
  - Histogram
  - Capability Report ( $C_p$ ,  $C_{pk}$ ,  $P_p$ ,  $P_{pk}$ ,  $C_{pm}$ , ppm, %)
  - Normal Probability Plot
  - Anderson-Darling Normality Test
  - Control Charts

# Process Capability: Capability Combination Report



Process Capability Report: Indiv & MR - Delivery Time Deviation	
Count =	725
Mean =	6.0036
StDev (Overall, Long Term) =	7.1616
StDev (Within, Short Term) =	7.2020
USL =	10
Target =	0
LSL =	-10
Capability Indices using Overall StDev	
Pp =	0.47
Ppu =	0.19
Ppl =	0.74
Ppk =	0.19
Cpm =	0.36
Potential Capability Indices using Within StDev	
Cp =	0.46
Cpu =	0.18
Cpl =	0.74
Cpk =	0.18
Expected Overall Performance	
ppm > USL =	288409
ppm < LSL =	12720
ppm Total =	301130
% > USL =	28.84%
% < LSL =	1.27%
% Total =	30.11%
Actual (Empirical) Performance	
% > USL =	26.90%
% < LSL =	1.38%
% Total =	28.28%
Anderson-Darling Normality Test	
A-Squared =	0.708616
P-value =	0.0641

# Process Capability for Nonnormal Data

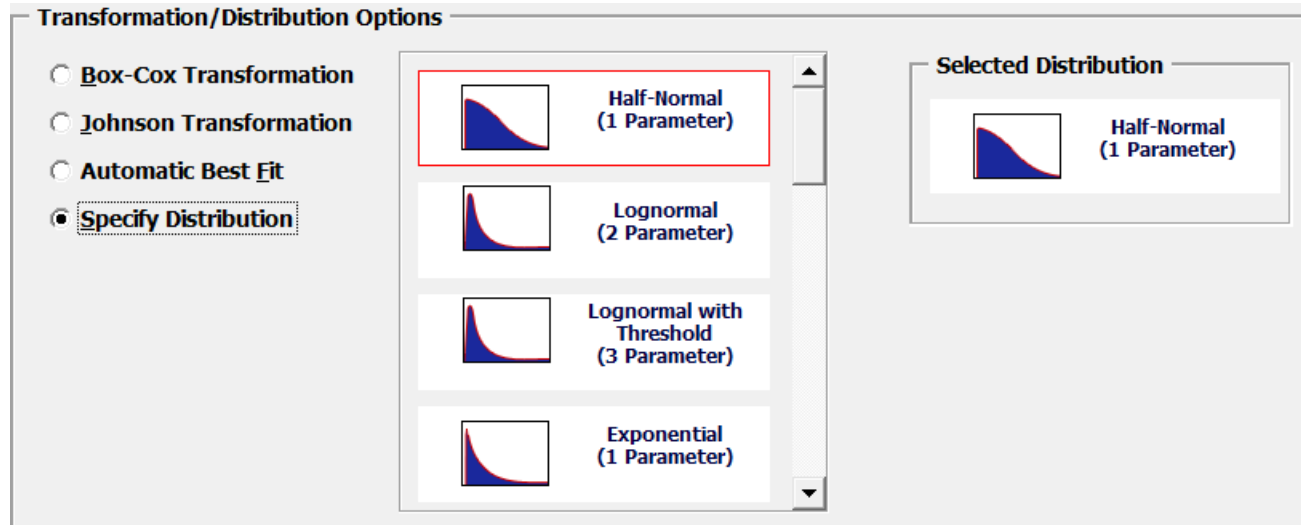
- Box-Cox Transformation (includes an automatic threshold option so that data with negative values can be transformed)
- Johnson Transformation
- Distributions supported:
  - Half-Normal
  - Lognormal (2 & 3 parameter)
  - Exponential (1 & 2 parameter)
  - Weibull (2 & 3 parameter)
  - Beta (2 & 4 parameter)
  - Gamma (2 & 3 parameter)
  - Logistic
  - Loglogistic (2 & 3 parameter)
  - Largest Extreme Value
  - Smallest Extreme Value

# Process Capability for Nonnormal Data

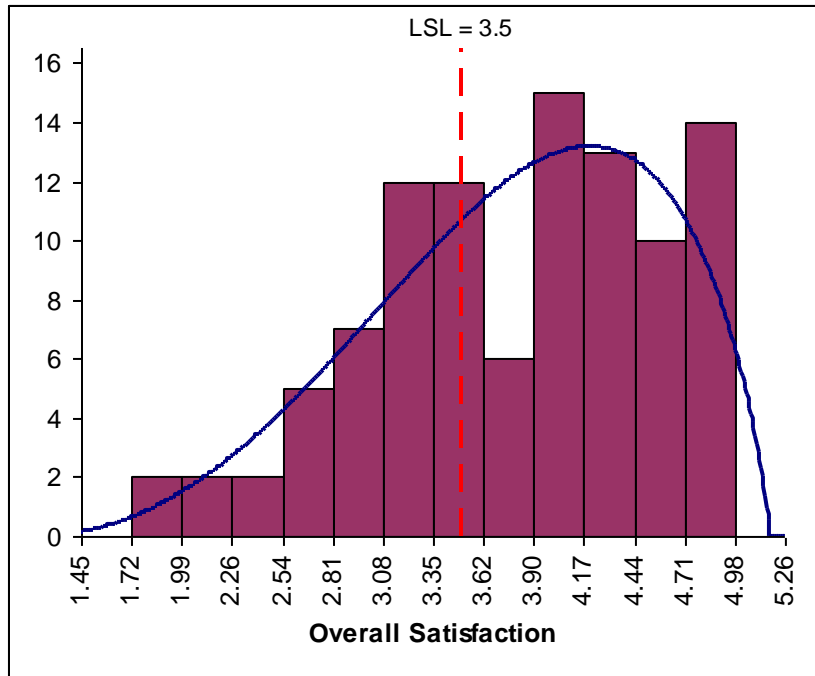
- Automatic Best Fit based on AD p-value
- Nonnormal Process Capability Indices:
  - Z-Score (Cp, Cpk, Pp, Ppk)
  - Percentile (ISO) Method (Pp, Ppk)
- Distribution Fitting Report
  - All valid distributions and transformations reported with histograms, curve fit and probability plots
  - Sorted by AD p-value

# Process Capability for Nonnormal Data

- Distribution options displayed visually



# Nonnormal Process Capability: Automatic Best Fit



Process Capability Report (Nonnormal): Overall Satisfaction	
Distribution: Beta with Lower/Upper Threshold (4 p)	
Sample Count	100
Sample Mean	3.801
Shape1	3.465
Shape2	1.775
Upper Threshold (Optimal)	5.170
Lower Threshold (Optimal)	1.117
Percentile (Overall Satisfaction)	1
StDev (Normalized Within, Short Term)	0.949670
USL	
Target	
LSL	3.5

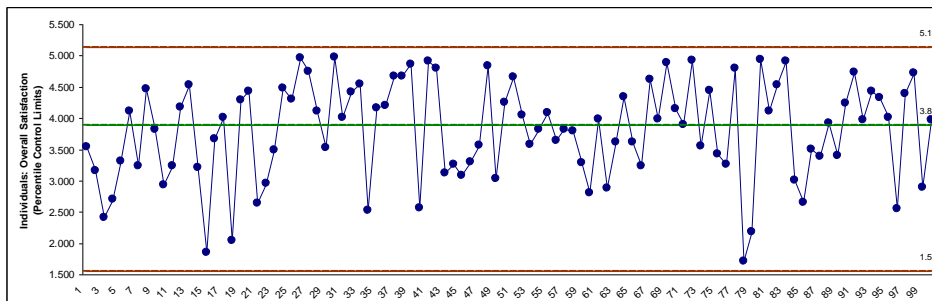
Capability Indices (Z-Score Method)	
Pp	
Ppu	
Ppl	0.143006
Ppk	0.143006

Potential Capability Indices using Normalized Within StDev	
Cp	
Cpu	
Cpl	0.150585
Cpk	0.150585

Expected Overall Performance	
ppm > USL	
ppm < LSL	333955
ppm Total	333955
% > USL	
% < LSL	0.333955
% Total	33.40%

Actual (Empirical) Performance	
% > USL	
% < LSL	33.00%
% Total	33.00%

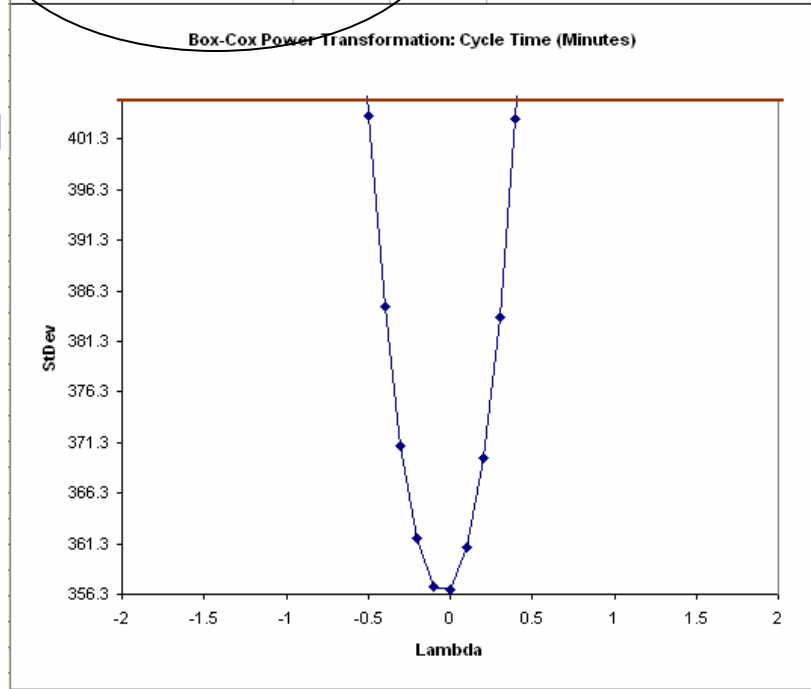
Anderson-Darling Goodness-of-Fit Tests	
AD Beta (4P)	0.199268
AD Beta (4P) p-value	0.882 (Z-Score Est.)
AD Normality Original Data	0.803438292
AD Normality P-Value Original Data	0.0363



# Process Capability: Box-Cox Power Transformation

Box-Cox Power Transformation: Cycle Time (Minutes)		Cycle Time (Minutes)	Transformed Data (Ln(Y))
Optimal Lambda	-0.04	3216	8.07589363
Final Lambda	0	261	5.564520407
UC Lambda (95%)	0.407756	392	5.97126184
LC Lambda (95%)	-0.506879	63	4.143134726
Anderson Darling Normality Test for Transformed Data:		28	3.3220451
A-Squared	0.326821	6101	8.716207971
AD P-value	0.5063	151	5.017279837
		46	3.828641396
		1465	7.289610521
		383	5.948034989
		287	5.659482216
		322	5.774551546
		538	6.28785856
		574	6.352629396
		586	6.37331979
		920	6.82437367
		178	5.18178355
		129	4.859812404
		187	5.231108617
		71	4.262679877
		342	5.834810737
		167	5.117993812
		794	6.677083461
		205	5.323009979
		576	6.356107661
		575	6.354370041
		381	5.942799375
		576	6.356107661
		918	6.822197391
		190	5.247024072

Optimal Lambda	-0.04
Final Lambda	0
UC Lambda (95%)	0.407756
LC Lambda (95%)	-0.506879
Anderson Darling Normality Test for Transformed Data:	
A-Squared	0.326821
AD P-value	0.5063



**Normality Test is automatically applied to transformed data!**