R&R Report

Method

Parts:	10	Operators:	3
Replicates:	2	Total runs:	60

Summary

Original Value	Recoded Value	Number of Rows
1.1	1	10
1.2	1	10
2.1	2	10
2.2	2	10
3.1	3	10
3.2	3	10

Recoded data column Operator

Variance Components

Source	VarComp	%Contribution (of VarComp)
Total Gage R&R	0.0014850	5.16
Repeatability	0.0006758	2.35
Reproducibility	0.0008092	2.81
Part-To-Part	0.0272724	94.84
Total Variation	0.0287574	100.00

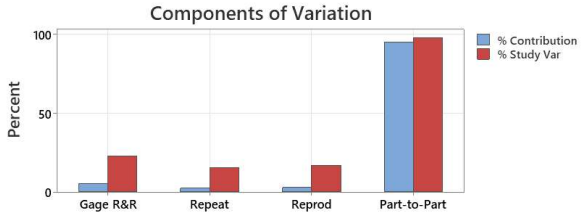
Gage Evaluation

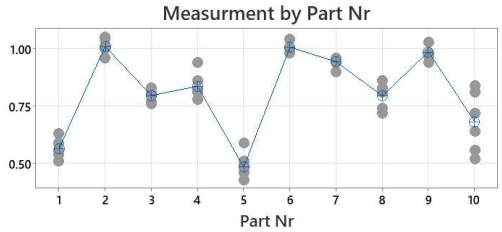
Source	StdDev (SD)	Study Var (6 × SD)	%Study Var (%SV)
Total Gage R&R	0.038535	0.23121	22.72
Repeatability	0.025996	0.15598	15.33
Reproducibility	0.028446	0.17068	16.77
Part-To-Part	0.165144	0.99086	97.38
Total Variation	0.169580	1.01748	100.00

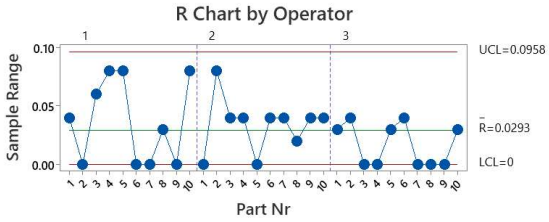
Gage R&R (Xbar/R) Report for Measurment

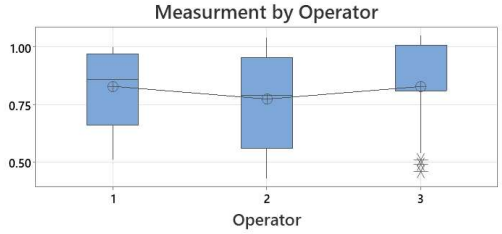
Gage name:
Date of study:

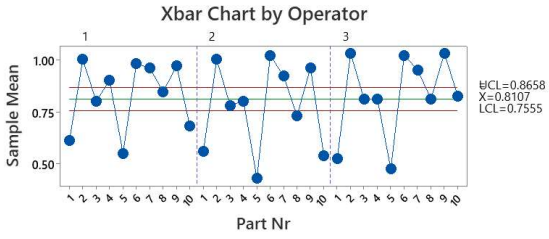
Reported by:
Tolerance:
Misc:

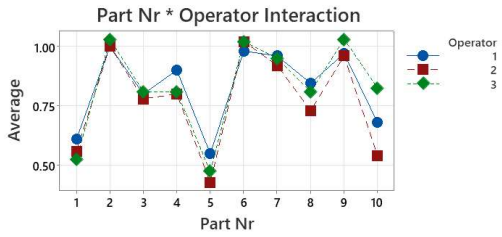












	Operator 1	
Part #	**1**	**2**
1	0.63	0.59
2	1	1
3	0.83	0.77
4	0.86	0.94
5	0.59	0.51
6	0.98	0.98
7	0.96	0.96
8	0.86	0.83
9	0.97	0.97
10	0.64	0.72

Averages:

Overall Range Average (R double bar)	0.029333
Range of Operator Average (xD)	0.0555
Range of Parts Average	0.525
Trials, r	2
Operators , m	3
Parts, n	10
Tolerance	0.5
K1	4.56
K2	2.7
K3	1.62
D4	3.27

		% of Total Variation	**Variance Ratio**
EV	0.13376	15%	2.35%
AV	0.146835	17%	2.83%
R&R	0.198626	23%	5.17%
PV	0.8505	97%	94.83%
TV	0.873386		
Upper Limit	0.09592		
	15%		

		Operator 2				Opera
Average	**Range**	**1**	**2**	**Average**	**Range**	**1**
0.61	0.04	0.56	0.56	0.56	0	0.51
1	0	1.04	0.96	1	0.08	1.05
0.8	0.06	0.8	0.76	0.78	0.04	0.81
0.9	0.08	0.82	0.78	0.8	0.04	0.81
0.55	0.08	0.43	0.43	0.43	0	0.46
0.98	0	1	1.04	1.02	0.04	1.04
0.96	0	0.94	0.9	0.92	0.04	0.95
0.845	0.03	0.72	0.74	0.73	0.02	0.81
0.97	0	0.98	0.94	0.96	0.04	1.03
0.68	0.08	0.56	0.52	0.54	0.04	0.84
0.8295	0.037			0.774	0.034	

% Tolerance
26.75%
29.37%
39.73%
170.10%

ator 3

2	Average	Range	Part Averages
0.54	0.525	0.03	0.565
1.01	1.03	0.04	1.01
0.81	0.81	0	0.796666667
0.81	0.81	0	0.836666667
0.49	0.475	0.03	0.485
1	1.02	0.04	1.006666667
0.95	0.95	0	0.943333333
0.81	0.81	0	0.795
1.03	1.03	0	0.986666667
0.81	0.825	0.03	0.681666667
	0.8285	0.017	

Glass Breaking Strength

A salsa company is considering using a new container for its salsa. According to their research, the glass containers for the salsa should have a strength between 185 and 325 psi. A vendor has provided the following data for ealuation. Is there evidence that the process is in control? Is it capable of producing jars with a breaking strength between 185 and 325 psi?

Sample			Data			
1	265	205	263	307	220	264.06
2	268	260	234	299	215	
3	197	286	274	243	231	
4	267	281	265	214	318	
5	346	317	242	258	276	
6	300	208	187	264	271	
7	280	242	260	321	228	
8	250	299	258	267	293	
9	265	254	281	294	223	
10	260	308	235	283	277	
11	200	235	246	328	296	
12	276	264	269	235	290	
13	221	176	248	263	231	
14	334	280	265	272	283	
15	265	262	271	245	301	
16	280	274	253	287	258	
17	261	248	260	274	337	
18	250	278	254	274	275	
19	278	250	265	270	298	
20	257	210	280	269	251	

Is the process cabaple of producing jars with a breaking strength between 185 and 325 psi?

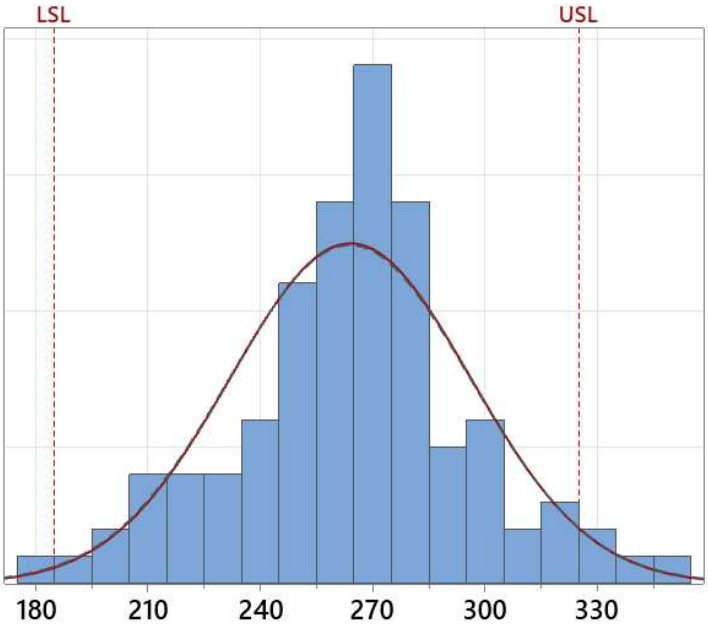
Mid Point	255
StdDev	32.01793
Cpl	0.82308
Cpu	0.634436
Cpk	0.634436

WORKSHEET 1

Process Capability Report for C2, C3, C4, C5, C6

Process Capability Report for C2, ..., C6

Process Data	
LSL	185
Target	*
USL	325
Sample Mean	264.06
Sample N	100
StDev(Overall)	32.0179
StDev(Within)	32.1522



Overall
Within

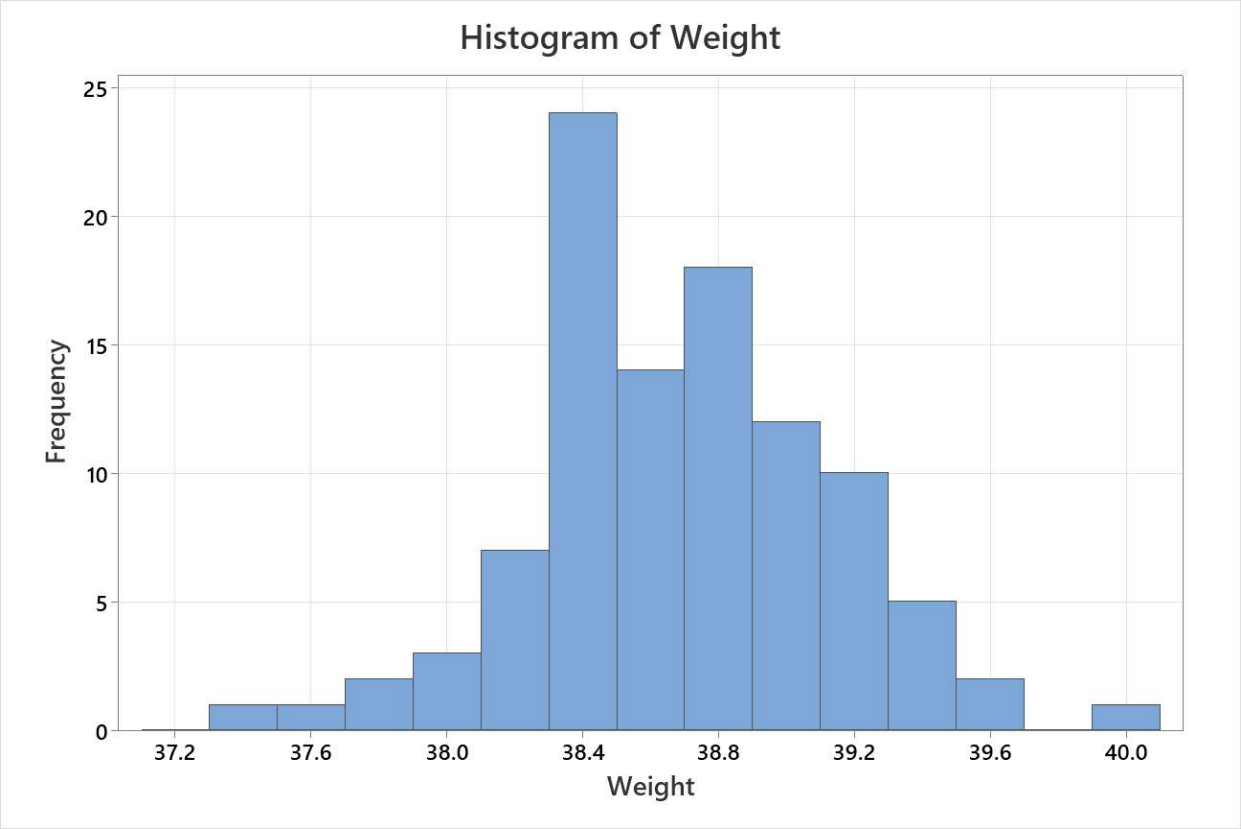
Overall Capability	
Pp	0.73
PPL	0.82
PPU	0.63
Ppk	0.63
Cpm	*

Potential (Within) Capability	
Cp	0.73
CPL	0.82
CPU	0.63
Cpk	0.63

	Performance		
	Observed	Expected Overall	Expected Within
PPM < LSL	10000.00	6769.99	6967.64
PPM > USL	40000.00	28500.15	29022.46
PPM Total	50000.00	35270.14	35990.09

The actual process spread is represented by 6 sigma.

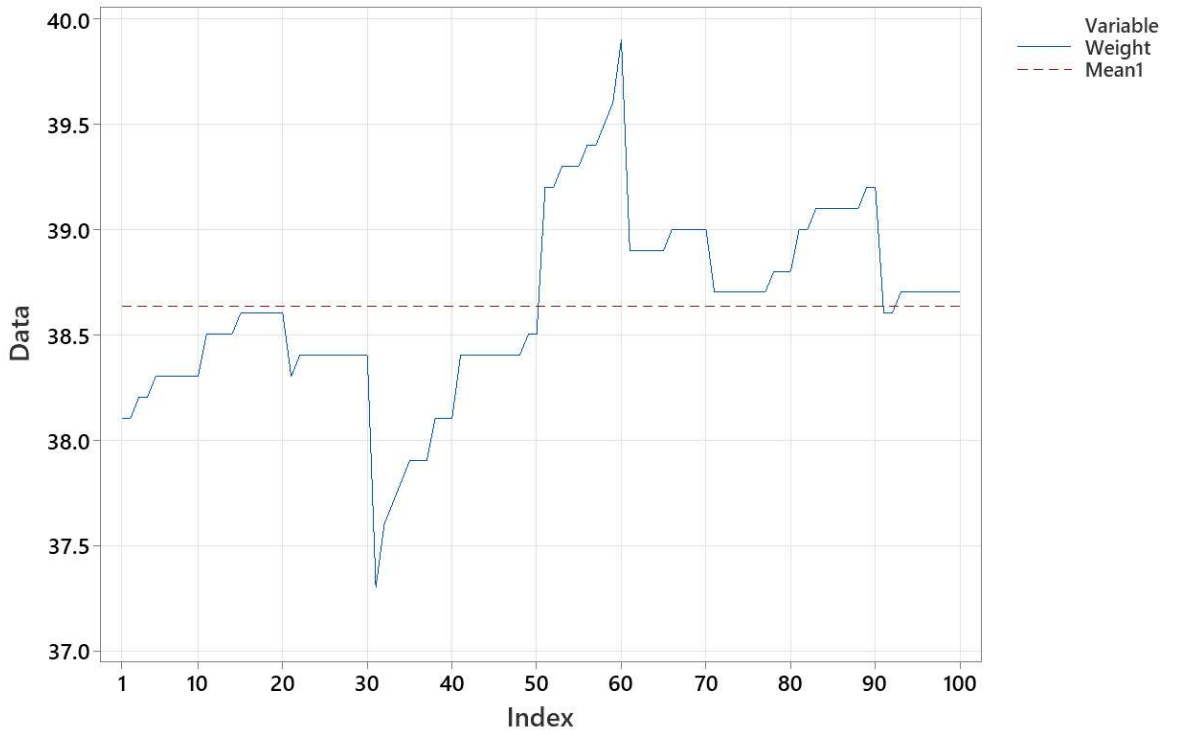
Descriptive Stats Demo

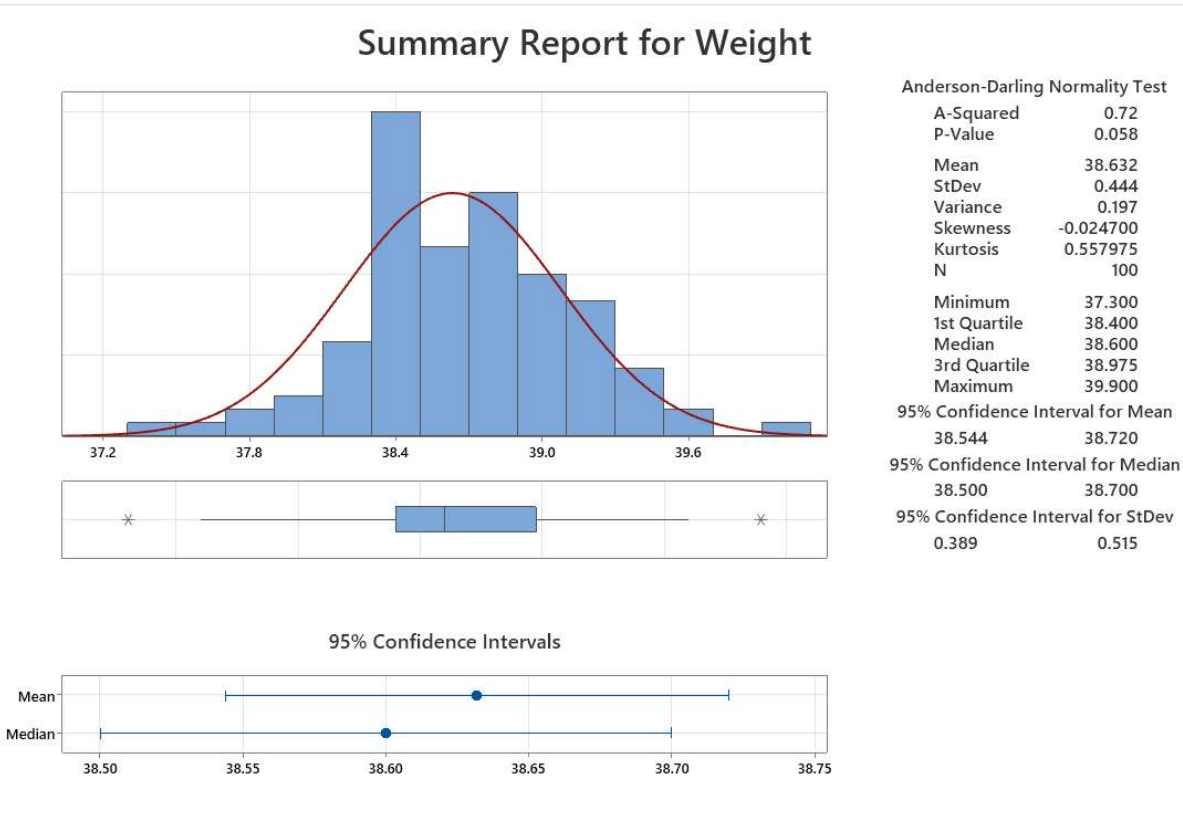


Statistics

Variable	N	N*	Mean	StDev	Variance	CoefVar	Minimum	Q1	Median	Q3	Maximum
Weight	100	0	38.632	0.444	0.197	1.15	37.300	38.400	38.600	38.975	39.900

Variable	IQR	Mode	N for Mode
Weight	0.575	38.4	17


Time Series Plot of Weight, Mean1
Variable
Weight
Mean1
Data
Index
40.0
39.5
39.0
38.5
38.0
37.5
37.0
1
10
20
30
40
50
60
70
80
90
100


Summary Report for Weight
Anderson-Darling Normality Test
A-Squared 0.72
P-Value 0.058
Mean 38.632
StDev 0.444
Variance 0.197
Skewness -0.024700
Kurtosis 0.557975
N 100
Minimum 37.300
1st Quartile 38.400
Median 38.600
3rd Quartile 38.975
Maximum 39.900
95% Confidence Interval for Mean
38.544 38.720
95% Confidence Interval for Median
38.500 38.700
95% Confidence Interval for StDev
0.389 0.515
37.2
37.8
38.4
39.0
39.6
95% Confidence Intervals
Mean
Median
38.50
38.55
38.60
38.65
38.70
38.75

WORKSHEET 1

Test and CI for Two Proportions

Method

p_1: proportion where Sample 1 = Event
p_2: proportion where Sample 2 = Event
Difference: $p_1 - p_2$

Descriptive Statistics

Sample	N	Event	Sample p
Sample 1	200	180	0.900000
Sample 2	100	85	0.850000

Estimation for Difference

Difference	80% CI for Difference
0.05	(-0.003227, 0.103227)

CI based on normal approximation

Test

Null hypothesis	$H_0: p_1 - p_2 = 0$
Alternative hypothesis	$H_1: p_1 - p_2 \neq 0$

Method	Z-Value	P-Value
Normal approximation	1.20	0.229
Fisher's exact		0.252

Demo Week 3

Tuesday, June 14, 2022 8:04 PM

$C_p = \frac{USL - LSL}{6\sigma} = \frac{18 - 10}{6\sigma}$

a)

$n = 5$, $K = 25$, $\sum_{i=1}^{25} R_i = 81.32$, $\sum_{i=1}^{25} \bar{x}_i = 376.417$, $d_2(5) = 2.326$

$\hat{\sigma} = \frac{\bar{R}}{d_2}$

$\bar{R} = \frac{\sum R_i}{K} = \frac{81.32}{25} = 3.252$

$\hat{\sigma} = \frac{3.252}{2.326} = 1.398$

$C_p = \frac{18-10}{(1.398)(6)} = \boxed{0.954}$

$C_p < 1.33$, process is NOT capable

b)

$p = \left(\frac{1}{C_p}\right)(100) = \left(\frac{1}{.954}\right)(100) = 104.85\%$

$\bar{\bar{x}} = \frac{\sum \bar{x}_i}{K} = \frac{376.417}{25} = 15.06$

C_p is not at 14 (mean) so not the correct capability ratio. Use C_{pk}

BP: $\bar{x} = 7$, $s = 1.41$, $n = 8$

EM: $\bar{x} = 9.92$, $s = .96$, $n = 13$

95% CL, $\alpha = 0.05$

$\bar{x}_1 - \bar{x}_2 \pm t_{\alpha/2} \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$

DOF

$\nu = \left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2 \approx 9 \Rightarrow t_{\alpha/2} = 2.26$ ← From table

$\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1 - 1} + \frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2 - 1}$

$\boxed{0.8367 \leq \mu_1 - \mu_2 \leq 3.30}$

Midwest: $n = 100$, $p = 85\%$, events = 85 $\hat{p}_2$

West Coast: $n = 200$, $p = 90\%$, events = 180 $\hat{p}_1$

80% CL, $\alpha = 0.2$

$\hat{p}_1 - \hat{p}_2 \pm z_{\alpha/2} \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$

$z_{0.10} = 1.2815$ (From Excel)

$.9 - .85 \pm (1.2815) \sqrt{\frac{(.9)(.1)}{200} + \frac{(.85)(.15)}{100}}$

$\boxed{-0.0032 \leq p_1 - p_2 \leq 0.1032}$