Six Sigma Statistics using Minitab 17

Green Belt Edition

10 Process Capability Answers to Exercise

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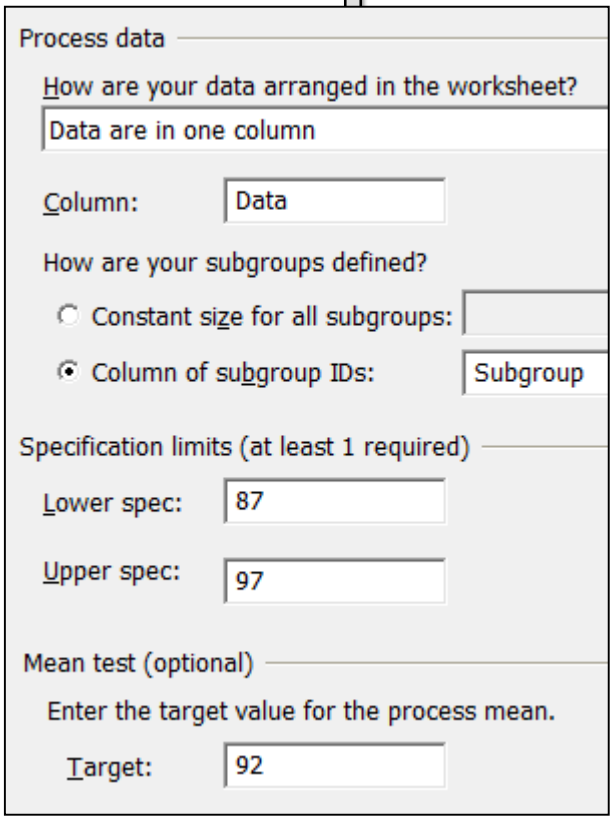
Exercise 10.12.1
Process Capability

Data is taken from a process in time order with a subgroup size of 7. Use the Assistant to calculate capability metrics using the Complete Analysis for continuous data. The LSL is 87, the USL is 97 and the target for the process mean is 92.

Analyse the data in File 10 Process Capability.xlsx worksheet Ex 10.12.1 and answer the questions shown below.

1) Is the process stable and is it normally distributed?
2) How capable is the process?
3) Is the process breaching either spec limit?
4) Is the process aligned between the spec limits?

Set-up I



1. Click Assistant<< Capability Analysis
2. Click on the button for Capability Analysis for continuous data.
3. Select the Radio button for Complete Analysis.
4. Complete the menu as shown then click OK.

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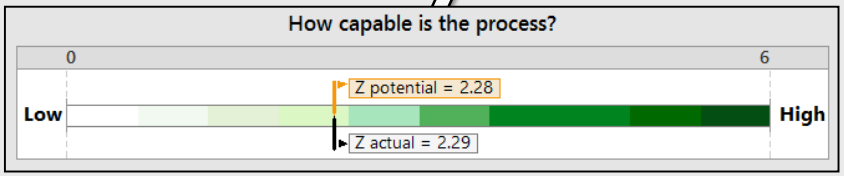
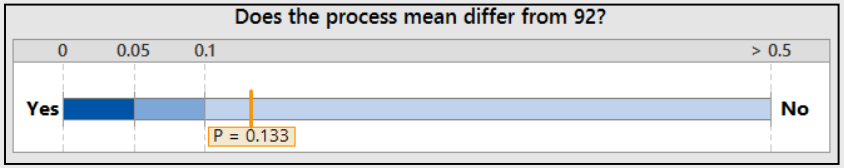
Analysis- I

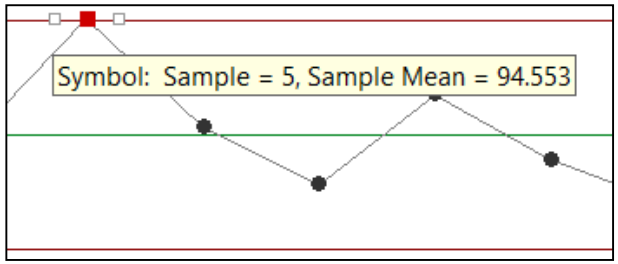


Starting on the top left of the Summary Report, we can see that the Zactual is less than 3. Indicating that the process is making out of spec product.

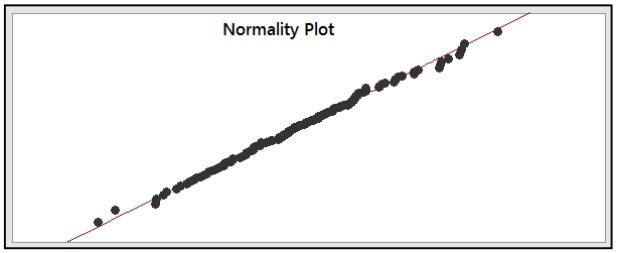


Cannot say that the process mean is different to 92 so at least that is good news that the process appears centred.

Analysis-2



On the Diagnostic Report we see that a single point is just touching the control limit on the R Chart. As it is only just touching the control limit I would investigate the data behind the data point and if nothing unusual turned up I would ignore it.



The Probability Plot and the AD P-value show that the sample make from a normally distributed population.

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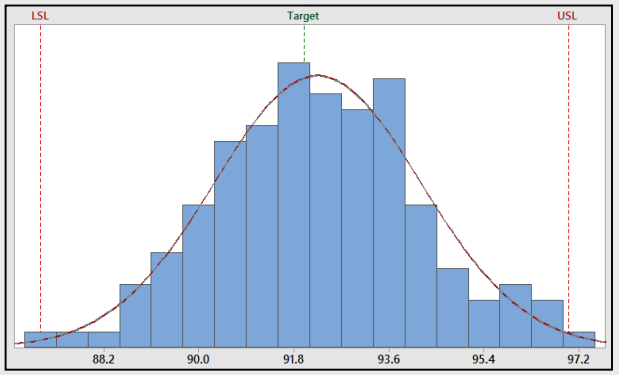
Analysis-3



On the Process Performance Report we see the histogram of the process and fitted plot. We see that the process is actually breaching both spec limits.

Capability Statistics	
Actual (overall)	
Pp	0.85
Ppk	0.81
Z.Bench	2.29
% Out of spec (observed)	1.43
% Out of spec (expected)	1.11
PPM (DPMO) (observed)	14286
PPM (DPMO) (expected)	11106
Potential (within)	
Cp	0.85
Cpk	0.81
Z.Bench	2.28
% Out of spec (expected)	1.13
PPM (DPMO) (expected)	11255

The within and overall metrics are identical so we know the single out of control point is having little impact. The main issue is that the VOP needs to be reduced to fit within the VOC. The process is already fairly well aligned to the centre of the spec limits.