

2019 Spring – SPC&O HW#8

1. Use the CD data provided in 19Spring-HW4.xls to:
 - (i) Design an optimal Tabular CUSUM chart with $\delta=1.0\sigma$ and $ARL_0=400$. What would be the ARL_1 if the mean is shifted by 0.5σ , 1.0σ , 1.5σ , 2.0σ , 2.5σ , and 3.0σ ?
 - (ii) Use the optimal “graphical” Tabular CUSUM chart designed in (i) to monitor the site 3 CD and compare the results with HW7 Problem 2(vii).
 - (iii) Let $Z_0=\mu_0=59.5$. Construct a “graphical” EWMA chart to monitor the site 3 CD with the $(L, \lambda)=(2.856, 0.133)$ and $(2.866, 0.139)$ and compare the results with HW7 Problem 2(vii).
 - (iv) Design an optimal Tabular CUSUM chart with $\delta=1.0\sigma$ and $ARL_0=400$. What would be the ARL_1 if the mean is shifted by 0.5σ , 1.0σ , 1.5σ , 2.0σ , 2.5σ , and 3.0σ ? Compare the ARL_1 with the ARL_1 in (i).
 - (v) Use the optimal EWMA control chart designed in (iii) to monitor the site 3 CD and compare the results with (ii).
2. Use the CD data in 19Spring-HW4.xls to perform the following analysis.
 - (i) Suppose the engineering target is 60 and the specification window is (58, 61). Estimate C_p , C_{pk} , C_{pm} , and C_{pm}^* for the overall CD mean process capability. Assuming normal distribution of the CD, calculate the overall out-of-specification probability. How would you propose to improve the process to achieve overall $C_{pk}=2.0$?
 - (ii) With the same engineering specifications, estimate C_p , C_{pk} , C_{pm} , and C_{pm}^* for each site. Assuming normal distribution of the CD, calculate the out-of-specification probability for each site. How would you propose to improve the process to achieve $C_{pk}=2.0$ for each site?
 - (iii) With the same engineering specifications, what are the “within-wafer” C_p , C_{pk} , C_{pm} , and C_{pm}^* (Note: “within-wafer” σ and $\tilde{\sigma}$ have to be estimated by calculating the among-site sample variance and sample squared-deviation from target within each wafer). How would you propose to improve the process to achieve within-wafer $C_{pk}=2.0$.