2.830J / 6.780J / ESD.63J Control of Manufacturing Processes (SMA 6303)
Spring 2008

Problem 8-1.

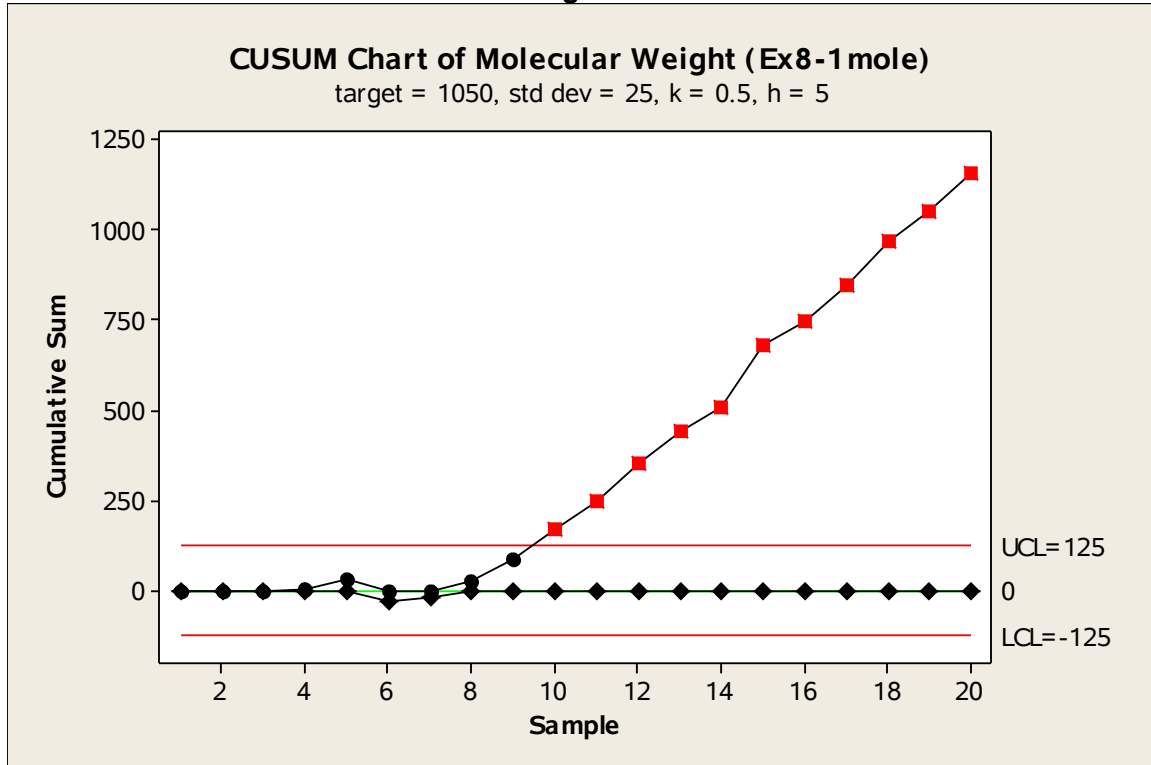$\mu_0 = 1050$; $\sigma = 25$; $\delta = 1\sigma$, $K = (\delta/2)\sigma = (1/2)25 = 12.5$; $H = 5\sigma = 5(25) = 125$

(a)
MTB > Stat > Control Charts > Time-Weighted Charts > CUSUM

CUSUM Chart of Molecular Weight (Ex8-1mole)
target = 1050, std dev = 25, k = 0.5, h = 5

The process signals out of control at observation 10. The point at which the assignable cause occurred can be determined by counting the number of increasing plot points. The assignable cause occurred after observation $10 - 3 = 7$.
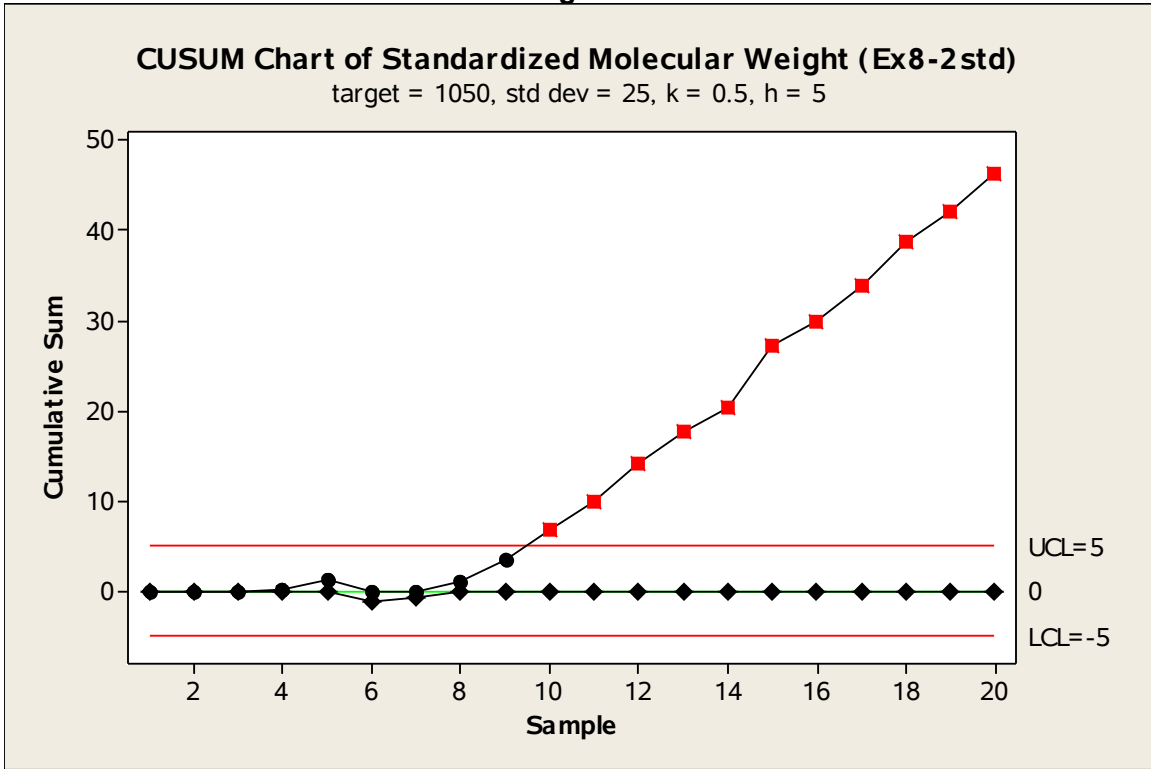
(b)

$\hat{\sigma} = \overline{MR2}/d_2 = 38.8421/1.128 = 34.4345$ equation 5-6.

No. The estimate used for σ is much smaller than that from the data.

Note: can equivalently use Sbar/c4, where Sbar is the mean of
the standard deviations of all pairs of consecutive samples
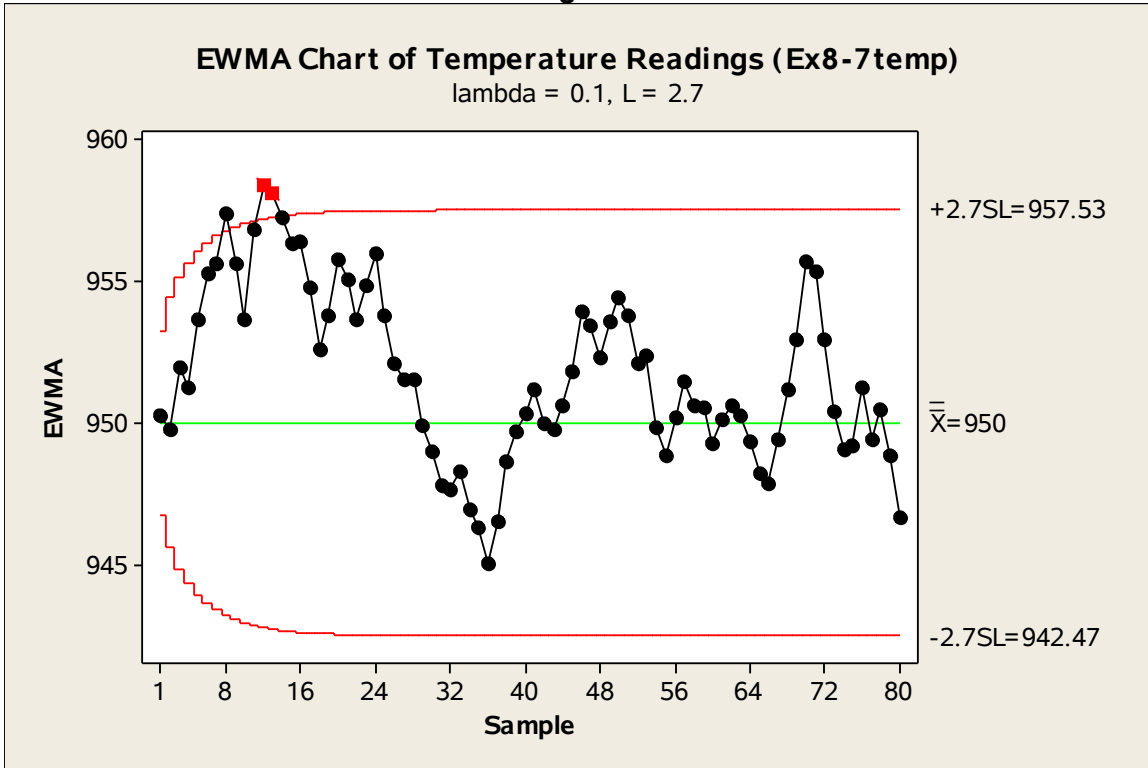(a moving standard deviation, cf. a moving range)

Problem 8-2.

The process signals out of control at observation 10. The assignable cause occurred after observation $10 - 3 = 7$.

Problem 8-21 (8-19, 4th ed.).

$\lambda = 0.1, L = 2.7, \hat{\sigma} = 12.16$, CL $= \mu_0 = 950$, UCL $= 957.53$, LCL $= 942.47$.

MTB > Stat > Control Charts > Time-Weighted Charts > EWMA

EWMA Chart of Temperature Readings (Ex8-7temp)
lambda = 0.1, L = 2.7

Test Results for EWMA Chart of Ex8-7temp
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TEST. One point beyond control limits.
Test Failed at points:  12, 13
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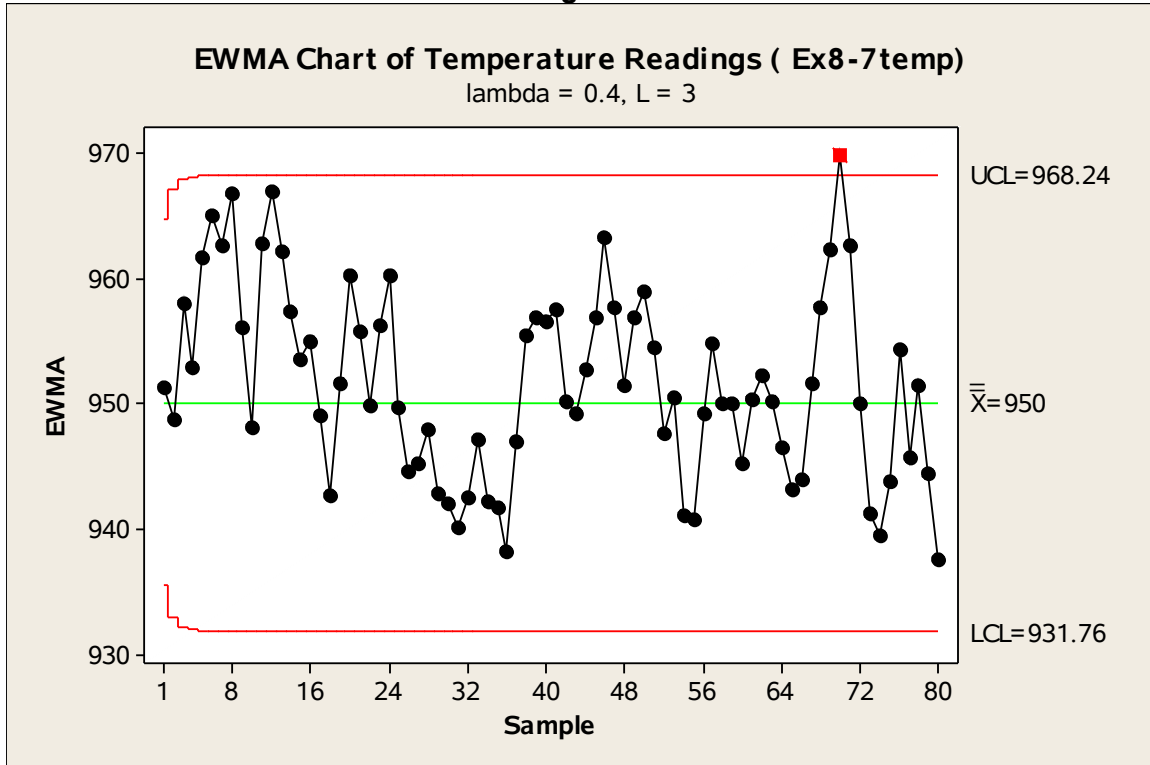
Process is out of control at samples 8 (beyond upper limit, but not flagged on chart), 12 and 13.

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Note that the estimate of sigma used here is again calculated
as MR2bar/d2 (the mean of a moving average of 2 samples, divided
by d2)
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8-22 (8-20 4th ed.).

$\lambda = 0.4, L = 3, \hat{\sigma} = 12.16$, CL = μ_0 = 950, UCL = 968.24, LCL = 931.76.

MTB > Stat > Control Charts > Time-Weighted Charts > EWMA

EWMA Chart of Temperature Readings (Ex8-7temp)
lambda = 0.4, L = 3

Test Results for EWMA Chart of Ex8-7temp
```
TEST. One point beyond control limits.
Test Failed at points:  70
```

With the larger λ, the process is out of control at observation 70, as compared to the chart in the Exercise 21 (with the smaller λ) which signaled out of control at earlier samples.