



## When to Recalculate Control Limits

by *John J. Flaig, Ph.D.*

A problem that has often confronted practitioners using control charts is, when to consider recomputing the control limits. I've put this question to several experts and researched it in numerous SPC texts. Oddly, either the issue is ignored or there is no clear answer to this important question. So I'll offer my recommendation in this column.

Once control limits are established, they should not be changed without a complete investigation of the cause(s) and implication(s)\*. Therefore, I propose the following action plan: **The practitioner should evaluate the need to recalculate the control limits every time a statistically significant sign of instability is detected.** A decision matrix for what to do is given in Table 1.

**Table 1.** Decision Matrix for Control Chart Signals

<u>Search for Cause(s)</u>	<u>Corrective Action(s)</u>	<u>Recalculate Limits</u>
1. Cause(s) not found	None, continue search	No
2. Cause(s) found (the process has improved)	1. Adopt 2. Can't adopt	1. Yes 2. No (causes SPC problems)
3. Cause(s) found (the process has degraded)	1. Remove 2. Can't remove	1. No 2. Yes

*Let's discuss each case.*

1. If the cause(s) are not found, then we should continue to search if it makes economic sense to do so [Tukey, 1946] and don't recalculate the limits.

2. If the cause(s) are found and the process has stabilized at an improved level, then we want to try and lock-in the improvement. If it is possible to lock-in the process improvement, then the limits should be



recalculated using data from the improved process otherwise they should not be recomputed. If it is not possible to lock-in the improvement, then serious SPC problems may ensue. For example, suppose that one production unit is upgraded and now performs significantly different than another, but the low performing unit can not be upgraded, Then mixing the data from these two units on a single chart will give rise to improper limits. In this case two charts are now required.

3. If the cause(s) are found and the process has stabilized at a degraded level, then we want to take corrective action. If it is possible to fix the problem, then we should do so and not recalculate limits because the process should now have been returned to its previous level and controlled state. If it is not possible to fix the problem and it appears a sustained process change has occurred, then the limits should be recomputed with data taken after the change.

\* Note: Some SPC software programs recompute the limits as each new point is added. This type of program can be used in the preliminary phase when we are trying to develop limits, but should NOT be used once the limits are established.

Tukey, J. W. (1946). Review of Deming, W. E., Statistical Adjustment of Data, Review of Scientific Instruments 17, pp. 152-153.

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