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Short- and Long-Term Estimates of Capability

In the previous video, you were introduced to the common capability indices: C_p, C_{pl}, C_{pu}, and C_{pk}. To compute each of these indices, you need to estimate the standard deviation.

As you learned in the previous lesson on control charts, there are different ways to estimate the standard deviation. You can calculate a short-term estimate, or you can calculate an overall, long-term estimate.

The short-term estimate can be used if data were collected using rational subgrouping.

This estimate is a within-subgroup estimate of the standard deviation, which should be free of special causes.

When you use the short-term estimate the capability indices are labeled C_p and C_{pk}.

You learned that C_p is sometimes referred to as potential capability.

Because C_{pk} takes into consideration centering, it is sometimes called actual capability.

The long-term estimate of the standard deviation is simply the standard deviation of all of the data. If the process is not stable, this will include special causes of variation.

When the long-term estimate of the standard deviation is used, the indices are generally referred to as process performance indices. These indices are labeled P_p, for potential performance, and P_{pk}, for actual performance.

The same formulas are used to calculate the process performance indices, but the long-term estimate of the standard deviation is used instead of the short-term estimate.

If the process is not stable, P_p and P_{pk} will be lower than C_p and C_{pk}.

Of course, if the process is not stable, it doesn't make sense to talk about process performance, because the future performance is not predictable.

You learn more about interpretation of these capability indices in a future video.

For technical details and for additional background information about capability indices based on short- and long-term variation, see the Read About It for this lesson.

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