Estimating Process Capability for Many Variables

Some manufacturing processes have hundreds or even thousands of parameters that are measured and monitored daily.

Evaluating the capability of these measures, and identifying potential problems, can be overwhelming and time consuming.

However, you can compute capability indices for many variables at one time to help you find the poorly performing processes. Let's see how this is done.

It is likely that the different performance measures will have different targets and different spec limits.

You can normalize the mean and standard deviation for each variable relative to the specification range. This puts the mean and the standard deviation for all of the variables on the same scale.

These normalized values can then be plotted on the same graph, called a goal plot.

Here's an example of a goal plot for 20 process variables. Variables with P_{pk} greater than 1.3 are plotted in the green triangle, and variables with a P_{pk} of less than 1.0 are plotted beyond the yellow shaded area. These are variables that are the most poorly performing.

The variables that are close to 0 on the X axis are well centered within their spec limits.

The variables that are closer to 0 on the Y axis have less variability.

The variables that are plotted high on the Y axis have a lot of variation relative to the spec limits.

For this example, the most poorly performing variables are Y 01, Y 12, and Y 17.

Y 01 and Y 12 are both off target, shifted to the lower spec limit, and have too much variability.

Y 17 is on target but has way too much variability.

If you are on a team improving the performance of this process, this analysis identifies the variables that are the poorest performers. It also tells you whether you need to address variability, process centering, or both.

In this video, you learned how to evaluate capability for many processes at a time. In the next video, you learn how to evaluate both stability and capability for many variables at a time.

For more information about setting spec limits and evaluating capability for many variables at once, see the Read About It for this module.

Statistical Thinking for Industrial Problem Solving

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