Print

Demo: Calculating Capability Indices Using the Distribution Platform

In this video, we show how to compute capability indices for the Metal Parts example using the Distribution platform in JMP.

To start, we select Distribution from the Analyze menu.

We select Thickness for Y, Columns, and click OK.

To calculate capability indices, we select Process Capability from the red triangle for Thickness.

Our lower spec is 35, the target is 40, and the upper spec is 45.

Notice that there are several Process Capability Options.

The default distribution is normal, but you can also calculate capability based on other distributions. If the distribution of the process characteristic is not normal, you would select Use Nonnormal Distribution, and then you would select the appropriate distribution from the list of available distributions. You can also select other options for calculating nonnormal capability indices.

In this video, we calculate capability indices based on the normal distribution.

The default subroup size is 1, but you can also use a subgroup ID column, or specify a constant subgroup size. We've got rational subgroups taken every hour, so we use Hour as the Subgroup ID Column.

The results of the capability analysis are provided in the Process Capability outline. JMP provides a histogram, with several default reports. Additional options for the analysis, such as an interactive capability plot, are available under the red triangle next to Thickness Capability.

Let's take a closer look at the individual reports.

From the histogram, we can see that the process mean is shifted towards the upper spec limit, and some observations fall beyond the upper spec.

In the Process Summary report you see the specifications, the sample mean, and two estimates of sigma. Within sigma is the short-term estimate of sigma, and Overall is the long-term estimate of sigma.

Several capability indices are calculated using these two estimates of sigma.

The short-term estimate of C_p, which is reported under Within Sigma Capability, is 0.94, and the C_{pk} is 0.69.

The long-term estimate of sigma is used to estimate the capability indices reported under Overall Sigma Capability. The P_p is 0.963, and the P_{pk} is 0.707.

How do we interpret these estimates? Both C_p and P_p are close to one, so the process spread is about the same as our spec limits. However, both C_{pk} and P_{pk} are well below one, so the process is off target.

Note that JMP also reports confidence intervals for the indices. Let's look at the interval for C_p. Here's a loose interpretation of this interval: the true C_p could be as low as 0.806 or as high as 1.074.

Finally, let's talk about the Nonconformance report. Under Observed % we see that 2.4% of the measurements fell above the upper spec limit.

The estimated percent out of spec, based on the within and the overall estimates of sigma, are also reported. These are the estimates of future process performance.

Additional measures, such as the observed and estimated PPM rates, can also be displayed. To do this, right-click on the table, and under Columns, select the measure of interest.

One final note..... In this example, JMP reported P_p and P_{pk} when the long-term or overall estimate of sigma was used. This is now the default labeling.

If you want to display C_p and C_{pk} labeling for the long-term capability in the Distribution platform, you can set a platform preference.

To do this, we select Preferences from the File menu (or the JMP menu on a Mac). Then, in the Platforms grouping, we select Distribution. In the list of options we deselect Ppk Capability Labeling to turn off the labeling, or we select this option to turn the labeling on. To accept the change, we click OK.

Next time we run a capability analysis using the Distribution platform, the change will be applied.

Close