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What is a Measurement Systems Analysis?

In previous lessons, you learned about common cause variation. Remember that this is variation that is inherent in the process. If a poorly performing process is stable, and is on target, you need to reduce common cause variation. Common cause variation can come from a number of sources.

There might be variation due to operating conditions, raw materials, or environmental factors.

But some of the variation might be from the measurement system. When you measure a product characteristic, the total variability you observe is the sum of the product variability and the measurement variability. For every measurement you take, the measured value is the sum of the actual or true value and the measurement error. As you will see in this lesson, it is very difficult to improve a process when you have a poor measurement system. You can use a measurement system study, or measurement system analysis (MSA), to understand and quantify measurement system variation. An MSA is a structured process for studying the variation within a measurement system. Measurement system studies have two general goals: to determine whether the measurement system measures the characteristic of interest accurately, without bias, and to determine whether the measurement system is capable of detecting critical differences in the characteristic. This is the function of the variability, or the precision, of the measurement system. Measurement system studies also help you identify potential improvements in the measurement system. For example, you might need better training, procedures, or operational definitions, maintenance and calibration of the measuring devices, or further development of the measurement instrument. There are two broad categories of measurement systems based on the nature of the tests used. Non-destructive measurement systems do not physically alter the object's form or substance. So, you can take repeated measurements on the same part or sample to study measurement system variation on the same object.

Examples include X-ray imaging, visual characteristics like color and surface finish, and mechanical measurements like thickness and diameter. Destructive measurement systems, on the other hand, physically alter the object being measured.

Examples include tensile testing, breaking strength, and many types of chemical analysis.

With destructive measurement systems, you can't take repeated measurements. However, the methods introduced in this lesson can often still be applied. You see an example MSA for a destructive measurement system in a future video. In this lesson, we focus on studies involving continuous measurement systems that are non-destructive.

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