KNOWLEDGE SAVES COSTS

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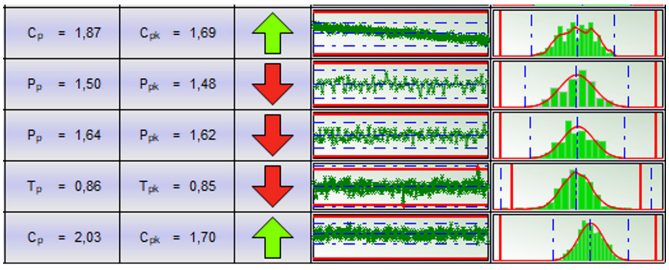
Manufacturing processes are not always able to meet requirements and quality demands. You thus have to accept the consequences, i.e. some parts do not satisfy quality requirements and have to be sorted out.

The later it gets until you detect a problem in the manufacturing process, the more expensive the impacts. To reach the best possible solution, it is important to evaluate all manufacturing processes separately but also as a whole. Statistics support you in performing this kind of quality information. Since it takes quite a lot of effort to evaluate each and every part you produce (100% inspection), which, by the way, is not feasible in practice, you apply statistical analyses to make a statement about the population.

C_p AND C_{PK} VALUES - WHAT IS THE USE OF THESE STATISTICS?

The evaluation of processes may be based on the statistics C_p and C_{pk}. They specify the process variation and the location of the measured values within the tolerance. The next step depends on specifications helping you determine whether a process is capable or not.

Taken to extremes, this is where the knowledge acquisition ends. The user sees if a process characteristic is capable or not and he gets the result for every single characteristic. This is enough information to create a report on the capability of a process. However, the approach is only reasonable for capable processes.



5 characteristics and their evaluation of process capability

WHY ARE SOME PROCESSES NOT CAPABLE?

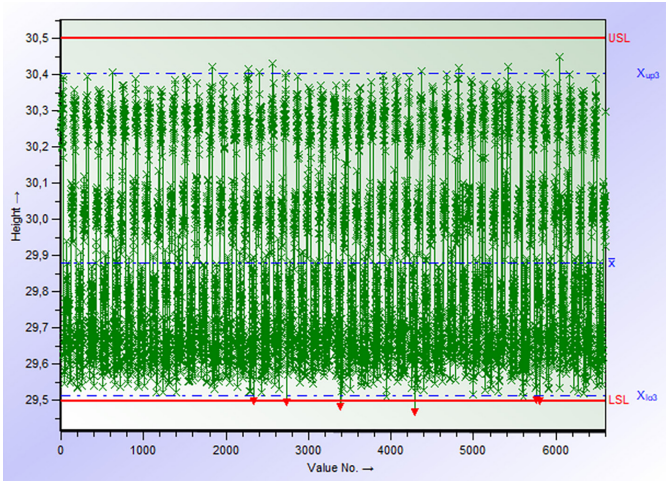
One day it will not be enough to know whether a process is capable or not, most certainly by the time you will no longer be able to meet process capability requirements. The question is always why the process is not capable. Q-DAS software is able to provide answers to this question.

The answer is based on the general idea of process capability analysis. It says that representative samples must be taken from the manufacturing process and the associated measurements contain information describing the influences affecting the process at the time of sampling. As an example, material 1b2A was applied at 8.13 a.m. when the milling machine of machine 3 processed the parts at 21.3 degree Celsius and Mr. Smith inspected them. At 8.32 a.m., an operator measured another 5 parts affected by different influences.

A successful measurement system analysis and machine acceptance mean that **ANY KIND** of process variation is caused by these influences. The Q-DAS software qs-STAT is able to sort the measured values by the influences they were affected by.

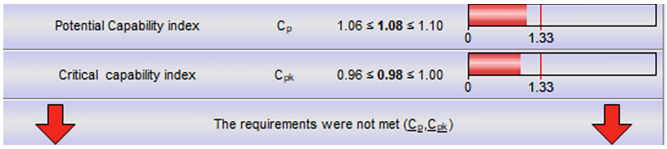
Example

The measured values for the height of a part are evaluated. A total of 6,600 measured values for the height have been recorded in subgroup measurements.



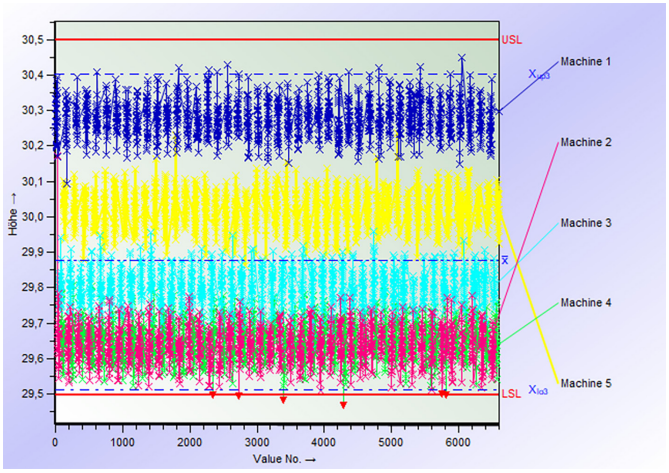
Measured values indicating the height of a part

A process capability analysis leads to the conclusion that the process is not capable.



Process capability for the characteristic indicating the height

You may show additional information in the program. In case of this example, different machines produce the part. At the end of the manufacturing process, the Q-DAS software product procella measures the part and records the machine number. This information is quite useful in qs-STAT since you may show several value charts, one for each machine and each chart displayed in a different colour.



Value charts per machine displayed in different colours

Having a look at this chart, it becomes clear that different machines affect the process significantly. Machine 5 (yellow) looks quite good. You might assume that the capability seems to be even better than the capability of the entire process. You can get things straight concerning this assumption by using qs-STAT to sort the measured values by machine.

Heights sorted by machine

You may examine the influence of different machines separately. In this case, Machine 1, Machine 3 and Machine 5 lead to capable processes. This is the first insight into the process we gain. The histograms (graphically) or the C_p values (numerically) offer us the second insight. All C_p values clearly exceed 2. The corrective action you have to take is to centralise all processes for each machine to reach an overall process that is capable.

This approach is not restricted to machines. You may even apply it to several different levels since the program e.g. creates characteristics per line and production facility or per day and order number etc.

GAINING INSIGHTS FOR AN AUTOMATED PROCESS CONTROL

The users involved in our example know that they have to keep an eye on the machine to control the process. The Q-DAS software M-QIS is able to perform this task automatically. The idea is to define allocation criteria that M-QIS uses to analyse measurement data cyclically. As soon as a problem occurs, the software automatically sends a report indicating the machine that leads to processes that are not capable. If necessary (e.g. Cpk is not capable), you may thus provide responsible persons by email with well-prepared information given in PDF reports. Even users who do not apply Q-DAS software are thus able to benefit from the knowledge gained in the software.

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The potential for savings offered by these new insights can be high since simple measures (that are often for free) frequently improve the process.

Let us assume you produce a product you regularly sell for €26 . You produce 1,260 units of this product a day. The outgoing goods control, however, always detects some defective parts. In the end, an average of 8% of these products cannot be supplied to the customer because they do not meet quality requirements – every day.

	Potential			*Reality*	
Product price [€]	Parts per day	€ per day	Rejects [%]	Good parts per day	Real turnover per day
26	1260	32760	8	1159,2	30139,2

Let us assume that you are able to improve your processes in a way that you reduce the amount of rejects by 3%.

Optimization		
Rejects reduced to [%]	Parts per day without rejects	Turnover per day in €
5	1197	31122

This example will lead to an increased income of **€358,722** a year.

	After optimisation		**Difference**
30.139,20 €	per day	31.122,00 €	**982,80 €**
904.176,00 €	per month	933.660,00 €	**29.484,00 €**
11.000.808,00 €	per year	11.359.530,00 €	**358.722,00 €**

You are thus able to put a number on the insights Q-DAS software products give you. It is obvious that the potential for savings is considerably higher when you reduce the amount of rejects by more than 3% or in case you produce expensive parts.

Interested in this topic?

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