



# New Process Capability Metrics

by John J. Flaig, Ph.D.

By now most quality practitioners know that using Cpk or Cpm alone to measure the capability of a process is not the best idea. Yes, I know that the AIAG, Six Sigma, and Taguchi advocates recommend these metrics. But relying on a single metric can get you into serious trouble, and these are definitely not robust metrics. So how can we improve our ability to characterize process capability?

It seems that no single metric can adequately represent the concept of process capability. Just as height alone does not tell us everything about a person, so many researchers have reached the conclusion that a single metric is insufficient to characterize process capability [Bothe, 2002]. For example, it is possible to have vastly different distributions with the same Cpk value, and it is also possible to have two distributions with the same fraction nonconforming that have much different shapes. The lack of a unique relationship between process shape and capability indices is a fundamental problem.

To overcome this problem several researchers have proposed dual capability metrics. For example, Bothe suggests four metrics  $C_p$ ,  $C_{pk}$ ,  $p_{USL}$ , and  $p_{LSL}$ . On the other hand Ramberg suggests the dual [EL, SD(EL)] where EL is the quadratic expected loss and SD(EL) is the standard deviation of the expected loss [Ramberg, 2002], or my own proposal of [NC, NS] where NC is the nonconformance rate, and NS is the net sensitivity [Flaig, 2002]. These multiple value metrics have the advantage of expressing more information concerning a process and although they are not perfect they are a significant improvement over the use of a single value metrics in characterizing process capability.



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