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Table 11

Capability Indices

Type of Index	Sample Size	Stability Assessment	Standard Deviation	Centering not considered	Centering Considered	Remarks
Preliminary or Initial Capability Index	**Typically 30 to 100**	**Using histogram, Normal Probability Plot and Goodness of Fit Test (Such as Andersen Darling Test)**	$s = \sqrt{\frac{\sum_{i=1}^{n}(X_i - \overline{X})^2}{n-1}}$	$P_p = \frac{USL - LSL}{6s}$	$P_{PL} = \frac{USL - \overline{X}}{3s}$ $P_{PU} = \frac{\overline{X} - LSL}{3s}$ **$P_{pk}=P_{PL}$ or P_{PU} whichever is less**	Variation does not consider causes than may not occur in a short period. This is usually the case when we want a quick estimate of the capability. Histogram requires larger sample size as compared to probability plot.
Process Capability Index	**Typically greater than 100, preferably 300**	**Using Control Charts with minimum 25 subgroups**	$\sigma_C = \frac{\overline{R}}{d_2}$	$C_p = \frac{USL - LSL}{6\sigma_C}$	$P_{PL} = \frac{USL - \overline{X}}{3\sigma_C}$ $P_{PU} = \frac{\overline{X} - LSL}{3\sigma_C}$ **$C_{pk}=C_{PL}$ or C_{PU} whichever is less**	σ_C is calculated from control charts after eliminating assignable causes. This does not include variation due to assignable causes.
Process Performance Index	**Typically greater than 100, preferably 300**	**Using Control Charts**	$\sigma_P = \sqrt{\frac{\sum_{i=1}^{n}(X_i - \overline{X})^2}{n-1}}$	$P_p = \frac{USL - LSL}{6\sigma_P}$	$C_{PL} = \frac{USL - \overline{X}}{3\sigma_C}$ $C_{PU} = \frac{\overline{X} - LSL}{3\sigma_C}$ **$P_{pk}=P_{PL}$ or P_{PU} whichever is less**	σ_P is calculated from control charts after eliminating assignable causes. However, this includes variation due to assignable causes.
Process Capability Index considering process centering with ref to target	**Typically greater than 100**	**Using Control Charts**	$\sigma_P = \sqrt{\frac{\sum_{i=1}^{n}(X_i - \overline{X})^2}{n-1}}$	NA	$C_{pm} = \frac{UTL-LTL}{6\sqrt{(\mu-T)^2+\sigma_P^2}}$	C_{pm} is a better indicator than Cpk of centering.