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On Developing an Adaptive Gage R&R Evaluation Model of Measurement System

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Abstract

To ensure the consistency of a process, a stable and appropriate measurement system which also meeting the practical limits of technology is fundamental. In many previous studies, the judgment of system stability requires a measurement system operating under routine and stable conditions being scheduled, where the execution of so called Gage R&R (reproducibility and repeatability) is important. A common practice is to perform MSA (Measurement System Analysis) which calculates the variation of measurements by operators (reproducibility) and variation of a gauge (repeatability). The total variation of a system, however, concerns not only the appraiser variation and equipment variation but also the part-to-part variation. That is, an unstable production process may cause an unstable measurement system due to tampering or over-adjustment of the process. A simultaneous consideration between the traditional MSA and statistical process control (SPC) in order to recognize and analyze the sources of variation is therefore very critical. This work proposes a model to calculate the BEP (break-even point) between the Gauge R&R of a measurement system and the process capability (Cp/Cpk). Based on the developed model, the part-to-part variation components can be better identified within the measurement system and the critical factors of the process can be better controlled. A real life case is also presented in order to justify the feasibility of the proposed model.