

Setup Error Adjustment: Sensitivity Analysis and a new MCMC Control Rule

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In this paper, we focus on performance of adjustment rules for a machine that produces items in batches and that can experience errors at each setup operation performed before machining a batch. The adjustment rule is applied to compensate for the setup offset in order to bring back the process to target. In particular, we deal with the case in which no prior information about the distribution of the offset or about the within-batch variability is available. Under such conditions, adjustment rules that can be applied are Grubbs' rules, the EWMA controller and the MCMC adjustment rule, based on a

Bayesian sequential estimation of unknown parameters that uses Markov Chain Monte Carlo (MCMC) simulation. The performance metric of the different

adjustment rules is the sum of the quadratic off-target costs over the set of batches machined. Given the number of batches and the batch size, different production scenarios (characterized by different values of the lot-to-lot and the within-lot variability and of the mean off-set over the set of batches) are considered. The MCMC adjustment rule is shown to have better performance in almost all the cases examined. Furthermore, a closer study of the cases in which the MCMC policy is not the best adjustment rule motivates a modified version of this rule which outperforms alternative adjustment policies in all the scenarios considered.