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Engineering model-based Bayesian monitoring of ramp-up phase of multistage manufacturing process

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Abstract

Process monitoring of full mass production phase of multistage manufacturing processes (MMPs) has been successfully implemented in many applications; however, monitoring of ramp-up phase of MMPs is often more difficult to conduct due to the limited information to establish valid process control parameters (such as mean and variance). This paper focuses on the estimation of the process control parameters used for monitoring scheme design of ramp-up phase of MMPs. An engineering model of variation propagation of an MMP is developed and reconstructed to a linear model, establishing a relationship between the error sources and the variation of product characteristics. Based on the developed linear model, a two-step Bayesian method is proposed to estimate the process control parameters. The performance of the proposed Bayesian method is validated with simulation data and real-world data, and the results

demonstrate that the proposed method can effectively estimate process parameters during ramp-up phase of MMP.

Keywords:

Bayesian method | multistage manufacturing process | engineering model | ramp-up phase | parameter estimation

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