An integrated optimization of quality control chart parameters and preventive maintenance using Markov chain

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**ABSTRACT**

Manufacturing costs are reduced significantly with the integrated optimization of preventive maintenance and quality control. In this paper, a new mixed integer non-linear programming model is presented. This model determines the optimal preventive maintenance interval and the optimal parameters of the \( \bar{X} \) control chart, including the sampling interval and the sample size and the control limit. The production system is considered in the form of a continuous time Markov chain. Formulation of the production process of a machine in the form of a continuous time Markov chain is a breakthrough in the integrated modeling of repair and quality. The goal is to reduce costs per unit time. It is assumed that preventive maintenance can be carried out at several levels either perfect or imperfect. The duration of corrective and preventive maintenance is not negligible. Considering the length of time for maintenance, this model is closer to the real production environment. A numerical example is used to illustrate this new model. Sensitivity analysis was performed to determine the effect of the model parameters on optimal decisions. This analysis further shows the relationship between preventive maintenance and statistical quality control as well as the performance of the new model.

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