Integrated on-line and off-line quality control for products with destructive testing

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Abstract

In this paper, we consider the problem of determining the optimal testing interval for producing a batch from an unreliable process with a two states of Markov chain, where a destructive test is required to identify product quality. The identified quality is used to infer the process state, i.e., if a non-conforming product is identified, then it means that the process has already shifted into the out-of-control state and it should be terminated. Once the process ends production, the optimal no testing policy is used for off-line quality control. The aim of this paper is to find the optimal testing interval that minimizes the expected total cost per item of setup, material, product testing and off-line quality control related cost. When the process has a high reliability, an approximate solution for the optimal testing interval is proposed by solving a cubic equation. Numerical examples show that it is adequate to adopt the approximate solution since the resulting percentage of cost difference between the optimal solution and the approximated solution is insignificant. Besides, when the process shift rate increases, it needs more tests to monitor the process status. Finally, possible extensions for this work are addressed.

Keywords: *Destructive test; Deteriorating process; Off-line inspection; Quality control*

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