An Optimal Production Run For An Imperfect Production Process With Allowable Shortages And Time-Varying Fraction Defective Rate

Rahim, MA; Al-Hajailan, WI

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King Fahd University of Petroleum & Minerals

http://www.kfupm.edu.sa

Summary

The effects of an imperfect production process on the optimal production run by assuming that an elapsed time until the process shift is exponentially distributed have been studied. This problem was extended by assuming that the elapsed time until the process shift is arbitrarily distributed. The models, however, do not allow for shortages. This work has been generalized by assuming that shortages were allowed. The common assumption of all the above-mentioned models is that a fixed percentage of defective items are produced during the out-of-control period. This assumption may not be applicable in many industrial situations. Intuitively, the percentage of defective rate should increase with an increase in the duration of the out-of-control period. In fact, other research has considered an imperfect production process model with a variable rate of defective units produced when the process is in an out-of-control state. The defective rate is assumed to be a function of detection delay. The main purpose of this paper is to further generalize earlier work by introducing a time-varying percentage defective rate. This paper develops a model to determine the optimal production run for a deteriorating production system, with allowable shortages, and time-varying fraction defective rate. However, the elapsed time until the production process shift is assumed to be exponentially distributed. A unique optimal production run is found that minimizes the total expected cost. A numerical

example is provided to illustrate the application of the model and to prove the convexity of the total cost function. A sensitivity analysis is also conducted to study the effects of various model parameters on the optimal production run and the total cost.

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For pre-prints please write to: yahim@unb.ca