

Joint Economic Selection Of Target Mean And Variance

Rahim, MA; Bhadury, J; Al-Sultan, KS

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King Fahd University of Petroleum & Minerals

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Summary

This paper considers the problem of selecting the most economical target mean and variance for a continuous production process. In earlier studies, many authors considered the problem of finding an optimal target mean assuming that the variance is known. The problem with this assumption is the difficulty or impossibility of setting a target variance. Taguchi suggested a two-step procedure: first, set the target mean; then, find the smallest variance through redesign or experiment (resetting the level of factors). In this study, three new approaches are suggested for the economic selection of a target variance integrated with a target mean. In the first approach, an expected profit maximization criterion is used to obtain the target mean and variance simultaneously. The example used to illustrate this approach is a filling process where the quality characteristic is assumed to be normally distributed. The containers that are underfilled can be sold in a secondary market at a price of $\$P-L$ per can, those within specification can be sold at a price of $\$P-0$ per can, and those over the upper specification limit can be sold at a price of $\$P-U$ per can. In the second approach, a minimum cost criterion based on the Taguchi loss function is used: first, the processes optimized for the variance; then, an optimal process mean is obtained. In the third approach, an economic model for the selection of the target variance is developed, using both customer and producer costs to minimize societal loss independent of the product quality characteristic distribution.

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