A Control Chart to Monitor the Process Mean Based on Inspecting Attributes Using Control Limits of the Traditional X-bar Chart *

R. C. Quinino [1], L. L. Ho [2],
F. R. B. Cruz [1], L. F. Bessegato [3]

[1]*Department of Statistics*
Universidade Federal de Minas Gerais
31270-901 - Belo Horizonte - MG, Brazil

[2]*Department of Production Engineering*
University of São Paulo
05508-010 - São Paulo – SP, Brazil

[3]*Department of Statistics*
Universidade Federal de Juiz de Fora
36036-900 - Juiz de Fora – MG, Brazil

roberto@est.ufmg.br, lindalee@usp.br
fcruz@est.ufmg.br, lupercio.bessegato@ufjf.edu.br

Abstract

This paper proposes a new control chart, denoted by $\bar{X}^{\text{tn}}$, for evaluating the stability of a process mean, which is based on an attribute inspection of the quality characteristics of the interest of the sampled items rather than physical measurements taken with an instrument such as, for instance, a caliper or precise balance. In the $\bar{X}^{\text{tn}}$ control chart, the mean of the quality characteristic of interest is controlled by a go-no-go gauge device that generates five categorizations. In equally spaced times, samples of n items are collected, their categories are determined, and random values are generated according to a truncated normal distribution that corresponds to their categories. With these random values, the averages are estimated, and the $\bar{X}^{\text{tn}}$ control charts are built. Extensive computational experiments show that the newly introduced $\bar{X}^{\text{tn}}$ control charts perform similar to the usual $\bar{X}$ control chart in terms of average run length, provided that the sample sizes are raised by approximately three additional sample units. Because the $\bar{X}^{\text{tn}}$ control charts use attributes, which are easier to determine than the physical measurements, they can be considered a viable alternative to the traditional $\bar{X}$ control chart.
Keywords: Quality; $\bar{X}$ control chart; attribute and variable control charts; average run length.

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