A New Lot Sentencing Method for Products with Multiple Quality Characteristics Based on Process Yield

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Abstract

To make a cost-efficient and reliable lot disposition, various acceptance sampling strategies were developed for different perspectives in recent years. In this article, we propose a new method involving a flexible operating mechanism of decision rules, and the quality characteristic of interest of the inspected product considers multiple dimensions. The plan parameters, critical values and required sample size of the proposed method are obtained by solving a constructed optimization model, which minimizes the required average sample number (ASN) and constrains two non-linear equations under desirable quality levels of submission and tolerable sampling risks simultaneously. Both ASN and operating characteristic (OC) functions of the proposed method are derived based on the Markov chain technique. To examine the performance of the proposed method, several analyses are conducted and also compared with existing methods under the same conditions. The results indicated that the proposed method (*i*) has a better discriminatory power with equal sample consumption, (*ii*) requires a smaller ASN for inspection under the same conditions, (*iii*) provides a flexible operating procedure, which may avoid the disruption between the vendors and buyers. Thus, the proposed method provides a more efficient and reliable lot sentencing scheme for products with multiple quality characteristics. In addition, an example taken from the real-world application is illustrated to show the practicability of the proposed method.

Keywords
Lot disposition, process yield index, multiple quality characteristics, Markov chain and operating characteristic function.

Acknowledgement

Biographies
Dr. Shih-Wen Liu is currently an Assistant Professor in the College of Management at National Chin-Yi University of Technology (NCUT), Taiwan. Dr. Liu received his Ph.D. degree in Industrial Management from National Taiwan University of Science and Technology (NTUST) in 2016. Dr. Liu was honorably subsidized by Ministry of Science and Technology (MOST) of Taiwan to Rutgers University, USA for research purposes. Before he joined NCUT, Dr. Liu spent three years as an R&D engineer in the contact lens industry which expanded his horizon of the Industrial Engineering field. Also, Dr. Liu was a member of Quality Management Lab in National Tsing Hua University (NTHU), Taiwan as a Postdoctoral Researcher. His research interests include quality engineering and management, statistical process control, process capability analysis, applied statistics and data analysis.

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