

Developing a Two-stage Sampling Plan for Products with an Unilateral Specification Limit

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Abstract

Acceptance sampling plan is a statistical tool of quality control. It is a well-considered decision system that meets both consumers and producers need for product quality. The purpose of acceptance sampling plan is to provide a decision-making guideline, whether or not the lot is likely to be accepted. Many efforts were directed to make sure that we are meeting the requirement in the most cost-efficient way. A common practice is single acceptance sampling plan, because of its simplistic. However, with its simplistic comes with a downside that a larger sample size is usually required to avoid making a judgment mistake, because there is only a chance to sentence the lot. In this paper, for the expectation of reducing the required sample size, we propose a two-stage sampling plan to give a questionable lot another chance of inspecting samples before deciding to accept or reject the lot. The propose plan is designed on the basis of one-sided capability index with the assumption of the quality characteristic follows a normal distribution. The concept of two-stage sampling is that decisions in the second-stage sampling inspection is independent to the first-stage sampling inspection, having the desired to operate on variables inspection. The optimal parameters are determined by optimization of the design model, which minimizes the average sample number (ASN) and satisfies the producer's and the consumer's risks at the specified quality levels. The utility of the proposed sampling plan is shown through comparison with the single sampling plan in terms of sample size required for inspections under various combinations of quality levels and required risks. The result indicates that two-stage sampling plan involves smaller required sample than that corresponding to the single sampling plan. Thus, the propose plan proceeds towards to help practitioners efficiently sentence the submitted lots.

Keywords

Acceptance sampling plan, Process capability index, OC curve, process yield

Biographies

Yuting Won is currently a graduate student in Industrial Engineering and Engineering Management at the National Tsing Hua University, Taiwan. Miss. Won holds a Bachelor of Science degree in Industrial Engineering and Management from Yuan Ze University. Her research engages in research on quality management and statistical methods, including process capability indices and acceptance sampling plans.

Chien-Wei Wu is currently a Professor in the Department of Industrial Engineering and Engineering Management at National Tsing Hua University (NTHU), Taiwan. Dr. Wu received his Ph.D. degree in Industrial Engineering and Management with Outstanding Ph.D. Student Award from National Chiao Tung University in 2004 and the M.S. degree in Statistics from NTHU in 2002. He is serving as one of Editors-in-Chief of Quality Technology and Quantitative Management (QTQM) and editorial board members for various international journals. His research interests include quality engineering and management, statistical process control, process capability analysis and data analysis.