

Experimental Design for Analyzing Shade Variation in Dyeing Process

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Abstract

Shade variation occurs when the same textile material is dyed using the same recipe but reflects different color. Shade variation is one of the major problems in textile dyeing industry causing delays, reworking, or even loss of the customer. Even though shade variation cannot be avoided completely, it should be within an acceptable range specified by the customer. In this study, a two-level fractional factorial design for six factors is used to perform an experiment for the dyeing process of knitted cotton fabric. The difference between the reflectance data of the samples from the experiment and the reflectance data of the standard sample is used as the response variable. The statistical analysis of the experimental data is carried out to investigate the factors accounted for shade variation. The objective is to determine influential factors in order to identify opportunities for quality improvement. It is concluded that temperature and liquor ratio are the most influential factors on the shade variation and their two-factor interactions with salt type are also significant.

Keywords

Shade variation; experimental design; fractional factorial design; quality improvement

Biography

Bahar Sennaroglu is an Associate Professor in the Industrial Engineering Department of Faculty of Engineering of Marmara University. Dr. Sennaroglu received her MSc and PhD degrees in Industrial Engineering from Marmara University. Her research interests include design and analysis of experiments, decision techniques, forecasting techniques, project management, production and quality systems. She is an academic visitor for the academic year 2016-2017 in the Department of Engineering and the Built Environment of Faculty of Science and Technology of Anglia Ruskin University. Her ORCID ID is orcid.org/0000-0002-6809-634X.