

An innovative approach for planning and execution of pre-experimental runs for Design of Experiments

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Abstract

Purpose – This paper addresses the study of pre-experimental planning phase of the Design of Experiments (DoE) in order to improve the final product quality. The pre-experimental planning phase includes clear identification of problem statement, selection of control factors and their respective levels and ranges.

Design/methodology/approach – To improve production quality based on the DoE a new approach for the pre-experimental planning phase, called Non-Conformity Matrix (NCM), is presented. This article also addresses the key steps of the pre-experimental runs considering a goods manufacturing process.

Findings – This paper discusses comprehensively the application of a NCM to identify the problem definition and also when and how to perform pre-experimental runs for the manufacturing processes. Results of the application for an industrial case show that this methodology can support clear definition of the problem and also correct identification of the factor ranges in particular situations.

Practical implications – The proposed approach allows modelling the entire manufacturing system holistically and correctly defining the factor ranges and respective levels for a more effective application of DoE.

Originality/value – This paper reports a new tool for the pre-experimental planning phase and application of pre-experimental runs, using an industrial case. This new approach can be a useful resource for both research and industrial practitioners who are dedicated to large DoE projects with unknown factor interactions, when the operational levels and ranges are not completely defined.

Keywords: Pre-experimental runs, Non-Conformity Matrix, Design of Experiments.