

Search for the best operating conditions of a soft drink bottling through optimum designs of experiments.

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Taguchi's off-line control methods pose the quality improvement of products and processes at the design stages. Parameter design plays a crucial role in these stages. This method is based on the recognition of two kinds of factors that may have impact on a quality characteristic: those that can be controlled at the design -control factors- and those that influence the quality of the product when it is being used -noise factors-. The aim of this technique is to identify the optimum settings for the control factors that bring about the desired values for the quality characteristic with the minimal sensitivity to noise factors. This methodology, named "Robust Parameter Design", has been widely spread but also criticized. Among the most important weaknesses, it can be mentioned that it involves experiments with a large number of runs, although the analysis only use a summary of the observations not fully exploiting the collected information

The theory of optimum design of experiments provides a valid alternative for obtaining the necessary information with less runs than the traditional strategies of experimental designs. There are three aspects to be considered before applying this method: the specification of a model proposed to describe the relationship between the factors and the quality characteristic, the choice of an optimality criterion and the determination of the number of runs to be performed. The optimality criterion reflects the quality of the estimates of the model parameters. The objective of this strategy is to find the treatments that must be tested in order to estimate the parameters of the model so that the desired criteria is satisfied. This work presents an overview of the fundamental aspects of the theory of optimum design of experiments and the innovative application of this technique in a process of soft drink bottling. The objective of this study is to find the operating conditions that lead to the least loss of CO₂ in the drinks between packaging and product purchase. The traditional designs were also performed for comparison purposes.

Key words: Robust Parameter Design; Off-line Control; Optimality Criterion