A Comparison of Regression and Neural Network Based for Multiple Response Optimization in a Real Case Study of Gasoline Production Process

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ABSTRACT

Most of existing researches for multi response optimization are based on regression analysis. However, the artificial neural network can be applied for the problem. In this paper, two approaches are proposed by consideration of both methods. In the first approach, regression model of the controllable factors and S/N ratio of each response has been achieved, then a fuzzy programming has been applied to find the optimal factors' levels. In the second approach, a tuned Artificial Neural Network (ANN) is used to relate controllable factors and overall exponential desirability function then Genetic Algorithm (GA) is used to find factors optimum value. Mentioned approaches have been discussed in a real case study of oil refining industry. Experimental results for the suggested levels confirm efficiency of the both proposed methods; however, the Neural Network based approach shows more suitability in our case study.

Keywords: Multi-response optimization, Taguchi method, Artificial Neural Network, Genetic Algorithm, Fuzzy programming.

1. INTRODUCTION

Many processes around us need to be analyzed for their performance improvement. The analyzer is interested in optimizing processes with minimal experiments and the least cost. Taguchi method (Taguchi, 1991) is an important technique in design of experiment and is used in many case studies we are dealing with them. Taguchi method can be carried out based on a few periods of time and low number of experiments; also, it is a useful and coincident method for industrial experiments. The Taguchi method of robust parameter design is an offline statistical quality control technique in which the level of controllable factors or input process parameters are so chosen to nullify the