# Trade-off in robustness, cost and performance by a multi-objective robust production optimization method

ABSTRACT

Designing a production process normally is involved with some important constraints such as uncertainty, trade-off between production costs and quality, customer's expectations and production tolerances. In this paper, a novel multi-objective robust optimization model is introduced to investigate the best levels of design variables. The primary objective is to minimize the production cost while increasing robustness and performance. The response surface methodology is utilized as a common approximation model to fit the relationship between responses and design variables in the worst-case scenario of uncertainties. The target mean ratio is applied to ensure the quality of the process by providing the robustness for all types of quality characteristics and with a trade-off between variability and deviance from the ideal point. The Lp metric method is used to integrate all objectives in one overall function. In order to estimate target value of the quality loss by considering production tolerances, the process capability ratio () is applied. At the end, a numerical chemical mixture problem is served to show the applicability of the proposed method.

**Keyword :** Robust design; Loss function; Uncertainty; Response surface methodology; Process optimization