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MATHEMATICAL MODEL GENERATION TO DETERMINE THE OPTIMAL TOLERANCE OF QUALITY IN PRINTING INDUSTRY

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Abstract

Quality Engineering uses robust design in order to improve quality by reducing the effects of variability. Variability of the product can be reduced by two stages. One is Parameter Design, which is adjustable to the nominal value so that output is less sensitive to the cause of variability. Other one is Tolerance Design, which is to reduce the tolerance in order to control variability. All costs incurred in a product life cycle can be divided into two categories - manufacturing cost before the sale to the customer and quality loss after the shipment of the product to the customer. It is very important to find the optimum tolerances for each of the characteristics. A balance between manufacturing cost and quality loss should be arrived at in the tolerance design for quality improvement and cost reduction For the case of Nominal-The-Best, a mathematical model is developed in order to determine the optimum product tolerance and minimize the total cost which includes the manufacturing cost and the quality loss. Since the process capability index (*Cpm*) shows the balance of quality responsibility between the design and the manufacturing engineers, this is taken as the basis in developing the functional relationship between the variability of the product and the tolerance. Based on these relationships, the total cost of model can be expressed as function of product
tolerance from which the optimal tolerance limits can be found out. Finally using this model a tolerance design approach that increases the quality and reduces the cost can be achieved in the early stages of the product process design stage itself. The generated model is applied to the vikram industrial press and the quality of the printing.

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Key Words : *Parameter design, Tolerance design, Process Capability index, Quality loss Function.*