International Journal of General Engineering and Technology (IJGET)
ISSN (P): 2278–9928; ISSN (E): 2278–9936
Vol. 9, Issue 1, Jan – Jun 2020; 55–80

International Academy of Science, Engineering and Technology
Connecting Researchers; Nurturing Innovations

SHRINKAGE PREDICTION IN INJECTION MOLDING USING HYBRID TAGUCHI/ARTIFICIAL NEURAL NETWORK MODELS

Rafa Abdul[1], Ashvini Byri[2], Archit Joshi[3], Om Goel[4], Dr.Lalit Kumar[5] & Prof.(Dr.) Arpit Jain[6]

[1]Bradley University, Peoria, Illinois, USA

[2]Scholar, University of Southern California, Parel, Mumbai, India

[3]Syracuse University, Syracuse, Sadashivnagar New York , USA

[4]ABES Engineering College Ghaziabad, India

[5]Asso. Prof, Dept. of Computer Application IILM University Greater Noida, India

[6]KL University, Vijaywada, Andhra Pradesh, India

ABSTRACT

Injection molding is a widely used manufacturing process for producing plastic parts with high precision. However, shrinkage is a common defect that occurs during the cooling phase, affecting the dimensional accuracy of the final product. This study explores the development of a hybrid model combining the Taguchi method and Artificial Neural Networks (ANN) to predict and minimize shrinkage in injection molding. The Taguchi method is applied to design experiments and identify optimal process parameters, while the ANN is trained to model the non-linear relationships between the parameters and shrinkage behavior. By integrating the strengths of both methods, the proposed hybrid approach offers a robust predictive model that enhances accuracy and efficiency. The study includes experiments conducted on various process parameters, such as melt temperature, injection pressure, and cooling time, which were systematically varied to evaluate their effects on shrinkage. The ANN model, trained with the data obtained from the Taguchi experiments, accurately predicts shrinkage across a range of conditions. Results show that the hybrid Taguchi/ANN model outperforms traditional Taguchi and ANN models used separately, providing more precise control over process optimization. This approach not only reduces the occurrence of defects but also enhances the overall quality and consistency of injection-molded products. The findings of this research contribute to improved manufacturing processes, offering a practical tool for industries aiming to minimize defects and increase production efficiency.

KEYWORDS: *Injection Molding, Shrinkage Prediction, Taguchi Method, Artificial Neural Networks, Hybrid Molding Process Optimization, Dimensional Accuracy, Manufacturing Defects*

Article History

Received: *06 Feb 2020* **|** ***Revised:*** *10 Feb 2020* **|** ***Accepted:*** *12 Feb 2020*
