Integration of taguchi-grey relational analysis technique in parameter process optimization for rice husk composite

ABSTRACT

Injection molding is a widely used manufacturing process operation that generates polymer products. The selection of optimal injection molding process settings is essential due to the distinct influences of process parameters on polymeric material behavior and quality, particularly during the injection process. Therefore, it is vital to determine the optimized process parameters to enhance the mechanical properties of the products and ensure the most favorable performance. This paper examined the integration of Taguchi's method with grey relational analysis (GRA) to determine the effects of varied injection molding parameters on the mechanical properties such as tensile strength and hardness values. The experiments were designed using Taguchi's L9 orthogonal array after weighing in control factors, such as melting temperature, injection pressure, injection speed, and cooling time. The GRA revealed that the multiple responses correlation was successfully established. Finally, an analysis of variance was performed to validate the test outputs. The results revealed that the most influential factor was injection pressure, sequentially followed by melting temperature, cooling time, and injection speed.

Keyword: Integration; Injection molding; Natural composite; Optimization