

## **Multi-objective optimization in friction drilling of AISI1045 Steel using grey relational analysis**

### **ABSTRACT**

The friction drilling process has the great prospective to vitalize green manufacturing in hole-making process. The optimization of process performance in friction drilling can be realized through an appropriate selection on process parameters. However, some recognized techniques can successfully optimize only on a single-performance characteristic, and optimization on multi-performance characteristics can be difficult and challenging to investigate due to its complexity in the analysis. In this present work, a parametric optimization in friction drilling of medium carbon steel AISI 1045 using L25 orthogonal array design of experiments has been experimentally investigated. The grey relational analysis (GRA) has been utilized to determine optimum process parameters in friction drilling process by considering multi-performance characteristic, namely bush length and roundness error. The GRA results confirm that the best combination of process parameter is obtained as spindle speed 3000 rpm and feed rate 50 mm/min. It has been found that the spindle speed is the more significantly affected than feed rate to obtain a greater bush length and lower roundness error through response table. The confirmation test results show that the GRA succeeds in optimizing the process parameters in friction drilling process. The study revealed the multi-performance characteristic can be enhanced by selecting the proper process parameters.

**Keyword:** Friction drilling; Optimization; Grey relational analysis; Bush length; Roundness error