Investigation on turning operation using die sinking EDM process

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ABSTRACT
Electrical discharge turning (EDT) operation produces a cylindrical component using an electrical discharge machining method. Unlike a traditional turning process, it is a non-contact operation between the tool electrode and workpiece. Therefore, the design of electrode may influence the quality of turned workpiece. The present study investigates the effect of various processing parameters in EDT namely the electrode shape, workpiece rotational speed and jump down time. The analysis was conducted in terms of the surface roughness, circularity deviation and electrode wear rate. A special jig and fixture for the turning operation was developed as to fit on the commercial die sinking EDM machine. A fractional factorial approach using Taguchi orthogonal array of L9 was utilized in the present study. It was found that both shape of electrode and workpiece rotational speed had a greater influence on the surface roughness followed by the electrode jump down time. The surface roughness increases with an increase of quantity and duration of sparks during the process due to formation of a higher amount of debris. The circularity deviation has improved with a higher sparking area and faster duration of sparks since a smaller amount of workpiece material was removed thus improving its circularity. Furthermore, the highest electrode wear rate was produced using the electrode with a curvature shape which generated wider sparking area thus experiencing more erosion.

KEYWORDS
Circularity deviation; Curvature electrode; Electrical discharge turning; Electrode wear rate; Surface roughness

ACKNOWLEDGEMENTS

Authors would like to gratefully acknowledge the financial support from the Ministry of Higher Education Malaysia through FRGS/1/2019/TK03/UMP/02/25 (RDU1901161).