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Effect of process parameters on cutting speed of wire EDM process in machining HSLA steel with cryogenic treated brass wire

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A B S T R A C T

Wire electrical discharge machining (wire EDM), a most common non-conventional machine tool, is extensively employed to produce precise, delicate and intricate profiled shaped parts especially from hard to machine materials. The performance of wire EDM is mainly based on the electrical conductivity of both electrode wires and workpiece materials. The aim of research is to increase cutting speed (*CS*) of high strength low alloy (HSLA) hardened steel by determining main contributing input process parameters and effect of cold treatment on electrical conductivity of brass wire at –70 °C. Fractional factorial design is used to determine the relationship of *CS* with input process parameters includes; open voltage, pulse on time, pulse off time, wire tension, flushing pressure of deionized water and brass wires (cold treated – CT, and non-cold treated – NCT). Empirical model for *CS* is developed based on selected input process parameters and their contribution is analyzed through ANOVA technique. It is learned that pulse on time, pulse off time and wire electrode are the main contributing input process parameters that provide assistance to increase *CS* of wire EDM. In wire electrodes, cold treated brass wire is observed as a best alternative to enhance machining performance with an increase of electrical conductivity by 24.5 %.

A R T I C L E I N F O

Keywords:
Wire electrical discharge machining (WEDM);
HSLA steel;
Brass wire;
Cryogenic treatment;
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Process parameters

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