In vitro wear measurement of electrodes for sinking EDM processes by examing the resonance frequency

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Abstract

Electrical discharge machining (EDM) is one of the most important technologies for high-precision machining of electrically conductive materials, regardless of their hardness. It is widely used for the die and mould manufacturing, medical technology and the aerospace industry. The measurement of process-related wear of the tool electrode represents a major technical challenge. The wear of the tool electrode influences the dimensional and shape accuracy of the machined workpiece. Especially for the production of blind holes with a defined depth the wear has to be known. Previous methods for measuring the electrode length require the repositioning of the electrode to a reference point, which increases time consumption and cost of the manifacturing process due to the process interruption.

The presented technology for the in situ wear measurement of electrodes for the electrical discharge machining is an approach for increasing process accuracy and speed. The approach is based on the longitudinal deflection of the electrode by means of piezo ring actuators for frequencies 1 kHz ≤ f ≤ 10kHz.

The oscillation amplitude of the electrode is measured simultaneously by acceleration sensors and laser interferometers. The current resonance frequency of the tool electrode can be determined from the resulting amplification function. This allows conclusions about the current length and thus the wear of the tool electrode since the resonance frequency is directly related to the length of the tool electrode. With the new approach, a measuring system is provided, which allows the in situ monitoring of the wear of the tool electrode during the EDM process.