A New Servo Control Drive for Electro Discharge Texturing System Industrial Applications Using Ultrasonic Technology

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Abstract

This paper presents a new ultrasonic servo control drive for electro discharge texturing system industrial applications. The new drive is aiming to overcome the current teething issues of the existing electro discharge texturing system, servo control drive level of precision, processing stability, dynamic response and surface profile of the machined products. The new ultrasonic servo control drive consists of three main apparatuses, an ultrasonic motor, electronic driver and control unit. The ultrasonic motor consists of three main parts, the stator, rotor and sliding element. The motor design process, basic configuration, principles of motion, finite element analysis and experimental examination of the main characteristics is discussed in this paper. The electronic driver of the motor consists of two main stages which are the booster and piezoelectric amplifier. The experimental test and validation of the developed servo control drive in electro discharge texturing platform is also discussed and presented in this paper. The initial results showed that the ultrasonic servo control drive is able to provide: a bidirectional of motion, a resolution of <50μm and a dynamic response of <10msec. The electron microscopic micro examination into the textured samples showed that: a clear improvement in machining stability, products surface profile, a notable reduction in the processing time, arcing and short-circuiting teething phenomena.

Keywords: ultrasonic servo drive, servomotors, EDT, mechatronics

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