ANALYSIS OF INFLUENCE OF PHYSICAL CONDITIONS INSIDE INTERELECTRODE GAP ON WORK PIECE SHAPE EVOLUTION

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In the paper an analysis of the influence of physical conditions inside the interelectrode gap (IEG) on the workpiece (WP) shape evolution has been presented. This problem has been solved on the basis of a two-dimensional model of an electrolyte and hydrogen mixture flow through the interelectrode gap (IEG). There has also been demonstrated general mathematical modeling algorithm as well as a numerical calculation scheme.

Key words: *electrochemical machining, electrolyte flow, computer simulation*

1. Introduction

Electrochemical machining (ECM) patented in 1928 applied in industry after World War II enables effective solution of many problems connected with the manufacturing process, especially of hard to machine materials.

Nowadays electromachining with the tool electrode (TE) is one of the basic operations of electrochemical technology for machine and device elements treatment.

Traditional TE design requires repeated changes of the real TE for obtaining the correct shape of the machined workpiece (WP) which definitely increases the time and costs of the electrode production.

Past research in the field of ECM has proved occurrence of many complex phenomena connected with the inner structure of the electrochemical dissolution process. These are electrode processes of mass, momentum and energy exchange as well as those of electric charge transfer, hydrodynamic ones and others.

Many authors have already dealt with the problems connected with mathematical modeling of electrochemical machining process, e.g.: Tipton [1], FitzGerarld and McGeough [2], Kozak [3].

At present, for the description of the machined element shape evolution, numerical methods are in wide use, such as: boundary elements method; Narayanan [4], finite elements method; Jan Pandey [5], Alkirie [6], Zhou [7] et al.

Machining by means of electrochemical shaping requires to join the tool electrode to the negative end of a direct current source, whereas the workpiece must be joined to the positive end. The electrolyte is supplied to the interelectrode gap (IEG). During ECM the electrolyte flowing through the gap removes the products of electrochemical reaction from the surfaces of the electrodes. These are mainly hydrogen bubbles and ions of the dissolved metal [8].

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