# ABOUT OF DIMENSIONAL ALTERING OF THE EROSIVE INTERSTICE OF THE ELECTRIC EROSION PROCESSING

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**ABSTRACT:**

The relation between the theoretical knowledge and the practical one represents a very important issue in the machine construction industry. These concern of practically accomplishing "something" come to emphasize the theoretical knowledge amassed during a long period of time. We can assert that there are certain branches of the modern technology in which a "live" visualization of some fundamental process phenomena is somewhat reduced or even impossible. The electric erosion processing is one of the various unconventional means of processing in which the process phenomenon is a very interesting one. The singular discharge method has confirmed certain already acknowledged technological aspects, but has also revealed new aspects regarding the modeling and, subsequently, the optimization of the objective functions monitored during the electric erosion process, which magnetically actuated or not.

**KEYWORDS:** electric erosion, singular electric discharges, experimental research, phenomenon process, statistical quality control, quality.

## 1. INTRODUCTION

We can state that the experimental analysis of the influence of an ensemble of exterior magnetic fields on the dimensional processing by electric erosion can be accomplished by means of the singular discharges.

The aforementioned method consists of generating, between a transfer object and a processing one, an impulse electric discharge, with well-defined parameters, followed by a qualitative and a quantitative evaluation of the discharge effects on the surfaces of the two interacting objects.

By this, we aim at creating some dependency relations between the impulse parameters and the effects of the impulse electric discharge.

The conclusions permit us, on one hand, to clarify the fundamental physical-chemical phenomena, which are produced in the process, and on the other hand, to set up new optimization directions for the real method of dimensional processing by electric erosion with and without exterior magnetic activation.

The efficiency of the research by means of the impulse electric discharges in the processing by electric erosion depends on the precise knowledge of the initial conditions, preceding the discharge, on the exact definition of the impulse parameters and on the evaluation of the discharge effects. For a thorough study of certain phenomena that appear in the during the overlapping of the exterior magnetic fields with the erosive interstice, by removing the reciprocally produced influences by the recurring discharges, we considered it would be advantageously to tackle the study of the singular discharges that are generated between the transfer object and the processing object in the electric erosion procedure. As a reference measure, we made use of the singular discharge, initially dampened, in the absence of the exterior magnetic field.

## 2. EXPERIMENTAL CONSIDERATIONS

For the experimental research we utilized a micro-machine but also an electronic stand that, especially designed and manufactured.

We designed the electronic stand for generating the impulse electric discharges and we conceived it as a feasible and modern dimensional processing equipment.

This was possible by starting from the (limited) functional and technological facilities of the classic RC generator.

The structure of the electronic stand is presented in figure 1.

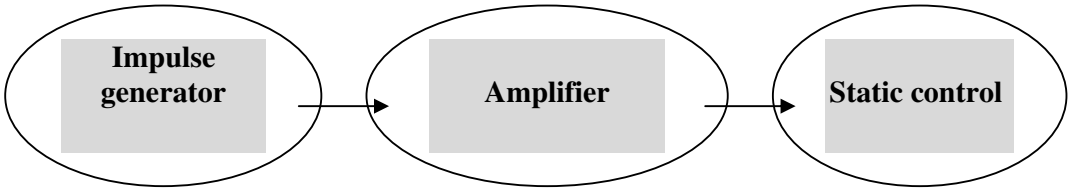


***Fig. 1. The structure of the electronic stand***

The connections in the impulse generator, the amplifier and the static control with a view to obtaining singular impulses, were made by means of certain rigid and secure couplings with proper cables mounted on the orientation and fixing device of the processing object respectively of the transfer object. The transfers were manufactured of electrolytic copper and OL37 steel and the processing objects were made of a high alloyed material C120 STASS 36 11/ 86, hard sintered alloys OL 37 steel. The electronic chain was connected to a memory oscilloscope of the type HAMEG Instruments HM 305. Because we intended to obtain an impulse shape visualization but also to define and study certain electric and electronic parameters of the impulse electric discharge.

The whole electronic chain was supplied by means of a stabilized, of high quality, which provides a digital display of the values of certain important electric and electronic parameters, which are crucial for the functioning of the electronic stand.

## 3. EXPERIMENTAL RESULTS

The parts on which we processed the singular discharges, at different frequencies, were not chemically damaged.

The polarity of the transfer object was positive, so the processing polarity was opposite.

The obtained craters were magnified 250 times, 200 times, 80 times, 50 times, varying with the processing conditions.

The impulse electric discharges were accomplished in the presence of the magnetic field exteriorly overlapped by means of an auxiliary working equipment, especially designed, and also in the absence of the magnetic activation of the process.

Figure 2 and 3 are suggestive from the point of view of the analysis of the discharging column fragmentation in the material prelevation process.

We notice that if the material prelevation process is not activated with an exterior magnetic field the discharge column fragmentation is present but mot at the same level as when the process is activated with an ensemble of magnetic fields. Figure 3 presents a picture of the craters obtained by a fragmentation of a single discharge at a mean value of the magnetic field intensity.

In the aforementioned picture (Fig.3) we noticed that the crater is larger than in the case when the process took place in the absence of magnetic fields.

The pictures we presented are made by using the same magnifying order of the microscope. The activation of the material prelevation process, in the dimensional processing by electric erosion analyzed by means of some singular discharges, that is of some “impulse trains” leads to certain conclusions which refer to the crater size, to the size of the thermally influenced areas, to the size of the erosive interstice.

The phenomenological problem about the discharge column fragmentation in the presence of magnetic fields raises.

The explanations that lead to this fragmentation of column discharge are delicate and can be quantified by the generated effects but also by the

observations that result after the activation of the material prelevation process.

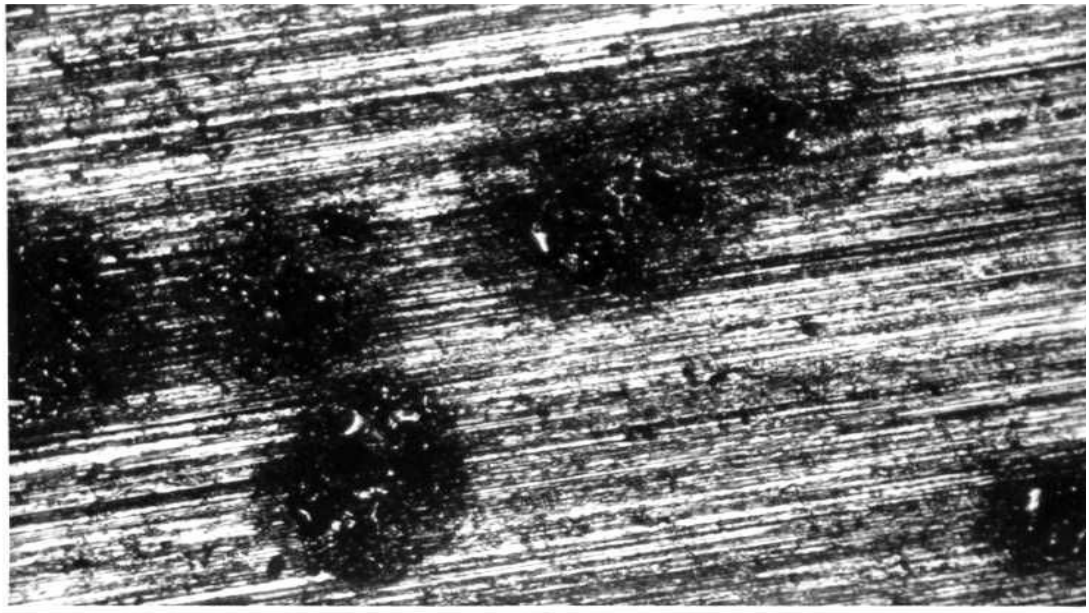

***Fig. 2. Experimental capture number one***

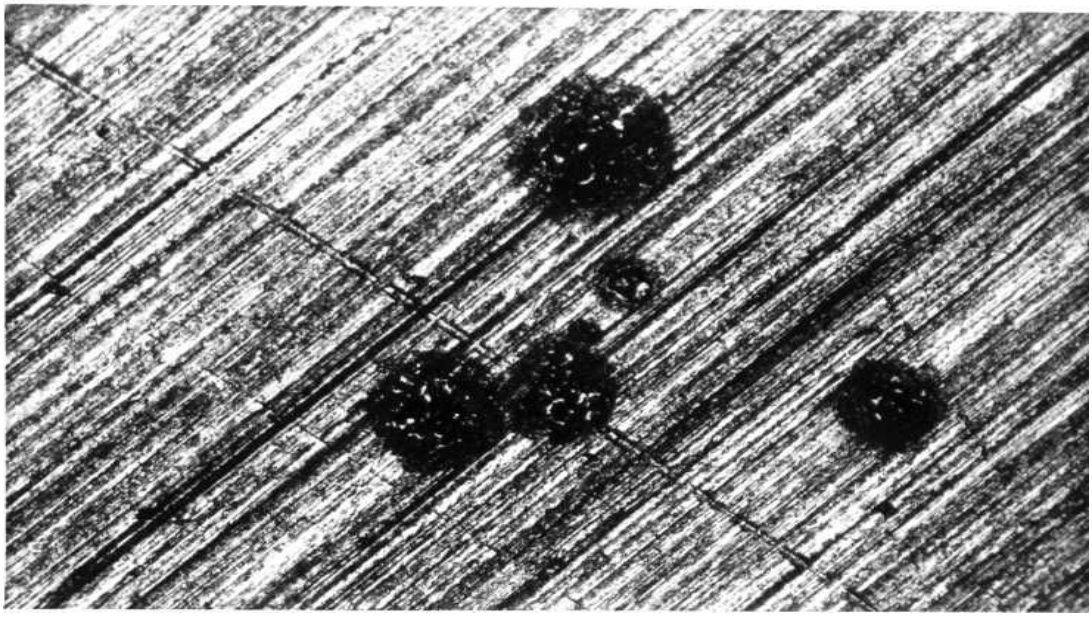

***Fig. 3. Experimental capture number two***

**4. CONCLUSIONS**

When there is an ensemble of magnetic fields overlapped with the erosive interstice an energy excess appears. If this energy has a certain value then it leads to a breaking of the discharge column, and so practically to a discharge fragmentation.

The phenomenon can be analyzed and explained by means of electric and magnetic forces.

Due to the fact that these types of forces do not have the vectors orientated in the

same direction and do not have the same route direction, the resultant of these forces will not have a coaxial direction with the advanced direction of the transfer object so neither with the initial direction of the discharge column.

Thus the discharge column will be fragmented especially when the resultant intensity of the magnetic fields has a certain value experimentally defined.

All these lead to the explanation by which the substantial productivity increase, the decreases of the transfer object ware, the increases of some parameters that express the quality of the processed surface and the increase of the processing procedure are generated; all these are experimentally demonstrated.

From the phenomenological point of view the explanations about the didactic modifications are based on the following conclusions, which were experimentally verified: due to the fact that there is an ensemble of overlapped exterior led magnetic fields, we can state that there is a favorable modification of the movement parameters of the electric particles that move in the erosive interstice; the resultant force consisting of an electric and a magnetic force will have a vector with a certain direction towards the advanced direction of the transfer object; the approximately tangent magnetic force that contributes to the aforementioned resultant force will lead to a modification of the crater shape, which will be finally elliptical; the enlargement of the crater sizes together with the increase of the magnetic field intensity sustains the theory of a supplementary quantity of heat and therefore, theoretically the increase of the kinetic energy of the electric particles which move in the erosive interstice.

Theoretically and experimentally as well this will lead to significant productivity increases; the existence of a larger number of power lines generates an increase of the ionized gas channel, therefore increasing its radial dimension, fact that can explain a large quantity of removed material that is the column fragmentation by means of acceleration of the Skin-Pinch effect.

In addition we experimentally established viable increase of the working interstice in the same time with the increase of the resultant intensity of the magnetic field in the prelevation area.

All these lead to the conclusion that the activation of the material prelevation process in the dimensional processing by electric erosion leads to a widening of the application area of the analyzed procedure.

The necessary and sufficient condition for obtaining good results is connected to the way in which the exterior magnetic field ensemble is overlapped with the material prelevation process, but also to the numerical values experimentally established of the resultant intensity of the exterior, led, homogenous or inhomogeneous, spatially positioned towards the working interstice magnetic fields.

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