DISPERSION ANALYSIS WITH TWO INDEPENDENT FACTORS AT PROCESSING THROUGH COMPLEX EROSION WITH INTRODUCTION OF ELECTROLYTE THROUGH OBJECT OF TRANSFER

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Abstract: Complex electrical and electrochemical erosion (EEC) represents overlapping in time and space, in the working gap, of the processing through electrochemical erosion and electrical erosion.. EEC processing is defined as the simultaneous development process of the dissolution anode (DA) and discharge electric impulse (DEI) in the space delimited by OT, connected to the negative pole of the source of DC power, and OP connected to the positive pole of power supply in the presence of the working environment (ML).

Keywords: complex erosion, processing productivity, surface roughness, voltage U, current I.

The experimental results that the user makes use of to establish the mathematical model of technological process are obtained from a large number of experiments carried out for different values of adjustable parameters of the process (hereinafter called input factors) and which allow obtaining values for the measured technical and economic features (hereinafter called technological indicators).

For debit processing through EEC with disc electrode with the introduction of the working fluid inside the object transfer OT were chosen as response functions: Processing productivity OP (Qop [mm^3/min]); Surface roughness (R_a [µm]) and Plan deviation A_p (Press [mm]). As input quantities were chosen U Voltage [V], Intensity I [A] and the additional pressure of OT-OP (p [daN/cm^2]) for productivity.

If on the experimentally measured technological indicator operates two independent factors A and B input ,dispersional analysis with two factors (bifactorial) allows to check whether the technological indicator depends on both factors or just one of them. When processing through EEC, the large volume of input factors and their interdependences among them are the causes that have not so far allowed the mathematical expression of a law for carrying out the process. This method enables the determination of the technological links between the various indicators and the associated input factors.

For this, considering that y_{ij} is the result of the experiment obtained for value A_i (for factor A, which can take k values) B_j respectively (for factor B, which can take n values) are made the followingdeterminations:

$$V_A = n\sum_{i=1}^{k}(y_i - \bar{y})^2, \quad unde\ y_i = \frac{y_{i1} + y_{i2} + ... + y_{in}}{n} \tag{1}$$

$$V_B = k\sum_{j=1}^{n}(y_j - \bar{y})^2, \quad unde\ y_j = \frac{y_{1j} + y_{2j} + ... + y_{kj}}{k} \tag{2}$$

$$V_1 = \sum_{i=1}^{k}\sum_{j=1}^{n}(y_{ij} - y_i - y_j + \overline{y})^2 \qquad (3)$$

$$V_g = \sum_{i=1}^{k}\sum_{j=1}^{n}(y_{ij} - \overline{y})^2 \qquad (4)$$

$$S_A{}^2 = \frac{V_A}{k-1} \qquad (5)$$

$$S_B{}^2 = \frac{V_B}{n-1} \qquad (6)$$

$$S_1{}^2 = \frac{V_1}{(k-1)(n-1)} \qquad (7)$$

$$S_g{}^2 = \frac{V_g}{kn-1} \qquad (8)$$

under which the criterion applies F:

$$F_A = \frac{S_A{}^2}{S_1{}^2} \qquad (9)$$

$$F_B = \frac{S_B{}^2}{S_1{}^2} \qquad (10)$$

and are compared the tabulated values thus obtained; for input factor in which $F_{calculated} < F_{tabulated}$ results that the hypothesis is true and then the technological indicator depends on input factor; if the relationship $F_{calculated} < F_{tabulated}$ is true for both input factors, this means that both A and B influences the technological indicator analyzed.

For elaborating a program that automatically performs establishing functions of dependency of the technological parameters on the influencing factors were developed mathematical models for:

- Productivity processing dependency OP (Qop [mm^3/min]) on voltage (U [V]) and OT-OP pressure (p [daN/cm^2]) - (figure 1)

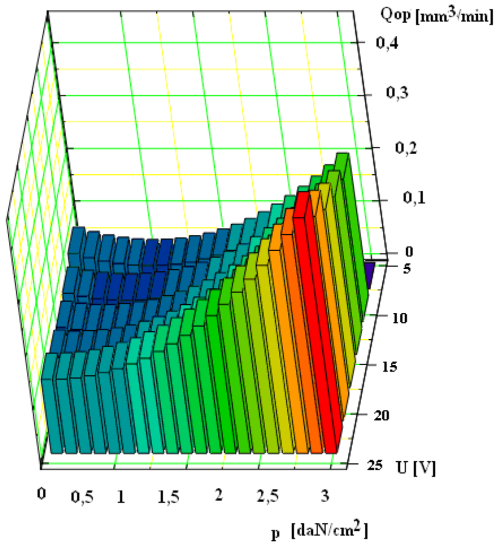

Fig. 1. *Dependence of processing productivity OP (Qop [mm^3/min]) on voltage (U [V]) and OT-OP pressure (p [daN/cm^2]).*

- Productivity processing dependency OP (Qop [mm^3/min]) on the electrolyte flow (Q [l / min]) and thickness of the electrode (G [mm]) - (Figure 2)

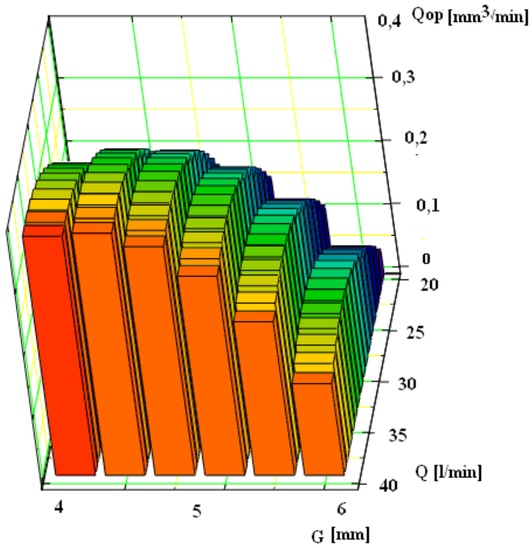

Fig 2. *Dependence of the processing productivity OP (Qop [mm3 / min]) on the electrolyte flow (Q [l / min]) and thickness of the electrode (G [mm])*

- The dependence of surface roughness (R_a [μm]) on the intensity of the current (I [A]) and the relative speed OT-OP (V [mm / min]) - (Figure 3)

-Dependence of deviation from flatness A_p [mm] on the current intensity (I [A]) and electrolyte flow rate (Q [l / min]) - (Figure 4).

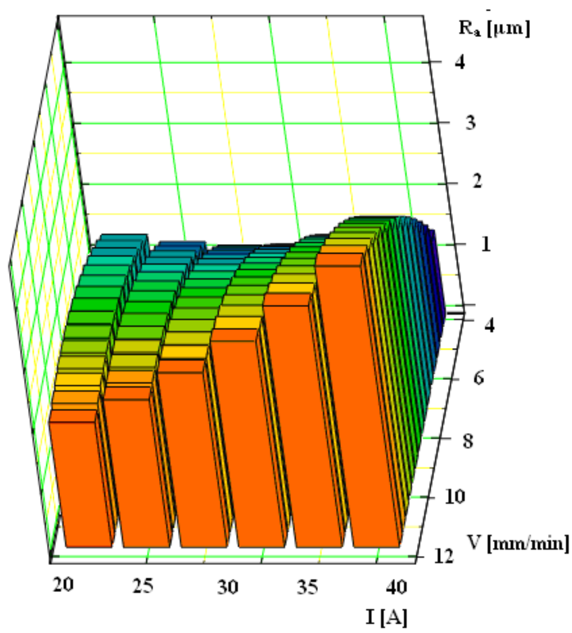

Fig. 3. *Dependence of surface roughness (Ra [µm]) on the current (I [A]) and OT-OP relative speed (V [mm/min])*

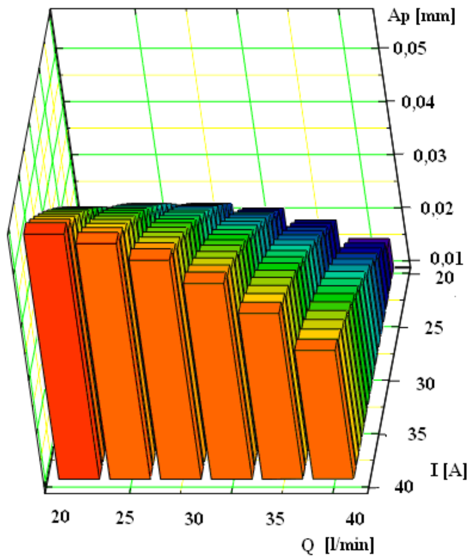

Fig. 4. *Dependence of deviation from flatness Ap [mm] on the intensity of the current current (I [A]) and the electrolyte flow rate (Q [l/min])*

CONCLUSION

The objective of mathematical modeling and optimization (Fig. 6.2.) is to develop a database (with the possibility of subsequent completing) relating to processing operations through EEC by introducing LL through OT, which can be exploited by users who want:

• any further practical attempts by providing a program of active experiment which allows executing the fewest number of attempts for as rich information as possible;
• to obtain a mathematical model of dependence of technological parameters on input factors

• to carry out a processing operation in optimal conditions established by the informatic system;
• to obtain information about the experiments that were carried out and their results.

In order to achieve this informatic system we aimed at developing the necessary algorithms on the one hand and on the other hand at defining the database information and its loading with information.

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