ESTABLISHING EXTREME POINTS IN MECHANIC PRELUCRATION OPERATIONS

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Keywords: applied mathematics in technique mechanics

For the responses supposed by the mathematical model and for each coefficient, establishing the reliable intervals is made on the basis of response dispersion, of coefficients of the model and of distribution, through some limit values.

Establishing the reliable intervals is made through a final global appreciation on the quality of the regression analysis and of the mathematic model.

For continuing the research it was necessary to identify the extreme points of the process functions, the coordinates of these points representing the set of parameters that satisfy the functions at a maximum or minimum level.

These values represent the best parameters of the working processes used in the research unfolded in this paper.

In the same time, the character of an extreme point, maximum or minimum, leads to establishing the global improvement which can be pursued.

According to the literature in this field, for a function with more variables to admit variables of first degree, it must admit a maximum point, it will have to fulfil two fundamental conditions, a necessary condition and another one sufficient.

Considering the process functions given by the specific relations, the necessary condition for these functions to admit extreme points (critical and stationary points) is in the same way that the equation system admits solutions that determines the coordinates of the searched points.

$$\frac{\partial X_i}{\partial x_i} = 0 \quad , i = 1\ldots4 \tag{1}$$

By solving this equation system with partial derivates of first degree, for each of the four process functions, we obtain values for the coordinates of the critical points, codified and natural.

The coordinates of these points are presented in the following table, for the four process functions.

For verifying the sufficiency condition of extreme condition, there were used Sylvester's [40], relations from the square forms theory which applied to the process functions with multiple variables that were studied, lead to the following theorem:

Function $f : R^n \rightarrow R$ admits in a singular point M with the coordinates (x_{01},x_{02}, …, x_{0n}) a minimum point, if only all the numbers :

$$\Delta_1 = A_{11}, \Delta_2 = \begin{vmatrix} A_{11} A_{12} \\ A_{21} A_{22} \end{vmatrix}, ..., \Delta_n = \begin{vmatrix} A_{11} A_{12} .... A_{1n} \\ A_{21} A_{22} .... A_{2n} \\ ..... \\ A_{n1} A_{n2} .... A_{nn} \end{vmatrix} \quad (2)$$

Are positive or, a maximum, if these numbers meet the requirements :

$$\Delta_1 < 0; \Delta_2 > 0; \Delta_3 < 0; \Delta_4 > 0 , \quad (3)$$

in which :

$$A_{ij} = \frac{\partial^2 X_i}{\partial x_i \cdot \partial x_j} \quad (4)$$

Considering the process functions under the form of relation, in which the coefficients and exponents have the values presented, after doing te specific calculations for the singular points of each function, with the corresponding functions, resulted the values from the following table:

Table 1

Centralizing the extreme points

Process function	The signs of the numbers Δ				Conclusions
	Δ_1	Δ_2	Δ_3	Δ_4	
Ra	< 0	< 0	< 0	> 0	Has not an extreme point
Fz	> 0	> 0	> 0	> 0	Has not an extreme point
T	< 0	> 0	> 0	< 0	Has not an extreme point
C_{dl}	< 0	< 0	> 0	< 0	Has not an extreme point

From the analysis of this table, we observe that the studied process functions do not admit absolute extreme points, these ones having only extreme points locally, which leads to the conclusion that improving the working parameters can be made by the optimized conditioned method.

In the current practice of railway wagon wheels, it is not possible for the best condition to be fulfilled in the case of some unique values of optimization parameters

After the research and the production experience acquired during the years, the conclusion that reached was that for the researched prelucrations from this paper, it is more productive for some variation intervals of the optimized parameters to be identified, in a way in which the working processes to be adapted for the particularities of the working system MUSDP at the technological rhythm of the transformed wheels, according to the optimization criteria.

Taking into account those said above, we put in a table the medium and maximum values for the process function according the values obtained precedently for the optimized parameters.

There were made influence graphics for the working processes parameters and the used materials, for the analysed process functions and there were formulated theoretical and practical conclusion.

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