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RESEARCH OF THE FINISHING AND STRENGTHENING TECHNOLOGICAL OPERATIONS BY USING SADT-TECHNOLOGIES

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The priority function of technological process design (TP) at the stage of technological preparation of production is the rationality of selection of process (or set of processes), which is achieved through the systematic design. The technical requirements should be providing both: for the individual elements of the technological environment in the development of new technological processes, and for the whole complex system "control system - technological environment" during the improvement of existing technologies. This allows to optimal realizing the technical and economic indicators for a given class of TP [1].

The technology is crucial in the formation of quality parameters of parts. Each technological operation in the structure of the technological process has an impact on the formation of the properties of the final product, given by technological inheritance. Each technological operation has an influence on the formation of the properties of the final product in the structure of the technological process, which is determined by technological inheritance. The design of multifactor technological operations, optimized for a large numbers of parameters of accuracy and surface quality should be carried out by means of SADT-Structured Analysis and Design Technique [2].

Technological operations for finishing and reinforcing, in particular surface-plastic deformations (PDD) for ensuring the quality of products has a priority task.

The peculiarity of SPD methods is to preserve the accuracy of the dimensions, achieved on the previous operation. Therefore, the use of SPD methods for finishing and reinforcing technological operations allows us to focus on the study of the quality parameters of the surface layer of products [1]. Therefore, methods of SPD on finishing and strengthening technological operations ensure formation of quality parameters of the surface layer of parts [1]. Technological operations of finishing and strengthening , which are realized by means of SPD methods, allow minimizing the influence of technological inheritance on the formation of endpoints parameters of the product.

The method of vibration-centrifugal hardening (VCH), developed at National University “Lviv Polytechnic”, refers to the methods of dynamic hardening. It is used to provide the performance of different kinds of parts. Providing of the required level of deformation energy, compactness and versatility of reinforcing devices, productivity, and the possibility of qualitative processing of internal surfaces of parts are the advantages of this method. It is an important feature that the VCH process of hardening does not require additional margins for treatment. The method of the VCH is used for the SPD treatment of parts from different materials. The VCH is also effective for hardening of parts subjected to alternating cyclic loads [1].

When using structural analysis [2] for the study of the final operations, implemented by the method of VCH, for detailing on the SADT-diagram (Fig. 1) of the technological operation it is necessary to separate the groups of physical, mechanical and geometric parameters of parts (Fig. 2).

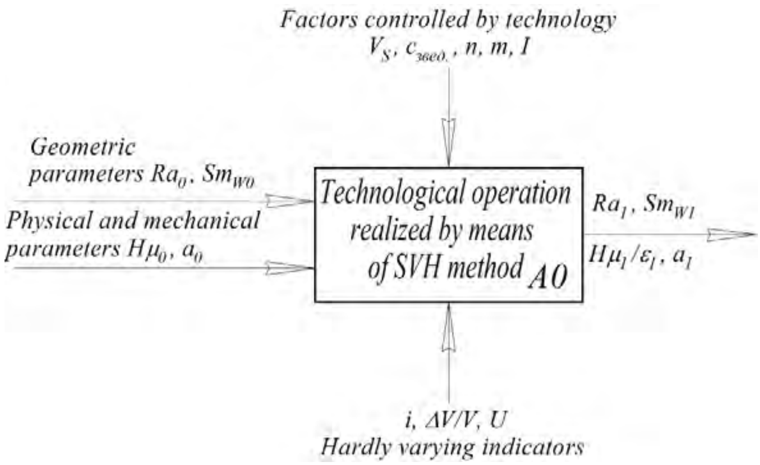

Fig. 1. The primary model of the operation of the vibrational-centrifugal hardening

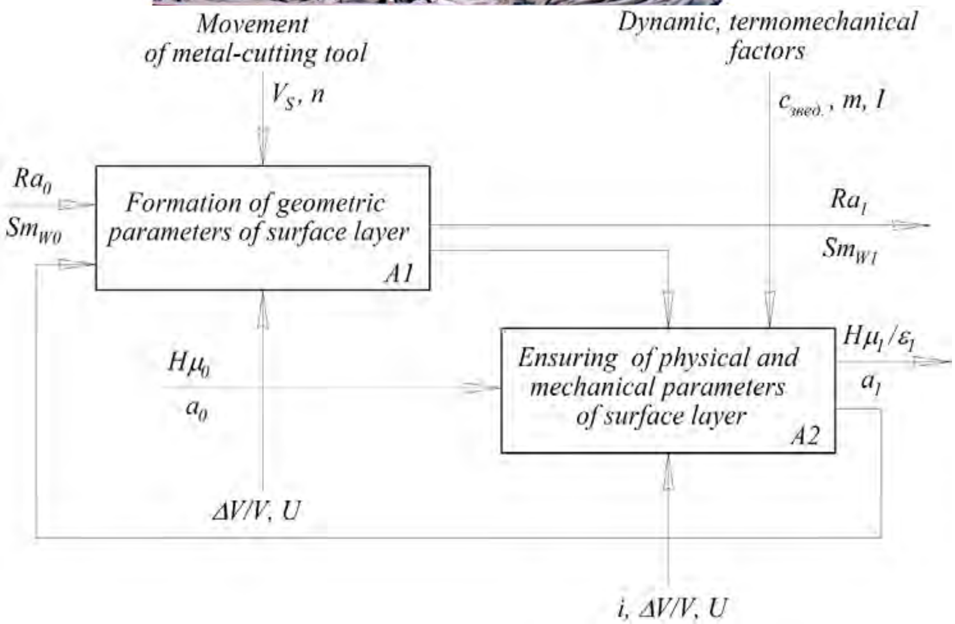

Fig. 2. The concept model of operation of vibration-centrifugal hardening.

Factors, affecting the changes in the physical and mechanical parameters of the surface of the product (the thickness of the hardened layer a and the degree of cold-hardening), are reduced rigidity of the sections of elastic systems $c_{comb.}$, the mass of the working bodies of the device $m_{2(4)}$, the feed rate n , the current in the coils of electromagnets tool *I*, (Figs. 1, 2).

To determine the physico-mechanical quality parameters of the surface layer of the material cylindrical product samples were prepared according to the standard method [1]. Samples according to the standard method were prepared for determination of physical-mechanical parameters of quality of the surface layer of the material of the cylindrical product [1]. The thickness of the hardened layer on the finished samples was estimated by means of evaluation of the distribution of micro hardness parameter $H\mu$ in the surface layer. It was measured by means of the ПМТ-3 device in accordance with [1].

The degree of the cold-hardening was determined as it follows from [1]:

$$\varepsilon = \left(H\mu_{surf.} - H\mu_{in.}\right)\cdot 100\ /H\mu_{in.}\ \left[\%\right],$$

where $H\mu_{surf.}$ - micro hardness of the hardened material surface; $H\mu_{in.}$ - micro hardness of the material before processing.

To obtain the specified physical and mechanical parameters $Y_1 = a$ and $Y_2 =$, dynamic and thermo mechanical parameters $X_2 = c_{звед}$, $X_4 = m$, $X_5 = I$ (Fig. 3) have the most significant influence.

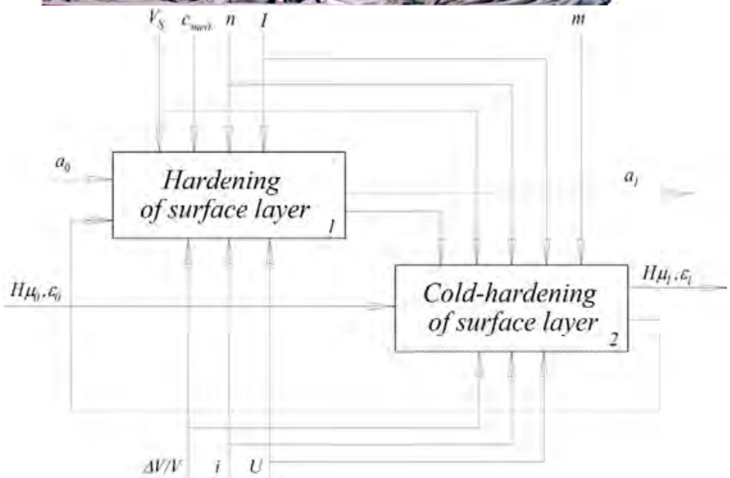

Fig. 3. Decomposition of the unit for formation of physical-mechanical parameters of the surface layer of the material

Relations $a=f\ (V_S,\ c_{звед.},\ n,\ m,\ I)$, $=f\ (V_S,\ c_{звед.},\ n,\ m,\ I)$ between physical-mechanical parameters of the surface of material and technological modes of treatment of parts were obtained by applying a fractional factor experiment 2^{5-2} and processing of the experimental data in accordance to [3].

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FINITE ELEMENT SIMULATIONS OF RUBBER SEALS IN AUTOMOTIVE INDUSTRY

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Rubber profiles are used as weatherstripin doors, windows and trunks in the automotive industry [3]. Apart from keeping rain water and dust from entering the vehicle cabin (sealing), rubber profiles have also an effect onto noise control, vibration control and decorative trim [3].

In the process of construction of rubber profiles, numerical calculations using the Finite Element Method are very important. The use of nonlinear analysis software, such as MSC.Marc/Mentat, allows to speed up the design process and fully