STUDY ON THE NEED FOR THE MODERNIZATION OF CUTTING TOOLS

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Abstract: *This study describes the trend of a new flexible work structure that allows researchers to quickly respond to market demands and respond to many challenges.The dominant feature of the current development phase of this field is the modernization, improvement, innovation of technological processes and products or services with the ultimate goal of satisfying customers*

Keywords: cutting tools, research, analysis, design, new products.

1. INTRODUCTION

At present, manufacturing methods and systems are continually changing, new processing technologies are emerging, technological flows have a minimum number of phases, technology flexibility grows, methods and tools for managing and monitoring processing processes appear [1]. Of all the technological processes necessary for the execution of equipment, machinery, machinery, the mechanical processing process is the most complex. Nowadays about 20% of the current materials used for the processing of large and mass series are special.

The new, modern tools are made of more tenacious carbons and in the same time more durable, dedicated to higher cutting speeds, generating lower cutting forces. They are equipped with chip breakers, have a high degree of universality, and in terms of the types of materials they process, they have a broad spectrum of action. Therefore, the trend is a universalisation of instruments. Increasingly, tools become multifunctional, being implemented as much as possible in modular systems that reduce inventory of tools to the user (related costs) and, at the same time, increase their capabilities.

New surprising tools are being developed for the new approach to manufacturing, such as tangential pocket-type turntables for very high working speeds, MQL cooling tools (low-volume lubrication), tools for machining very harsh material. Modern machine tools offer more and more solutions to processors, which often leads to "rethinking" the manufacturing processes of different parts and especially small ones. Multifunction machines and lathes equipped with drive units offer the possibility of performing different types of operations on the same machine tool. The possibility of machining the pieces in one piece, represents a long time the dream of many chippers. Particularly, this step forward is appreciated by small-volume manufacturers who have a high volume and reduced cycle times. [2]

The continuous development of multifunctional cutting tools and the complexity of the works led to the emergence of specialized software tools to assist the management of the various technological processes. There are applications that can be easily adapted to the technological process of mechanical processing such as: planning of activities under constraints, cost control, working charts, import / export data, generation of work reports, resource management, monitarization and control projects, sorting and filtering work data.

The technological process of mechanical processing requires that the activities be

carried out in a certain order, well determined sequence. Some activities can begin only after others have finished (immediately or after a certain interval), other activities must begin before others end in order to ensure a good synchronization.

2. THE STAGES OF PRODUCT DEVELOPMENT

One of the common problems in both management and engineering is the difference between the current and the desired state, and it is necessary to identify the corrective actions.

The stages of achieving a new product include: defining the problem, setting research objectives, establishing new product functions, hierarchizing functions, designing the product, designing, adapting and improving the optimal solution. At these stages are added audit, monitoring and control actions, which are considered as cross-actions, so they run throughout the new product. In order to exemplify the design methodology, the specifications of a project theme are defined. The design of a technological process involves the adoption by the technologist of decisions that will ensure the realization of the product in conditions of maximum productivity, costs and high quality. Taking into account all of these criteria involves designing an optimal technological process. The optimization of a technological process must respond to economic functions, which can be expressed in value through minimum production costs or a minimum manufacturing cycle. [3]

The optimization of the conditions in which the cutting process is carried out requires the optimization of the factors determining the cutting process, ie the cutting depth (t), the feed (s), the cutting speed (v), etc.

The major objectives to be pursued by the design team for making a new product are:

- high quality;
- low costs;
- high productivity;
- ease of operation.

The optimal cutting regime, which ensures minimal costs and programmed productivity with respect to the technical quality requirements imposed on the workpiece, is determined by the coordination of the kinematics and dynamics of the machine tool with the possibilities of cutting of the cutting tools, solving the problem using the mathematical methods of the theory linear programming. [4]

In most cases, the optimization function is considered the cost of an operation:

$$C_{op} = \frac{cons\tan t}{t.s.n.} \quad \text{[lei]} \tag{1}$$

From the relationship it follows that the minimum value of the cost of an operation is given by the maximum value of the product from the denominator.

Market analyzes can be made on the product-specific offer that the main tool-makers can analyze; in the end, the Quality House allows the response that the project can deliver to the customer's expectations. It is found that this quality house is a systematic method of analysis, documentation and evaluation. The centralization of all data is done by one of the team members, for example with the Qualica software.

The final product of this analysis is a set of engineering values that must be found in the new design tool. These values include information about customer needs, competitors' liking, and the potential of the research center. [5]

The functions of the new product set by the team can be:
- obtaining a certain diameter or a certain size;
- obtaining a certain surface accuracy and tolerance;
- roughness of the surface;
- high productivity;
- high durability;
- fast tool reconfiguration;
- extended scope of use;

The functions the cutting tool needs to perform for drilling, boring, grooving, bending, are decisive in designing the representative tool model for the required operations. The materialization of the functions that the proposed model has to fulfill, highlights the constructive theoretical variants of drilling and drilling tools, which can then determine the construction of the optimal model. In order to arrive at an optimal solution, a heuristic analysis combined with morphological analysis is used.

3. SPECIFICATIONS ON THE ADVANTAGES OF USING MODERN CUTTING TOOLS

Figure 1 shows a front cutter COROMANT.

At this milling each plaque has four cutting edges.

Fig. 1 Front cutter COROMANT

The new cutting tools achieved in the field are designed to add value in the form of high speed capacities and provide a safer cut edge with a consistent tool hardness, all of which help reduce cost per component. Deburring can be done with the removal of larger blades. The process allows for reduced processing time and costs by offering a full range of benefits. Not all of these advantages are due exclusively to quality, a very important factor in the structure and geometry of the cutting edge. A standard toe radius generates the smallest cutting forces and is suited to low stability. Wiper and Xcel geometries are designed to provide a combination of high productivity and optimal surface finishing. [6]

Top Plate Radius is a performance parameter required for the machining process. A small peak of 0.2-0.4 mm (0.008-0.0016 to) ensures good chip breaking, while a high radius of 0.8-1.2 mm (0.03-0, 05 toll) generates better surface finishing and produces smaller chips, thus reducing crate cracking.

Turning hard parts requires CBN (cubic boron nitride) quality plaques because it has been proven that they keep their cutting edge at temperatures and high cutting forces.

Typical components that can be processed with this assortment include toothed wheels, pinions, toothed crowns, joints, etc. [7]

Reliable and repeatable machining is also always the objective when turning a cementitious component or a high-quality inducer, such as transmission shafts and toothed wheels. Using the newest CBN quality sheets with advanced substrates, edge preparation and optimized cutting edge quality, manufacturers can provide a better and more predictable level of tool durability and process reliability.

Fig. 2 High speed F90LN-AFR CA11 milling machine

The milling cutter from Fig. 2 is dynamically balanced, with adjustable pockets equipped with PCD / CBN plates being made predominantly in automotive and aerospace industries.

The tool body is lightweight, made of aluminum alloy and provided with an outer coating that gives high hardness and adhesion to the contact with the shavings. The milling cutter is equipped with a front shield, which spreads the liquid in radial directions and thus trains the chisels, eliminating the unwanted re-cutting phenomenon. Pockets are provided with axial, bi-directional adjustment mechanism. By simply actuating a screw, the cutting edges can be placed in the same plane, within a 0.002mm tolerance field. They are dynamically balanced to work at high speeds and are in most cases equipped with PCD / CBN plates. Mills can also be equipped with standard pads. [8]

4. CONCLUSIONS

In experimental research or in production conditions, the determination of cutting capacity based on the durability of the cutting tool involves the passage of some stages, starting with the preparation of the tool and ending with the achievement of the value of the durability.

The results obtained can help determine the reliability of the cutting tools. Durability determined in complex working conditions is also called good working time.

The advantages that special tools bring to this type of production cancel the price differences between them and the standard tools, bringing extra profits, so unrealized. Ensures that you maintain the desired productivity level.

Along with switching to computer-assisted manufacturing, the methodology for setting the values of the chip parameters has improved with the use of automated computing programs using various databases.

The technological process as part of the manufacturing process is an orderly succession of operational systems that embody a decision-making approach on each stage of the work.

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