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ANALYSIS OF THE MILLING PROCESSING PROCESS ON THE SHAPED SURFACES OF STAMP MOLDS

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ABOUT ARTICLE

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Abstract: In modern mechanical engineering, the development of a technological process for processing stamping forms on shaped surfaces remains the most important task of today. Before processing the shaped surfaces, it will be necessary to study the working surfaces of the stamping molds. This article describes methods for determining the geometric parameters of the surface when processing stamping forms on shaped surfaces, in particular, the drawing structures of the cutting zone of shaped surfaces, the penetration of the cutter into the cutting zone and data on the conditions of editing in the cutting zone.

INTRODUCTION

When black milling the shaped surfaces using a cylindrical milling cutter, untreated zones are formed in it. Untreated surfaces are made with spherical clean milling cutters, and the cutting force will not be constant as the angle and processing depth of the treated surface are constantly changing during full milling processing. This in turn leads to a change in the trajectory of the cutting edge of the cutting tool and, as a result, to a processing error. Existing methods, including additional adaptive devices, do not allow proper control over the processing of such cutting areas in clean processing. Therefore, the issue of setting optimal cutting conditions on any part of the surface to be treated should be resolved at the stage of developing the control program. In existing Sam systems (including high-level UNIGRAPHICS, CATIA, PRO/ENGINEER), it is based on the modeling of the object structure (parasolid-format X_T), it is necessary to carry out the step-by-step removal of the sheep from the zagotovka model, the detail model processed to control the cutting modes. But in Sam systems, the zagotovka model is built through the edges (STL format), and therefore modern Sam systems cannot perform rotational operations around their axis. Even if we mean that the formats of the detail and zagotovka (from the previous Opera) coincide, the system will have to perform a step-by-step determination of the cutting volume. This significantly increases the calculation time of the control program.

When developing a control program, the Sam system itself only calculates the trajectory of the instrument. The technologist-programmer sets the following parameters:

- working push;

- the push of the first keskich;

- adding cutting tools and pushing;

- accelerated push value;

- the number of turns of the spindle.

It should be noted that during the processing of the control program, the values of these parameters do not change.

In this regard, it is necessary to develop a new method that allows you to influence the formation process by controlling the cutting modes in algorithms on any part of the treated surface.

To do this, the RDB system must solve the following tasks.

- determination of changes in the geometric parameters of the processing zone;

- scaling processing modes, bringing their value to the optimal state, processing in any part of the surface.

Solving these problems provides stabilization of power parameters that affect the accuracy and quality of shaped surfaces treated during volumetric clean milling.

When volumetric milling of shaped surfaces with spherical milling cutters, the action of the cutting tool is usually given in accordance with the norms in relation to the surface to be treated. This method reduces the number of working and idle movements and improves the accuracy and quality of processing. The trajectory of the cutting tool during hajmiy processing is the movement along the oblique path.

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To determine the maximum possible sheep value, it will be necessary to know the bogies of the surface to be processed, the trajectory of the cutting tool.

However, modern systems do not automatically carry out such an analysis on their own. To do this, it is necessary to build surface sections that require additional costs. The top part of the parabola is in the form of an ellipse and a hyperbola, and the shape is slightly different from each other.

Based on this, the parameter of the maximum possible quantity for any type of cone is considered the same, and the parabola parameters are more easily accepted by RDB systems, and the maximum permissive parameters are generated for specific sections, and the maximum possible sheep per para parabolic section is calculated.

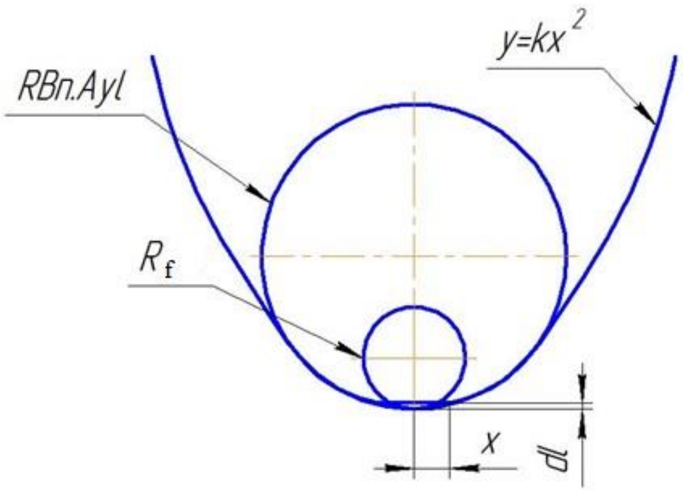

Fig 1. Scheme for calculating Parabola parameters

Parabola equation:

$$y=kx^2 \qquad (1)$$

In the part of the parabola where ΔT depends on the accuracy of operation, it is possible to build a circle with a circle radius RBn.ayl. From production experience it is known that the maximum radius of the cutting tool should be 1.1 times less than the radius of the inscribed circle in order to ensure that it is free of crumbs during the cutting process. Therefore, 1. according to the figure, the parabola coefficient k-depends on the radius of the instrument instrument sphere used.

$$x=\sqrt{(1{,}1R_{fr})^2-\left(1{,}1R_{fr}-\Delta\mathrm{T}\right)^2}=\sqrt{(1{,}1R_{fr})^2-(\left(1{,}1R_{fr}\right)^2-2{,}2R_{fr}\Delta\mathrm{T}+\Delta\mathrm{T})^2}=\sqrt{\Delta\mathrm{T}(2{,}2R_{fr}-\Delta\mathrm{T})} \qquad (2)$$

From the Parabola equation:

$$y=\mathrm{k}x^2 \Rightarrow k=\frac{\mathrm{y}}{x^2} \qquad (3)$$

$$\Rightarrow k=\frac{1}{2{,}2R_{fr}-\Delta T} \qquad (4)$$

The last semi-clean transition process is performed with cylindrical frees equal to the diameter of the cylindrical frees. Therefore, the maximum value of the incremental sheep for processing into a symmetric parabola is determined by the following expression:

$$H_{1пар} = y = kx^2 \approx k(R_{fr} + T) + T^2 = \frac{(R_{fr}+T)^2}{2{,}2R_{fr}-\Delta T} + T^2 \qquad (5)$$

The expression calculates the maximum sheep parameter that can be formed during Black processing with a cylindrical milling cutter, provided that the diameter of the cylindrical chisel is equal to the spherical diameter.
parabolic cut. In practice, such a situation is extremely rare and requires its completion.
The actual value of the sheep depends on any part of the processed trajectory:
Expression (5) calculates the depth of the cut for a random part, a

- Diameter of D_{fr} disposable cutting tool.;
- T one-time processed sheep;
- -part of the radius of the arc of the $R_{surface}$ circle of the treated surface.

The action of the cutting tool during processing is calculated by the formula for the maximum depth of the untreated part for shaped surfaces, which is performed in a circle:

$$H_{lokr} = H_2 + T, \qquad (6)$$

Here H_2-additional leave, mm.
Seen from the expression

$$tg\alpha = \frac{2H_2}{R_{fr.}} \Rightarrow H_2 = \frac{R_{fr.}tg\alpha}{2}; \qquad (7)$$

$$sin\alpha = \frac{R_{fr.}}{R_{surf.}} \Rightarrow \alpha = arcsin\frac{R_{fr.}}{R_{surf.}}; \qquad (8)$$

Then the equation takes the following value:

$$\text{t. k. } H_2 = \frac{R_{fr} \cdot tg(arcsin\frac{R_{fr}}{R_{surf}})}{2} \Rightarrow$$

$$H_{1ayl} = \frac{R_{fr} \cdot tg(arcsin\frac{R_{fr}}{R_{surf}})}{2} + T, \qquad (9)$$

CONCLUSION

The analysis of the resulting expression shows that the larger the diameter of the first-obtained die and cutting tool, the higher the cutting depth parameter on the previously untreated surface, and the greater the radius of the surface to be processed, the lower the processing depth.Removing the putty on the treated surface is put as the main task.In this case, the cutting parameters of the cutting tool and the thickness of the cutting layer are considered important.As the cutting tool moves along a complex shaped surface, it will be necessary to structure the processing trajectory with optimal behavior in CAD/CAM/CAE systems.Because the cutting tool the cutting part parameters can be eaten, broken when processing along the trajectory, the parameters of the cutting part may change.This in turn affects the surface quality of the cutting surface.In this article, the capabilities of the CAD/CAM/CAE systems were used when processing the working part of stamp molds.

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