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INVESTIGATION OF THE AXIAL TOOL FEED EFFECT ON THE GEOMETRIC PARAMETERS OF THE CHIPS IN POWER SKIVING PROCESSING

In today's flexible manufacturing environment, the search for new and productive methods of gear machining is a pressing issue for business technologists.

Today, Power Skiving is such a process. In recent decades, it has been increasingly used and developed by the world's leading companies. The progress of this method of gear cutting is mainly due to the invention of servo motors and the development of computer numerical control machines [1-3].

The main objective of this work is to determine the parameters of the undeformed chips formed during the cutting of the external gear rim by means of geometric modelling. Finding all the geometrical parameters of this chip will provide answers to the necessary forces and power for cutting teeth, temperature indicators during machining both on the gear and on the tool edge. Based on the results of the study, the most rational technological parameters can be determined and recommended to the technologist for machining a given gear.

Once the simulation is complete and all the sections of undeformed chips have been obtained at each fixed cutter position, a 3D chip model can be created. Knowing the trajectory of the tool movement and the known shape of the chip cut at each step, it is possible to reconstruct its three-dimensional shape. The proposed algorithm allows this to be implemented using CAD. Particular attention should be paid to the chip thickness at each of these positions, as well as the change in the cross-sectional area of the chip during the cutting process. The chip thickness is determined on the cross-section of the undeformed chip for each position and for each part of the cutter (leading, upper, trailing).

Table 1 – Thickness and cut area of undeformed chips for different axial tool feed

		Axial tool feed mm/rev			
		0,25	0,5	0,75	1,0
leading edge	thickness, мм	0,004	0,017	0,036	0,065
	cutting area, mm^2	0,007	0,028	0,058	0,098
upper edge	thickness, мм	0,013	0,051	0,116	0,207
	cutting area, mm^2	0,014	0,058	0,136	0,260
trailing edge	thickness, мм	0,011	0,041	0,091	0,155
	cutting area, mm^2	0,029	0,118	0,264	0,458

In all the simulations performed, the effect of axial tool feed on the thickness and cutting area of the undeformed chip is the greatest, demonstrating the direct relationship between feed rate and chip shape. In many cases, the free flow zone around the gear is limited, so large tilt angles are not always achievable.

References

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