Theoretical Analysis of the Contact Area between Grinding Wheel Surface and Workpiece in Flat Face Grinding with Spindle Axis Inclination

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Theoretical analysis has been carried out for the determination of the analytical dependences connecting various parameters of contact area between wheel cutting surface and workpiece, such as length, width and arc length in the case of flat face grinding with preliminary inclination of spindle axis. The role of factors, such as angle of preliminary inclination of the spindle axis, grinding depth and grinding wheel diameter, in this process, are established. The capability to define the above mentioned parameters permits the calculation of the contact area between wheel cutting surface and workpiece. In addition, with the proposed methodology, it is possible to correctly determine the value of cross-feed, in the case of multiple-pass processing scheme, which, as it is known, should be consistent with the value of contact width of wheel cutting surface with workpiece. It can be guaranteed that on the ground surface there will be no areas unaffected by the wheel. In the case of through-feed grinding the obtained theoretical dependences make it possible to determine the processing conditions, taking into account the allowable value of flatness deviation. Finally, the latter, contributes in improving flat face grinding process and thus expanding its technological capabilities.

Keywords: wheel cutting surface, contact area, spindle axis inclination, grinding depth, wheel diameter

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