Effect of manufacturing imprecision in tap surface-shaping points on the radial force

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The article presents an analytical description of the threaded coupling between the tool and the workpiece as a complex geometric object characterised by specific manufacturing precision. We analyse the extent to which components of manufacturing imprecision in the tool cutting edge affect thread cutting dynamics. The study shows that the radial force component that depends on the effective thread diameter deviation proper is the most significant one for taps of all tolerance classes. We consider the possibility of computing dynamic properties based on the actual thread profile outline, to be used at the design stage for standardising manufacturing precision of surface-shaping points of the threading tool implementing a nibbling cutting pattern.

Keywords: *thread cutting, nibbling cutting pattern, tap, tolerance, error, precision, chip parameters, radial force*

REFERENCES

[1] Matveev V.V. *Narezanie tochnykh rezb* [Precision thread cutting]. Moscow, Mashinostroenie Publ., 1978, 85 p.

[2] Ananev A.S., Serov V.P. *Tekhnologiya mashinostroeniya — Journal "Tekhnologiya mashinostroeniya"* [Mechanical engineering technology], 2008, no. 4, pp. 67–68.

[3] Ivanina I.V. *Vestnik MGTU im.N.E. Baumana. Ser. Mashinostroenie — Herald of the Bauman Moscow State Technical University. Ser. Mechanical Engineering*, 2002, no. 4, pp. 56–68.

[4] Ivanina I.V. *Izvestiya vysshikh uchebnykh zavedeniy. Mashinostroenie — Proceedings of Higher Educational Institutions. Machine Building*, 2004, no. 10, pp. 56–63.

[5] Ivanina I.V. *Izmeritelnaya tekhnika — Measurement Techniques*, 2005, no. 10, pp. 38–41.

[6] Dobryanskiy S.S. *Visnik Natsionalnogo tekhnichnogo universitetu Ukraini "Kiivskiy politekhnichniy institute", Seriya Mashinobuduvannya — Journal of Mechanical Engineering, the National Technical University of Ukraine "Kyiv Polytechnic Institute"*, 2012, no. 66, pp. 17–20.

[7] Dobryanskiy S.S. *Visnik Natsionalnogo tekhnichnogo universitetu Ukraini "Kiivskiy politekhnichniy institute", Seriya Mashinobuduvannya — Journal of Mechanical Engineering, the National Technical University of Ukraine "Kyiv Polytechnic Institute"*, 2012, no. 66, pp. 43–46.

[8] Ananyev A.S., Zemlyanskiy M.S. *Izvestiya Volgogradskogo gosudarstvennogo tekhnicheskogo universiteta — Scientific journal "Izvestia VSTU"*, 2010, vol. 6, no. 12 (72), pp. 6–7.

[9] Ananyev A.S., Serov V.P. *Obrabotka metallov (tekhnologiya, oborudovanie, instrumenty) — Metal working and material science*, 2008, no. 3, pp. 24–25.

[10] Markov A.M., Lebedev P.V. *Obrabotka metallov (tekhnologiya, oborudovanie, instrumenty) — Metal working and material science*, 2011, no. 1, pp. 8–11.

[11] Dreval A.E. *Izvestiya vysshikh uchebnykh zavedeniy. Mashinostroenie — Proceedings of Higher Educational Institutions. Machine Building*, 1970, no. 9, pp. 174–178.

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