
Improving the efficiency of carbide cutters use for face grooving on the details of rocket and space machinery

© S.V. Grubby¹, L.A. Tatarova², E.V. Vorobyeva²

¹ Bauman Moscow State Technical University, Moscow, 105005, Russia

² ZAO “ZEM” of S.P. Korolev Rocket and Space Corporation “Energia”, Korolev, 141070, Moscow region, Russia

The article presents results of engineering research carried out for the purpose of hard-alloy cutters testing and commissioning. The end grooves of these components were machined with hard-alloy cutters at the "Energia" Corporation. The calculations and analysis showed that the cutters are functional, cutting is fulfilled without chattering. The machined surface quality meets the requirements. There were no cutter breakages registered during manufacturing testing. In spite of this fact there are some breakages under the workshop conditions. This points out to the necessity of strength calculation to be carried out. Cutting part stress condition has great tension stress. The limit value of certain nodes tension is approximate to hard-alloy strength. It is necessary to increase the cutter face angle or to apply high strength hard-alloy for cutter making. According to the research we developed technological recommendations and grooving carbide cutters were implemented in the production of parts of space hardware.

Keywords: face grooves, carbide cutters, strength criteria, geometrical parameters of cutters, factor of safety, cutting mode.

REFERENCES

- [1] *Catalog of the Carmex Precision Tools Ltd, 2013.* Available at: <http://www.carmex.com> (accessed on 03.09.2014).
 - [2] *Catalog of the company Kemmer GripLock, 2014.* Available at: <http://www.kemmerhwm.de> (accessed on 03.09.2014).
 - [3] Grubby S.V. *Modelirovanie protsessa rezaniya tverdospavnymi i almaznymi reztsami* [Modeling of the cutting process by carbide and diamond tools]. Moscow, BMSTU Publ., 2010, 107 p.
 - [4] Grubby S.V. *Fizicheskie zakonomernosti protsessa iznashivaniya tverdospavnnykh i almaznykh instrumentov* [Physical laws of the wear of carbide and diamond tools]. Moscow, BMSTU Publ., 2013, 123 p.
 - [5] Grubby S.V., Zaytsev A.M. *Nauka i obrazovanie. Elektronnoe nauchno-tekhnikhicheskoe izdanie — Science and Education. Electronic Scientific and Technical Journal*, 2013, no. 12. doi: 10.7463/1213.0634375
 - [6] Grubby S.V., Lapshin V.V. *Nauka i obrazovanie. Elektronnoe nauchno-tekhnikhicheskoe izdanie — Science and Education. Electronic Scientific and Technical Journal*, 2013, no. 9. doi: 10.7463/0913.0598355.
 - [7] Grubby S.V., Lapshin V.V. *Nauka i obrazovanie. Elektronnoe nauchno-tekhnikhicheskoe izdanie — Science and Education. Electronic Scientific and Technical Journal*, 2014, №2. doi: 10.7463/0214.0699743
 - [8] Astafiev V.A. *Raschet dinamicheskoy prochnosti rezhushchego instrumenta* [Calculation of dynamic durability of the cutting tool]. Moscow, Machinostroenie Publ., 1979, 168 p.
 - [9] Silin S.S. *Metod podobiya pri rezanii materialov* [A method of similarity when cutting materials]. Moscow, Machinostroenie Publ., 1979, 152 p.
 - [10] Kirsanov S.V. *Spravochnik. Inzhenernyi zhurnal — Handbook. An Engineering Journal*, 2014, №5, p. 2–5.
-

Grubyy S.V., Dr. Sci. (Eng.), Professor of the Instrumental Techniques and Technologies Department at Bauman Moscow State Technical University. He is a specialist in modelling, optimization, control of machining processes, study of cutting tools wear, analytical mechanics of the cutting processes, development of ultra-precision machining. e-mail: grusv@yandex.ru

Tatarova L.A., an engineer, head of the Department at ZAO “ZEM” of S.P. Korolev Rocket and Space Corporation “Energia”. She is a specialist in organization, development and introduction of progressive technological processes of machining parts for rocket and space hardware. e-mail: omo471@mail.ru

Vorobyeva E.V., an engineer at ZAO “ZEM” of S.P. Korolev Rocket and Space Corporation “Energia”. She is a specialist in progressive designs of cutting tools. e-mail: evgeniavo@mail.ru
