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STUDY OF RELATIONSHIP BETWEEN THE PROCESSED MATERIAL HARDNESS AND THE PRETREATMENT SPEED

This research is funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant No. AP14972884). *This research has shown that a serious limiting factor inhibiting the use of harder metals and alloys as dressing materials is the loss of form stability of the cutting edge when, due to high contact loads, it is plastically deformed with deterioration of cutting properties caused by changes in the geometry of the cutting edge. To address this issue, a study of the relationship between the hardness of the machined material and the pre-treatment rate was carried out. Pretreatment was carried out on two heat-treated hardened 20X steel materials with a hardness of HRC 21...23 and HRC 19...20.*

As a result it is established that by varying the hardness of the machined material during tool lapping it is possible to increase the hardening effect and significantly reduce the material consumption.

Also plots of influence of pre-treatment duration on tool life of T5K10 when turning steel 20X (HRC 16...17) and influence of hardness of working material on optimum rate of pre-treatment of R6M5 tool and time of pre-treatment are presented.

Keywords: Hardness, pre-treatment, hardening, optimum rate, wear resistance, pre-treatment time.

Introduction

The existence of optimum regimes of tool pre-treatment is theoretically and experimentally proved [1–5], but their fast and reliable determination is still an open question. Taking into account that the main role in formation of the wear resistant contact secondary structures is played by the deformation hardening processes, it is necessary to solve the optimization of the pre-treatment mode from the deformation-thermal point of view. Deformation hardening processes during tool pre-treatment are realized on the background of technological factors, therefore when solving problems of optimization of pre-treatment it is necessary to take into account all technological features of exploitation of concrete type of the tool [6].

Numerous experimental studies have established that for the majority of metal-cutting tools, optimum conditions for pre-treatment lie in the area of reduced cutting conditions, which can be achieved by reducing either the cutting speed or feed rate. In order to clarify the efficiency of pre-treatment when varying different parameters of cutting conditions, a special series of experiments was presented, when an optimum condition was achieved by autonomous undercutting of cutting speed and feed.

The effect of improved durability when running at a reduced speed was almost twice as effective as running at the optimum cutting speed compared to running at the optimum feed rate, and this process of varying the cutting speed is much easier to implement [6].

Materials and methods

The optimum mode of tool pretreatment provides the best deformation and thermal hardening conditions, which can be further improved if the pretreatment is carried out on a harder material. To clarify this circumstance by special experiments a study was carried out to find out the effect of hardness of the machined material on the wear resistance of the secondary contact structure [5, 7]. The results of this series of experiments are presented in figure 1, where the effect of hardness ratio of machined material to tool material on the degree of increase of tool material durability after machining in relation to a conventional tool is presented [7].

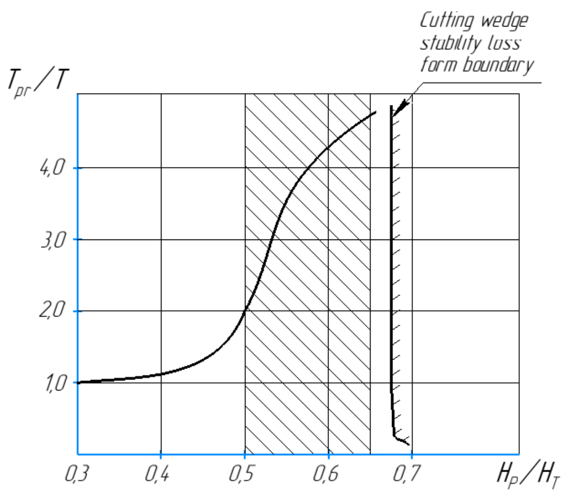


Figure 1 – Effect of hardness ratios of machined (NP) and tooled (NT) materials on the magnitude of the increase in pre-treatment durability

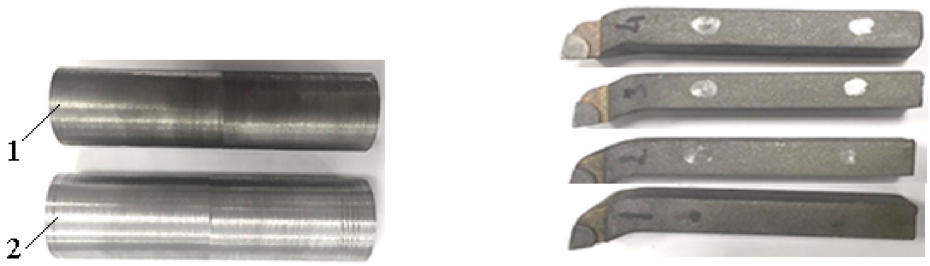
The dependence has monotonically increasing character, showing that with the increase of hardness of the processed material the hardening effect of working surfaces of the tool increases, thus the degree of increase of durability can reach values at a level of 4.5...4.6 times. The character of the specified dependence once again confirms that deformation processes play an important role in the mechanism of formation of wear-resistant secondary contact structure [6–8].

A serious limiting factor restraining the use of harder metals and alloys as running materials is the loss of dimensional stability of the cutting wedge, when, due to high contact loads, its plastic deformation occurs with deterioration of cutting properties caused by changes in the geometry of the cutting edge. According to the existing conceptions [9–11] the loss of form stability takes place, when the hardness ratio of tool material to tool material is greater than 1.4...1.6. Then the boundary of loss of form stability on figure 1 can be represented by the vertical line, drawn through the abscissa axis at the level of . A doubling of the resistance takes place starting with a hardness ratio of 0.5. Therefore the range of hardnesses of processed materials providing double increase of firmness is 0,5...0,65 [6-8].

An important parameter of the pre-treatment process is its duration, which determines the degree of completion of the secondary structure.

Results and discussion

Experimental studies on the pre-treatment of lathe cutters were carried out in the laboratory of the «Technological machinery and equipment» department of the S. Seifullin Kazakh Agrarian-Technical Research University. Machining of workpiece from steel 20X during pre-treatment of cutters was made on screw-cutting lathe 1K62.



a) b)

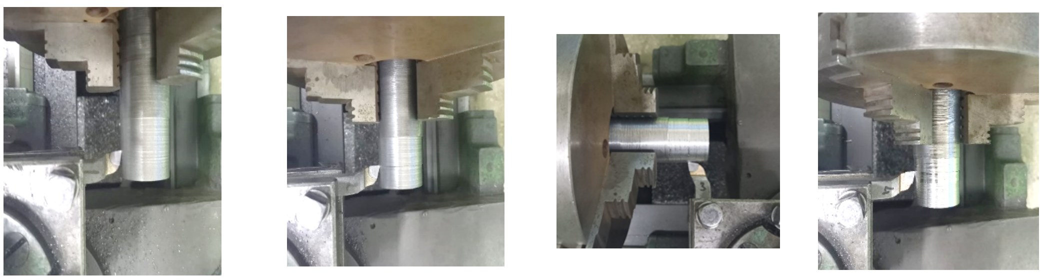
Figure 2 – shows the workpieces and cutters used during pre-treatment

1 – with hardness HRC 21...23; 2 – with hardness HRC 19...20;

a) workpieces of 20X steel hardened by heat treatment; b) undercutting tools from T5K10

Figure 2 – Workpieces and cutters used during pre-treatment

Figure 3 shows the pre-treatment process for picks.



a) b) c) d)

Figure 3 – Process of pre-treatment of cutters

a) cutter №1; b) cutter №2; c) cutter №3; d) cutter №4

Figure 4 shows the machined workpieces during pre-treatment.

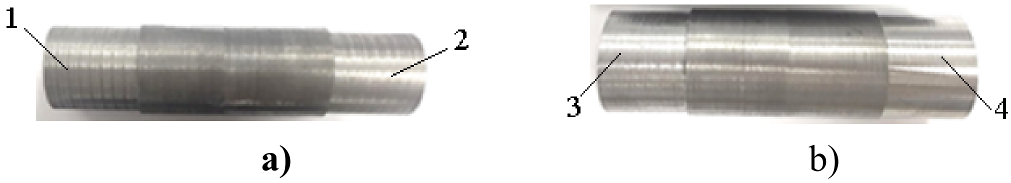


Figure 4 – Machined workpieces during pre-treatment

1 – frequency of rotation nsp = 20 rpm; 2 – frequency of rotation nsp = 40 rpm; 3 – frequency of rotation nsp = 63 rpm; 4 – frequency of rotation nsp = 80 rpm

a) workpiece with a hardness of HRC 21...23; b) workpiece with a hardness of HRC 19...20

In figure 5 results of researches on influence of duration of the period of preliminary pre-treatment on durability of the cutter from T5K10 at turning 20X with HRC 16...17 on modes V=60 м/min; S=0,2 mm/rev; t=0,3 mm are resulted.

Pre-treatment was carried out on two heat-treated hardened 20X steel materials with a hardness of HRC 21...23 and HRC 19...20. In the first case, the pre-treatment speed was Vn = 3 m/min, and in the second case, Vn= 6 m/min. The pre-treatment time was varied from zero to 6 minutes. The received results showed the following: at pre-treatment on a workpiece with hardness 21...23, optimum duration of pre-treatment was 3 minutes, and at cutting on a material with hardness 19...20 – 5 minutes, i.e. with increase of hardness of processed material, duration of pre-treatment providing maximal durability decreases. Depending on the pre-treatment time the character of wear accumulation curve also changes. Thus, with the pre-treatment duration shorter than the optimum, the catastrophic wear area is faintly visible on the blunting curve, which disappears as the pre-treatment duration approaches the optimum one. Pre-treatment at the optimum variant provides tool operation up to the accepted criterion of blunting in the mode of steady-state wear. If the pre-treatment period is longer than the optimum, tool durability decreases due to the high value of pre-treatment wear. Optimum mode of pre-treatment corresponds to the value of pre-treatment wear in the range hp = 0,18 ... 0,22 mm.

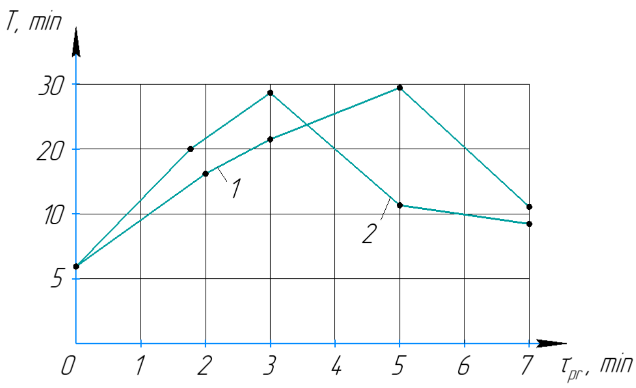


Figure 5 – Effect of pre-treatment duration on durability of T5K10 cutter when turning steel 20X (HRC 16...17)

1 – hardness of pre-treatment steel HRC 19...20; 2 – hardness of pre-treatment steel HRC 21...23

In earlier works on pre-treatment in order to substantiate the physical nature of optimum regimes the studies on the independent influence of temperature and velocity factors on the formation of wear resistant contact structures have been given [12–14]. In particular, it was noted that in the real process of cutting the temperature and velocity factors are inseparable and are determined by machining modes. It was found that the experimental character of the influence of cutting speed on the hardening and wear resistance of the secondary contact structure of the tool is determined by temperature factors, while the degree of hardening and the numerical value of wear resistance are determined by the speed factor. In addition, it has been shown that the autonomous velocity effect represents one of many, and not always dominant, factors responsible for the degree of hardening. Indeed, the amount of hardening is determined by the degree of plastic deformation, the numerical value of which depends on specific contact loads, contact adhesion forces, process duration and sliding speed. Therefore, it can be assumed that in many cutting modes, the contact layers of the tool reach the ultimate hardening state, and the degree of completion of this process will mainly depend on time.

The effect of the hardness of the material to be machined on the optimum pre-treatment speed and pre-treatment time is shown in Figure 6, from which it can be seen that the optimum pre-treatment speed and time decrease as the hardness increases.

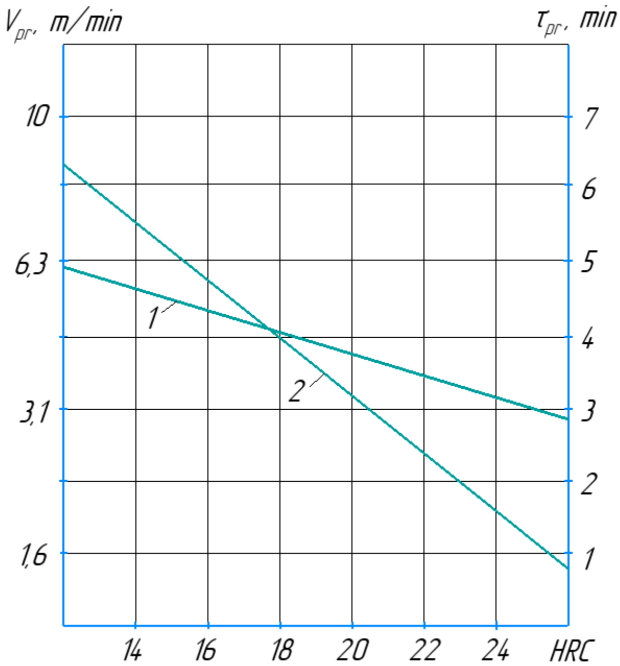


Figure 6 – Influence of hardness of the machined material on the optimum pre-treatment speed of the R6M5 tool and the pre-treatment time

1 – pre-treatment time τpr; 2 – pre-treatment speed Vpr

The optimum pre-treatment speed in this case for a high-speed tool can be determined according to the empirical formula

$$V_{opt}=1,87–0,047·HRC_m$$

where Vopt is the optimum pre-treatment speed, m/s;
HRCm is the hardness of the pre-treatment material.

Based on the above it is possible to conclude that by varying the hardness of the workpiece during tool-hardening it is possible to increase the hardening effect and significantly reduce material consumption. So, we are using steel with hardness HRC 20, optimum cutting speed is 28 mm/min, and grinding time is 5 minutes, while length of the travelled path (or material consumption) is 160 m. With steels in hardness HRC 23, an optimum cutting speed of 4 m/min and a pre-treatment time of 3 minutes, which corresponds to a travel distance of 12 m. Hence, pre-treatment on a billet with HRC 23 saves more than 10 times the material, and shortens the process by more than 15 times compared with the raw steel process.

Conclusions

1. The efficiency of the pre-treatment of cutting tools can be improved by using steels with higher hardness as the pre-treatment material. Higher contact loads occurring during the cutting process provide greater strain hardening and shorten the pre-treatment time.

2. Pre-treatment increases not only the wear resistance of tool working surfaces, but also the operational reliability and heat resistance of contact structures.

Based on the above, it can be concluded that by varying the hardness of the machined material during the tool pre-treatment period it is possible to increase the hardening effect.

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REFERENCES

1 **Yakubov, F. Ya., Kim, V. A.** Strukturno-e`nergeticheskie aspekty` uprochneniya i povy`sheniya stojkosti rezhushhego instrumenta [Structural and energy aspects of hardening and improving the durability of cutting tools // Simferopol`: Kry`mskoe uchebno-pedagogicheskoe gosudarstvennoe izdatel`stvo, 2005. – 300 p.

2 **Sherov, K. T., Mardonov, B. T., Irzaev, A.** Vliyanie rezhimov predvaritel`noj prirabotki na povy`shenie stojkosti rezhushhego instrumenta [The effect of regimes of pre-treatment on increasing the service life of cutting tools] // Vestnik TashGTU. – Tashkent: Izd-vo TashGTU, 2005. – № 4. – P. 68–71.

3 **Sherov, K.T., Mardonov, B.T., Irzaev, A., Karimov, Sh.A.** Sposob povy`sheniya iznosostojkosti i nadyozhnosti chervyachny`x frez [Method of increasing wear resistance

and reliability of worm mills] // Problemy` mexaniki. Tashkent: Izd-vo «Fan» AN RUz, 2005. – № 3. – P.100–103.

4 **Sherov, K. T., Sagitov, A. A., Userbaev, M. T., Sherov, A. K., Tusupbekova, G. M.** Sposob povy`sheniya iznosostojkosti metallorezhushhix instrumentov [Method of increasing the wear resistance of metal-cutting tools] // VESTNIK ENU imeni L. N. Gumileva. Seriya texnicheckie nauki i texnologii – Nur-Sultan : Izd-vo ENU, 2022. – № 3(140) – P. 141–149 DOI: [Electronic resource]. – https://doi.org/10.32523/2616-7263-2022-140-3-141-149

5 **Sagitov, A. A., Sherov, K. T., Tusupbekova, G. M.** Wear resistance of metal-cutting tools and formation of secondary contact structures during cutting // VESTNIK ENU imeni L. N. Gumileva. Seriya texnicheckie nauki i texnologii – Astana: Izd-vo ENU. 2022. – № 4(141) – P. 87–97 DOI: [Electronic resource]. – https://doi.org/10.32523/2616-7263-2022-141-4-87-97.

6 **Mardonov, B. T., Ravshanov, J. R.** Issledovanie processa rezaniya metodom teplofizicheskogo analiza [Investigation of cutting process by method of thermophysical analysis] // Akademicheskaya nauka kak faktor i resurs innovacionnogo razvitiya Sbornik statej II Mezhdunarodnoj nauchno-prakticheskoj konferencii – Petrozavodsk: MCzNP «Novaya nauka», 2021 – P. 79–83.

7 **Mardonov, B. T., Sherov, K. T., Ravshanov, J. R., Smajlova, B. K.** Issledovanie vliyanie tverdosti obrabaty`vaemogo materiala na optimal`nuyu skorost` predvaritel`noj prirabotki [Research of influence of hardness of machining material on optimum speed of precharge] // Science and Technology of Kazakhstan. Pavlodar: Izd-vo PGU, 2021. – № 4. – P. 22–29.

8 **Klepikov, V. V.** Opredelenie zhestkosti uprugoj texnologicheskoj sistemy` tokarny`x i frezerny`x stankov staticheskim i proizvodstvenny`m metodami [Determination of rigidity of elastic technological system of lathes and milling machines by static and production methods] // M. : MGIU, 2011. – 35 p.

9 **Yulikov, M. I., Gorbunov, B. I., Kolesov, N. B.** Proektirovanie i proizvodstvo rezhushhego instrumenta [Design and manufacture of cutting tools] // M. : Mashinostroenie, 2007. – 296 p.

10 **Kim, V. A.** Samoorganizaciya v processax uprochneniya, treniya i iznashivaniya rezhushhego instrumenta [Self-organization in processes of hardening, friction and wear of cutting tools] // Vladivostok: Dal`nauka, 2001. – 203 p.

11 **Youcef, A.** Analysis of the compromise between cutting tool life, productivity and roughness during turning of C45 hardened steel [Analysis of the compromise between cutting tool life, productivity and roughness during turning of C45 hardened steel] // Production Engineering Archives. 2021. – 27(1). – P. 30–35. [Electronic resource]. – https://doi.org/10.1063/1.5112619

12 **Kim, V.A., Karimov, Sh. A.** Proyavlenie fizicheskoj mezomexaniki pri kontaktnom vzaimodejstvii i iznashivanii [Manifestation of physical mesomechanics in contact interaction and wear] // Ucheny`e zapiski Kry`mskogo inzhenerno-pedagogicheskogo universiteta. 2014. – № II-1(18). – P. 79–85.

13 **Kartamy`shev, A. Yu.** Povy`shenie rabotosposobnosti lezvijnogo instrumenta pri obrabotke detalej, vosstanovlenny`x i uprochnenny`x metodami e`lektrokontaktny`x texnologij [Serviceability increase of the blade tool at detail processing, restored and hardened by the methods of the electrical contact technologies] // avtoref. diss. kand. texn. nauk. – Ivanovo, IvGu, 2011. – 22 p.

14 **Yakubov, F. Ya., Kim, V. A.** Strukturno-e`nergeticheskie aspekty` uprochneniya materialov [Structural-energetic aspects of strengthening materials] // Nauchnaya stat`ya Mezhdunarodnogo nauchnogo zhurnala «Uchyony`e zapiski Kry`mskogo inzhenerno-pedagogicheskogo universiteta» № 24. Simferopol`, Kry`m. – 2010. – P. 4–10.

15 **Mardonov, B. T., Ravshanov, J. R.** Investigation of Deformation-Thermal Processes in the Structural Adaptability of the Tool // International Journal of Advanced Research in Science, Engineering and Technology. 2021. – Vol. 8. – Issue 9. – pp. 18206-18209. [Electronic resource]. – http://ijarset.com/upload/2021/september/23-kh_ashurov-36.PDF

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СПИСОК ИСПОЛЬЗОВАННЫХ ИСТОЧНИКОВ

1 **Якубов, Ф. Я., Ким, В. А.** Структурно-энергетические аспекты упрочнения и повышения стойкости режущего инструмента // Симферополь: Крымское учебно-педагогическое государственное издательство. 2005. – 300 с.

2 **Шеров, К. Т., Мардонов, Б. Т., Ирзаев, А.** Влияние режимов предварительной приработки на повышение стойкости режущего инструмента // Вестник ТашГТУ. – Ташкент: Изд-во ТашГТУ. 2005. – № 4. – С. 68–71.

3 **Шеров, К. Т., Мардонов, Б. Т., Ирзаев, А., Каримов, Ш. А.** Способ повышения износостойкости и надёжности червячных фрез // Проблемы механики. Ташкент: Изд-во «Фан» АН Руз. 2005. – № 3. – С. 100–103.

4 **Шеров, К. Т., Сагитов, А. А., Усербаев, М. Т., Шеров, А. К., Тусупбекова Г. М.** Способ повышения износостойкости металлорежущих инструментов // Вестник ЕНУ имени Л. Н. Гумилева. Серия технические науки и технологии – Нур-Султан: Изд-во ЕНУ. 2022. – № 3(140). – С. 141–149. [Электронный ресурс]. – https://doi.org/10.32523/2616-7263-2022-140-3-141-149

5 **Sagitov, A. A., Sherov, K. T., Tusupbekova, G. M.** Wear resistance of metal-cutting tools and formation of secondary contact structures during cutting // Вестник ЕНУ имени Л. Н. Гумилева. Серия технические науки и технологии – Астана: Изд-во ЕНУ, 2022. – № 4(141) – С. 87–97. [Электронный ресурс]. – https://doi.org/10.32523/2616-7263-2022-141-4-87-97.

6 **Мардонов, Б. Т., Равшанов, Ж. Р.** Исследование процесса резания методом теплофизического анализа // Академическая наука как фактор и ресурс инновационного развития Сборник статей II Международной научно-практической конференции. Петрозаводск : МЦНП «Новая наука», 2021 – С. 79–83.

7 **Мардонов, Б. Т., Шеров, К. Т., Равшанов, Ж. Р., Смайлова, Б. К.** Исследование влияние твердости обрабатываемого материала на оптимальную

скорость предварительной приработки. // Наука и техника Казахстана. Павлодар: Изд-во ПГУ. 2021. – № 4. – С. 22–29.

8 **Клепиков, В. В.** Определение жесткости упругой технологической системы токарных и фрезерных станков статическим и производственным методами // М. : МГИУ, 2011. – 35 с.

9 **Юликов, М. И., Горбунов, Б. И., Колесов, Н. Б.** Проектирование и производство режущего инструмента // М. : Машиностроение, 2007. – 296 с.

10 **Ким, В. А.** Самоорганизация в процессах упрочнения, трения и изнашивания режущего инструмента // Владивосток: Дальнаука, 2001. – 203 с.

11 **Youcef, A.** Analysis of the compromise between cutting tool life, productivity and roughness during turning of C45 hardened steel // Production Engineering Archives. 2021. – Vol. 27. – Issue 1 – P. 30–35. [Электронный ресурс]. – https://doi.org/10.1063/1.5112619

12 **Ким, В. А., Каримов, Ш. А.** Проявление физической мезомеханики при контактном взаимодействии и изнашивании // Ученые записки Крымского инженерно-педагогического университета. 2014. – № II-1(18). – С. 79–85.

13 **Картамышев, А. Ю.** Повышение работоспособности лезвийного инструмента при обработке деталей, восстановленных и упрочненных методами электроконтактных технологий // автореф. дисс. канд. техн. наук. Иваново. – ИвГу. – 2011. – 22 с.

14 **Якубов, Ф. Я., Ким, В. А.** Структурно-энергетические аспекты упрочнения материалов // Научная статья Международного научного журнала «Учёные записки Крымского инженерно-педагогического университета» № 24. Симферополь. Крым. 2010. – С. 4–10.

15 **Мардонов, Б. Т., Равшанов, Ж. Р.** Investigation of Deformation-Thermal Processes in the Structural Adaptability of the Tool // International Journal of Advanced Research in Science, Engineering and Technology. 2021. – Vol. 8. – Issue 9. – P. 18206-18209 [Электронный ресурс]. – http://ijarset.com/upload/2021/september/23-kh_ashurov-36.PDF.

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ӨҢДЕЛГЕН МАТЕРИАЛДЫҢ ҚАТТЫЛЫҒЫ МЕН АЛДЫН АЛА ӨҢДЕУ ЖЫЛДАМДЫҒЫ АРАСЫНДАҒЫ БАЙЛАНЫСТЫ ЗЕРТТЕУ

Зерттеуді Қазақстан Республикасы Ғылым және жоғары білім министрлігінің Ғылым комитеті қаржыландырады (грант № AP14972884).

Зерттеулер көрсеткендей, қатты металдар мен қорытпаларды түзету ретінде қолдануға кедергі келтіретін маңызды шектеу факторы кесу жиегінің геометриясының өзгеруінен туындаған кесу қасиеттерінің нашарлауымен жоғары жанасу жүктемелерінің әсерінен пластикалық деформацияланған кезде кесу жиегінің пішінге төзімділігін жоғалту болып табылады. Бұл мәселені шешу үшін өңделген материалдың қаттылығы мен алдын ала өңдеу дәрежесі арасындағы байланыс зерттелді. Алдын ала өңдеу HRC 21...23 және HRC 19...20 қаттылығы бар 20Х қатайтылған болаттан жасалған екі термиялық өңделген материалда жүргізілді.

Нәтижесінде, құралды сыру кезінде өңделетін материалдың қаттылығын өзгерту арқылы беріктендіру әсерін арттыруға және материалды тұтынуды едәуір азайтуға болатындығы анықталды.

Сондай-ақ, алдын-ала өңдеу ұзақтығының 20Х (HRC 16...17) болатты өңдеу кезінде Т5К10 құралының тұрақтылығына әсер ету графиктері және өңделетін материалдың қаттылығының Р6М5 құралын алдын ала өңдеудің оңтайлы жылдамдығына және алдын ала өңдеу уақытына әсері келтірілген.

Кілтті сөздер: қаттылық, алдын-ала өңдеу, шынықтыру, оңтайлы жылдамдық, тозуға төзімділік, алдын-ала өңдеу уақыты.

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ИССЛЕДОВАНИЕ ВЗАИМОСВЯЗИ ТВЕРДОСТИ ОБРАБАТЫВАЕМОГО МАТЕРИАЛА И СКОРОСТИ ПРЕДВАРИТЕЛЬНОЙ ПРИРАБОТКИ

Исследование финансируется Комитетом по науке Министерства науки и высшего образования Республики Казахстан (грант № AP14972884).
Проведенные исследования показали, что серьезным ограничивающим фактором, препятствующим использованию более твердых металлов и сплавов в качестве правки, является потеря формоустойчивости режущей кромки, когда под действием высоких контактных нагрузок она пластически деформируется с ухудшением режущих свойств, вызванных изменением геометрии режущей кромки. Для решения этой проблемы было проведено исследование связи между твердостью обработанного материала и степенью предварительной обработки. Предварительная обработка проводилась на двух термообработанных материалах из закаленной стали 20Х с твердостью HRC 21...23 и HRC 19...20.

В результате установлено, что, изменяя твердость обрабатываемого материала при притирке инструмента, можно повысить эффект упрочнения и значительно снизить расход материала.

Также представлены графики влияния продолжительности предварительной обработки на стойкость инструмента Т5К10 при токарной обработке стали 20Х (HRC 16...17) и влияния твердости обрабатываемого материала на оптимальную скорость предварительной обработки инструмента Р6М5 и время предварительной обработки.

Ключевые слова: твердость, приработка, закалка, оптимальная скорость, износостойкость, время приработки.

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