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Satbayev University

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ИЗВЕСТИЯ

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K.T. Sherov[1*], S.O. Tussupova[2], A.V. Mazdubay[2], M.R. Sikhimbayev[3], B.N. Absadykov[4]

[1]S. Seifullin Kazakh Agro Technical University, Nur-Sultan, Kazakhstan;
[2]Toraigyrov University, Pavlodar, Kazakhstan;
[3]Karaganda Economic University of Kazpotrebsoyuz, Karaganda, Kazakhstan;
[4]A.B. Bekturov Institute of Chemical Sciences, Almaty, Kazakhstan.
E-mail: *shkt1965@mail.ru*

INCREASING DURABILITY OF THERMO-FRICTION TOOLS BY SURFACING

Abstract. The article presents the results of a study on increasing the wear resistance of the cutting part of thermofriction tools by surfacing. The main factors that have a prevailing influence on the increase in the consumption of metal-cutting tools in the current conditions of machine-building industries of the Republic of Kazakhstan are revealed.

The analysis of the methods of traditional thermo-frictional treatment and methods of applying coatings to increase the wear resistance of the surface of steels. Analysis of existing surfacing materials showed that STOODY M7-G, STOODY 102-G and OK TUBRODUR 58 O / G M surfacing materials have high hardness, wear resistance and temperature resistance. The technique for studying the hardness of the deposited layers is based on experimental and metallographic research methods. Surfacing of 12 samples of mild structural steel St3 was carried out.

One-layer, two-layer and three-layer surfacing were applied on the surface of the samples. Surfacing of 12 samples of mild structural steel St3 was performed. One-layer, two-layer and three-layer surfacing were applied on the surface of the samples. The results of the study of the hardness of the deposited layers showed that the surfacing materials retain the original hardness during two-layer surfacing. In this case, the thickness of the first and second layers should be 4 and 2 mm, respectively.

Key words. Wear resistance, hardness, surfacing material, thermofriction tool, wear, friction, melting point, surfacing.

К.Т. Шеров[1*], С.О. Тусупова[2], А.В. Маздубай[2], М.Р. Сихимбаев[3], Б.Н. Абсадыков[4]

[1]С. Сейфуллин атындағы Қазақ агротехникалық университеті, Нұр-Сұлтан, Қазақстан;
[2]Торайғыров университеті, Павлодар, Қазақстан;
[3]Қазтұтыну одағы Қарағанды экономикалық университеті, Қарағанды, Қазақстан;
[4]Ә.Б. Бектұров атындағы химия ғылымдары институты, Алматы, Қазақстан.
E-mail: *shkt1965@mail.ru*

БАЛҚЫМАЛАУ АРҚЫЛЫ ТЕРМОФРИКЦИЯЛЫҚ ҚҰРАЛДАРДЫҢ ТОЗУҒА ТӨЗІМДІЛІГІН АРТТЫРУ

Аннотация. Отандық және шетелдік өндірушілердің жаһандық интеграциясы отандық өнеркәсіпте шетелдік техниканы пайдаланудың артуына әкелді. Осыған байланысты химиялық құрамы мен механикалық қасиеттері бойынша ерекшеленетін жаңа материалдар өндірістерде көбірек қолданыс табуда. Мұндай материалдарды кескіш құралдармен өңдеу кезіндегі шығынына теріс әсерін тигізеді. Себебі, қолданыстағы анықтамалық-техникалық әдебиет көздерінде кесу режимдерін тағайындау және құралдың кесу бөлігінің материалын таңдау сияқты тиісті ұсыныстардың болмауынан жасалған қателер кесу жиегінің мерзімінен бұрын тозуына немесе бұзылуына әкеледі. Бұл мәселенің шешімі, жаһандық даму жағдайында, жоғары сапа, өнімділік, ресурстарды үнемдеу, қол жетімділік және т.б. сияқты өндіріс талаптарын қанағаттандыратын металл кесетін құралдың конструкциясын және механикалық өңдеу әдісін жарату болуы мүмкін. Осындай өңдеудің бірі импульсті салқындатуы бар термофрикциялық өңдеу әдісі және құралдың конструкциясы. Термофрикциялық өңдеу әдістерін эксперименттік зерттеу нәтижесінде олардың тозуға төзімділігімен байланысты мәселе бар екендігі анықталды. Бірнеше рет кесу құралымен өтулерден кейін, термофрикциялық құралдардың кесу бөлігінде тозу, жарықтар мен сызаттар байқалды. Бұл жұмыста термофрикциялық құралдардың тозуға төзімділігін арттыру үшін балқымалау процесін зерттеу нәтижелері ұсынылған. Балқымалауды жасау үшін электр доғалы дәнекерлеу әдісі таңдалған, ол кеңінен таралған, атап айтқанда отандық машина жасау кәсіпорындарында кең пайдалануда. Қабаттардың қаттылығын зерттеу әдісі эксперименттік және металлографиялық зерттеу әдістеріне негізделген.

Қолданыстағы балқыма материалдарды талдау STOODY M7-G, STOODY 102-G және OK TUBRODUR 58 O/G M жоғары қаттылыққа, тозуға және температуралық төзімділікке ие екенін көрсетті. Зерттеу нәтижелері көрсеткендей, барлық үш материал екі қабатты балқымалау кезінде бастапқы қаттылықты сақтайды. Сонымен қатар, бір қабатты балқыманың ортасынан бастап, екі қабатты балқыманың соңына дейін балқыманың қаттылық мәні өзгермейтіні анықталды.

Термофрикциялық құралдардың кесу бөлігін балқымалау үшін екі қабатты балқыма жеткілікті екендігі анықталды. Бұл жағдайда бірінші және екінші қабаттардың қалыңдығы сәйкесінше 4 және 2 мм болуы керек.

Түйін сөздер: тозуға төзімділік, қаттылық, балқымалау материалы, термофрикциялық құрал, тозу, үйкеліс, балқыту температурасы, балқыма.

К.Т. Шеров[1*], С.О. Тусупова[2], А.В. Маздубай[2], М.Р. Сихимбаев[3], Б.Н. Абсадыков[4]

[1]Казахский агротехнический университет им. С. Сейфуллина, Нур-Султан, Казахстан;
[2]Университет Торайгырова, Павлодар, Казахстан;
[3]Карагандинский экономический университет Казпотребсоюза, Караганда, Казахстан;
[4]Институт химических наук имени А.Б. Бектурова, Алматы, Казахстан.
E-mail: *shkt1965@mail.ru*

ПОВЫШЕНИЕ ИЗНОСОСТОЙКОСТИ ТЕРМОФРИКЦИОННЫХ ИНСТРУМЕНТОВ ПУТЕМ НАПЛАВКИ

Аннотация. Глобальная интеграция отечественных и зарубежных производителей привела к увеличению использования в отечественной промышленности зарубежной техники. В связи с этим в производствах все большее применение находят новые материалы, отличающиеся по химическому составу и механическим свойствам. Механическая обработка таких материалов также отрицательно влияет на расход металлорежущих инструментов.

Решением данной проблемы может быть разработка такого способа механической обработки и конструкции металлорежущего инструмента, которые удовлетворяли бы такие требования производства, как высокое качество, производительность, ресурсосбережение, доступность и др. в условиях глобального развития.

Одним из таких способов механической обработки является термофрикционная обработка с импульсным охлаждением и конструкция инструмента. В результате проведенных экспериментальных исследований термофрикционных способов обработки было выявлено, что существует проблема, связанная с износостойкостью термофрикционных инструментов. После многократного количества резов на режущей части термофрикционных инструментов наблюдались износы, трещины и сколы. В данной работе представлены результаты исследования процесса наплавки термофрикционных инструментов с целью повышения их износостойкости. Для нанесения наплавок был выбран способ электродуговой сварки.

Методика исследования твердости наплавленных слоев основана на экспериментальных и металлографических методах исследования. Анализ существующих наплавочных материалов показал, что наплавочные материалы STOODY M7-G, STOODY 102-G и OK TUBRODUR 58 O/G M обладают высокой твердостью, износостойкостью и температурной стойкостью. Результаты исследования показали, что все три наплавочных материала сохраняют исходную твердость при двухслойной наплавке.

При этом установлено, что начиная с середины однослойной наплавки до конца двухслойной наплавки значение твердости наплавки не меняется. Установлено, что для наплавки режущей части термофрикционных инструментов достаточно выполнение двухслойной наплавки. При этом толщина первого и второго слоев должна составлять соответственно 4 и 2 мм.

Ключевые слова: износостойкость, твердость, наплавочный материал, термофрикционный инструмент, износ, трение, температура плавления, наплавка.

Introduction. The efficiency of mechanical engineering production is determined by many factors, among which an important place is taken by metal-cutting tools. Most tool failures (up to 75%) occur due to wear on the cutting edges (Samuel, 2019: 13, Zyuzin, 2019: 3).

This is especially observed when processing difficult-to-process materials, which are widely used in all industries, since for these materials the complexity of processing the workpiece is commensurate with the tool life (Khodzhibergenov, 2019: 4, Makarenko, 2019: 4, Dudak, 2017a: 8). The global integration of domestic and foreign manufacturers has led to an increase in the use of foreign technology in the domestic industry. In this regard, new materials that differ in chemical composition and mechanical properties are increasingly used in production. The machining of such materials also negatively affects the consumption of metal cutting tools. Since the mistakes made when assigning cutting modes and choosing the material of the cutting part of the tool, due to the lack of relevant recommendations in the available reference and technical sources, lead to premature wear or breakage of the cutting edge.

The situation is further aggravated by the fact that for countries (which include Kazakhstan) that do not have their own tool production, metal cutting tools have to be purchased at a high (overpriced) cost from foreign manufacturers. All this leads to an increase in the cost of mechanical operation, and ultimately an increase in the cost of production. In this regard, the problem of increasing the durability (working life) of the cutting tool during the processing of difficult to process materials is one of the major practical problems of modern engineering. The solution to this problem can be the development of such method of the machining and the design of metal cutting tools that would satisfy such production requirements as high quality, productivity, resource saving, availability, etc. in the context of global development. One of such methods of mechanical processing is thermofriction processing with pulse cooling and tool design (Sherov, 2020a: 9).

As a result of experimental studies of thermofriction segments of metal billets (Sherov, 2017 b: 14), rotational-friction boring of large holes (Kadyrov, 2021: 9, Mukanov, 2019: 4, Zhunusbekova, 2016: 4), it was revealed that there is a problem associated with the wear resistance of thermofriction tools. After a multiple number of cuts on the cutting part of thermofriction tools, wear, cracks and chips were observed. This is the result of a pulse-cooled thermofriction cutting process, where a heating-cooling thermal cycle takes place, which exposes the cutting part of the tool to periodic heat treatment. Studies have been conducted to study the factors affecting the wear of a thermofriction tool, taking into account the cutting mechanism of the processing method, as well as the search for methods and ways to increase its wear resistance. As a result, four areas of scientific research were identified to increase the wear resistance, rigidity and strength of thermofriction cutting tools: Development of a method for selecting the material of a friction cutting disk based on the physical- mechanical properties and chemical composition of the workpiece, Development of manufacturing technology of a cutting disc of friction, contributing to the hardening of the cutting part of the friction disc, Improving the strength characteristics of structural steels (St. 50, St. 65G, etc.) used to manufacture friction discs by improving the chemical composition, Improving the wear resistance of the cutting part of thermofriction tools by surfacing with wear-resistant surfacing materials.

Currently, research is in the fourth direction, increasing the wear resistance of the cutting part of thermofriction tools by surfacing with wear-resistant materials.

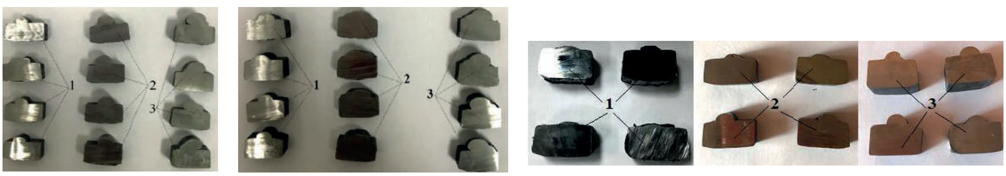
Research materials and methods. ESAB surfacing materials were selected, which have all the necessary qualities to increase the wear resistance of thermofriction tools and are readily available for machine-building industries in Kazakhstan. For deposition, the method of electric arc welding was chosen, which is also widely distributed, in particular at domestic engineering enterprises. Before surfacing, the surfaces of the samples were preheated to a temperature of ≈150 ^{0}C. Experimentally, surfacing modes were selected. As a result of surfacing, 3 samples were obtained with different layers of deposited material for each type of wire. The first surfacing layer is 4 mm thick, the second and third layers are 2 mm thick. Figure 1 shows the deposited samples.

a) b) c)

Figure 1. Fused samples: a - surfacing material STOODY M7-G; b - surfacing material STOODY 102-G; c - surfacing material TUBRODUR 58 O / G M; 1 - single-layer surfacing; 2- two-layer surfacing; 3 - three-layer surfacing

Complying with all standard requirements for organizing and conducting hardness measurements, we carried out the following preparatory work for the study:

1. Samples welded from STOODY M7-G, STOODY 102-G, TUBRODUR 58 O / G M materials were cut transversely into several parts (Fig. 2).



a) b) c)

Figure 2. Samples after cutting: a - STOODY M7-G; b - STOODY 102-G; c - TUBRODUR 58 O / G M; 1 - single-layer surfacing; 2- two-layer surfacing; 3-three-layer surfacing

The UNITOM-2 cutting machine was used for cutting. The machine is equipped with automatic setting of cutting parameters and an automatic cutting table for parallel cuts. It has the ability to recirculate cooling (65 l) and perform cutting without deformation and burnout, thanks to the ExciCut mode, as well as to illuminate the cutting chamber.

2. It is required to grind the processed parties. For grinding and polishing samples, the automatic machine LABOPOL-5 was used. The grinding process was carried out in four stages: leveling, fine grinding, diamond polishing and oxide polishing. Figure 3 shows the samples after grinding.

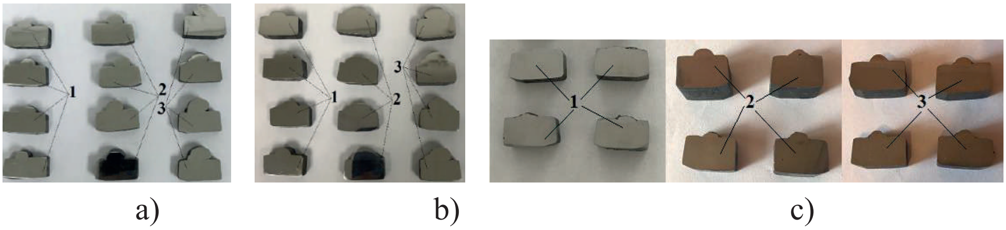


Figure 3. Samples after grinding: a - STOODY M7-G; b - STOODY 102-G; c - TUBRODUR 58 O / G M; 1 - single-layer surfacing; 2- two-layer surfacing; 3 - three-layer surfacing

After grinding, hardness was determined using a WILSON VH1150 hardness tester. The hardness tester is designed to measure the macro-hardness of the material on the Vickers scale. It has a unique range of loads from 300 g to 50 kg (Balgabekov, 2014: 3, Volkov, 2016: 5, Togizbayeva, 2020: 9, Ganyukov, 2018: 12, Dudak, 2019 b: 12). A hardness test was carried out on each prepared sample at 4-5 points. Figure 4 shows diagrams explaining the process of measuring the hardness of samples from surfacing materials STOODY M7-G, STOODY 102-G, TUBRODUR 58 O / G M.

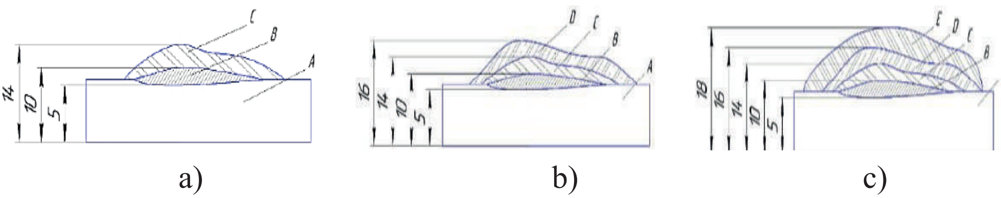


Figure 4. Schemes explaining the process of measuring hardness of samples: a - a sample deposited in one layer; b - a sample deposited in two layers; c - a sample deposited in three layers; A - the main material; B - mixing zone of the material and the surfacing wire; C - the first layer of surfacing; D - the second layer of surfacing; E - the third layer of surfacing

Results. After completion of the hardness measurement, the obtained data were processed. According to the results of measuring the hardness of the samples from surfacing materials, STOODY M7-G, STOODY 102-G, TUBRODUR 58 O / G M were built. Figure 5 shows graphs of the distribution of hardness over the deposited layers.

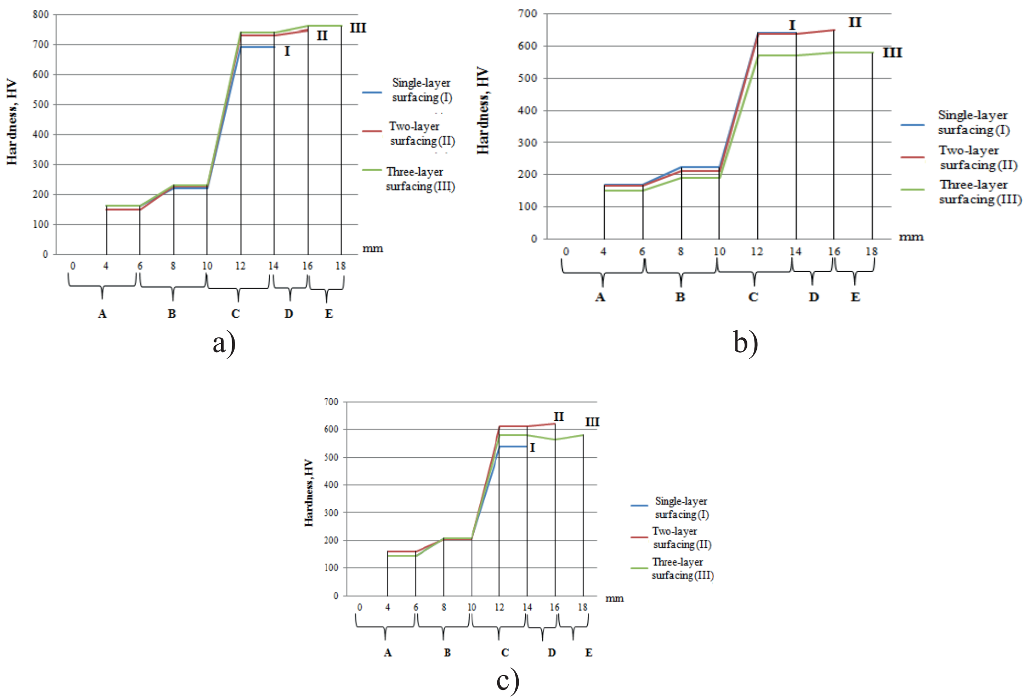


Figure 5. Graphs of the distribution of hardness over the deposited layers of samples: a - STOODY M7-G; b - STOODY 102-G; c - OK TUBRODUR 58; A - the size of the zone of the main material; B - the size of the mixing zone of the material and the surfacing wire; C - the size of the zone of the first layer of surfacing; D - the size of the zone of the second layer of surfacing; E - the size of the zone of the third layer of surfacing

Discussion. The results of the study showed that the hardness of the STOODY M7-G surfacing material with three-layer surfacing in BCDE zones is HV 220-760, the hardness of STOODY 102-G surfacing with three-layer surfacing in BCDE zones is HV 222-580, the hardness of TUBRODUR 58 O / GM for three-layer surfacing in BCDE zones is HV 208-580. In all samples deposited from three surfacing materials, there is a decrease in the initial hardness of surfacing materials during single-layer surfacing (zone B, Fig. 5, a, b, c). This is due to the fact that in single-layer surfacing, a decrease in hardness occurs due to mixing of the surfacing material with the base metal. It can be seen from the graphs that all three surfacing materials retain their original hardness during two-layer surfacing (zone D of Fig. 5, a, b, c). It was found that starting from the middle of a single-layer surfacing (see zone C with a height of 12 mm, Fig. 5 a, b, c) to the end of a two-layer surfacing (zone D with a height of 16 mm, Fig. 5 a, b, c) value of hardness of surfacing does not change. This conclusion makes it possible to abandon the third layer of surfacing. Based on this, it can be recommended for surfacing the cutting part of thermofriction tools in two layers. The thickness of the first and second layers can be set respectively within 4 and 2 mm. Based on the results, according to the above recommendations, pilot batches of thermofriction tools were manufactured. The cutting parts of a circular saw for cutting metal blanks, cup cutters for turning external cylindrical surfaces and boring holes, a friction cutter for thermofriction milling, a conical friction cutter for milling a conical surface were surfaced. Samples for thermofriction treatment were prepared from various materials. The results of the tests showed that the wear resistance of thermofriction tools made with surfacing increased by 1.5-2 times in comparison with tools without surfacing. In the future, the study of quality indicators during thermofriction processing using deposited tools, in particular roughness and stress-strain state of the treated surfaces, as well as the distribution of temperature and hardness during processing, is relevant.

Conclusions. The results of the study showed that the absence of tool production in the Republic of Kazakhstan negatively affects the full-scale development of the engineering complex. Tool support focused on the purchase of metal cutting tools from foreign manufacturers leads to an increase in the cost of mechanical operations, and ultimately an increase in the cost of production.

It has been established that the cutting parts of thermofriction tools in the process of thermofriction processing with impulse cooling, where the thermal cycle of heating-cooling occurs, undergoes periodic heat treatment. As a result, after a multiple number of cuts, wear, cracks and chips appear on the cutting part of thermofriction tools. Analysis of existing surfacing materials showed that surfacing materials STOODY M7-G, STOODY 102-G and OK TUBRODUR 58 O / G M have high hardness, wear resistance and temperature resistance.

The results of the study showed that all three surfacing materials retain their original hardness during two-layer surfacing (zone D of Fig. 5, a, b, c). It was found that starting from the middle of a single-layer surfacing (zone C with a height of 12 mm, Fig. 5, a, b, c) to the end of a two-layer surfacing (zone D with a height of 16 mm, Fig. 5, a, b, c), the hardness value surfacing does not change. It was established that for surfacing the cutting part of thermofriction tools, it is sufficient to perform two-layer surfacing. The thickness of the first and second layers should be 4 and 2 mm, respectively.

Prototypes of thermofriction tools were manufactured and tested. The test results showed an increase in the wear resistance of thermofriction tools by 1.5-2 times. In the future, it is of scientific and practical interest to study the thermal phenomena occurring in the cutting zone and the stress-strain state of the treated surfaces using thermofriction tools with surfacing.

Information about the authors:

Sherov Karibek Tagayevich – Doctor of Engineering Sciences, Professor, S. Seifullin Kazakh Agro Technical University, Nur-Sultan, Kazakhstan, E-mail: *shkt1965@mail.ru*, ORCID: *https://orcid.org/0000-0003-0209-180X*;

Tussupova Sayagul Oralovna – Dr. PhD, Senior Lecturer, Toraigyrov University, Pavlodar, Kazakhstan, E-mail: *suleeva.s@inbox.ru;* ORCID: *https://orcid.org/0000-0002-8920-4901*;

Mazdubai Asylkhan Vladimirovich – Dr. PhD, Senior Lecturer, Toraigyrov University, Pavlodar, Kazakhstan, E-mail: *asylkhan_m@mail.ru;* ORCID: *https://orcid.org/0000-0002-2421-042X*;

Sikhimbayev Muratbay Ryzdikbayevich – Doctor of Economic Sciences, Professor, Karaganda economic university of Kazpotrebsoyuz, Karaganda, Kazakhstan; E-mail: *smurat@yandex.ru*, ORCID: *https://orcid.org/0000-0002-8763-6145*;

Absadykov Bakhyt Narikbayevich – Doctor of Technical Sciences, Professor, the Corresponding member of National Academy of Sciences of the Republic of Kazakhstan, A.B. Bekturov Institute of Chemical Sciences, Almaty, Kazakhstan; E-mail: *b_absadykov@mail.ru*, ORCID: *https://orcid.org/0000-0001-7829-0958*.

REFERENCES

Balgabekov T.K., *Issin D.K.*, *Kimanov B.M.*, *Akashev A.Z.*, *Issin B.D.* Studying and improving blast furnace cast iron quality, *Metalurgija*, 2014, 53(4), стр. 556–558. (in Eng.).

Dudak N., Taskarina A., Kasenov A., Itybaeva G., Mussina Z., Abishev K., Mukanov R. (2017) Hole Machining Based on Using an Incisive Built-Up Reamer, International Journal of Precision Engineering and Manufacturing, Volume 18, Issue 10, Pages 1425-1432. *https://doi.org/10.1007/s12541-017-0170-9* (in Eng.).

Dudak N., Itybayeva G., Kasenov A., Mussina Zh., Taskarina A., Abishev K. Multi- ute drill-broach for precision machining of holes, Scientia Iranica, Transactions B: Mechanical Engineering 26 (2019) P.1415-1426. DOI: *https://doi.org/10.24200/sci.2018.5623.1379* (in Eng.).

Ganyukov A.A., Kadyrov A.S., Balabekova K.G., Kurmasheva B.K. (2018) Tests and calculations of structural elements of temporary bridges, Roads and Bridges - Drogi i Mosty 17, P.215 - 226 DOI: 10.7409/rabdim.018.014 (in Eng.).

Khodzhibergenov D.T., Ibragimova Z.A., Khodzhibergenova U.D. *Abdukarimov A., Esirkepov A.* (2019) Some aspects of software in cutting tools designing and testing, Russian Engineering Research. Vol. 39. pp 772-775. *https://doi.org/10.3103/S1068798X19090090* (in Eng.).

Kadyrov A., Zhunusbekova Zh., Ganyukov A., Kadyrova I., Kukesheva A. General Characteristics for Loading the Working Elements of Drilling and Milling Machines when Moving in the Clay Solution, Communications - Scientific Letters of the University of Zilina. - 2021. - Vol. 23, no. 2. P. B97-B105. DOI: *https://doi.org/10.26552/com.C.2021.2.B97-B105* (in Eng.).

Makarenko K.V., Zabelin A.L., Savinov D.N. (2019) A rational choice of the method for the restoration of parts by the method of manual arc surfacing of a wear-resistant layer [Ratsional'nyy vybor metoda vosstanovleniya detaley metodom ruchnoy dugovoy naplavki iznosostoykogo sloya] Bulletin of the Bryansk State Technical University No. 2 (75). P.12-15. (in Russian).

Mukanov R.B., Kasenov A.Z., Itybaeva G.T., Musina Zh.K., Abishev K., Bykov P.O. (2019) Face Turning of Holes, Russian Engineering Research, Volume 39, Issue 1, Pages 75-78. DOI: 10.3103/S1068798X19010064 (in Eng.).

Sherov K.T., Sikhimbayev M.R., Nasad T.G., Absadykov B.N., Izotova A.S., Okimbayeva A.E., Kuanov I.S. (2020) The research of the steel cutting blade reliability for thermo-frictional processing, News of the National Academy of Sciences of the Republic of Kazakhstan. Series of geology and technical sciences. 2020. Volume 1, Number 439, P.122 – 130. *https://doi.org/10.32014/2020.2518-170X.15* ISSN 2518-170X. (Online), ISSN 2224-5278 (Print). (in Eng.).

Sherov K.T., Sikhimbayev M.R., Donenbayev B.S., Sagitov A.A., Ainabekova S.S. (2017) Experimental Research of Rotational-and-Frictional Boring of Big Holes in Large Parts, Journal of Theoretical and Applied Mechanics, Sofia, Vol. 47, No. 4, P. 23-36. *https://doi.org/10.1515/jtam-2017-0018* (in Eng.).

Togizbayeva B.B., *Sazambayeva B.T.*, *Karazhanov A.A.*, *Kenesbek A.B.*, *Cocoșilă M.* (2020) Simulation of operation of neural network with purpose of utilisation of hydraulic actuators in complicated technical conditions, *International Journal of Agricultural and Biological Engineeringthis link is disabled*, 2020, 13(1), P.11–19. (in Eng.).

Volkov D.I., Proskuryakov S.L., Druzhkov S.S. (2016) The use of modified multifunctional coatings of metal-cutting tools during turning of high-strength cast iron [Ispol'zovaniye modifitsirovannykh mnogofunktsional'nykh pokrytiy metallorezhushchikh instrumentov pri tokarnoy obrabotke vysokoprochnogo chuguna] Mechanical Engineering Bulletin - Moscow: LLC Publishing House Innovative Engineering, No. 9. P. 79-83. (in Russian).

Zyuzin A.A., Konstantinova I.S., Kaz'min B.N., Yurov M.D. (2019) Determination of Tool Life in the Cutting of Conical Gears with Circular Teeth. Russian Engineering Research 39, P.396–398. *https://doi.org/10.3103/S1068798 X19050228* (in Eng.).

Zhunusbekova Zh.Zh., Kadyrov A.S. (2016) Study of digging machine flat element loading in clay solution, Journal "Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu" Volume 2 (152), P.30-33. (in Eng.).

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