Обосновано стратегическое планирование как необходимый элемент деятельности машиностроительного предприятия в сфере повышения эффективности его деятельности. Сделаны выводы о возможности достижения большей эффективности целостной системы, чем сумма эффектов взаимодействия отдельных подсистем и элементов, за счет использования синергетического подхода к стратегическому планированию деятельности предприятия

Ключевые слова: планирование, стратегия, машиностроение, синергия, синергетический подход.

УДК 621. 9

Методы анализа и оптимизации нагруженных элементов технологических систем / Э. А. Симсон, С. А. Назаренко, И. Д. Прево // Вісник НТУ «ХПІ». Серія: Технології в машинобудуванні. – Х. : НТУ «ХПІ», 2014. – № 42 (1085). – С. 187-192. – Бібліогр.: 3 назв. – ISSN 2079-004X.

На єдиній науково-методологічній основі розглянуті числові методи аналізу та оптимізації високо навантажених елементів деяких технологічних систем. Математичне моделювання процесу розкочування кільця підшипнику проводилося за допомогою метода скінчених елементів в постановці об'ємного напружено-деформованого стану в рамках інкрементального змішаного підходу Лагранжа-Ейлера. Представлена динамічна модель сонотроду для ультразвукової системи технологічного призначення.

Ключові слова: математична модель, оптимізація, технологічні системи, методи аналізу, високо навантажені елементи, розкочування, сонотрод, інструмент.

УДК 621.9.025

Аналитическая модель и расчет рейтинговой оценки нитридборных сверхтвердых композитов / Ю. Г. Гуцаленко Вісник НТУ «ХПІ». Серія: Технології в машинобудуванні. – Х. : НТУ «ХПІ», 2014. – № 42 (1085). – С. 182-196. – Бібліогр.: 3 назв. – ISSN 2079-004X.

Рассматривается проблема сравнения эксплуатационных возможностей инструментальных материалов в условиях использования каждого из них в своей рекомендуемой области и в своей системе нормативных режимов резания и нормативной стойкости. Предложена аналитическая модель и выполнен расчет рейтинговой оценки для стандартной группы сверхтвердых композитов на основе кубического нитрида бора.

Ключевые слова: кубический нитрид бора, сверхтвердые композиты, эксплуатационные возможности, рейтинговая оценка.

ABSTRACTS

Analysis of cutting patterns and technological equipment for intensive and high quality gear treatment quenched coarse-grained wheels / U.V.Timofeev, A.N Shelkovoy, E.V. Mironenko, A.A. Klochko, A.N. Kravtsov // Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 7-19. – Bibliogr.: 9. – ISSN 2079-004X.

Relationship theoretical cutting speed depending on various technological factors, physical and mechanical properties of materials and tools of hardened gear enables the selection of rational schemes gear treatment. Schemes cutting and technological equipment for intensive and high quality gear treatment using the method of numerical simulation of the process of formation of the surface layer, thus yielding stress-strain state of the surface layer of machined gears, tool and chip and recommendations on the choice of technological rules processing.

Keywords: cutting scheme, technological factors, the quality of surface-hardened gears coarse-grained, numerical simulation.

Research of force characteristics by a series-parallel hole-making operations with combined axial tool / M. P. Stepanov, M. P. Ivanova // // Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 19-25. – Bibliogr.: 6. – ISSN 2079-004X.

An axial component of cutting force and the torque at a series-parallel mode with combined axial tool was investigated. The influence of the number of steps of combined axial tool for total power loads and their variation with an increase in the number of concurrent steps of tool was researched. The conclusion was made about a suitable number of concurrent steps of the combined axial tool.

Key words: combined axial tool, cutting conditions, axial cutting force, torque, chip removal.

Improving competitiveness national mechanical-engineering production in modern terms / S.S. Dobrotvorskyy, E.V. Basova, L.G. Dobrovolskaya et ath. // Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 25-31. – Bibliogr.: 9. – ISSN 2079-004X.

The algorithm implementation technology of manufacturing high-quality and precision engineering products of hard materials based on advanced CAD/CAE/CAM/CAPP-systems was considered. The specialty of the hard-steels machining were described. The energy approach prospects to determine the region of technological modes existence of high-speed processing of materials were given.

Keywords: processing technology, high-speed machining**,** CAD/CAE/CAM/CAPP-system, hard materials, energy approach, treatment regimenP.

Completion functional possibilities of machine-tool complexes on bases of monitoring process of tooling / N.R. Veselovskaja, A.A. Permjakov // Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 31-37. – Bibliogr.: 7. – ISSN 2079-004X.

The basic idea of work is the development of principle new way of machine tools complex monitoring of tooling, which is aimed to organize the methods of tooling process control on the basis of the unique integrated informative environment of the computer design of Matlab/Stateflow and Matlab/Simulink adapted to the universal complex, at structural presented all of constituents of process of tooling and design, as instrument of decision of task which extends functional possibilities of machine-tool complexeP.

Keywords: machine-tool complex, functional possibilities, monitoring, calibrations of equipment, process of tooling, informative, financial and power streams, multico-ordinate machine-tools, machine-tools with a parallel kinematicP.

Changes depth roughing grinding caused curvature of rolled and discontinuous surface circle / Yu. A. Sizuy, D. V. Stalinskiy, Ye. M. Pomazan // Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 38-48. – Bibliogr.: 3. – ISSN 2079-004X.

In this article the model of the dynamic system of rough grinding (DSGR) with action on it by curvature of rolled product and by interruption surface of grinding wheel are offered. The analysis of DSRG model are fulfilled by right simulation in computer and by amplitude-frequency of the system. This analysis allow to call for conditions of rough grinding for achievement of requirement to quality rolled product after rough grinding.

Keywords: rough grinding, dynamic, modeling, grinding wheel, rolled.

Differentiation of international standards in the preparation of the production / E.V.Naboka, M.E. Kolisnyk // Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 49-53. – Bibliogr.: 5. – ISSN 2079-004X.

The paper analyzes the ISO standards and recommendations for use in all types of engineering production, in all organizations, regardless of type of activity, size of the organization and delivered products (services). The interrelation between the main standards of product quality was detected. Proposed requirements, which can be used to develop a system of manufacturing quality productP.

Keywords: standard, certification, quality management, production.

Modeling of technological processes of body parts using the control Petri nets / O.Yu. Prikhodko, S. Slipchenko // Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 53-58. – Bibliogr.: 3. – ISSN 2079-004X.

In article discusses interpretation of the Control Networks (SN), which is built on the basis of safe Petri nets (SPN). In the example of task about the effective use of production resources possibilities of SN are shown, comparing is conducted to the models on the basis of safe Petri netP.

Keywords: Petri nets, simulation, detail, label, algorithm.

Developing a stress-strain model state of «an abrasive pellet-sheaf» / A.N.Ushakov Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 59-65. – Bibliogr.: 1. – ISSN 2079-004X.

In a paper the assaying of existing shapes of abrasive pellets is made. The three-dimensional sample piece of a power tension in which the sheaf is presented in the form of bridges of link of the cylindrical shape is developed, and the pellet is presented in the form of the combined shape. This sample piece allows to execute complex probe with application of computer aids for improvement of master schedules of manufacture and maintenance of wheelP.

Keywords: grind, a wheel, a pellet, a sheaf, a sample piece.

Research is strained - the deformed condition of a metalwork of cranes with various designs of mechanisms Movement / Gubskyi S . O. // Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 65-74. – Bibliogr.: 12. – ISSN 2079-004X.

Comparison of influence of various designs of the mechanism of movement of bridge cranes on the intense deformed condition of their metalwork is carried out. Are investigated a domestic design of the mechanism of movement of the crane on axle boxes of the Kharkov plant "PTU" and KONEKREYNS UKRAINE firm. The resource of a metal construction of the last crane will depend less on its mechanism of movement thanks to constructive and technological decisions in the mechanism.

Keywords: bridge crane, movement mechanism, metal construction, axle box, wheel, loadingP.

Ensuring the effectiveness of air-plasma cutting of sheet metal / D.O. Minenko, V.O. Ivanov, I.G. Goncharenko // Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 74-81. – Bibliogr.: 5. – ISSN 2079-004X.

The main criteria for the quality assurance of air-plasma cutting steel were described. The dependence for determining the modes of air-plasma cutting of sheet metal was proposed, provided the required quality of the cutting and the maximum processing performance with the optimal combination of performance plasma cutting complexity further machining.

Keywords: efficiency, air-plasma cutting, moving speed, the thickness of the metal, current, burr, quality.

New way of the steel surfaces ni-carbing /N.V. Terelnik // Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 81-86. – Bibliogr.: 9. – ISSN 2079-004X.

The new way of the steel parts ni-carbing, including electroerosive alloying (EEA) by carbon with a combination to ionic nitrogen hardening (INH) is offered, besides INH carry out up to or after operation EEA during time, sufficient for saturation of metal by nitrogen on depth of a thermal influence zone.

Keywords: a ni-carbing, an electroerosive alloying, ionic nitrogen hardening, surface layer, hardening.

Distributive computer system increase of efficiency process of diamond grinding / O.Ienikieiev, F.M Yevsiukova, L.O. Shy`shenko // Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 86-98. – Bibliogr.: 6. – ISSN 2079-004X.

It is developed the concept of building a computer system to improve the efficiency of diamond grinding in conditions of incomplete information on the basis of methods of direct and coordinate-wise management , hierarchical principle and indirect measurements of the amplitude of microroughnesseP. It is suggested the method and hardware means to compensate the kinematic error of primary converters of instantaneous speed.

Keywords: concept, architecture, structurally logical organizations, methods of improving the accuracy.

Improving the efficiency of finishing abrasive blasting of small parts / A. A. Andilahay // Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 98-105. – Bibliogr.: 4. – ISSN 2079-004X.

In the paper, we develop mathematical models generalizing the empirical parameters of the abrasive machining submerged jets, which allow for the smallest surface roughness criteria and maximum performance to determine rational processing parameterP. It is established that during the treatment the rounding of edges of parts, eliminates burrs, corrosion and different inhomogeneity on the treated surface forming a homogeneous matt surface with a roughness in the range Ra = 0,8 - 1,25 mm, with the reinforcing hardening (deep compressive stresses 5 - 6 microns), significantly reduced the complexity of processing.

Keywords: abrasion, the abrasive grains, fine detail, the compressed air, the Laval nozzle, surface roughness, processing performance.

Theoretical justification conditions for increasing the efficiency of high-speed machining / F.V. Novikov, O.P. Klenov // Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 106-111. – Bibliogr.: 6. – ISSN 2079-004X.

The analytical solution of the conditions to reduce the cost of processing and technological feasibility of high-speed cutting. It is shown that the cutting speed is limited by the extremum (minimum) cost of treatment. Increase cutting speed and to implement high-speed machining conditions can be achieved by increasing the resistance of the cutting tool through the use of more durable and wear-resistant tool materials and coatings instruments characterized by a low coefficient of friction.

Keywords: high-speed machining, tool material, the cost of processing, cutting speed, cutting temperature, processing performance

Fatigue resistance study of rear axle trunnions of special vehicles / V. K. Lobanov, G. I. Pashkova // Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 112-115. – Bibliogr.: 8. – ISSN 2079-004X.

The study is related to the development of the special vehicle "Dozor". This work presents the researching of the fatigue resistance of rear axles trunnions for the vehicle "Dozor" from different variants of manufacturing. Totally, 20 different constructions of the trunnion, namely welded (11 variants) and mixed (9 variants) ones are examined. Universal testing machine, enabling to generate maximum static load of 500 kN and maximum cyclic load of 250 kN with an accuracy of ± 1% is used for testing. Working load is simulated using loading conditionP. It is shown that the test items are optimal under the combined action of bending and torsion. Examples of the tensometry results and final results of all tests are given. It was founded that the connection point of trunnion with nozzle is less loaded and less stressful than splines and zone, where trunnion is connected to the body. Approved test pattern for trunnion under the simultaneous action of the bending and torsional moments is recommended for further use in the development of technologies and standards in percentage check tests of trunnions in serial production for the purpose of intermittent monitoring of the level and stability of the quality of their manufacture.

Keywords: vehicle, rear axle, trunnion, fatigue resistance.

A Generalized Example of Structural and Parametric Optimization of Functionally-Oriented Process / V.V.Stupnytskey // Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P.116-129 . – Bibliogr.: 18. – ISSN 2079-004X.

The example of structural and parametric optimization of the functionally-oriented technological process machining of mold's parts is described in the article. The objective function is to provide such an optimization criterion integrated providing wear resistance, the contact stiffness, fatigue strength and corrosion resistance of products in terms of their potential exploitation . The article describes the research methodology and algorithm optimization.

Keywords: function-oriented process optimization , residual stress , fatigue strength , corrosion resistance, friction coefficient , CAF- system

Cracking when drilling polymer composites / G. L. Khavin // // Bulletin of NTU “KhPI”. Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 129-139. – Bibliogr.: 26. – ISSN 2079-004X.

The problem of define the dimension and depth of interlayer delamination crack for drilling of polymeric reinforced multilayer composites is considered. Take account of anisatropic properties of material suppose crack delamination has elliptical shape and grater axis is maximal crack length. The empirical form of delamination factor using as function of mechanical treatment parameterP. The model of local delamination, which used of linear fracture mechanic and empirical formulation of delamination factor, is presented. The correlation of connect maximal crack delamination depth appeared and hers length is obtained. The numerical dependences between crack length and speed and feed are presented.

Keywords: crack delamination, delamination factor, polymer compositeP.

Method of determining membership functions in system design of microstructure technology transition / A.R. Ruzmetov // Bulletin of NTU “KhPI”. Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 139-147. – Bibliogr.: 5. – ISSN 2079-004X.

To improve the efficiency of operation of semiautomatic equipment in the conditions of multimachine system, it is necessary to provide relative synchronization of periods of work and service of all units of equipment. In solving this problem is necessary more accurately determine costs of time required for the each of technological step. A significant part the working time of machining of cutting operation (about 40%) is occupied auxiliary operations using handmade. System microelements labor movements auxiliary technological process allows the most detailed display the characteristics of the operation and to implement its simulation.For the synthesis of microelement workflow expedient use of linguistic variables associated with basic numerical values relations via configurable membership functionP. This allows you to manage the synthesis of the microstructure of the working process, which promotes more precise account of industrial needs of the specific work situation.

Keywords: technological equipment, technology reception, technology transition, technical manuals, functional activation phase, linguistic variable.

Modeling moving bridge crane with a warp / O.V. Grigorov, O.V. Stepochkina // Bulletin of NTU “KhPI”. Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 147-153. – Bibliogr.: 8. – ISSN 2079-004X.

Article is devoted to aspects of the bridge crane, moving with skew, mathematical modeling. The model is made as a program in an Excel environment, which can be used for the solution of research tasks, and also for engineering calculationP. The mechanism submodel is considered. The examples proving practical importance of the mechanism elements specified modeling are given. The special attention is paid to architecture of data presentation on spreadsheet. Provides a method of mechanism kinematic scheme object-oriented descriptionP. Thus to each element of the drive there corresponds the separate column. Communications of data in columns are executed by the same principle, as well as mechanical communications between drive elementP. Restructuring of the kinematic scheme is made by adding, deleting, and moving columns without VBA programming. This provides reliability, simplicity and visibility, which is important for engineering calculationP.

Keywords: crane skew, bridge type cranes, mechanism, mathematical model, MS Excel, kinematic scheme, data structure.

Multicriterion choice of optimal technological processes treatment of cabinet-type details / A. V. Kotlyar // Bulletin of NTU “KhPI”. Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P.153-163 . – Bibliogr.: 4. – ISSN 2079-004X..

The questions of multicriterion optimization technological processes of making cabinet-type details are considered in the conditions of multitop-level production. Worked out competitive variants of technological processes and system of criteria of optimization. The comparative analysis of criteria of optimality is conducted and the most optimal variant of technological process is certain depending on productive termP.

Keywords: cabinet-type detail, multitop-level production, technological process, criteria of optimality, intensity of forming, intensity income.

Development of organizational and technological structures of assembly of complex engineering

products / O.L.Kondratyuk, A.O.Skorkin // Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 163-167. – Bibliogr.: 5. – ISSN 2079-004X..

Large proportion of the total assembly operations occupy assembly operations model compounds characterized by a high level of monotony of work, the frequency of occurrence of labor movements, as well as low-skilled worker. Proceeding from this, this paper discusses the design principles of organizational and technological structures of small-scale assembly of complex engineering products based on a comprehensive analysis of existing methods for developing small-scale assembly structures for assembly. The made conclusions on the choice of rational assembly structures for specific conditions and the type of engineering products

Keywords: workflow assembly, subassembly, accuracy, workplace.

Technological features hardened wheel spindle gear treatment and duplex scheme cutting / A.A. Klochko // Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 167-172. – Bibliogr.: 5. – ISSN 2079-004X.

For finishing gear wheels large module a method is proposed for intermittent rolling using modular disk cutters (size cutters do not depend on the module), equipped with ceramic plates and special milling calipers with one spindles and two spindle cutting scheme taking into account all the basic installation of the movements of high-speed mobile disk cutters. Method intermittent rolling is used for shaping and grinding machines and has the advantage that at the time of the stroke of the tool cutting wheel is stationary or makes a slight rotation, i.e., processing flows, compared with the method of running with the support of the greatest of the contact stiffness of the tool and determines the ability of the surface layers of gear wheels in contact with the cutting edge of the tool to provide a cutting action.

Keywords: gear treatment, cutting scheme, coarse-grained hardened gears, single and duplex caliper

Building a model of equivalent elastic system of heavy vertical lathes / E. V. Mironenko , P.L. Mirantsov, D.G. Kovalev // Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P.172-182. – Bibliogr.: 6. – ISSN 2079-004X.

Offers a model of technological system of heavy vertical lathes . Proposed a design scheme of the system " slider - a tool ." The conclusions about the dynamic svoytvh cutting tool for given processing conditions .

Keywords : boring machine tool model slider cutting algorithm.

The use of synergistic strategies of production and economic systems / E.V. Kamchatnova-Stepanova, Y.A Klochko, N.G Siketina// Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P.182-186. – Bibliogr.: 14. – ISSN 2079-004X.

There has been informed strategic planning as a necessary element of the activities of the machine building enterprise in improving the efficiency of its activitieP. To determine the scale of synergies application of the synergetic theory on machine building enterprise. Defined methodological principles of creation of positive synergistic effect on the process management of enterprise development machine building industry, namely, the necessity of the application of systematic and synergetic approach that allows to analyze the complex factors internal and external marketing environment and based on the assessment of the prospects for their further development to determine the mechanisms for managing development processes the enterprise. The conclusions about the possibility of achieving greater efficiency of complete system than the sum of the effects of the interaction of individual subsystems and components through the use of a synergistic approach to the strategic planning of the company

Keywords: planning, strategy, engineering, synergy, synergistic approach.

A method of the analysis and optimization of construction elements of the technological systems / E. A. Simson, S. A. Nazarenko, I. D. Prevo // Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 187-192. – Bibliogr.: 3. – ISSN 2079-004X.

Mathematical model of construction elements of the technological system is presented. Structural optimization methods of high both geometric and physical informational content are suggested for complicated finite-element models, especially with design variables vector of high dimension, to minimize numbers of straight calculation procedure activation. Based on the current investigations two basic methods of optimization are developed. The first one uses an approximation of the problem in a finite dimensional space. The second one is based on setting the problem in a continuum space, in which the initial differential, integral, or variational equation describing the construction model is defined. The resolved equations of mathematical formulation are provided. Computation stages are investigated. In the three-dimensional formulation contact problem (distribution of normalized dynamic stresses) is solved numerically for the process of ring-rolling. The analysis of spectrum of frequencies and modes of vibrations of sonotrod of ultrasonic welding is conducted.

Keywords: mathematical modeling, tool, plastic deformation, sonotrod, ring-rolling, technological system, finite-element method, contact problem, modes of vibrations.

Analytical model and the calculation of rating estimation for superhard boron nitride composites / **Yu. G. Gutsalenko** // Bulletin of NTU "KhPI". Series: Technologies in mechanical engineering. – Kharkiv : NTU "KhPI", 2014. – № 42 (1085). – P. 192-196. – Bibliogr.: 3. – ISSN 2079-004X.

The problem of comparing the operational capabilities of the tool materials in the conditions of use of each of them in their recommended area and its system of standard cutting conditions and regulatory stability is considered. Development is based on the database of the conditions and tool life norms for tests of the superhard materials under regulations the interstate standard 28762-90 that is applied in Ukraine. An analytical model and the calculation are made for the rating of the standard group of superhard composites based on cubic boron nitride. Preference for the proposed model as a reflection of adopted technological ideology is determined by amount (volume) of removed material for the cutting tool life. The highest rating is determined by the maximum material removal. The calculations on the model established the superiority of Tomal-10 composite over others. In the context of the research motive this composite is proposed as a base superhard boron nitride to develop an expert system for forecasting roughness on difficult to machine materials after diamond-spark grinding. The expert system is created in Ukraine within the framework of tasks for state research project 0113U000425.

Keywords: cubic boron nitride, superhard composites, operational capabilities, rating estimation.