

УДК 621.646.42

**Результаты математического моделирования переходных процессов в регуляторе давления газа / С. А. Шевченко, С. А. Валивахин // Вісник НТУ «ХПІ». Серія: Математичне моделювання в техніці та технологіях. – Харків: НТУ «ХПІ», 2014. – №39 (1082). – С. 198 – 206. Бібліогр.: 3 назви. – ISSN 2222-0631.**

Представлены результаты расчёта переходных процессов в регуляторе давления газа при его работе в составе испытательного стенда по нелинейной математической модели, которая учитывает разрыв связей между элементами подвижной системы регулятора. Приведены результаты экспериментального определения переходных процессов. Показана удовлетворительная сходимость экспериментальных характеристик регулятора с результатами расчета по модели.

**Ключевые слова:** регулятор давления газа, отрыв элементов подвижной системы, нелинейная математическая модель, динамические характеристики, переходный процесс.

УДК 621.923

**Аналитическое описание параметров шероховатости поверхности при абразивном полировании / В. Г. Шкурупий // Вісник НТУ «ХПІ». Серія: Математичне моделювання в техніці та технологіях. – Харків: НТУ «ХПІ», 2014. – №39 (1082). – С. 206 – 213. Бібліогр.: 7 назв. – ISSN 2222-0631.**

Обоснованы условия уменьшения шероховатости поверхности при абразивном полировании с фиксированным радиальным усилием, которые состоят в основном в уменьшении давления в зоне обработки и увеличении поверхностной концентрации абразивных зерен на рабочей поверхности инструмента. Доказано, что с кинематической точки зрения уменьшение шероховатости поверхности связано с уменьшением мгновенной суммарной площади поперечного сечения среза всеми работающими абразивными зёрнами до минимально возможного значения, при котором процесс резания переходит в процесс упруго-пластического деформирования обрабатываемого металла.

**Ключевые слова:** абразивное полирование, абразивное зерно, процесс резания, шероховатость поверхности, скорость радиальной подачи, радиальное усилие.

УДК 629.017:681.532.58

**Результаты моделирования адаптивного управления торможением автомобиля с частично автоматизированным гидравлическим тормозным приводом / С. Н. Шуклинов // Вісник НТУ «ХПІ». Серія: Математичне моделювання в техніці та технологіях. – Харків: НТУ «ХПІ», 2014. – №39 (1082). – С. 213 – 220. Бібліогр.: 5 назв. – ISSN 2222-0631.**

Приведены результаты моделирования процесса торможения автомобиля с адаптивной автоматизированной системой управления в случае частично автоматизированного тормозного привода. Дана оценка изменения замедления автомобиля при действии возмущающих внешних и внутренних факторов в случаях с адаптивным управлением и без адаптивного управления при заданном усилии на педали тормоза. Представлены зависимости изменения корректирующего воздействия на поршне управления вакуумного усилителя тормозного привода, сформированного исполнительным устройством адаптивной системы управления, при торможении груженого автомобиля и при отказе одного тормозного контура во время торможения. Результаты моделирования показывают, что адаптивное управление в частично автоматизированном тормозном приводе обеспечивает инвариантно управление торможением автомобиля при действии возмущающих факторов.

**Ключевые слова:** автомобиль, система, тормозное управление, замедление, усилие на педали тормоза, давление жидкости.

## ABSTRACTS

UDC 621.923

**Mathematical modeling of the dynamics of abrasive blasting / A. A. Andilakhai // Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 3 – 10. Bibliog.: 6 titles. – ISSN 2222-0631.**

*ISSN 2222-0631. Вісник НТУ «ХПІ». 2014. №39 (1082)*

235

A mathematical model for determining surface roughness and abrasive blasting performance considering motion dynamics of the abrasive grains in the treated materials was developed, which allowed to describe analytically the trajectories of the abrasive grains during processing and to justify in a fundamentally new way the major technological patterns of the material removal and surface shaping. On this basis, the decisive influence of the abrasive grain speed on the roughness of the machined surface and processing performance was proved.

**Key words:** the cutting process, the dynamics of the process, abrasive grain, surface roughness, cutting force, energy intensity of processing.

UDC 621.923

**A mathematical model for determining the components of the cutting forces when machining deep holes / T. M. Brizhan** // Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 10 – 19. Bibliog.: 5 titles. – ISSN 2222-0631.

A mathematical model for determining the components of cutting forces when machining deep holes has been developed, which allows us to estimate the level of imbalance of the radial component of the cutting force when removing non-uniform allowance and to justify the conditions of its reduction to improve the accuracy of hole machining. The possibility of substantial reduction of the radial component of the cutting force by creating a sweep angle of the teeth has been demonstrated theoretically, which opens up technological capabilities for high-precision machining of deep holes.

**Key words:** deep hole cutting process, scan, comprising cutting forces, the elastic displacement, processing accuracy, the coefficient of friction.

UDC 532.57:519.63

**Applying the finite element method for solving parabolic problems of mathematical physics / A. A. Brichak, V. A. Vanin** // Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 19 – 27. Bibliog.: 6 titles. – ISSN 2222-0631.

The article presents an application of the finite element method for solving the heat equation. A simple procedure of taking into account the boundary conditions of the problem has been suggested. We have compared the computation time and the calculating errors when using elements of different types and different shape functions. The results of applying the finite element method have been compared with the finite difference schemes. We have shown the improvement of the accuracy of solution subject to mesh refinement. The theoretical order of approximation for different shape functions has been verified experimentally.

**Key words:** finite element method, Galerkin method, heat equation.

UDC 621.436: 621.454

**Model-speed electromagnetic actuator for controlling stem-propane supply system of the heat engine / A. N. Wrublewskij, A. L. Grigoriev** // Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 28 – 44. Bibliog.: 13 titles. – ISSN 2222-0631.

The operation of a high-speed valve actuator in an electrically controlled injector of an automotive diesel engine is analyzed and its mathematical model is built. The model allows taking into account eddy currents and magnetic hysteresis at the anchor, elastic vibrations of the valve stem and the multiplier under deformations, and oscillations of the coils of the actuator spring. It is shown that using magneto-dielectrics for the magnetic core and hard magnetic alloys for the anchor, as well as changing the scheme of electromagnet boosting provides the required performance of the valve. It is planned to apply the same principles to improve the launching valves of the supply system of a thruster.

**Key words:** electrically controlled injector, electromagnetic actuator, magneto-dielectric, hard magnetic material, eddy current, magnetic hysteresis, magnetic flux.

UDC 539.01: 621.01

**An algebraic method for sequential localization and calculation of the frequencies of free oscillations of a cylindrical helical rod / A. L. Grigoriev, A. I. Derienko** // Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv:

NTU «KhPI», 2014. – №39 (1082). – pp. 45 – 70. Bibliog.: 17 titles. – ISSN 2222-0631.

An original method for calculating the free vibration frequencies of a cylindrical helical rod is proposed. The method uses operator equations of the linearized dynamic model of the rod, allowing a unified position to consider different types of boundary conditions (eg, symmetric and asymmetric versions of securing rod ends), both specified by structure, and resulting from technological errors. We prove a theorem that allows determining a priori the direction and value of frequency shifting when changing boundary conditions. The algorithm of the method is reduced to sequentially localizing all the points of the spectrum while gradually complicating the boundary conditions.

**Key words:** dynamic model, the differential operator, boundary conditions, the spectrum of the operator, the helical rod, coil spring, symmetric conditions for fixed ends, longitudinal oscillations, the transverse oscillation, frequency of free oscillations.

UDC 539.3

**Determining the loads applied to a hinged shell ribbed by concentric stiffeners / P. A. Yegorov** // Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 71 – 80. Bibliog.: 4 titles. – ISSN 2222-0631.

The problem of determining the time dependent component of the load acting on a hinged shell ribbed by concentric stiffeners is solved. The solution of the direct problem of analyzing the deformed state of the system is presented as a substep. The accuracy of the solution to the direct problem is verified by comparing with FEM; the accuracy of the solution to the inverse problem is verified by comparing with the input data of the direct problem. The Volterra integral equations obtained when solving the problems are analyzed numerically. The ill-posedness of the problem is overcome by using the Tikhonov regularization method.

**Key words:** shell, stiffener, Fourier series, Laplace transformation, regularization method.

UDC 656.073:622.611

**Analysis of mathematical models of auxiliary cargo transporting in coal mines / I. V. Kozina** // Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 80 – 85. Bibliog.: 4 titles. – ISSN 2222-0631.

In the article a mathematical model of transporting auxiliary cargos in coal mines is developed. The model is aimed to coordinate material flow in mine preparatory faces. Traditional methods of material management service in coal mines are improved. The optimal route was calculated using the Floyd-Warshall algorithm. An optimization criterion, that is the minimum total energy consumed by the locomotive, which is used to deliver auxiliary materials and equipment, is proposed. Applying the method allows to improve the material transporting schemes. Alternatively, the route of transporting mine materials is calculated using Dijkstra's algorithm. The results obtained by both algorithms are compared. The results of the experimental research of auxiliary transport are presented. Mine materials are offered. The results of the experimental research of auxiliary transport are presented.

**Key words:** transporting of materials and equipment, mine preparatory faces, auxiliary cargo, transport management.

UDC 622.625.28-592.112(043.5)

**Dynamic brake model with contact excitation of frictional oscillations / A. N. Koptovets** // Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 85 – 91. Bibliog.: 10 titles. – ISSN 2222-0631.

A mathematical model of frictional oscillation excitation and interaction in a tread and wheel brake has been developed in terms of availability of ligaments and distribution of contact forces over deformable rough surfaces. To implement the results, problems of pit rolling stock brakes have been classified as a tribological system. Within the system, the friction coefficient has aggregate properties. The dynamic model of the brake uses an oscillating system with two degrees of freedom. The wheel has constant angular velocity. The tread ligaments are modeled by two Voigt elements. It is usual to neglect the tread and wheel surface curvature. Under certain conditions, the availability of Voigt elements in the

model results into a coordinate relation between the normal oscillations and tangential ones. The normal components of the local forces arising at the microroughness contact points are considered proportional to the area of microroughness overlap. The friction between the contact surfaces is described by monomial Amonton's law.

**Key words:** brake, model, dynamics, load, friction, oscillations, roughness, contact surface, efficiency.

UDC 532.5:621.65.01

**General model for calculating gas condensate field parameters / M. M. Kutia, K. Y. Skrylnyk, V. V. Shevchenko** // Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 91 – 97. Bibliog.: 2 titles. – ISSN 2222-0631.

We propose a method of calculating gas production parameters that is based on the material balance equation. The basic characteristics and innovations of the method, its application in practice, and in the process of teaching students are considered. The algorithm of the basic model is given. It is compared to a similar program of previous generation. The ways and options for further improvement of the algorithm are indicated.

**Key words:** gas extraction, gas, reservoir pressure, flow rate, the material balance equation.

UDC 621.43

**Predicting emission of soot and nitrogen oxides by direct injection diesel engine / A. M. Levterov, L. I. Levterova** // Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 97 – 108. Bibliog.: 21 titles. – ISSN 2222-0631.

In the article a methodology of predicting the emission of soot and nitrogen oxides with the exhaust gases of a direct injection diesel engine is proposed. The research was conducted in a thermodynamic structure of a full cycle of a diesel engine with a two zone model of combustion. It is based on the conceptual statements of laser diagnostics of the combustion process in a diesel engine, chemical kinetics of combustion of hydrocarbonic fuels developed in recent years, and experimental research. The numerical results are obtained for a specific engine in the maximum torque mode taking into account the level at which the start of fuel injecting influences the emission of soot and nitrogen oxides that is important for possible research of alternative fuels.

**Key words:** modeling, soot, nitrogen oxides, diesel engine, toxicity, working process.

UDC 539.375

**Features of logging equipment to be used in areas with a slope. Part 3. Calculation of frame structures / O. S. Machuga** // Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 108 – 125. Bibliog.: 18 titles. – ISSN 2222-0631.

For elements of frame structures and hinged equipment of logging, agricultural, road construction machines moving and operating in areas with a slope, additional loading is inherent. The asymmetry of the external force impact caused by the technological equipment operation as well as compatible action of the tangential components of the basic reactions of the engines and weight of the individual parts of the mechanism, cause a complex stress-strain state of the frame elements and rod elements of hinged equipment such as bending and free or compressed torsion. It is suggested to determine the basic reactions and the internal power factors of the considered structure using the variation principle of mechanics for statically indeterminate rod systems, namely a generalization of the method of minimum potential energy. The problem is formulated mathematically. The method of solving is illustrated by an example of sagittal frame calculation.

**Key words:** logging machine frame design, bending and compressed torsion, the variation principle of mechanics.

UDC 004.94:621.382.002.56(045)

**Computer design of arithmetic nanodevices / O. S. Melnyk, V. O. Kozarevich, R. I. Pylypenko** // Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 126 – 134. Bibliog.: 3

titles. – ISSN 2222-0631.

Quantum Cellular Automata (QCA) is a recently emerging technology where logic states are stored as the positions of individual electrons rather than the voltage levels. A single device known as a quantum cell is used for constructing all the components of an entire nanocircuit (computation elements and wires). This paper presents a two-bit multiplier which uses quantum dot cellular automata and is composed of simple 3- input majority gates and inverters. The research is focused on the design and simulation of QCA using numerical tools such as the QCADesigner tool.

**Key words:** quantum cellular automata, majority gate, quantum full adder, quantum multiplier, synchronization zone, nanowire complanar crossing.

UDC 629.083:621-113

**Mathematical modeling of redistribution of axle reactions during emergency braking on a sloped road / V. I. Nazarov, A. I. Nazarov, I. A. Nazarov // Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 134 – 141. Bibliog.: 10 titles. – ISSN 2222-0631.**

A mathematical model of the changes of the vertical axel reactions during emergency braking of a car not equipped with braking electronic control systems on a straight road with a longitudinal slope, taking into account aerodynamic disturbing factors is presented. For specific cars the operation of the created algorithm is considered, the results obtained by the program are given and the results of the computational experiment are analyzed. The prospects for further research to ensure traffic safety are discussed.

**Key words:** passenger car, operating conditions, disturbing factor, emergency braking, the vertical reaction.

UDC 539.3

**Model of granular composite with spherical grains / A. G. Nikolaev, E. A. Tanchik // Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 141 –152. Bibliog.: 15 titles. – ISSN 2222-0631.**

A model of granular composite, in which the grains are modeled by elastic spherical inclusions, is proposed. The stress state in the composite is described by a boundary value problem for Lamé's equation with ideal contact conditions at the grain boundaries and conditions at the infinity. The analytical solution is constructed as a superposition of the exact basis solutions of Lamé's equation in spherical coordinate systems, which origins are related to the centers of inclusions. The boundary conditions are satisfied exactly by using the generalized Fourier method. The problem is reduced to an infinite system of linear algebraic equations with Fredholm operator. The numerical analysis of the normal components of the stress tensor in the region between the inclusions is given.

**Key words:** granular composite, spherical inclusions, generalized Fourier method, method of reduction.

UDC 629.7.05

**Increasing accuracy of determining orientation in SNS by special arrangement of computations / Yu. A. Plakhsy, Yu. O. Kuznyetsov // Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 153 – 159. Bibliog.: 6 titles. – ISSN 2222-0631.**

A practical problem of increasing the accuracy of determining the orientation in strapdown navigation systems is considered. A new scheme of calculations of the quaternion of orientation by an algorithm of a low order when calculations are simultaneously conducted on two temporary grids with different steps is offered. Runge's principle and the concept of actual order of the algorithm of defining the quaternion of rotation, based on practical estimates, are used. Introducing the concept of actual order of an algorithm allows us to track the existing correlation between the values of the quasicordinates received at the algorithm input on a computation step, with the accuracy of determining the orientation by this algorithm. A reference model of regular precession of a rigid body is used to show that such an organization of calculations provides essential increase of accuracy of determining the orientation. The results of calculations are given.

**Key words:** quaternion, orientation, reference model, quasicordinates, drift.

UDC 517.95:519.63:532.5

**Mathematical modeling of spatial singularly perturbed processes of convection-diffusion mass transfer in two-porous multilayered environment / I. M. Prysiazhniuk, Y. Y. Klymyuk, O. V. Prysiazhniuk //** Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 159 – 177. Bibliog.: 10 titles. – ISSN 2222-0631.

A mathematical model of one-component convection-diffusion-adsorption mass transfer in a nanoporous multilayered environment under the conditions of the prevailing convective component of the process over the other components is formed. The algorithm for asymptotic expansions of solutions of appropriate spatial nonlinear singularly perturbed boundary value problem in a piecewise-homogeneous stratified water-saturated nanoporous environment – a curvilinear parallelepiped divided into subregions by equipotential surfaces, is constructed.

At first we perform the transition from the curvilinear physical area of filtration to the corresponding area of complex potential which is a parallelepiped with edges parallel to the coordinate axes. The problem of grid construction is solved automatically; the convection-diffusion equation is simplified; the stated problem is reduced to the canonical domain, and the corresponding solution can be represented in a numerical – analytical form. Then we construct an asymptotic expansion of the solution of the problem of convective diffusion in the area of complex potential under the condition of filtration which to significant level allows to autonomously add the mass transfer and diffusion components, and also the corrections at the exit of the flow filtration, in the neighborhood of the lateral facets and the surfaces dividing the layers to the convective component of the solution.

The results of computer computations let us to evaluate the impact of physical and chemical characteristics of the process on the distribution of pollutants in the area.

**Key words:** convective-diffusive mass transfer, nanoporous microparticles, multilayered environment.

UDC 629.423.3

**Operation of the system «traction drive – energy storage» during braking of electric rolling stock / V. P. Severin, L. V. Overyanova, O. V. Omelyanenko //** Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 178 – 183. Bibliog.: 4 titles. – ISSN 2222-0631.

The article deals with the functioning of an on-board electromechanical energy storage which is a part of the traction drive of a suburban train. A mathematical model of the energy exchange in the system «traction drive – energy storage» during braking of the electric rolling stock is developed ignoring the processes in the contact network. The model allows determining the dependence of the energy exchange process on the storage and drive parameters. It also lets us to evaluate the energy efficiency of the system under consideration. The recuperation coefficient is used to evaluate the benefit of using an on-board energy storage.

**Key words:** rolling stock, electromechanical flywheel energy storage, traction drive, energy efficiency.

UDC 629.429.3:621.313

**Tilting train model in the problem of optimal train control / S. U. Cherviakov, B.G. Liubarskyi //** Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 183 – 190. Bibliog.: 8 titles. – ISSN 2222-0631.

Nowadays the development of new electric rolling stock (ERS) and motion modeling raises the question of increasing the average stock speed and feasibility of using tilting trains. In this paper we use tilting cars to reduce the lateral acceleration of the carbody of a train that is passing a curve. Using such systems lets us to increase significantly the allowed speed in a curve while decreasing the lateral acceleration experienced by the carbody. The simulation of an active tilting train on a track with curves is provided. We recommend using the tilting cars with a tilt restriction starting from 4°.

**Key words:** tilting train, lateral acceleration, passing curves, active carbody tilt, passive carbody tilt.

UDC 532.5:621.65.01

**A software module for predicting hydrodynamic characteristics of the gas-liquid mixture in**

**a well with artificial lift / N. G. Shevchenko, A. L. Shudryk** // Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 190 – 197. Bibliog.: 6 titles. – ISSN 2222-0631.

The distribution of pressure in a well is calculated by an iterative algorithm using correlations of the PVT characteristics of the 2-phase flow (oil and gas) under the changes of temperature, relative density of associated petroleum gas, factors of compressibility and gas saturation, properties of oil in the shaft. The calculations are performed using DELPHI software products. The calculation results are presented as an autonomous IT application that will be used in the future for designing, simulating and optimizing the submersible drilling rig for artificial lifting. The paper presents a graphical interface of the program module for selecting the depth for suspending the pump in the well and determining the parameters of the petroleum products at its reception.

**Key words:** borehole, pumps, thermodynamic conditions, gas-liquid mixture, saturation pressure, density, dissolved gas, emitted gas, pressure distribution, correlation ratio, a software module.

UDC 621.646.42

**The results of mathematical modelling of transients of a gas pressure regulator / S. A. Shevchenko, S. A. Valivakhin** // Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 198 – 206. Bibliog.: 3 titles. – ISSN 2222-0631.

The results of computations by nonlinear mathematical model for the transients of a gas pressure regulator as a part of a test bench are presented. The mathematical model describes the dynamics of the gas pressure regulator considering breaking the bonds between the elements of its mobile system. The experimental data for the transients are given. The convergence between the experimental characteristics and the computed results is shown.

**Key words:** gas pressure regulator, separation of the elements of a mobile system, nonlinear mathematical model, the dynamic characteristics, transient.

UDC 621.923

**Analytical description of surface roughness in abrasive polishing / V. G. Shkurupiy** // Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 206 – 213. Bibliog.: 7 titles. – ISSN 2222-0631.

The work conditions for reducing surface roughness during abrasive polishing with a fixed radial force are justified, which consist mainly in decreasing pressure in the treatment zone and increasing surface concentration of the abrasive grains on the working surface of the tool. It is proved that from the kinematic standpoint the reduction of the surface roughness is associated with the decrease of the instantaneous total cross-section of the slice by all working abrasive grains to the minimal possible value, at which the cutting process evolves into the process of elastic-plastic deformation of the processed metal.

**Key words:** abrasive polishing, the abrasive grains, the cutting process, the surface roughness, the radial flow velocity, radial force.

UDC 629.017:681.532.58

**The results of simulation of adaptive vehicle braking control by means of a partially automated hydraulic brake actuator / S. N. Shuklinov** // Bulletin of National Technical University «KhPI» Series: Mathematical modeling in engineering and technologies. – Kharkiv: NTU «KhPI», 2014. – №39 (1082). – pp. 213 – 220. Bibliog.: 5 titles. – ISSN 2222-0631.

The results of modeling vehicle braking by means of an adaptive automatic control system in the case of a partially automated brake gear are presented. The changes of the vehicle deceleration under the action of external and internal factors are estimated for the cases with adaptive control and without it for a given brake pedal force. The dependences of the adjustment impact of the control piston of the brake vacuum booster of the brake drive formed by the actuating device of the adaptive control system are studied for braking of a loaded vehicle and for a brake circuit failure during braking. The simulation results show that the adaptive management in a partially automated brake actuator provides invariant vehicle braking control when perturbing factors are in action.

**Key words:** vehicle, system, braking control, deceleration, brake pedal force, fluid pressure.