MATHEMATICAL MODELING — APPLIED ASPECTS

MODELING OF ELECTRIC POWER SYSTEMS

page 4–8

The need to improve the scientific and methodical approach to modeling processes in electrical power systems was substantiated in the paper. Simulation was proposed to perform in two stages. The first is the ideological and theoretical model of the process, which reveals its physical nature and answers the question: How and why? The second is the real-mathematical model, based on the ideological and theoretical model defines numeric values of the characteristics of the process modes and answers the question: How and why so much?

The need for scientific developments of this approach was justified by wide use of purely mathematical calculation methods in the electric power industry, which often leads to the mathematical formalism and making wrong decisions in the real operating conditions of electric power systems.

Since in regulations of the electric power industry there is no definition of matter, which is the basis for the physics of the electric power industry, it is proposed to consider the concept of the physical vacuum with its elementary indivisible particles — phytons, which possess both positive and negative elementary charges and can be the building material of all electrical materials as such.

Based on the ideological and theoretical model of the electric power system, it was proved that even though the reactive energy (power) of the system is created by real values of conduction voltage and current (and active), it is of fluctuating nature. Therefore, electricity of the electric power system is the wave of the polarization energy of its dielectric medium, which runs from the power plant generator to consumers. Physical justification of mathematical calculation methods ensures reliability of models.

Keywords: electric power industry, modeling, materiality in electric power industry, ideological and theoretical model, real-mathematical model.

References

1. Venikov, V. A. (1966). *Sealing Theory and modeling as applied to the problems of electric power industry*. M.: Higher school, 487.
2. Buckovski, I. R., Molnar, M. M., Nikonets, A. L., Nikonets, L. A., Sabat, M. B.; In: Niconts, L. A. (2012). *Physical phenomena internal resonance in electrooborudovanie with high voltage windings*. Lviv: NPF «Ukrainian technologies», 167.
3. Butkevych, A. F., Kirilenko, O. V., Mazur, T. A., Szeged, M. S. (2010). *Mathematical modeling in electric power industry*. Lviv: Publishing of the National University «Lviv Polytechnic», 608.
4. Bessonov, L. F. (1973). *Theoretical foundations of electrical engineering*. Ed. 6. M.: The High school, 752.
5. DSTU 2843-94. (1995). *The state standard of Ukraine. Electrical engineering. Basic concepts. Terms and definitions*. Kiev: State standard of Ukraine, 66.
6. Repchenko, O. N. (2011). *Field fiscal or how world works?* M.: Gallery, 320.
7. Kopylov, I. P. (2011). Great laws of nature. *Electricity, № 4*, 63–66.
8. Akimov, A. E., Tarasenko, V. E. (1992). Model of the polarized States of physical vacuum and torsion fields. *Minsk: Isvestia of higher schools. Physics, № 3*, 13–23.
9. Bogoroditsky, N. P., Pasinkov, V. V., Tareev, B. M. (1985). *Electrometrical materials*. Ed. 7. Leningrad: Energoatomizdat. Leningrad separation, 304.
10. Landau, L. D., Akhieser, A. I., Lifshits, E. M. (1969). *Course of General physics. Mechanics and molecular physics*. M.: Science. Editorial of physic-mathematical literature, 399.
11. Doroshenko, A. I. (2011). On the issue of materiality in physics electricity. *Scientific works of Donetsk National Technical University, Issue 11(186)*, 120–124.

POLYMER WALL SLIP MODELLING

page 8–11

The paper considers the influence of the wall slip effect on the extrusion molding process when melting a polymer. The aim of this study is to develop a method for assessing the effect of wall slip in designing an extrusion forming tool.

The mathematical modelling of polymer melt flow in a channel was carried out taking into account the wall slip, the results of which were compared with the experimentally obtained dependencies, which allowed to find matching points. Using these points, the dependence of the velocity on the channel wall and the average integral velocity at the channel inlet was obtained. By approximating the resulting curve, an empirical equation was derived. It was the third degree polynomial which can be used for calculating the process parameters.

The study showed that taking into account the effect of wall slip had a significant impact on the process, which made it necessary to account for this parameter in the calculation of the extrusion moulding processes and in the design of processing equipment.

The results can be applied in the design of a forming tool and mathematical modelling of polymeric materials' extrusion moulding processes.

Keywords: polymer flow, polymer melting, wall slip.

References

1. Hatzikiriakos, S. G. (2012, April). Wall slip of molten polymers. *Progress in Polymer Science, Vol. 37, № 4*, 624–643. doi:10.1016/j.progpolymsci.2011.09.004.
2. Tolstoy, D. M. (1952). Theory of wall slip. *Reports of the Academy of Sciences USSR, 5*, 192.
3. Kirpikov, V. A., Shorin, G. N.; In: Guhman, A. A. (1974). *Introduction To The Theory Of The Boundary Layer*. M.: MICM, 287.
4. Gerbeau, J.-F., Lelièvre, T. (2009, January). Generalized Navier boundary condition and geometric conservation law for surface tension. *Computer Methods in Applied Mechanics and Engineering, Vol. 198, № 5–8*, 644–656. doi:10.1016/j.cma.2008.09.011.
5. Ferrás, L. L., Nóbrega, J. M., Pinho, F. T., Carneiro, O. S. (2007). Profile extrusion die design: the effect of wall slip. *MATERIAIS 2007 Porto, 1–4 April 2007. The Polymer Processing Society 23rd Annual Meeting*. Available: http://paginas.fe.up.pt/~fpinho/pdfs/PPS23_P04-013.pdf.
6. Ivitskyi, I. I., Sokolskyi, O. L., Siveckyi, V. I., Mikulionok, I. O. (2013). Numerical simulation of wall layer on the flow of polymer processing equipment. *Chemical Industry of Ukraine, № 6*, 34–37.
7. Ivitskyi, I. I., Sokolskyi, O. L., Mikulionok, I. O. (2013). Determination of the viscosity of the wall layer in modeling the flow of polymers in forming channels. *Abstracts of the All-Ukrainian scientific conference of young scientists and students «Modern technologies for producing composite materials, fibers and nanocomposites»*, 18–19.
8. Baguta, V. A., Kulinchenko, G. V. (2012). Mathematical modeling of the polymer flow in the die channel based on its wall slip. *Radio electronic and computer systems, № 4(56)*, 140–144.
9. A Rheological Viewpoint of Thermoplastic Melts. *Rheology application note*. Available: http://www.iesmat.com/iesmat/upload/file/Malvern/Productos-MAL/REO-A%20rheological%20view%20point%20of%20thermoplastic%20melts.pdf.
10. Saeed, U., Hussain, K., Rizvi, G. (2014, 2 May). Characterization of glass fiber-reinforced high-density polyethylene. *Society of Plastics Engineers*. Available: http://www.4spepro.org/view.php?article=005393-2014-04-29. doi:10.2417/spepro.005393.

APPLICATION OF PARAMETER CONTINUATION METHOD FOR ANALYSIS OF VIBROIMPACT 2-D OF SYSTEMS

page 11–15

The possibility and peculiarities of the numerical parameter continuation method application to the mechanical system with repeating impacts are considered. The theoretical bases of the continuation method combined with the shooting method and Newton-Raphson method are presented. The technique is adapted to two-mass two-degree-of-freedom vibroimpact system under periodic excitation. The peculiarities and difficulties of the technique application to vibroimpact systems, i. e. mechanical systems, which constantly change their structure due to repeating impacts among their elements are discussed. Parameterization is fulfilled after the arc length of the solution curve that allows to pass turning points and find branch points. The impact is simulated by nonlinear contact interaction force based on the quasistatic Hertzian contact theory,

which takes into account local deformations of colliding bodies in the contact zone. Such simulation allows to obtain the law of motion of bodies on the whole time base, including impact period. It also allows to calculate the impact forces, which are the significant characteristics of vibroimpact motion. It can be successfully applied to systems with soft impact that is confirmed by experiments. Stability or instability of periodic solutions is determined by monodromy matrix eigenvalues (multipliers) based on the Floquet theory. The values of multiplies, the module of which is greater than one, are defined by the types of bifurcation points.

Keywords: vibroimpact system, parametric continuation method, periodic solutions, Hertzian contact force, parameterization, arc length, stability, multiplier.

References

1. Babitsky, V. I (1998). Theory of Vibro-Impact Systems and Applications. *Foundations of Engineering Mechanics*. Available: http://dx.doi.org/10.1007/978-3-540-69635-3.
2. Ivanov, A. P. (1997). *Dynamics of Systems with Mechanical Impacts*. Moscow: International Education Program, 336.
3. Ibrahim, R. A. (2009). Vibro-Impact Dynamics. *Lecture Notes in Applied and Computational Mechanics*. Available: http://dx.doi.org/10.1007/978-3-642-00275-5.
4. Shalashilin, V. I., Kuznetsov, E. B. (1999). *Parametric Continuation Method and the Best Parametrization*. Moscow: Editorial URSS, 224.
5. Allgower, E. L., Georg, K. (2003). Introduction to Numerical Continuation Methods. *Society for Industrial and Applied Mathematics*. Available: http://dx.doi.org/10.1137/1.9780898719154.
6. Gouliaev, V. I., Bazhenov, V. A., Gotsuliak, E. A., Dekhtyaryuk, E. S., Lizunov, P. P. (1983). *Stability of Periodical Processes in Non-Linear Mechanical Systems*. Lvov: Vyshcha Shkola, 286.
7. Bazhenov, V. A., Pogorelova, O. S., Postnikova, T. G. (2013). Comparison of Two Impact Simulation Methods Used for Nonlinear Vibroimpact Systems with Rigid and Soft Impacts. *Journal of Nonlinear Dynamics, Vol. 2013*, 1–12. doi:10.1155/2013/485676.
8. Bazhenov, V. A., Pogorelova, O. S., Postnikova, T. G., Goncharenko, S. N. (2009). Comparative analysis of modeling methods for studying contact interaction in vibroimpact systems. *Strength of materials, 41(4)*, 392–398. URL: http://www.scopus.com/inward/record.url?eid=2-s2.0-68949096576&partnerID=MN8TOARS.
9. Goldsmith, W., Frasier, J. T. (1961). Impact: The Theory and Physical Behavior of Colliding Solids. *Journal of Applied Mechanics, Vol. 28, № 4*, 639. doi:10.1115/1.3641808.
10. Holodniok, M., Klič, A., Kubíček, M., Marek, M. (1991). *Methods of analysis of nonlinear dynamics models*. Translation from Czech. Moscow: Mir, 368.
11. Kubíček, M. (1976, March 1). Algorithm 502: Dependence of Solution of Nonlinear Systems on a Parameter [C5]. *ACM Transactions on Mathematical Software, Vol. 2, № 1*, 98–107. doi:10.1145/355666.355675.
12. Johnson, K. L. (1985). *Contact Mechanics*. Cambridge University Press, Cambridge, UK, 468.

TECHNOLOGY OF ORGANIC AND INORGANIC SUBSTANCES

STUDY OF WHISKERS' MECHANICAL PROPERTIES. CREEP AND INTERNAL FRICTION

page 16–18

The results of the previously conducted studies of whiskers on the changes in properties of creep and internal friction were considered and analyzed in this paper. The results of these studies in terms of the applied load influence on them, leading to a change of crystal structure were analyzed. The conducted analysis of literature data indicates that in these and many other processes whiskers' properties continue to be negatively influenced by the mechanical properties, including internal friction and creep.

The estimation of such influence is quite important and relevant in current conditions because organometallic compounds continue to occupy a prominent place among other raw materials used in the production of metal powders, films, coatings and even finished gas-phase bulk products. Instead of huge electroplating industries and costly short-lived plants in engineering and electronic enterprises, high-output waste-free production of «small» chemistry appears. They provide not only the production of high-quality products, but also the compliance with environmental requirements for protecting human health and environment.

Keywords: whiskers, load, creep, internal friction.

References

1. Shishelova, T. I., Stepanova, N. E., Plynskaia, D. A., Beliaeva, M. A. (2009). Nitevidnye kristally. *Uspehi sovremennogo estestvoznaniia, № 8*, 12–13.
2. Pomerantseva, E. A., Kozlova, M. G., Leonova, L. S., Dobrovol'skiy, Yu. A., Kulova, T. L., Skundin, A. M., Gudilin, E. A., Tret'iakov, Yu. D. (2007). Nitevidnye kristally. Materialy Vserossiyskoy konferentsii «Issledovaniia i razrabotki po prioritetnomu napravleniiu razvitiia nauki, tehnologiy i tehniki «Industriia nanosistem i materialy»», 18–19 ianvaria 2007 goda, g. Moskva. *Mezhdunarodnyy nauchnyy zhurnal «Al'ternativnaia energetika i ekologiia», № 1(45)*, 126–127. Available: http://isjaee.hydrogen.ru/pdf/01_07_Pomerantseva-2.pdf.
3. Hadiia Abass Mohamed Nomeri. (2011). *Poluchenie i issledovanie opticheskih svoystv poluprovodnikovyh oksidov ZnO_2 i Zn_2O_3*. Voronezh, 128.
4. Eisner, R. L. (1959). *Growth and Perfection of Crystals, № 21*. N. Y.: John Willey, 191.
5. Brenner, S. S. (1959). *Growth and Perfection of Crystals, № 12*. N. Y.: John Willey, 157.
6. Cabrera, N., Price, P. B. (1959). *Growth and Perfection of Crystals, № 3*. N. Y.: John Willey, 204.
7. Serebriakov, A. V., Kostiuk, V. H., Zilinh, K. K. (1965). Fizika tverdoho tela. *FTT, T. 7*, 858.
8. Berezhkova, H. V. (1969). *Nitevidnye kristally*. M.: Hosizdat, 158.
9. Price, P. B. (1960, April). On microcreep in zinc whiskers. *Philosophical Magazine, Vol. 5, № 52*, 417–419. doi:10.1080/14786436008235860.
10. Pearson, G., Read, W., Jr., Feldmann, W. (1957, April). Deformation and fracture of small silicon crystals. *Acta Metallurgica, Vol. 5, № 4*, 181–191. doi:10.1016/0001-6160(57)90164-5.
11. Eisner, E. (1960, December 31). Fatigue Straining of Copper Whisker. *Nature, Vol. 188, № 4757*, 1183–1184. doi:10.1038/1881183b0.
12. Oding, I. A., Kop'ev, I. M. (1961). *Metallovedenie i termicheskaia obrabotka metallov, № 9*, 44.
13. Oding, I. A., Kop'ev, I. M. (1961). *Dislokatsii v metallah i voprosy prochnosti*. Izd. AN SSSR, 20.
14. Postnikov, V. S., Ammer, S. A., Kosilov, A. T., Belikov, A. M. (1966). Relaksatsionnye svoystva mednozheleznyh nitevidnyh kristallov. *FMM, T. 21, № 5*, 770–773.
15. Zevu, P. W., Cammerer, O. F. (1955). *Appl. Phys., № 26*, 182.
16. Postnikov, V. S., Ammer, S. A., Kosilov, A. T. (1967). *Fizika tverdogo tela, T. 9, № 1*, 227–231.
17. Schurerova, E. (1964). *Cescosl. Casop. Fys., № 14*, 151.

OBTAINING OF MICRO- AND NANOSCALE COPPER COMPOUNDS BY PLASMA-CHEMICAL TREATMENT OF SOLUTIONS

page 19–22

The paper describes the methods for obtaining nanoscale copper compounds by the plasma-chemical treatment of aqueous solutions by a contact non-equilibrium low-temperature plasma of reduced pressure. The treatment process was carried out under the pressure of 15–20 kPa, the current strength of 10–140 mA and the voltage of 400 V in the laboratory plasma-chemical reactor. When treating the solutions of nitrate and copper sulphate in distilled water, mainly copper oxide compounds were obtained. The compounds similar in composition to malachite were obtained by the plasma-chemical treatment of copper

nitrate with sodium bicarbonate in water. During the treatment processes, the possibility to influence the particles size formed by varying the conditions of treatment and drying was revealed. The feature of the process under study is the production of micro- and nanoscale compounds without the introduction of stabilizing additives.

Keywords: low-temperature non-equilibrium plasma, reduced pressure, aqueous solution, micro-, nano, copper compounds.

References

1. Shakhnov, V. A., Panfilov, Yu. V., Vlasov, A. P. et al. (2008). *Nanorazmernyye struktury: klassifikatsiya, formirovaniye i issledovaniye*. M.: MGTU im. N. E. Baumana, 100.
2. Drexler, E. (2006). Toward Integrated Nanosystems: Fundamental Issues in Design and Modeling. *Journal of Computational, and Theoretical Nanoscience, Vol. 3, № 1*, 1–10.
3. Luchinin, V. V. (2007). Vvedeniye v industriyu nanosistem. *Nano- i mikrosistemnaya tekhnika, № 8*, 2–7.
4. Courrol, L. C., de Oliveira Silva, F. R., Gomes, L. (2007, September). A simple method to synthesize silver nanoparticles by photoreduction. *Colloids and Surfaces A: Physicochemical and Engineering Aspects, Vol. 305, № 1–3*, 54–57. doi:10.1016/j.colsurfa.2007.04.052.
5. Yershov, B. G. (2001). Nanochastitsy metallov v vodnykh rastvorakh: elektronnyye, opticheskiye i kataliticheskiye svoystva. *Zhurnal Rossiyskogo himicheskogo obschestva im. D. I. Mendeleeva, T. XLV, № 3*, 20–30.
6. Baranchikov, A. Ye., Ivanov, V. K., Tret'yakov, Yu. D. (2007). Sonokhimicheskiy sintez neorganicheskikh materialov. *Uspekhi khimii, T. 76, № 2*, 147–168.
7. Polak, L. S., Sinyayev, G. B., Slovetskiy, D. I. (1991). *Khimiya plazmy*. Novosibirsk: Nauka, 328.
8. Takasaki, M., Harada, K. (1986). Plasma induced reaction in aqueous solution. *Sci. And Technol., Vol. 126, № 2*, 31–52.
9. Pivovarov, A. A., Sergeyeva, O. V., Tishchenko, A. P. et al. (2007). Plazmokhimicheskoye izvlecheniye polivalentnykh metallov iz stochnykh vod gal'vanicheskikh proizvodstv. *Voprosy khimii i khimicheskoy tekhnologii, № 6*, 230–237.
10. Lee, W. M. (1991). Metal/water chemical reaction coupled to a pulsed electrical discharge. *Journal of Applied Physics, Vol. 69, № 10*, 6945–6951. doi:10.1063/1.348931.
11. Sergeyeva, O. V., Pivovarov, A. A., Frolova, L. A., Dubovik, T. N. (2012). Vosstanovleniye ionov serebra iz vodnogo rastvora putem yego plazmokhimicheskoy obrabotki. *Proceedings of the conference «Přední vědecké Novinky-2012», 27 srpna — 05 Zari 2012 roku*. Praha: Obrazovaniye i nauka, 27–29
12. Sergeyeva, O. V., Pivovarov, A. A., Ovcharenko, O. V. (2009). Primer resheniya pryamoy zadachi khimicheskoy kinetiki s ispol'zovaniyem sredstv Mathcad Professionel. *Voprosy khimii i khimicheskoy tekhnologi, № 5*, 166–170.

MECHANICAL ENGINEERING TECHNOLOGY

EXPANSION OF TECHNOLOGICAL POSSIBILITIES OF UNIVERSAL GEAR MILLING MACHINES BY INTRODUCTION OF THE CONTROLLED MAIN MOTION DRIVE

page 23–27

The ways of solving problems, currently existing in the gear cutting technology are considered in the paper. The purpose of research is to improve the technical level and the automation level of universal mechanically-driven gear milling machines by the introduction of controlled drive of one of the shaping motions, which is carried out by the radial-circular method. Using the radial-circular method in the gear treatment technology is based on the idea of separation of kinematic chains of the main motion and indexing-generating motion. This allows to substitute expensive and complicated hob cutters for shaping and cutting with thin disc cutters, based on this reduce cutting strength and power and energy costs, provide vibration stability of elastic system of the machine without increasing its weight, as well as intensify the cutting conditions and reduce machining time. Patterns of change in cutting force in treatment cycle that can be used to compensate for uneven cutting process by change in machining travel speed of the stepper motor. Upgrading the gear milling machine design and using the stepper motor provides the program control of the tool drive, improves machining accuracy and quality of gear profiles, increases the automation level and technical level of universal equipment.

Keywords: gear milling, radial-circular method, stepper motor, controlled drive, automation, technical level.

References

1. Kalashnykov, A., Morhunov, Yu., Kalashnykov, P. (2012). *Sovremennye metody obrabotky zubchatykh kolios*. Moskva: Spektr, 238.
2. Loktev, D. A. (2007). Sovremennye yznosostoikye pokrytyia cherviachnykh frez. *Struzhka, 19*, 32–36.
3. Kohanov, Y. A. (1970). *Prohressyvnaia obrabotka zubchatыkh profylei y fasonnykh poverkhnostei*. Tula: Pryokskoe knyzhn. yz-vo, 180.
4. Kryvosheia, A., Danylchenko, Yu. et al. (2007). Formoutvorennia zubchastykh kolis riznykh klasiv vykhidnymy dyskovymy formoutvoriuvalnymy tilamy. *Tezy dopovidei 8-y mizhnarodnyi sympozium ukrainskykh inzheneriv-mekhanikiv u Lvovi*, 101.
5. Pasternak, S. I., Danylchenko, Yu. M., Storchak, M. H., Kryvosheia, A. V. (2011). Sylovi kharakterystyky konturnoi obrobky tsylindrychnykh zubchastykh kolis instrumentom. *Vestnyk NTU «KhPY». Problemy mekhanichnoho pryvodu, 28*, 96–100.
6. Danylchenko, Yu. M., Kryvoshyia, A. V., Pasternak, S. I. (2006). Matematychne modeliuvannia zakoniv rukhu dyskovoho instrumentu pry obrobtsi zubchastykh kolis dovilnoho profiliu. *Vestnyk NTUU «KPY». Mashynostroenye, 49*, 104–108.
7. Pasternak, S. I., Danylchenko, Yu. M. et al. (2007). Konturna obrobka zubchastykh kolis z dovilnym profilem zubiv dyskovymy instrumentamy. *Materialy dopovidei Mizhnarodnoi naukovo-tekhnichnoi konferentsii studentiv, aspirantiv i molodykh vchenykh «Prohresyvni napriamky rozvytku mashyno-pryladobudivnykh haluzei ta transportu»*. Sevastopol: SevNTU, 90–91.
8. Pasternak, S. I., Danylchenko, Yu. M., Storchak, M. H., Kryvosheia, A. V. (2009). Ekonomichne obgruntuvannia metodu konturnoi obrobky detalei z periodychnymy profiliamy dyskovym instrumentom. *Vestnyk NTU «KhPY». Problemy mekhanichnoho pryvodu, 19*, 118–126.
9. Hrytsai, Y. E., Blahut, E. N. (2005). Zubchatye peredachy y tekhnolohyy ykh yzghotovlenyia: novoe v tradytsyonnom. *Oborudovanye i ynstrument, 2(61)*, 36–40.
10. Hrytsai, I. Ye. (2007). Pidvyshchennia tekhnichnoho rivnia peredach pryladiv na osnovi zubchastoho zacheplennia synusoidalnoho profiliu. *Zb. Tez dopovidei 6-yi naukovo-tekhnichnoi konferentsii «Pryladobuduvannia: stan i perspektyvy», 24–25 kvitnia, 2007 r.* Kyiv, 108–109.
11. Lytvyniak, Ya., Hrytsai, I. (2009). Modeliuvannia vplyvu tekhnolohichnykh faktoriv na sylovi parametry protsesu zubonarizannia ta tochnist tsylindrychnykh synusoidalnykh zubchastykh kolis. *Deviatyi mizhnarodnyi sympozium ukrainskykh inzheneriv-mekhanikiv u Lvovi*. Lviv: KINPATRI LTD, 196–198.
12. Hrytsai, I. Ye., Hromniuk, S. I. (2013). Pidvyshchennia efektyvnosti protsesu narizannia zubchastykh kolis na osnovi radialno-obertovoho metodu v umovakh obkochuvannia. *Materialy XI Mizhnarodnoi naukovo-tekhnichnoi konferentsii «Vazhke mashynobuduvannia problemy ta perspektyvy rozvytku»*. Kramatorsk, 44.
13. Hrytsai, I. Ye. (1998). Modeliuvannia parametriv zriziv, syl ta momentiv pid chas narizannia zubchastykh kolis cherv`yachnymy frezamy. *Mashynoznavstvo, 7*, 19–23.
14. Hrytsai, I. Ye., Hromniuk, S. I., Kuk, A. M. (2014). Parametry poperechnoho pererizu zriziv v radialno-obkochuvalnomu sposobi narizannia zubchastykh kolis z osovoiu podacheiu. *Visnyk NU «Lvivskoho politekhnika» Optymizatsiia vyrobnychykh protsesiv i tekhnichnyi kontrol u mashynobuduvanni ta pryladobuduvanni, 772*, 8–14.

RESEARCH OF SYNTHETIC IRON MICROSTRUCTURE PARAMETERS TO MAXIMIZE OF ITS QUALITY

page 27–30

The analysis of existing quality system in foundry is given in the article. One of the main components of product yield quality is the influence of chemical composition of the alloy on mechanical properties and microstructure parameters. It is proposed the methods of microstructure evaluation using mathematical methods: least squares and normal distribution law. Graphite is selected as quality criterion for research. The diagrams of graphite distribution in cast iron are constructed as a result of microstructure analyses. This will allow to create a mathematical model of chemical composition influence of input parameters on the output parameters in the smelting of cast iron. This is an actual problem in real production. Researches in this area will reduce the probability of defective items and improve the physical and mechanical properties of molded pieces.

Keywords: quality, microstructure, graphite, mathematical model.

References

1. *GOST 15467-79. Upravlenie kachestvom produktsii*. (1987). M.: Izdatel'stvo standartov. Available: http://vsegost.com/Catalog/31/31626.shtml.
2. Shindovskiy, E., Shorts, O. (1976). *Statisticheskie metody upravleniia kachestvom*. Translation from German. M.: Mir, 314.
3. *GOST 3443-87. Otlivki iz chuguna s razlichnoy formoy grafita. Metody opredeleniia struktury*. (2008). M.: Standartinform, Available: http://ostapbenderx.narod.ru/Index/52/5239.htm.
4. Demin, D. A., Pelikh, V. F., Ponomarenko, O. I. (1998). Complex alloying of grey cast iron. *Litejnoe Proizvodstvo, 10*, 18–19.
5. Demin, D. A. (1998). Change in cast iron's chemical composition in inoculation with a Si-V-Mn master alloy. *Litejnoe Proizvodstvo, 6*, 35.
6. Demin, D. A., Pelikh, V. F., Ponomarenko, O. I. (1995). Optimization of the method of adjustment of chemical composition of flake graphite iron. *Litejnoe Proizvodstvo, 7–8*, 42–43.
7. Demin, D. O.; National Technical University «Kharkiv Polytechnic Institute». (1995). *Deiaki aspekti upravlinnia iakistiu chavuna z plastinchastim grafitom*. Kh., 24.
8. Demin, D. A. (2000). Statisticheskoe modelirovanie zavisimostey mezhdu strukturnymi sostavliaiuschimi chuguna, modifitsirovannogo ferrosilitsiem. *Vestnik Khar'kovskogo gosudarstvennogo politehnicheskogo universiteta, № 119*, 36–39.
9. Demin, D. A. (2001). Statisticheskoe modelirovanie zavisimostey mezhdu strukturnymi sostavliaiuschimi i tviordost'iu chuguna, modifitsirovannogo ferrosilikovanadiem. *Protsessy lit'ia, № 2*, 55–58.
10. Demin, D. A. (2004). Sravnitel'naia otsenka ieffektivnosti modifitsirovaniia chuguna kompleksnymi modifikatorami. *Vestnik Natsional'nogo tehnicheskogo universiteta «KhPI», № 39*, 72–76.

INFORMATION TECHNOLOGY AND CONTROL SYSTEMS

DEVELOPMENT OF A METHOD FOR MAINTAINING ENERGY PRODUCTION AND CONSUMPTION RATIO

page 31–34

The necessity of maintaining the ratio of production and consumption of electric energy and heat for the resource- and energy saving was substantiated. The architecture of an intelligent system of energy production and consumption, which is based on the integrated dynamic subsystem, including co-generation unit, electric battery and thermo-electric battery was proposed.

Using the resulting information, obtained based on monitoring the operability and identifying the status of electric battery and thermo-electric battery, a method for integrated decision-making in conditions of mismatch of energy production and consumption was developed. Forecasting changes in the battery charge and discharge voltage allows timely carry out economic electro-accumulation during unprofitable production of electric energy and its production reduction to match production and consumption of heat based on forecasting changes in the thermo-electric battery charge level. Thus, while maintaining the ratio of the production and consumption of electric energy and heat at the decision-making level, it is possible to reduce the cost of energy production and carbon dioxide emissions up to 10–15 %.

Keywords: intelligent system, electric energy, heat, battery, thermo-electric battery, decision-making.

References

1. Bilieka, B. D., Sergienko, R. V., Kabkov, V. Y. (2010). Efficiency cogeneration and combined-heat pump systems with gas piston and turbine engine. *Aerospace equipment and technolog, 7(74)*, 25–29.
2. Horobetc, V. G., Drahanov, B. H. (2010). Exergy efficiency analysis of power systems for integrated production of electricity and heat using renewable energy. *Renewable Energy, 3(22)*, 5–12.
3. Balasanian, H. A., Mazurenko, A. S. (2006). Optimization of parameters of the thermal circuit of the integrated system of energy consumption. *Proceedings of the Odessa Polytechnic University, 1(25)*, 59–65.
4. Basok, B. I., Rezakova, T. A., Chalaiev, D. M. (2006). Prospective cogeneration heat pump geothermal energy scheme. *Industrial Heat, 2(28)*, 36–40.
5. Bilieka, V. D., Harkucha, L. K. (2012). Cogeneration, heat pump technology in hot water circuits of high power. *Industrial Heat, 34(4)*, 52–57.
6. Fiedulov, S. P. (2013). Cogeneration agribusiness. Advanced projects. *Turbines and diesel engines, 2*, 18–22.
7. Kolesnichenko, N. V., Vodolazkaya, M. Y. (2011). The use of the storage tank to control pressure mini-CHP. *Scientific works of Donetsk National Technical University, 10(180)*, 67–72.
8. Chaikovskaya, E. E. (2013). Optimization of energy systems at the level of decision-making. *Industrial Heat, 35(7)*, 169–173.
9. Chaikovskaya, E. E. (2012). Maintaining of electrical accumulation in decision-making. *Bulletin of the National Technical University «KhPI». Series: New solutions in modern technologies, 5(956)*, 124–127.
10. Chaikovskaya, E. E. (2013). Maintaining accumulation in decision-making level. *Bulletin of the National Technical University «KhPI». Series: Energy and thermal engineering processes and equipment, 14(988)*, 127–133.

EXPERT ASPECTS OF INFORMATION TECHNOLOGIES FOR EVALUATION OF SPECTRAL CHARACTERISTICS OF TEXTILE MATERIALS

page 34–37

Expert aspects of information technologies for evaluation of the spectral characteristics of textile materials are considered in the paper. The main research goal is to develop recommendations on evaluating the results of color reproduction on fabrics with different textures based on the analysis of the results, obtained using computerized evaluation systems, mathematical description and reproduction of color and solving production coloistics problems. To achieve this goal, the empirical results are analyzed, and the main task, namely, to establish an objective quantitative relationship between the fabric texture and spectral characteristics of colors, obtained with direct dyes is solved. It is found that the Gurevich-Kubelka-Munk function values increase when decreasing the thinness of fabric and weaving, which provides a higher reflection coefficient of undyed fabric, in this case, a twill weave. It is shown that color deviation definition in NBS units does not accurately reveal color discrimination. During the examination of the spectral characteristics of textile materials to meet the standards, it is recommended to assess color

discrimination not only in NBS units, but also according to the hue. The considered expert aspects of information technologies for evaluation of the spectral characteristics of textile materials allow not only to improve the examination methodology, but also the technological regimes to enhance the production efficiency of textile materials.

Keywords: information technologies, expert evaluation, color characteristics.

References

1. Mak-Donald, R.; Translation from English Panova, M. V., Novosel'tsev, L. P.; In: Telegin, F. Yu. (2002). *Tsvet v promyshlennosti*. Moscow: Logos, 596. ISBN 5-94010-175-5.
2. Zhuravleva, N. V. Konovalova, M. V., Kulikova, M. A. (2007). *Kolorirovanie tekstilnyh materialov*. Moscow: MGTU, 368. ISBN 5-8196-0092-4.
3. Neverov, A. N., Pehtasheva, E. L., Raiykova, E. Yu. (2012). Identifikatsionnaya i tovarnaya ekspertiza odezhno-obuvnih i yuvelirnih tovarov. Moscow: INFRA, 472. ISBN 978-5-16-003789-9. doi:10.12737/752.
4. Tolmachov, V. S., Kuzmina, T. O. (2011). Analiz metodiv viznachennya pokaznika koloru llyanoyu sirovini. *Tovaroznavchiy visnik, № 3*, 309–315.
5. Medvedev, V. Yu. (2005). *Tsvetovedenie i koloristika*. Sankt-Peterburg: IPTS SPGUTD, 116. ISBN -7937-0082-6.
6. Sumskaya, O. P. (1995). Primenenie sistemy obektivnogo izmereniya tsveta dlya resheniya zadach promyshlenoi koloristiki. *Nauchno-tehnicheskiy progress v perehodnyi period razvitiya Ukrainy*, 152.
7. Sumskaya, O. P. Baranovskiy, V. I., Han Ibragim. (2000). Otsenka vliyaniya netraditsionnyh tehnologiy podgotovki hlopchatobumazhnyh tkaney na tsvetovye harakteristiki okrasok pri pechatanii aktivnymi krasitelyami. *Problemy legkoy i tekstilnoy promyshlennosti Ukrainy, 4*, 54–57.
8. Krivosheev, M. I., Kustarev, A. K. (1990). *Tsvetovie szmereniya*. Moscow: Energoatomizdat, 240. ISBN 5-283-00545-3.
9. Novoradovskiy, A. G. (2005). *Nauchnoe obosnovanie i razrabotka effektivnyh metodov prognozirovansya i formirovaniya okraski tekstilnyh materialov s zadannymi potrebitelskimi svoystvami*. Ivanovo, 38.
10. Sumskaya, O. P., Prohorova, I. A., Polishchuk, S. A. (2013). Usage of computerized complexes for effective formation of textured woolen fabrics coloring. *Eastern-European Journal Of Enterprise Technologies, 3(10(63))*, 58–61. Available: http://journals.uran.ua/eejet/article/view/14865.

ANALYSIS OF CAUSES DEGRADATION OF MATERIALS OF DISCRETE DEVICES OF COMPUTER SYSTEMS

page 37–41

Definition of reliability was given and classification of failures of discrete devices was performed in the paper. Long life cycle of computer systems should be provided by both functional, software components and physical hardware. One of the conditions of physical hardware is reliability of discrete devices of computer systems.

The analysis of the physics of failures was carried out. The concentration of substances, penetrating into the material and the level of energy effects depend on the quality of the element protection against external and internal operating factors. An increase in the intensity of their influence on the element increases the rate of physical and chemical processes, resulting in reversible and irreversible changes in materials. The physical nature of failures is based on the practical problems of determining reliability of discrete devices. Herewith, it is necessary to consider the causes of failures and construction of correct mathematical models.

For the analysis of the reliability of information computer systems, mathematical models on the reliability theory were developed. We have developed and described a composite material model, reflecting the behavior of discrete material taking into account completed physical processes in the material. In the analysis of metal-nonmetal, metal-metal systems, there is a special area — a thin layer that has physicochemical properties, different from that of the main components. This layer is responsible for the contact strength and is the link between phases. The numerical implementation of these tasks was carried out according to the developed algorithm using the existing mathematical software with some additions.

Keywords: reliability, failure, discrete device, composite material, analysis.

References

1. Gotra, Z. Yu., Nikolaev, I. M. (1978). *Kontrol' kachestva i nadezhnost' mikroshem*. M.: Radio i sviaz', 168.
2. Pogrebinskiy, S. B., Strel'nikov, V. P. (1988). *Proektirovanie i nadezhnost' mnogoprotsessornyh EVM*. M.: Radio i sviaz', 165.
3. Shor, Ya. B. (1962). *Statisticheskie metody analiza kontrolia kachestva i nadezhnosti*. M.: Sov. Radio, 552.
4. Matov, V. I., Belousov, Yu. A., Fedoseev, E. P. (1988). Bortovye *tsifrovye vychislitel'nye mashiny i sistemy*. M.: Vyssh. shk., 216.
5. Kapur, K., Lamberson, L.; Translation from English Kovalenko, E. G.; In: Ushakova, I. A. (1980). *Nadezhnost' i proektirovanie sistem*. M.: Mir, 604.
6. Liashok, A. P., Rossoshinskiy, A. A., Shevchenko, E. S. (1968). O prichine otkazov mikrosvarnyh soedineniy zoloto-aliuminiy v integral'nyh shemah. *Elektronnnaia tehnika. Ser. 6. Mikroielektronika, V. 3*, 74–79.
7. Goriunov, N. N. (1970). *Svoystva poluprovodnikovyh priborov pri dlitel'noy rabote i hranenii*. Moskva: Energiia, 103.
8. Hansen, M., Anderko, K. (1962). *Struktura dvoynyh splavov*. Moskva: Metallurgizdat, 608.
9. Sidniaev, N. I., Savchenko, V. P., Klochkova, D. V. (2013). Analiz fiziki otkazov dlia otsenki pokazateley nadezhnosti radioielektronnyh priborov sovremennyh radiolokatsionnyh sistem. *Inzhenernyy zhurnal: nauka i innovatsii, № 12(24)*. Available: http://engjournal.ru/catalog/appmath/hidden/1149.html.
10. In: Kolesnikov, V. G. (1991). *Osnovnye tverdotel'nye pribory, ispol'zuemye v ielektronnyh ustroystvah. Elektronika. Entsiklopedicheskiy slovar'*. Moskva: Sov. ientsiklopediia, 688.
11. Kravchenko, O. V. (2003). Matematichna model' mizhfazovoi vzaiemodii v kompozitah ta utochnennia modeli metodami obchisliuval'noi matematiki. *Visnik Shidnoukrains'kogo natsional'nogo universitetu im. V. Dalia, № 7(65)*, 84–88.

SOLUTION OF A PROBLEM OF AUTOMATED CREATION OF TERMINOLOGICAL DICTIONARY OF SUBJECT DOMAIN

page 41–44

This paper proposes the solution of the problem of automated creation of terminological dictionary of the subject domain using the authors' information system for the automated formation of lexicographical resources. Functional requirements for an information system for the automated formation of lexicographical resources were defined.

Mathematical, algorithmic, software support of problem of automated formation of terminological dictionary of the subject domain was developed. An information system for the automated formation of lexicographical resources will allow to solve problems such as automatic creation of terminological dictionary of subject domain; extraction of terms and keywords from the texts of the subject domain for their further use in indexing documents, for improving the full-text search.

To describe syntactic constructions, corresponding to the context of definitions of terms, the language of lexico-syntactic patterns was selected. In the paper, the authors have experimentally proved the effectiveness and evaluated the operation of information system in terms of solving the designated task.

Keywords: intelligent systems, lexico-syntactic patterns, automated formation of terminological dictionaries.

References

1. Nekos, V. Ye. (1999). *Osnovy obshchey ekologii i neoekologii. Chast' 1. Osnovy obshchey i global'noy traditsionnoy ekologii*. Kharkov: Tornado, 192.
2. Nekos, V. Ye. (2001). *Osnovy obshchey ekologii i neoekologii. Chast' 2. Osnovy obshchey i global'noy neoekologii*. Kharkov: Prapor, 287.
3. Borysova, N. V., Yamshanov, I. S. (2014). Informatsiyna systema avtomatyzovanogo formuvannya leksikografichnykh resursiv. *Problemi informatsiynykh tekhnologiy, № 01(015)*, 193–199.
4. Petrenko, M. G. (2014). *Metody ta zasoby pobudovy znannya-orientovanykh komp'yuternykh system z ontologo-kerovanoyu arkhitekturoyu*. Kyiv: Instytut kibernetyky im. V. M. Hlushkova, 40.
5. Borysova, N. V., Reshetilo, S. S. (2014). Avtomatyzovane vydobuvannya terminologichnykh odinyts' z naukovo-tekhnichnykh tekstiv. *Materialy III Vseukrains'koi naukovo-praktychnoi konferen-*

tsii «Intelektual'ni sistemy ta prikladna lingvistyka», m. Kharkiv, 17 kvitnya 2014 r. Kharkiv: NTU «KhPI», 43.
6. Borisova, N. V., Kochuyeva, Z. A. (2014). Indexing text documents for problem advanced information search by keyword. *Eastern-European Journal Of Enterprise Technologies, 1(2(67))*, 4–8. Available: http://journals.uran.ua/eejet/article/view/20332.
7. Borisova, N. V., Kanishcheva, O. V., Yurchenko, Ye. N. (2013) Avtomatizirovannoye formirovaniye slovarya sinonimov. *Vestnik KHNTU, № 1(44)*, 91–95.
8. Borisova, N. V., Kanishcheva, O. V. (2013). The formation of problem domain dictionary. *Eastern-European Journal Of Enterprise Technologies, 5(3(65))*, 16–19. Available: http://journals.uran.ua/eejet/article/view/18469.
9. Yefremova, N. E., Bol'shakova, Ye. I., Noskov, A. A., Antonov, V. Yu. (2010). Terminologicheskiy analiz teksta na osnove leksiko-sintaksicheskikh shablonov. *Komp'yuternaya lingvistika i intellektual'nye tekhnologii, Vyp. 9(16)*, 124–129.
10. Bol'shakova, Ye. I., Vasil'yeva, N. E., Morozov, S. S. (2012). *Leksiko-sintaksicheskiye shablony dlya avtomaticheskogo analiza nauchno-tekhnicheskikh tekstov*. Available: http://masters.donntu.edu.ua/2012/iii/sarry/library/bolshakova/Bolshakova.htm.
11. Vasil'yeva, N. E. (2004). *Shablony upotrebleniy terminov i ikh ispol'zovanie pri avtomaticheskoy obrabotke nauchno-tekhnicheskikh tekstov*. Available: http://www.dialog-21.ru/Archive/2004/Vasiljeva.htm.

DEVELOPMENT OF AN ELECTROSTATIC METHOD OF NONDESTRUCTIVE TESTING WITH HIGH NOISE IMMUNITY

page 44–47

New electrostatic method of nondestructive testing with high noise immunity for a wide range of materials and structures, dielectrics and conductive materials without using contact liquid is proposed in the paper. A block diagram of the device to use this method in the field of nondestructive testing is provided.

The method includes generating electrostatic field by supplying a reference signal with a given frequency to one pair of electrodes, registering induced charge using another measuring electrodes, and multiplying reference and measuring signals with further processing and visualization of results on the screen. The method involves two-axis scanning of the control object. Moreover, the measuring signal is defined as the difference of output signals of two pairs of measuring electrodes.

Using the proposed nondestructive testing allows to test products under normal laboratory conditions without using special facilities and special screening means. The results of experiments confirm that under normal laboratory conditions, the level of noise from power supply networks exceeds the level of the useful signal by more than 40 dB, which prevents the realization of the known testing under such conditions. Testing can be conducted with one-way access to the control object.

Keywords: electrostatic method, dielectric testing, two-axis scanning, noise immunity improvement.

References

1. Diamond, G., Hutchins, D. (2006). *A New Capacitive Imaging Technique for NDT*. UK: School of Engineering, University of Warwick, Coventry. Available: http://www.ndt.net/article/ecndt2006/doc/P229.pdf.
2. Beardsmore-Rust, S. T., Prance, R. J., Aydin, A., Prance, H., Harl, C. J., Stiffell, P. B. (2009, July 1). Signal specific electric potential sensors for operation in noisy environments. *Journal of Physics: Conference Series, Vol. 178*, 012011. doi:10.1088/1742-6596/178/1/012011.
3. Szczerba, A. A., Rezinkina, M. M. (2008). *Modeling and analysis of the electric fields of energy facilities*. K.: Naukova kniga, 248.
4. Watson, P., Prance, R. J., Beardsmore-Rust, S. T., Prance, H. (2011, June). Imaging electrostatic fingerprints with implications for a forensic timeline. *Forensic Science International, Vol. 209, № 1–3*, 41–45. doi:10.1016/j.forsciint.2011.02.024.
5. Ditchburn, R. J., Burke, S. K. (2005, December). Planar rectangular spiral coils in eddy-current non-destructive inspection. *NDT & E International, Vol. 38, № 8*, 690–700. doi:10.1016/j.ndteint.2005.04.001.
6. Fava, J. O., Lanzani, L., Ruch, M. C. (2009, December). Multilayer planar rectangular coils for eddy current testing: Design considerations. *NDT & E International, Vol. 42, № 8*, 713–720. doi:10.1016/j.ndteint.2009.06.005.
7. Aydin, A., Stiffell, P. B., Prance, R. J., Prance, H. (2010, November 4). A high sensitivity calibrated electric field meter based on the electric potential sensor. *Measurement Science and Technology, Vol. 21, № 12*, 125901. doi:10.1088/0957-0233/21/12/125901.
8. Sun, H. (2005). *Electromagnetic methods for measuring material properties of cylindrical rods and array probes for rapid flaw inspection*. Retrospective Theses and Dissertations. Iowa State University, 148.
9. Baxter, L. K. (1996). *Capacitive Sensors: Design and Applications*. John Wiley & Sons, 320.
10. Connor, S. (2011, September 1). *EPIC: A New Epoch in Electric Potential Sensing*. Available: http://www.sensorsmag.com/sensors/electric-magnetic/epic-a-new-epoch-electric-potential-sensing-8961.

ECONOMICS AND MANAGEMENT OF ENTERPRISE

DEVELOPMENT OF BASIC APPROACHES TO IMPROVE INDUSTRIAL ENTERPRISE INVESTMENT SUPPORT

page 48–51

It is justified in the paper that the full range of measures for effective formation, development and use of industrial enterprise investment support can be ensured using not the only management approach, but a complex of approaches that are combined in the proposed logical framework of the enterprise investment support management concept.

An integrated approach to the industrial enterprise investment support level evaluation using multidimensional scaling allows to determine the industrial enterprise investment support level and attract investments for object-orientated investment activities taking into account environment effects.

Matrix for a comprehensive evaluation of investment support of the studied engineering enterprises should be built based on certain indicators of investment attractiveness and financial support. The proposed matrix provides an objective description of the financial situation and potential of the enterprise, which is expected to invest in, and allows to develop policy recommendations.

Keywords: enterprise investment support, enterprise investment support management, investment support level evaluation.

References

1. Maiorova, T. V. (2003). *Investytsiina diialnist*. K.: TsUL, 376.
2. Peresada, A. A. (2002). *Upravlinnia investytsiinym protsesom*. K.: Libra, 472.
3. Shchukin, B. M. (2004). *Investuvannia*. K.: MAUP, 216.
4. Shevtsova, Ya. A.; Volodymyr Dahl East Ukrainian National University (2003). *Investytsiine zabezpechennia diialnosti pidpryiemstv*. L., 20.
5. Kapitanets, Yu. O. (2010). Investytsiine zabezpechennia fermerskykh hospodarstv. *Innovatsiina ekonomika, № 5*, 144–151.
6. Samoilova, T. A. (2009). Investytsii kapitalu ta investytsiinyi klimat v Ukraini. *Halytskyi ekonomichnyi visnyk, № 1*, 100–109.
7. Heiets, V. M., Aleksandrova, V. P., Skrypnychenko, M. I., Fedulova, L. I., Naumovets, A. H. et al. (2007). *Zvedenyi prohnoz naukovo-tekhnolohichnoho ta innovatsiinoho rozvytku Ukrainy na naiblyzhchi 5 rokiv ta nastupne desiatylittia*. K.: Feniks, 152.

8. Hrynov, A. V., Dedilova, T. V. (2008). *Upravlinnia innovatsiinym rozvytkom promyslovykh pidpryiemstv u hlobalnomu seredovyshchi*. Kh.: KhNADU, 148.
9. Yankovoi, A. H. (2002). *Mnohomernyi analyz v systeme STATISTICA*. O.: Optymum, 325.
10. Beltiukov, Ye. A., Dyskina, A. A. (2013). *Kompleksna otsinka investytsiinoho zabezpechennia promyslovykh pidpryiemstv*. O.: Interprint, 204.

FEATURES OF THE FUNCTIONING OF CORPORATE CONTROL MODELS

page 52–55

Theoretical approaches to identifying effective corporate control models under conditions of economic transformation, characteristic features of corporate control models in the context of ensuring an effective control distribution between owners and managers are defined in the paper. The main aim of the study is to highlight existing corporate control models and determine effective control model to ensure gainful activity of the corporation.

The need for theoretical studies of this issue is caused by imperfect study of models regarding adaptation to economic and legal features of Ukraine, as well as the need to settle corporate control relationships that would promote the resolution of the identified disadvantages of corporate control models.

The study has allowed to conclude that a model that reflects the efficient control distribution in corporate enterprises between owners and managers can be considered as the corporate control model.

The results of the study can be used by enterprises with corporate governance to ensure and increase their gainful activity.

Keywords: corporate governance, corporate control, corporate control model.

References

1. Dieieva, N. E., Mykhailova, N. S. (2010). Sutnist korporatyvnoho kontroliu ta peredumovy yoho vynyknennia. *Visnyk Donetskoho natsionalnoho universytetu ekonomiky i torhivli im. M. Tuhan-Baranovskoho. Ser. Ekonomichni nauky, № 4*, 338–343.
2. Kortunov, H. H. (2010). *Rozvytok fondovoho rynku yak instrument pidvyshchennia investytsiinoi pryvablyvosti Ukrainy*. Available: http://esteticamente.ru/portal/soc_gum/pips/2010_2/2010_2/433.pdf. Last accessed 18.07.2014.
3. Suprun, N. A. (2009). *Instytutsiini determinanty stanovlennia vitchyznianoi modeli korporatyvnoho upravlinnia*. Available: http://www.economy.nayka.com.ua/?op=1&z=73.
4. Zaitseva, T. H. (2008). *Orhanizatsiino-ekonomichnyi mekhanizm rozpodilu ta realizatsii korporatyvnoho kontroliu v aktsionernykh tovarystvakh*. Kh., 24.
5. Sirko, A. V. (2004). *Korporatyvni vidnosyny v perekhidnii ekonomitsi: problemy teorii i praktyky*. K.: Imeks, 414.
6. Belyanova, E., Rozinskiy, I.; In: Masahiko Aoki, Hyung Ki Kim. (1997). The evolution of commercial banking activities in Russia and its impact on corporate governance. *Corporate governance in transitional economies: insider control and the role of banks*. St. Petersburg, 558. doi:10.1596/0-8213-2990-1.
7. Umantsiv, Yu. *Formuvannia ukrainskoi modeli korporatyvnoho upravlinnia*. Available: www.spfu.gov.ua/ukr/journal/.../4_10_15.pdf. Last accessed 29.08.2014.
8. Golikova, V., Simachev, Yu., Yakovlev, A. (2004). Insaydery, autsaydery i osobennosti korporativnogo upravleniia v Rossii. *Al'manah Assotsiatsii nezavisimyh tsentrov ekonomicheskogo analiza, Vyp. 5*. Available: http://www.arett.ru/almanach_card.php?id=4124. Last accessed 26.07.2014.
9. Sokhatska, O. M., Tarnavska, N. P., Tybin, A. M., Ustenko, O. A., Chernychynets, S. P. (2007). *Korporatyvne upravlinnia v Ukraini: teoretyko-metodolohichni aspekty*. T.: Ekonomichna dumka, 359.
10. Burlachkov, V. (2010). Osoblyvosti suchasnykh ekonomichnykh protsesiv i hroshovo-kredytna polityka. *Ekonomika Ukrainy, № 4*, 16–21.
11. Pylypenko, O. I. (2010). *Korporatyvni prava v systemi bukhhalterskoho obliku*. Zh.: FOP Kuzmin D. N., 611.
12. Mokriak, V., Mokriak, E. (2007). Korporatyvne upravlinnia velykymy promyslovymy pidpryiemstvamy: suchasnyi stan ta aktualni problemy. *Ekonomika Ukrainy, № 4*, 42–54.

DEVELOPMENT OF PRODUCTIVE FORCES AND REGIONAL ECONOMY

FINANCIAL POSITION OF SOCIAL PROGRAMMES AS INSTRUMENTS OF SOCIAL PROTECTION OF UKRAINE'S POPULATION

page 56–59

The paper reveals the essence of the concepts of «programme» and «social programme». The stages of social programmes' development, their classification and basic features are considered. The sources and forms of financing social programmes are analyzed. The results of analyzing a set of state target social programmes, implemented in Ukraine, are given. The purpose of the study is to outline the role of social programmes in a general social protection system.

Searching new sources of funding for social programmes will help to relieve the state budget, which is currently under excessive financial burden. The paper considers a large number of alternative forms of financial support for social programmes. It reveals their effectiveness and necessity.

The paper results can be used in further research and improvement of this issue.

In this study, we proposed a number of innovations that would help to overcome difficulties in the development of social programmes, namely introducing the «state-business» method.

Keywords: social protection, social programme, state target programme, programming, non-profit organizations, public initiative.

References

1. Libanova, E. (2012). *Sotsialni rezultaty derzhavnykh prohram: teoretyko-metodolohichni ta praktychni aspekty otsiniuvannia*. Uman: Sochinskyi, 312.
2. Makarova, O. (2004). *Derzhavni sotsialni prohramy: teoriia, metodyka rozrobky ta otsinky*. K.: Lira-K, 328.
3. Ponomarenko, O. (2010). *Mekhanizm derzhavnoho upravlinnia sotsialnymy proektamy ta prohramamy*. Donetsk: Tehnopak, 342.
4. Yevdokymova, I. (2009). Efektyvnist sotsialnykh prohram iak instrumentiv sotsialnoho zakhystu naselennia. *Visnik Kharkivskoho natsionalnoho universytetu imeni V. N. Karazina, № 881*, 190–194.
5. Makarova, O. (2004). *Derzhavni sotsialni prohramy: teoriia, metodyka rozrobky ta otsinky*. K.: Lira-K, 34.
6. Kabinet Ministriv Ukrainy. (2011). *Pro zatverdzhennia Derzhavnoi tsilovoi sotsialnoi prohramy podolannia ta zapobihannia bidnosti na period do 2015 roku*. Available: http://zakon4.rada.gov.ua/laws/show/1057-2011-п.
7. Kabinet Ministriv Ukrainy. (2013). *Pro zatverdzhennia Derzhavnoi tsilovoi sotsialnoi prohramy pidtrymky sim'i do 2016 roku*. Available: http://zakon4.rada.gov.ua/laws/show/341-2013-п.
8. Kabinet Ministriv Ukrainy. (2007). *Pro zatverdzhennia Derzhavnoi tsilovoi sotsialnoi prohramy reformuvannia systemy zakladiv dlia ditei-syrit ta ditei, pozbavlennykh batkivskoho pikluvannia*. Available: http://zakon4.rada.gov.ua/laws/show/1242-2007-п.
9. Kabinet Ministriv Ukrainy. (2009). *Pro zatverdzhennia Derzhavnoi tsilovoi sotsialnoi prohramy «Molod Ukrainy» na 2009–2015 roku*. Available: http://zakon4.rada.gov.ua/laws/show/ 41-2009-п.

10. Kabinet Ministriv Ukrainy. (2012). *Pro zatverdzhennia Derzhavnoi tsilovoi sotsialnoi prohramy zabezpechennia pozhezhnoi bezpeky na 2012–2015 roku*. Available: http://zakon4.rada.gov.ua/laws/show/590-2012-п.
11. Ilchuk, L. I. (17.07.2014). *Monitorynh sytuatsii u sotsialnii sferi v Ukraini za kviten 2014 roku*. Available: http://cpsr.org.ua/index.php?option=com_content&view=article&id=392:-2014-&catid=17:2010-06-10-20-44-31&Itemid=24.

PROSPECTS OF CREDIT UNIONS' DEVELOPMENT AS A NECESSARY TOOL FOR PROVIDING FINANCIAL SERVICES

page 59–62

The paper examines recent trends in the development of credit unions and defines priority areas of their future activities. In particular, a detailed analysis of the Ukraine's credit unions state, focusing on the causes of problems in the activity of credit unions, is made. The purpose of this paper is to analyze the efficiency of the credit unions' development and their importance as a tool of providing financial services.

A statistical analysis of the credit unions makes it possible to assess the real state of the prospects for the credit unions' development in Ukraine and the appropriateness of their creation.

The paper results can be used for further research and improvement in this area.

Also, directions and areas for improving credit unions in the Ukrainian market of financial services are proposed. First of all, we have proposed to improve the monitoring of financial transactions carried out by credit unions from the state because the state is a guarantor of public confidence in such financial institutions.

Keywords: credit, credit union, commercial bank, financial institution, pawnshop, the All-Ukrainian Association of Credit Unions.

References

1. Honcharenko, V. (2000). *Finansy kredytnyh spilok Ukrainy: polozhennia ta protsedury*. K.: Kanadska prohrama rozvytku spilok v Ukraini, 203.
2. Ilchenko-Siuiva, L. (2009). Do problemy vykorystannia potentsialu kredytnyh spilok u zabezpechenni ekonomichnoho zrostannia: suchasna praktyka i realii Ukrainy. *Ekonomika ta derzhava, № 1*, 66–69.
3. Chyzhevska, M. (2006). Kredytna kooperatsia na rynku spozhyvchoho kredytuvannia. *Ekonomika. Finansy. Pravo, № 1*, 30–33.
4. Stepanova, V. (2012). Osnovni napriamy rozvytku kredytnyh spilok u suchasnyh umovah. *Visnyk Berdianskoho universytetu menedzhmentu ta prava, № 4*, 135–140.
5. Pro kredytni spilky. (2002). Zakon Ukrainy № 2908-III vid 20.12.2001. *Vidomosti Verkhovnoi Rady Ukrainy (VVR), N 15, st. 101*. Availabe: http://zakon4.rada.gov.ua/laws/show/2908-14.
6. Semchuk, O., Chorna, A. Kredytni spilky iak instrument ekonomichnoho zrostannia v Ukraini: problem rozvytku ta naprizmy reformuvannia. *Bukovynska derzhavna finansova academia*. Availabe: http://nauka.kushnir.mk.ua/?p=14516.
7. Ksondz, S., Barabash, A. Osoblyvosti rozvytku kredytnyh spilok v Ukraini: problem ta perspectyvy. *Visnyk Khmelnytskoho natsionalnoho universytetu*. Availabe: http://nauka.zinet.info/13/barabash.php.
8. *Kontseotsia rozvutku rynkiv nebankivskyh finansovyh posluh Ukrainy za 2013–2014 roky*. Availabe: http://nfp.gov.ua/files/docs/Prezentacia_syn.pdf.
9. *Pidsumky dialnosti kredytnyh ustanov za 2013 pik*. Availabe: http://nfp.gov.ua/files/OgliadRinkiv/KS/ ks_2013.pdf.
10. Dolhova, O. (2013). Nederzhavni penciini posluhy v Ukraini: napriamy rozvytku. *Visnyk KNTEU, № 1*, 98–108.

INFLUENCE OF CORRUPTION PRACTICES ON POLITICAL AND INSTITUTIONAL DEVELOPMENT INDICATORS OF MODERN ECONOMIC SYSTEMS

page 63–66

The closeness of the relationship between the corruption level and certain political and institutional development indicators of economic systems was analyzed in the paper. The urgency is caused by the fact that the information regarding the closeness of the relationship between the corruption level and range of political and institutional development indicators is sometimes controversial.

To answer this question, international indices, which are systematically presented under the auspices of authoritative non-governmental organizations were used as indicators. Thus, the corruption level is represented by Corruption Perception Index (CPI) on the one hand. On the other hand, to compare with the CPI category, a list of new indicators that reflect the dynamics of certain phenomena and processes, the condition of which, as mentioned in a number of scientific papers has some connection with the corruption level in the country was compiled.

As follows from the analysis, corruption has the greatest relationship with indicators that characterize property rights, innovation development, investment climate. A weak relationship is observed with labor freedom, tax and monetary freedom indicators, government expenditure level. Based on the foregoing, it can be assumed that the effective tools to overcome corruption is ensuring property rights protection, favorable investment climate, innovative economic development, civil institution development and strengthening the control over and responsibility for corruption crimes.

Keywords: corruption level, new welfare measures, modern economic systems.

References

1. Heidenheimer, A. J., Johnston, M. (2002). *Political Corruption: Concepts and Contexts*. New Jersey, New Brunswick: Transaction Publishers, 970.
2. Shacklock, A., Connors, C., Galtung, F. (2006). *Measuring Corruption*. Adershot, Burlington: Ashgate, 302.
3. Rouz-Ekerman, S.; Translation from English Kokiziuk, S., Tkachuk, R. (2004). *Koruptsiia ta uriaduvannia: prychyny, naslidky, zminy*. K.: «K. I. S.», 296.
4. Miler, V., Hredeland, O., Koshechkina, T. (2004). *Zvychaieva koruptsiia? Hromadiany ta uriad u postkomunistychnii Evropi*. Translation from English. K.: «K. I. S.», 328.
5. *Corruption Perceptions Index 2011*. Available: http://www.transparency.org/policy_research. Last accessed 01.04.2014.
6. *The Boston Consulting Group*. Available: http://www.bcg.com. Last accessed 15.09.2014.
7. *National Association of Manufacturers*. Available: http://www.nam.org. Last accessed 01.08.2014.
8. Dutta, S. (2012). *The Global Innovation Index 2012: Stronger Innovation Linkages for Global Growth*. INSEAD, 464.
9. *Reporters without borders: for freedom of information*. Available: http://www.rsf.org. Last accessed 19.10.2013.
10. Reinikka, R., Svensson, J. (2005, April). Fighting Corruption to Improve Schooling: Evidence from a Newspaper Campaign in Uganda. *Journal of the European Economic Association, Vol. 3, № 2–3*, 259–267. doi:10.1162/jeea.2005.3.2-3.259.
11. Olken, B. (2005). *Monitoring Corruption: Evidence from a Field Experiment in Indonesia*. National Bureau of Economic Research. Available: http://dx.doi.org/10.3386/w11753.
12. Guriev, S. (2007). Chto izvestno o korruptsii v Rossii i mozhno li s ney borot'sia. *Voprosy iekonomiki, № 1*, 11–18.
13. Kofmel, E. (16 December 2011). *Report: Democracy Index 2011: Democracy under stress*. Available: http://anti-democracy-agenda.blogspot.com/ 2011/12/report-democracy-index-2011-democracy.html. Last accessed 14.09.2012.
14. *Index of Economic Freedom 2012*. Available: http://www.heritage.org/index/explore. Last accessed 13.03.2013.
15. Konventsiia Orhanizatsii Obiednanykh natsii proty koruptsii vid 18.10.2006 r. № 251-V. (2007). *Vidomosti Verkhovnoi Rady Ukrainy (VVR), N 49*. Available: http://zakon4.rada.gov.ua/laws/show/995_c16. Last accessed 22.07.2014.

MATHEMATICAL METHODS, MODELS AND INFORMATION TECHNOLOGIES IN ECONOMICS

RESEARCH OF MODERN TRENDS IN GLOBAL E-COMMERCE MARKET DEVELOPMENT

page 67–71

The paper considers the general state of the global e-commerce market development as a whole and for its individual regions. It is noted that the global e-commerce market volume has been rapidly growing from year to year, in terms of the number of e-commerce and consumers, the United States and China are leaders, but India, Brazil and Russia should be considered rather promising. The assumptions, trends and prospects of the individual national e-commerce markets' development, including Ukraine, and its difference from highly developed countries, are revealed and generalized. It is determined that low paying capacity of the population, social and political instability, a high level of consumers' distrust to e-commerce are hazards to further development of e-commerce in Ukraine, but the domestic market of online business has great potential. The main trends of e-commerce developments are as follows: active development of online business mobile segment, the use of new marketing tools, including social networks, the wide use of e-money, credit cards for making online payments. It is necessary to study the development of online business as this area of the economy is rapidly progressing and modernizing. The experience in the development of highly developed countries' e-commerce can be implemented by developing countries. The revealed trends in the field of online business allow e-commerce entities quickly adapt to the market requirements and thus better meet the needs of consumers and make profits accordingly.

Keywords: e-commerce, e-business, e-commerce, Internet, network.

References

1. Kudina, O. (2011). The development of e-commerce in terms of global information space. *Bulletin of the International Nobel Economic forumu, № 1(4)*, 196–202.
2. Kredenets, O. (2011). Status and trends of e-retail sector in Ukrainian Network Internet. *Bulletin of the Lviv Academy of Commerce, № 34*, 268–272.
3. Chuchko, N. O., Lozikova, H. M. (2011). Ecommerce in the system of world economic relations. *Industrial Economics, № 4*, 153–158.
4. Voznyy, M. (2011). International e-commerce. Problems and prospects in Ukraine. *Scientific Papers of the University of Bukovina. Economic, Vol. 7*, 243–252.
5. Summer, A., Dunkan, Gr. (1999). *E-Commerce*. NYH Publishing, 263.
6. Hubaev, G. (2005). *Marketing information products and services*. Rostov-on-Don: RGEU «RINH», 224.
7. Tardaskina, T. M., Strelchuk, Ye. M., Tereshko, Yu. V. (2011). *E-commerce*. Odessa: ONAT, 244.
8. *Global Retail E-Commerce Index*. Available: http://www.atkearney.com/ consumer-products-retail/e-commerce-index. Last accessed 20.09.2014.
9. *Worldwide Ecommerce Sales to Increase Nearly 20 % in 2014*. (Jul 23, 2014). Available: http://www.emarketer.com/Article/Worldwide-Ecommerce-Sales-Increase-Nearly-20-2014/1011039#sthash.3WeekeUq.dpuf. Last accessed 20.09.2014.
10. *E-Commerce Europe. European B2C E-commerce Report 2014*. Available: http://www.ecommerce-europe.eu/facts-figures. Last accessed 20.09.2014.
11. *IT market in Russia 2014 — Current situation and short term outlook*. (Sep 29, 2014). Available: http://www.ewdn.com/category/data-reports. Last accessed 20.09.2014.
12. *Morgan Stanley Blue Papers*. (July 27, 2014). Available: http://www.morganstanley.com/views/perspectives. Last accessed 20.09.2014.
13. Ovchinnikov, B. *Rinor e-commerce v Rossii: 9 mecyacev 2014 goda v voprosah i otvetah*. Available: http://www.datainsight.ru/eretail-forum2014 s.
14. *KPMG-ASSOCHAM India Luxury summit 2014*. Available: http://www.kpmg.com/IN/en/IssuesAndInsights/ArticlesPublications/Documents/KPMG-ASSOCHAM-India-Luxury-Summit-2014.pdf. Last accessed 20.09.2014.
15. Wigder, Z. D. (August 4, 2014). *The Evolution Of eCommerce In Brazil*. Available: https://www.forrester.com/The+Evolution+Of+eCommerce+In+Brazil/ fulltext/-/E-RES117444. Last accessed 20.09.2014
16. *Retail in 2018 — Shop numbers, Online and the High Street*. Available: http://www.retailresearch.org/retail2018.php. Last accessed 20.09.2014.