SECTION 1
GEOTECHNOLOGY: TECHNICAL & TECHNOLOGICAL ASPECTS

PHYSICAL & CHEMICAL PROCESES FOR COAL DESTRUCTION IN UNDERGROUND GAS GENERATOR

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Purpose. Estimate the material and thermal balance for providing the chemical reactions in underground gasgenn according to physical spreads of their fluency.

Methodology. Statistical processing of experimental results of work of a stand installation from underground coal gasification and their adaptation to specific mining-geological conditions of their possible use.

Findings. The current methods of calculation of safety mining parameters for underground coal gasification are described and analyzed. The possibility of generator gas (methane, oxides of carbon and other) extraction in from coal deposits destruction is considered. Experimental data on the application of hydrodynamic impact on a gas-saturated outburst coal seam and reducing gasodynamic activity are defined. The technological schemes of providing the pipelines stability that includes emergency protection and monitoring in on-line regime are proposed. Also is proposed and examined on special test installation the utilization of mining wastes in closed cycle of gasgenn. To determine correlations of safety mining parameters are used the calculation and analytical method based on numerical definitions of rockmass deformations. The recommendations for physical and chemical coal destruction are done based on economical indexes and environmental protection.

Key words: underground coal gasification, mining, mining-geological conditions

References

1. Дичковський Р.О. (2015). Формування двошарової штучностворе ної оболонки георе актора при свердловинній підземній газифікації. Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu, (5), 37 - 42.

2. Gasenko, V.G.,, Sobolev, V.V. Evolution of finite perturbations in a viscoelastic relaxing liquid with gas bubbles // Fluid Dynamics. 10, Issue 3, May 1975, Pages 409-414.

3. Pivnyak, G,G, Dychkovskyi R.O, Falshtynskyi, V.S. and Cabana, Cáceres Edgar. (2017) Energy Efficiency and Economic Aspects of Mining Wastes Utilization within the Closed Cycle of Underground Gas Generator. Advanced Engineering Forum, 25, 1-10. doi:10.4028/www.scientific.net/AEF.25.1

4. Lozynskyi, V.H., Dychkovskyi, R.O., Falshtynskyi, V.S. and Saik, P.B. (2015). Revisiting possibility to cross the disjunctive geological faults by underground gasifier. Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu, (4), 22-27.

5. Falshtynskyi V.S., Dychkovskyi R.O., Saik P.B., Lozynskyi V.H., Cabana E.C. (2018). Substantiation into "rock massive – underground gasifier" system adaptability of Solenovskyi site in the Donetsk coal basin. Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu, (3), 14-21. DOI: 10.29202/nvngu/2018-3/5

6. Pivnyak, G., Dychkovskyi, R, Bobyliov, O., Cabana, C.E., Smoliński, A. (2018). Mathematical and Geomechanical Model in Physical and Chemical Processes of Underground Coal Gasification. Solid State Phenomena, (277), 1-16. doi: https://doi.org/10.4028/www.scientific.net/SSP.277.1

7. Caceres, E. and Alca, J.J. (2016). Potential For Energy Recovery From A Wastewater Treatment Plant. IEEE Latin America Transactions, 14(7), 3316-3321. doi:10.1109/tla.2016.7587636

8. Caceres, E., Alca, J.J. (2016). Rural Electrification Using Gasification Technology: Experiences and Perspectives. IEEE Latin America Transactions. 14(7), 3322 – 3328. DOI: 10.1109/TLA.2016.7587637

9. Dychkovskyi, R.O., Lozynskyi, V.H., Saik, P.B., Petlovanyi, M.V., Malanchuk, Ye.Z., & Malanchuk, Z.R. (2018). Modeling of the disjunctive geological fault influence on the exploitation wells stability during underground coal gasification. Archives of Civil and Mechanical Engineering, 18(4), 1183-1197. doi:10.1016/j.acme.2018.01.012

10. Falshtyns'kyy, V., Dychkovs'kyy, R., Lozyns'kyy, V., & Saik, P. (2013). Justification of the gasification channel length in underground gas generator. Annual Scientific-Technical Colletion -Mining of Mineral Deposits 2013, 125-132. doi:10.1201/b16354-23

11. Falshtynskyi, V. (2012). New method for justification of the technological parameters of coal gasification in the test setting. Geomechanical Processes During Underground Mining – Proceedings of the School of Underground Mining, 201-208. doi:10.1201/b13157-35

12. Xin, L., Wang, Z., Wang, G., Nie, W., Zhou, G., Cheng, W. and Xie, J. (2017): Technological aspects for underground coal gasification in steeply inclined thin coal seams at Zhongliangshan coal mine in China. Fuel, 191, 486-494. doi:10.1016/j.fuel.2016.11.102.

13. Zhao, Jing. (2010): Research on improving ecological compensation mechanism of mineral resources development. International Conference on E-Health Networking Digital Ecosystems and Technologies (EDT), 2, 567-571.doi:10.1109/edt.2010.5496460

14. Pivnyak, G., Dychkovskyi, R., Smirnov, A. and Cherednichenko, Y. (2013). Some aspects on the software simulation implementation in thin coal seams mining. Energy Efficiency Improvement of Geotechnical Systems, 1-10. doi:10.1201/b16355-2

15. Singh, S.K. and Jayanthu, S. (2011): Implication of continuous miner in room and pillar mining for mass exploitation of underground coal deposits: An overview. Journal of Mines, Metals and Fuels, 59(3-4), 83-95.

USING NON-BLASTING TECHNOLOGIES FOR DESTRUCTION OF HARD ROCK IN SURFACE MINING

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Purpose. Determination the effective application field of non-blasting technology and technologies for the hard rock preparation for excavation during surface mining.

Methodology. The carry out researches are based on the study of the physical and mechanical rocks properties influence on the mining equipment productivity at the non-blasting preparation of hard rocks and the excavation technology on the operating expenditure of the mining enterprise.

Findings. Current technological solutions in the field of non-blasting destruction of hard rock at the surface mining in practice allow increasing the economic efficiency of the mining enterprise and reducing the negative influence on the environment. The feasibility of using non-blasting technologies is confirmed in practice at the development hard rock with uniaxial compression strength of 20 – 90 MPa. The productivity of equipment at the non-blasting destruction of hard rocks in quarries depends on the physical and mechanical properties of rocks. The main factors that influence on the process of non-blasting destruction of hard rock by mining machines are strength, fracturing and abrasiveness of rocks.

The main difficulty in choosing effective technique and technology for the non-blasting preparation of rocks for excavation is the justification of the mining machine type in accordance with the given quarry productivity and grain size of the products. The results of the carry out researches show that continuous mining machines have high productivity in the non-blasting destruction hard rocks. At the same time, the capital and operating expenditure of the enterprise in this situation are much higher than using machines of cyclic action. A significant disadvantage of continuous machines in the non-blasting destruction of the hard rock is the regrinding of the mineral, which leads to an increase of its losses due to a decrease of the commodity fraction. Justification of the transition expediency from drilling and blasting to the non-blasting preparation of hard rock to the excavation should note specific conditions of mineral deposit and carried out individually, taking into account the reduction of expenditure for drilling and blasting, loading, crushing process.

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Key words: non-blasting technologies, mining equipment, hard rocks