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SMART AND INNOVATIVE POTENTIAL OF A MINING ENGINEER

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Abstract

The article analyzes the development dynamics of smart and intellectual potential of a mining engineer since the end of the 90s of the XX century. It also defines the significance of the coal mining industry in the development of the world and Russian power engineering. Besides, it specifies modern guidelines for the development of the mining industry at the beginning of the XXI century. Finally, the article determines innovative guidelines for the development of the mining industry such as: digitalization, orientation to innovative mechanisms and eco-friendly technologies. The aim of the article is to identify the leading trends in the development of the coal industry and in training mining engineers aimed at developing their innovative and smart potential. The research methodology is based on the analysis of archive records that reflect the history of the mining industry and the problems of staff training in the mining industry. The logic of the research focuses on the study and analysis of modern world experience in the development of the mining industry. It is concluded that a modern miner should have smart and innovative potential, taking into account the needs of the industry development. The results of the analysis can be used in formation of educational programs for training mining engineers in modern Russian universities based on the experience of using smart mine technologies, digitalization, as well as innovative technologies for effective protection of the environment.

Keywords: Smart and innovative potential, mining industry, ideals, digitalization, smart mine, eco-friendlytechnologies.

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1. Introduction

The emergence and development of civilization has always depended on natural resources. Rich and diverse minerals have accelerated economic and social development. Coal held a special place among them. It was coal mining that determined the pace of industrial development and created a strategic reserve for sustainable development of society. The success of the coal mining strategy in the modern world depends on professional qualities of miners (Esaulova, 2015). Changing working conditions in the coal mining industry, replacing physical labor with mechanisms and information technologies has transformed the smart and innovative resources of a miner (Knights 2019).

The object of research is to analyze the smart and innovative potential of a mining engineer for the development of the mining industry. Smart and innovative potential can be defined as a set of theoretical knowledge, skills and abilities that are implemented in non-standard situations that require a responsible and balanced decision in a strict time frame (Loyko & Sadovskaia, 2020).

2. Problem Statement

Development of the training staff system for the mining industry in Russia became essential in the eighties of the XX century and it was noted in government documents. "Our main drawback is insufficient attention to training multidiscipline engineers and their retraining system" (Ryzhkov, 1984, p. 87). Special attention was paid to training of engineers in the coal industry (Gorbachev, 1991). The Importance of the mining industry in the national economy of Russia required significant changes in the system of training engineers (Malyshev & Titova, 2019).

2.1. Crisis in the mining industry and its dynamics

The stated measures were declared, but not implemented. The mining industry has entered a period of prolonged crisis. According to Russian researchers, "The situation has changed significantly. Since 1995 the labor productivity movement in Russian coal industry has become stable." (Rozhkov et al., 2019, p. 116).

Relatively profitable enterprises have taken measures to eliminate unprofitable mines. At the same time, the growth rate of the average monthly productivity of a worker in coal mining was higher than the growth rate of coal production to the level of 1994 (Rozhkov et al., 2019) The Development Strategy of the Russian Coal Industry to 2030 (2009) focused on sustainable development of the coal mining industry.

3. Research Questions

Accomplishment of set goals determined the analysis of main issues which focus on transition to an innovative socially oriented type of economic development of the country and creation of a new operation model in the mining sector. Its components are: the so-called "smart mine"; development of mining technologies and tools; focusing on sustainable development and environmental protection.

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3.1. "Smart mine" project

The "Smart mine" project allows us to create smart, connected products that provide data to optimize labor productivity. Digitalization makes the work of a mining engineer smarter. It means that he is able to use and create new technologies and tools in the field of hardware, transport and equipment. Drone technology is already used in the global mining industry to help increase its safety (Litvin et al., 2017).

3.2. The efficiency of smart work

Fuel economy, increasing efficiency and productivity in mining encourages the development of smart work. Drones and mine robots can replace people when exploring abandoned mines. These mines can be opened with the help of robots that successfully perform mining that was previously impossible (Gasenko, 2012).

"Automation will allow us to operate a variety of small and low-cost autonomous equipment in mines designed only for machinery. This will allow us to develop new deposits and significantly decrease the environmental impact and reduce energy, capital and operating costs" (Staff Writer, 2019, p. 153).

3.3. Eco-friendly economy

Mining companies will participate in an eco-friendly economy and reduce mining costs by recycling resources and water. This can improve the image of the mining industry. Today's shift towards corporate social responsibility provides the basis for such concepts as "green mines" or "waste-free mining" and they become more and more popular (Titova & Naumov, 2017).

4. Purpose of the Study

Study of the historical experience of Russia and world achievements in the mining industry determines the requirements for staff training.

4.1. Analysis of smart work processes of a modern miner which focus on innovation

4.2. Building a new educational strategy of the training process for mining engineers, taking into account their environmental and social responsibility (Prokopenko et al., 2018).

5. Research Methods

- Comparative: study of innovations in the mining industry in Russia and abroad;
- Analytical: study of data from Russian archives and documents;
- Bibliographic: study of Russian and foreign publications on the stated problem.

6. Findings

6.1. It is proved that implementation of main components of modern mining ("smart mine", innovative technologies, digitalization, orientation to sustainable development and environmental protection) requires a specialist with a number of new skills, namely with capacity for innovative smart professional activity, which foundations are laid in modern education.

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6.2. It is proved that the change in the system of staff training in the mining industry in modern Russian universities should focus on the formation of smart and innovative potential of mining engineers (Popov et al., 2015).

6.3. It is proved that implementation of main components of modern mining ("smart mine", innovative technologies, digitalization, orientation to sustainable development and environmental protection) requires a specialist with a number of new skills, namely with capacity for innovative smart professional activity, which foundations are laid in modern education.

7. Conclusion

As a result of the research, we can conclude that it is necessary to promote the Russian training system of mining engineers, taking into account national historical experience and modern world educational trends. The goal of this strategy is to develop smart and innovative potential of a mining engineer.

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