



OCCUPATIONAL SAFETY AND HEALTH IN THE SECTOR OF COAL MINING

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ABSTRACT

The basic performances of the global coal industry, as well as data on occupational traumatism at coal mining enterprises are given. Despite the fact that in 2016 coal's share of global primary energy consumption fell to 28.1%, the coal industry still occupies leading places in world economy ranking. In these circumstances, the use of modern production technologies in the coal industry along with occupational safety and health (OSH) and environmental protection displays the three dimensions of sustainable development – economic, social and environmental. Being an important component of decent work, OSH is a matter of utmost importance for the coal industry, for the high levels of occupational accidents and diseases remain a major source of concern, impacting on productivity and competitiveness, as well on social protection systems. Actual standards on OSH management systems are observed.

Key words: coal mining, occupational safety and health management, Zero Accident Vision.

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1. INTRODUCTION

The importance of introducing modern occupational safety and health (OSH) management systems at the level of organization is now recognized by governments and employers. Occupational safety and health is a matter of utmost importance for the coal industry, for the

high levels of occupational accidents and diseases remain a major source of concern, impacting on productivity and competitiveness, as well on social protection systems.

The coal industry and global supply chains associated with it play a key role in economies of many countries, creating jobs, developing national infrastructure and eradicating poverty, especially in developing countries. It is reported by the International Labour Organization (ILO) [1], that the industrial sectors, including construction, manufacturing, mining, quarrying and utilities, accounted for around 22 % of total employment in lower middle-income and developed countries in 2017, and for around 10 % in developing countries. Globally, more than 7 million people are directly engaged in the coal industry and millions of workplaces are created in related industries.

In 2016, around 90 % of global coal production was mined by 7 leading coal-mining countries (China, USA, Australia, India, Indonesia, Russian Federation, South Africa) Despite the facts that in 2016 world coal production fell by 6.2% (or by 231 million tonnes of oil equivalent (mtoe), as it is reported by BP Statistical Review of World Energy [2], and coal's share of global primary energy consumption fell to 28.1%, coal production in Russia and India rose by 3.1 % and 2.4 %, respectively.

In 2016, global coal consumption fell by 1.7 % or 53 mtoe. Nevertheless, China and India remained the leaders in coal consumption (the share of China – 50.6 %, or 1887.6 mtoe, the share of India – 11.0%, or 411.9 mtoe). Moreover, the Asia and Pacific region still occupied the leading place in global coal consumption (73.8% of total coal consumption in terms of mtoe).

Present status of coal production and consumption and the use of modern production technologies in the coal industry (coal liquefaction or gasification, clean coal technologies etc.) will contribute to further and sustained demand for coal. In fact, coal production technologies along with occupational safety and health (OSH) and environmental safety displays the three dimensions of sustainable development – economic, social and environmental. Being enchainned, these dimensions can hardly be examined separately, because any change made in one of the three leads to changes in the two other ones.

Economic losses for enterprises caused by poor working conditions and occupational accidents are rather detrimental to the coal mining cost and eventually to the compatibility of the coal products on the domestic and foreign markets. In the current context, focusing of financial resources on the activity areas of the company, which are characterized by the maximum value of the decrease in the injury rate and occupational diseases per cost unit, should be deemed the primary way of minimizing the impact of unfavorable economic tendencies on OSH at the coal mining enterprises [3].

2. RESULTS

2.1. Occupational Accidents in Coal Mining Sector

In Russia, the improvements in occupational safety and health measures led to the decrease in fatal injuries in the coal mining sector. It is reported by the Federal Environmental, Industrial and Nuclear Supervision Service of Russia that there is a clear tendency towards the decrease in the general number of industrial accidents and occupational fatalities in the coal mining sector (Figure 1).

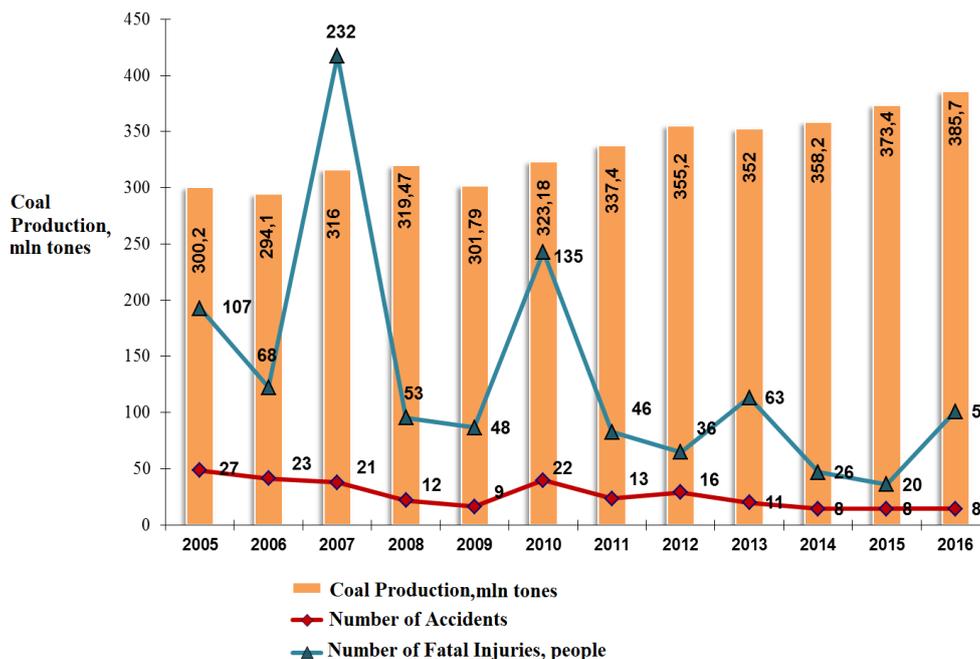


Figure 1 Dynamics of the coal production, the numbers of major industrial accidents and occupational fatalities in the coal mining sector of Russia [4]

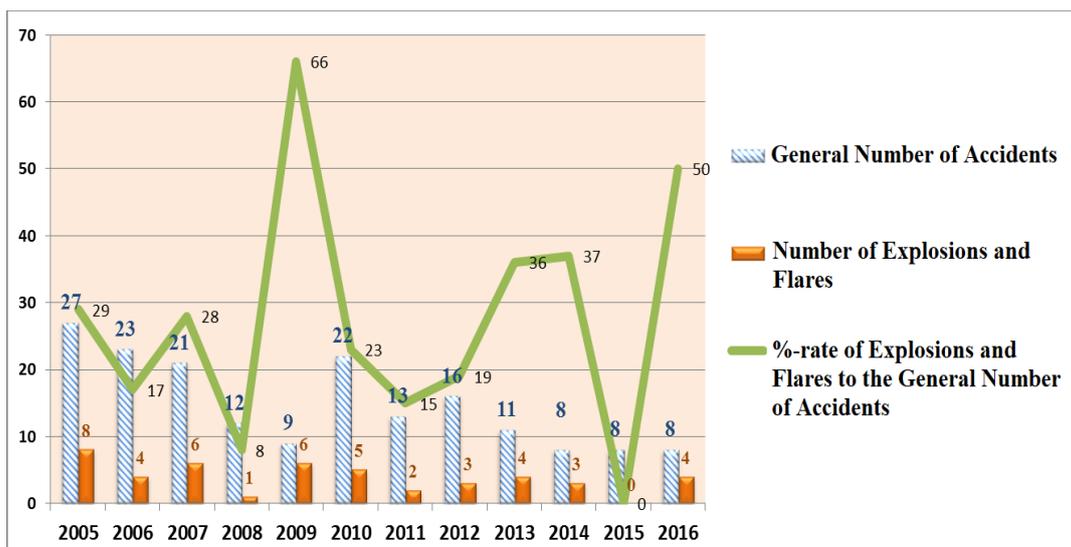


Figure 2 Dynamics of the total number of major industrial accidents, explosions and flares of methane at the underground coal mines of Russia

In general, the level of individual risk of employee’s death in the coal mining industry decreased by 2.5 times over the period from 2005 to 2016. (It is reported by Parchanski [5] that the same trend in the numbers of occupational injuries and fatalities was observed at the coal mines in Poland). At the same time, methane-air resultant mixture explosions at underground coal mines dominate in the identified causes of major industrial accidents in Russia (Figure 2).

Industrial accidents caused by methane-air explosions at the underground coal mines lead to the extremely high level of individual risk at particular enterprises (for example, according to the statistical data on accidents and injuries, the risk of employees’ death accounted for $9.1 \cdot 10^{-3}$ at Ulyanovskaya Coal Mine in 2007; $2.8 \cdot 10^{-3}$ at Severnaya Coal Mine in 2016, $1.7 \cdot 10^{-3}$

³ at Rospadskaya Coal Mine in 2010). Generally, the number of employees fatally injured in the coal mining industry of Russia keeps on exceeding the same indicator in the European Union states (Table 1), as it is reported by Eurostat (2016).

Table 1 The number of occupational fatalities in the sector ‘Production of coal and lignite’ in the EU states [6]

States	2008	2009	2010	2011	2012	2013	2014	2015
European Union (28 states)	52	49	21	46	28	27	33	:
European Union (27 states)	52	49	21	46	28	27	33	:
European Union (15 states)	6	5	2	13	3	7	4	:
Bulgaria	4	3	1	1	1	7	0	1
Czech Republic	5	1	2	7	5	4	10	4
Germany	2	0	0	1	2	1	0	1
Greece	0	0	0	0	0	0	3	0
Spain	3	2	1	6	1	6	1	2
Hungary	0	0	0	0	0	0	1	0
Poland	20	36	15	18	16	8	18	8
Romania	17	4	1	7	3	0	0	2
Slovakia	0	0	0	0	0	1	0	0
United Kingdom	1	3	1	6	0	0	0	0
Norway	0	0	0	0	0	2	0	0

2.2. Modern OSH Management Systems

The Guidelines designed by the ILO (ILO-OSH-2001) provide a framework for OSH management system applicable on both a national and an organizational level. The guidelines are based on internationally recognized principles concerning OSH defined by the ILO’s tripartite constituents. This tripartite approach shall provide the management system strength and flexibility, and the necessary basis to ensure a sustainable safety culture in the organization (ILO-OSH-2001). According to the guideline, the involvement of employers, employees and the competent authorities allows for continual improvement of the organization’s OSH performance. The guidelines are not legally binding, but are instead meant to be used as a framework for (preferably supported by national laws and regulations) establishing an OSH management system, based on the plan-do-check-act methodology. This method allows for continual improvement of the organization’s OSH management system. ILO-OSH-2001 do not provide detailed specification for the design of the OSH management system, but rather a generic assistance for organizations to either establish or improve their OSH management system. The effectiveness of the proposed OSH management system is entirely dependent on the motivation and competence of organization choosing to incorporate the guidelines in their safety management system [7].

The standard OSHAS 18001:2007 is very similar to the ILO-OSH-2001 guidelines (see Figure 3 below). They are based on the same plan-do-check-act model and the described management systems do not include any areas of significant difference (OSHAS 18001:2007). There are, however, some minor differences. OSHAS 18001:2007 does not mention the implementation of the described management system on a national level, as the standard is intended for organizations. Further, the safety management system described in the standard is developed in order to be integrated with other management systems, such as ISO 9000:2015 family – Quality management and ISO 14001:2015 – Environmental management. The organizations implementing OSHAS 18001:2007 may certify their OSH management system.

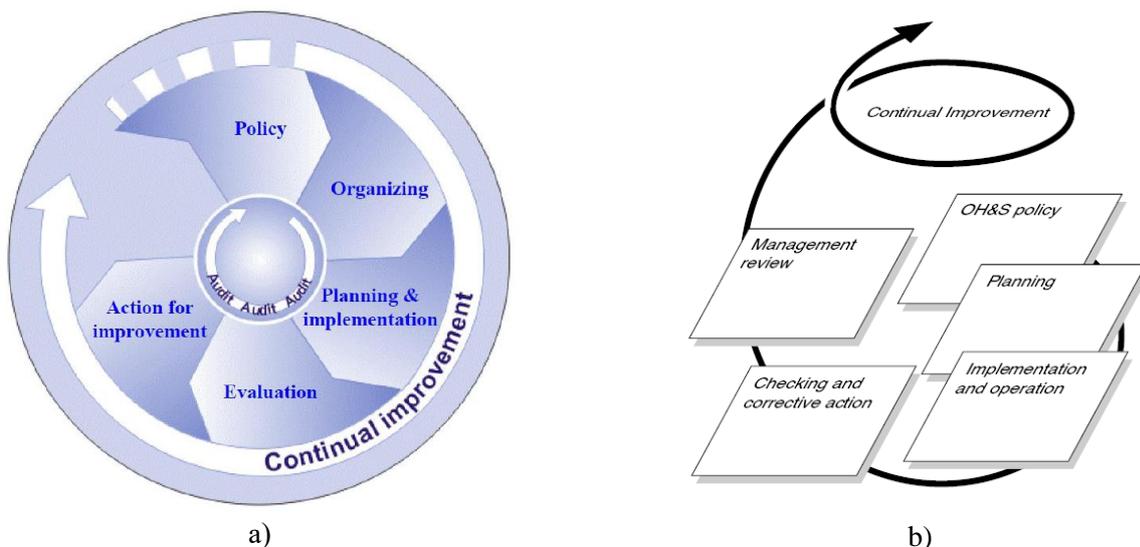


Figure 3 a) Main elements of the OSH management system (ILO-OSH-2001);
 b) – Occupational Health and Safety management system model (OHSAS 18001: 2007)

The two principal points should be underlined here: 1) Nowadays coal mining enterprises actively use the mentioned documents and certify their OSH management systems, and 2) neither ILO-OSH-2001, nor OSHAS 18001:2007 can guarantee absolute occupational safety, but rather continual improvement of OSH at the enterprise.

In March 2018, International Organization for Standardization (ISO) has published a newly developed standard, ISO 45001, Occupational health and safety management systems - Requirements, which has taken into account OHSAS 18001, ILO-OSH-2001 Guidelines, various national standards and the ILO's international labour standards and conventions. A three year transition period (to March 2021) has been established, so at the nearest future enterprises of the sector of mineral resources are to re-certify their OSH managements system in order to comply with ISO 45001 standard.

The development and implementation of OSH management system is a milestone on the way towards zero accidents. It is reported by the European Agency for Safety and Health at Work (EU-OSHA) [8] that among the basic 11 OSH benchmarking initiatives, stated in the research, 3 relate to the approach, which is called Zero Accident Vision (ZAV). ZAV suggests that ideally all occupational accidents are considered as preventable and thus, modern OSH management systems created at the enterprises focus exactly on prevention of accidents and diseases. Exactly this approach is currently considered as the basis for the formation of strategies and goals in the context of the development of a safety culture at enterprises of the sector of mineral resources.

3. DISCUSSION

These times, one can observe several success stories in the implementation of modern OSH management systems at coal mining enterprises. Nevertheless, these systems for coal mining industry though can be proclaimed but should be implemented carefully and consistently considering the peculiarities and hazards of coal mining operation. In fact, every change in the technological aspect of coal mining should be immediately followed by the appropriate changes in safety management.

The special question to be raised is the problem of adequate OSH performance to measure the level of safety. In the opinion of authors, both the number of occupational fatalities and

LTIFR (Lost Time Injury Frequency Rate) may be considered as the basic safety indicators of a coal enterprise. In this regard, the role of the top management of an organization is especially important in the promotion of the concept (vision) of potential preventability of occupational accidents. Therewith there is an apparent risk of discrediting the concept among the employees if it is not supported by real (though gradual) results [9]. Thus, at the first stage of implementation of OSH management system (or even ZAV) it is reasonable to focus on a gradual decrease in relative performances of fatal injury rate per 1 mln. hours worked (or per 1 mln. tons of produced coal). Figure 4 shows the dynamics of LTIFR at JSC ‘Suek’ and ‘Evraz’ holding. The results shown can be explained by the enterprises’ OSH policy aimed at combating hidden accidents and underreporting.

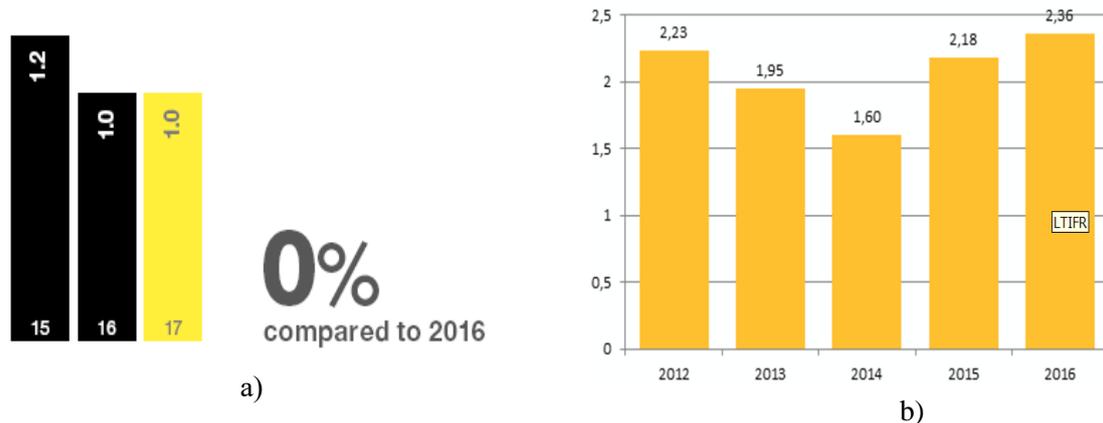


Figure 4 Dynamics of LTIFR: a) at ‘SUEK’, b) at ‘Evraz’ [10, 11]

4. CONCLUSIONS

The growing demand of the world economy for energy, needs of ensuring access to energy for people all over the world, have made the coal the irreplaceable power source for the long-term perspective. Thus, sustainable development of the coal industry must not be underestimated in achieving sustainable development goals in the global context.

The real implementation of modern OSH management systems, especially in the sector of mineral resources does not mean only certification of these systems. In fact, the OSH management must be instrumental on the way to safe and healthy working conditions. In this context, corporate OSH programs in the coal mining may be seen as a parallel with ‘Towards Zero’: Western Australia’s Road Safety Strategy for 2008-2020. Incorporating the Safe System approach, Towards Zero aims to improve road safety through four cornerstones: Safe Road Use; Safe Roads and Roadsides; Safe Speeds; and Safe Vehicles. The vision of the Strategy is one of no road deaths and serious injuries - a future where every journey is a safe one. Achieving the lowest rate of occupational traumatism in the coal mining, we must design and implement several analogical cornerstones: modern and safe technologies of coal extraction, IT safety systems, safety culture aimed at prevention, emergency response, and others.

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