IOP Conf. Series: Materials Science and Engineering **268** (2017) 012013 doi:10.1088/1757-899X/268/1/012013

Hazards and occupational risk in hard coal mines – a critical analysis of legal requirements

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Abstract. This publication concerns the problems of occupational safety and health in hard coal mines, the basic elements of which are the mining hazards and the occupational risk. The work includes a comparative analysis of selected provisions of general and industry-specific law regarding the analysis of hazards and occupational risk assessment. Based on a critical analysis of legal requirements, basic assumptions regarding the practical guidelines for occupational risk assessment in underground coal mines have been proposed.

1. Introduction

The current condition of occupational safety and health in hard coal mining, and especially the numbers and indicators characterizing occupational accidents and diseases, are a reason for seeking modern strategies and tools that would protect the life and health of the employees more efficiently. The obligations related to the occupational risk were supposed to be one of the tools used to improve the occupational safety and health in mines. These obligations include, among other things, the assessment of occupational risk related to the performed work, taking up actions which decrease the occupational risk, documentation of occupational risk assessment results and informing the employees on the occupational risk and the rules of protection against hazards.

The notion of occupational risk may be defined as the possibility of occurrence of the results of hazards in the working environment, manifested as injuries, health deterioration or reduced physical and mental capabilities. Generally, the term may be interpreted as the risk related to the performed profession. In more detail, it would be defined as the risk related to a given workstation or, to be precise, the risk related to the performance of work.

The form of implementation of legal requirements related to occupational hazards and risk is specified by the provisions of general and industry-specific law, including, among others: the requirement to keep a documentation of the occupational risk and the applied necessary preventive measures as well as the development and updating of the safety and health document for the employees of the mining plant. Although these obligations are formally met, the practical aspect still raises many doubts – among other things – in terms of the classification of the mining hazards (including natural hazards) and the rules of selection of occupational risk assessment methods adequate to the specific characteristics of the hazards in hard coal mines.

A detailed analysis of the general and industry-specific law regarding the occupational safety and health in hard coal mines has been presented, among other sources, in publications [1, 2]. The general

guidelines for occupational risk assessment are given by the Polish Standard PN-N-18002 [3]. The basics of the methodology of occupational risk assessment included, among others in CIOP-PIB publications [4, 5] and in the author's publications [1, 2, 6, 7, 8].

2. Analysis of selected provisions of the general law

The problems related to the assessment of the occupational risk started to gain increasing importance in the legislation of the EU countries since 1989, after the adoption of the 89/391/EEC directive regarding the introduction of measures to encourage improvements in the safety and health of workers at work [9], hereinafter called the 'framework directive' due to its leading nature in regard of detailed directives.

The Directive [9] contains the basic legal requirements regarding the obligations of the employers and employees related to the protection of life and health in the work environment, as well as it serves as the legal basis for the individual directives in terms of the provisions regarding the individual sections of the national economy, special risk groups, types of work processes and types of hazards.

The Framework Directive constitutes a new approach to the problems of protection of health and life in work environment, including: active prevention of hazards, cooperation of employees in management, ensuring continuous improvement of the health and safety conditions at work and the integration of various health and safety-related activities.

The Directive [9] has introduced new obligations for the employers related to the health and safety of the employees, among other things related to the prevention of risks, such as:

- Art. 6. 1. Within the context of his responsibilities, the employer shall take the measures necessary for the safety and health protection of workers, including the prevention of occupational risks and provision of information and training, as well as provision of the necessary organization and means. The employer shall be alert to the need to adjust these measures to take account of changing circumstances and aim to improve existing situations.
- Art. 6. 2. The employer shall implement the measures referred to in the first subparagraph of paragraph 1 on the basis of the following general principles of prevention: (a) avoiding risks; (b) evaluating the risks which cannot be avoided; (c) combating the risks at source; ... (i) giving appropriate instructions to the workers.
- Art. 6. 3. Without prejudice to the other provisions of this Directive, the employer shall, taking into account the nature of the activities of the enterprise and/or establishment: (a) evaluate the risks to the safety and health of workers, inter alia in the choice of work equipment, the chemical substances or preparations used, and the fitting-out of workplaces …

The provisions of the Framework Directive have been introduced to the Polish Law starting with the Labour Code Act [10] and ending with numerous executive acts.

The highest act in Poland is the Constitution of the Republic of Poland [11], which, in art. 66. 1 provides that everyone shall have the right to safe and hygienic conditions of work.

The legal basis regarding the occupational safety is constituted by the Act [10], which, in art. 15 states that employers are obliged to ensure healthy and safe working conditions for their employees.

The general rules regarding the organization of the occupational safety and health in workplaces are included in the chapter X of the Act [10] and in executive acts including the ordinance regarding special occupational safety and health provisions [12], hereinafter called the "general OSH provisions" due to their general application to all types of activities.

In line with the provisions of the Act [10]:

- Art. 207. § 1. The employer is responsible for health and safety in the work establishment.
- Art. 207. § 2. The employer is obliged to protect the health and life of employees by ensuring conditions of health and safety at work by the appropriate use of the achievements of science and technology.
- Art. 226. The employer must: 1) evaluate and provide documentation on any occupational risk connected with the work performed, and must apply necessary preventative measures decreasing the risk, 2) inform employees about any occupational risk related to the work performed, as well as on the principles of protection against dangers.

In line with the requirements of the ordinance [12]:

- § 40. 1. The employer shall provide systematic checks of the state of occupational safety and health with particular reference to the organisation of work processes, the technical condition of machinery and other technical equipment, and to determine methods to register irregularities and to remove them.
- § 39. 1. The employer shall implement the obligation to provide employees with safety and health at work, in particular by preventing the risks associated with their work, the Organization of work, the use of the necessary preventive measures and informing and training workers.
- § 39. 2. The obligation referred to in section 1, should be implemented on the basis of the General rules for prevention of accidents and work-related diseases, in particular by: 1) prevention of hazards; 2) carrying out the risk assessment of hazards, which may not be excluded; 3) removing hazards at the source of their formation; … 8) instructing employees on health and safety at work.
- § 39a. 1. The employer shall assess the occupational risk occurring while executing the work, in particular in the selection of equipment of workstations and workplaces, used chemical and biological substances and preparations, carcinogenic or mutagenic, and change the work organization. During the occupational risk assessment, all the factors in the working environment occurring while executing the work, and methods of performing the work shall be taken into account.
- § 39a.3 The employer shall keep a documentation of the occupational risk assessment and the applied necessary preventive measures. The document confirming the performance of the occupational risk assessment should give consideration to: 1) the description of the workstation under assessment, including a list of: a) the applied machinery, tools and materials, b) the performed tasks, c) the occurring at workstation hazardous, harmful and burdensome factors of the working environment, d) the applied individual and collective protection measures, e) the persons working at this workstation; 2) the results of the conducted occupational risk assessment per each of the work environment's factors and the necessary preventive measures to reduce the risk; 3) the date of the conducted assessment and the person performing the assessment.

The provisions of the Act [10] and the ordinance [12] constitute the general law regarding the occupational safety and health while the specific law includes, among other things:

- selected industries, such as mining, construction business, health care;
- selected types of work processes, such as using machines, manual handling;
- selected types of hazards, such as physical, chemical, biological and psychophysical;
- selected special risk groups e.g. juveniles, women including pregnant women.

Among many legal acts regarding the occupational safety and health that touch upon the hazards analysis and occupational risk assessment, the following may be listed:

- provisions regarding factors harmful to health [13, 14],
- provisions regarding the operation of machines [15],
- provisions regarding manual handling [16],
- provisions regarding the hazards related to chemical factors [17, 18],
- provisions regarding the exposure to harmful biological factors [19, 20],
- provisions regarding the exposure to noise and mechanical vibrations [21],
- provisions regarding the exposure to optical radiation [22],
- provisions regarding the exposure to ionizing radiation [23, 24, 25].

The Ordinance [13] specifies the following types of harmful conditions which require tests and measurements: chemical factors and dusts, carcinogenic and mutagenic factors, optical radiation (laser and non-laser), electromagnetic fields and radiation, cold and hot microclimate, noise and ultrasonic noise, mechanical vibrations (general and local). The rules for the assessment of ionizing radiation are subject to separate provisions [23, 25].

The ordinance [14] specifies the following types of harmful conditions, while providing the maximum allowable concentrations and intensities: chemical factors, dusts, cold and hot microclimate, noise and

ultrasonic noise, mechanical vibrations (general and local), optical radiation (laser and non-laser), electromagnetic fields and radiation. The threshold dosages of ionizing radiation are included in the provisions of the ordinance [24].

3. The analysis of selected provisions of the industry-specific law

The problems of the assessment of occupational risk in underground mining started to gain increasing importance in the legislation of the EU countries since 1992, after the adoption of the 92/104/EEC directive regarding the minimum requirements for improving the safety and health protection of workers in surface and underground mineral-extracting industries [26].

The directive [26] imposed new responsibilities on the employers, related to the safety and health protection of the employees, related among other things to the development and updating the document regarding health and safety protection and the analysis of risk related to occupational safety and health:

- Art. 3. 2. The employer shall ensure that a document concerning safety and health, hereinafter referred to as "safety and health document", covering the relevant requirements laid down in Articles 6, 9 and 10 of Directive [9]. The safety and health document shall demonstrate in particular that: the risks to which workers at the workplace are exposed have been determined and assessed, adequate measures will be taken to attain the aims of this Directive, the design, use and maintenance of the workplace and of the equipment are safe.
- Art. 8. 1. To ensure that workers receive health surveillance appropriate to the health and safety risks they incur at work, measures shall be introduced in accordance with national law and/or practices.

The provisions of the directive [26] have been introduced to the Polish Law starting with the Geological and Mining Act [27] and ending with numerous executive acts.

In line with the provisions of the Act [27]:

- Art. 108. 2. The mining plant operations plan specifies: … 2) specific activities necessary to ensure: … d) the safety of persons residing in the mining plant, in particular concerning occupational safety and health.
- Art. 117. The entrepreneur is obliged to: 1) identify hazards associated with mining plant operations and try to implement the measures to prevent and remove these hazards; … 4) evaluate and document the occupational risk and apply the necessary solutions that mitigate this risk, including the drafting of the document of the safety and health protection …

In the range of mining, the main executive acts of the Act [27] are, among others, the provisions related to the operation of the plant, the natural hazards, mining rescue operations and qualifications necessary in mining and mining rescue operations.

In terms of occupational safety and health, since 01.07.2017, the basic executive act of the Act [27] are the provisions regarding the operation of underground mining plants [28] (including: section II 'Occupational safety and health and fire safety', section II 'Ventilation', section IV 'Working conditions and health protection', section V 'Hazards occurring in the operation of a mining plant').

Section II of the ordinance [28], among other things specifies the detailed rules for the assessment and documentation of occupational risk and for the application of necessary preventive measures decreasing the risk, in the form of an employees' safety and health protection document.

In line with the requirements of the ordinance [28]:

- § 5. 1. Analyses and tests required for the safe operation of a mining plant, including the assessment and documentation of occupational risk and the application of necessary solutions for decreasing the risk, shall be conducted by the entrepreneur.
- § 6. 1. Before commencing the works, the entrepreneur shall draft an employees' safety and health protection document, hereinafter called the 'safety document'.
- § 6. 4. The mining plant's operation manager shall inform the employees of the mining plant the employees of the entities referred to in art. 121. 1 of the Act [27] on the contents of the safety

document or a relative part thereof, especially concerning the occupational risk assessment and the application of the necessary solutions applied to decrease the risk.

- § 218. 1. Tests and measurements of harmful factors and ionizing radiation in the working environment shall be conducted in the mining plant – in a manner specified by the provisions issued based on the art. 228 § 3 of the Act dated June 26th, 1974 – Labour Code [10], and based on the art. 25. 1 of the Act dated November 29th 2000 – Nuclear Law [23], with the exclusion of dusts, climatic hazards and harmful factors specified in § 142. 2, for which the tests are conducted in line with the provisions of the ordinance.
- The provisions of the ordinance [28] contain a reference to the following types of hazards:
- mining hazards: rock burst hazard, methane hazard, gas and rock breakout hazard, coal dust explosion hazard, climatic hazard, water hazard, natural radioactive substances hazard, fire hazard (section V, chapters 1-9),
- harmful gases: carbon dioxide, carbon oxide, nitrogen oxide, sulphur dioxide, hydrogen sulphide (section IV, chapter 1),
- harmful dusts (section IV, chapter 2),
- sources of ionizing radiation (section VI, chapter 8).

The basic hazards occurring in mining plants include natural hazards, for which the following provisions constitute the legal basis:

- until 30.06.2017, the provisions of the ordinance [29] encompassing: rock burst hazard, methane hazard, gas and rock breakout hazard, coal dust explosion hazard, water hazard, eruption hazard, hydrogen sulphide hazard, natural radioactive substances hazard, harmful dusts activity hazard;
- from 01.07.2017, the provisions of the ordinance [30] encompassing: rock burst hazard, methane hazard, gas and rock breakout hazard, coal dust explosion hazard, climatic hazard, water hazard, rockslide hazard, eruption hazard, hydrogen sulphide hazard, radioactive substances hazard (radiation hazard).

4. Summary and conclusions

Based on the critical analysis of selected provisions of the general and industry-specific law and the practical functioning thereof in selected hard coal mines, the following conclusions have been formulated:

- The current provisions are unsatisfactory. This concerns, among other things, the inconsistencies between the general and industry-specific law and the lack of practical guidelines for the assessment of occupational risk.
- Differing definitions of the occupational risk are an inconsistency. It is often referred to the workstation (ordinance [12]), while it should be related to the conducted work (act [10]).
- The lack of practical rules for the selection of the occupational risk assessment method both in the legal acts and in the PN-N-18002:2011 [3] standard is a basic problem.
- In terms of the occupational risk assessment in hard coal mines, a division of workstations into stationary and non-stationary may be applied, not only giving consideration to the fixed or varying location of workplace but also to the criteria of variability of the types of the work processes and the working conditions.
- Another important matter is constituted by the lack of coherent rules for the classification of hazards in mining plants. This results both from the analysis of legal acts and the industry-specific literature. It may be exemplified by the classification of hazards depending on the energy location criteria (natural, technical, personal) that is often applied in mines.
- As far as the assessment of occupational risk in hard coal mines is concerned, a classification of hazards depending on the character/type of activity (physical, chemical, biological, psychophysical) or the criterion of consequence/results of the activity (hazardous, harmful, burdensome) may be applied.

- In terms of the mining hazards, many controversies are caused by both the currently binding [30] and the out-dated [29] classification of natural hazards. The controversies are raised, among other things, by endogenous fires hazard, dust hazard and ionizing radiation hazard.
- The specific character of the working environment and hazards occurring in hard coal mines constitutes a difficulty in terms of the duty to assess and document the occupational risk, especially in the range of the variability of the workplace, the work process and the working conditions.
- Despite the advancement in the methodology of occupational risk assessment in mining, the general rules of developing and conducting the risk assessment and the qualitative method of risk estimation (risk matrix) in line with the PN-N-18002 [3] standard, still remain dominant.
- A shift from the traditional approach to documentation of the occupational risk assessment for a given workstations (stationary workstations) towards the assessment of the risk related to the conducted work (non-stationary workstations) should be made. This should be done while keeping in mind the criteria of the location of the workplace, the type of work process and the working conditions.
- The approach to informing the employees on the occupational risk should be altered from a complex information regarding the results of the risk assessment per a given workstation (multi-page document exhibited during OHS trainings) to the presentation of the most important information regarding the hazards and the occupational risk related to the conducted work (1 or 2 page document exhibited while changing the workplace, the work process or the working conditions).

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