

RISK ASSESSMENT AND GUIDELINES FOR RISK REDUCTION IN MINING

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Abstract: Safety and health at work of occupationally exposed workers not only formal approach through which community wishes to declare its commitment to improving the work environment and welfare of workers. Instead, safety and health of workers is a very economically-oriented category, through which you should protect the interests of workers, enterprises and economic organizations.

The right on health and safety at work are universal human and labor rights. Therefore, the International Labor Organization from its foundation until today has adopted and published the 187 Declaration and 198 recommendations in the area of health and safety at work.

This paper presents guidelines for the assessment of occupational risk in mining, one of the riskiest industries.

Key words: risk, assessment, safety and health

1. INTRODUCTION

Mining, like many other industries is a challenge to make as much as possible in terms of prevention of accidents and ensure timely planning, diligence, awareness and communication that enable the reduction of harmful effects on human health and the environment. One of the basic processes to prevent accidents is risk assessment.

The main reason, therefore is need to make a risk assessment is the possibility of risk management, its reduction or elimination. Generally accepted is that the risk assessment process should be separated from management decisions. The principle states that risk assessment should be as much as possible objective and that it depends on scientific criteria and not on political or social aspects and assessment. Risk assessment policy and its reduction should be an integral element of national and local policy at all levels to meet overall objectives, which are related to economic and social development. This policy must be considered in determining the dynamics and volatility of risk. Using information about the risks should elaborate an effective procedure to reduce it and increase efficiency in reducing the risk with application of research and knowledge in the field of management.

Risk assessment is the basis for safety and healthy workplace. The risk assessment process is the responsibility to the employees in order to encourage their

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security, motivation and confidence in the company. Risk assessment is an indicator of direction of long-term existence of the company, the capacity, productivity and profit improving (IGA, 2009).

The risk assessment process facilitates its management.

2. RISK DEFINITION

The risk is quantified measure of the probability that as a result of exposure will result in the occurrence of harmful effects on health and life of occupationally exposed workers.

Kinney method, which is commonly used for evaluation and assessment of risk due to the occurrence of identified hazards to health and safety of employees is based on the basis of considerations of:

- likelihood of possible events - L ;
- consequences - C and
- frequency (time of exposure to risks / hazards) - F .

Based on the determined likelihood, consequences and frequency, the level of risk R is calculated as the product of likelihood, consequence and frequency:

$$R = L \cdot C \cdot F \quad (1)$$

Key questions in terms of risk are:

- Which stakeholders could be affected or are likely to have an interest in the risk?
- Which stakeholder groups could perceive the risk differently?
- What are the various stakeholder expectations and understandings in relation to the risk?
- What are the legal requirements?
- What technical solutions to risk reduction can be employed?
- What risk communication strategies should be applied for the various stakeholder groups?

2.1. Main risks in mining

The main risks in the mining industry as one of the high-risk industrial sectors, are (Ozunu, 2009):

- the risk to health and safety of employees;
- environmental risks;
- social risks;
- land use risks;
- legal and financial risks and
- technical risks.

2.2. Hazards in mining and steps in risk assessment

The main hazards in mining are the presence of dust, chemicals, harmful gases, electricity hazards, fire and explosion, dynamic occurrence, radiation,

mechanical hazards, and working environment (microclimate, lighting, noise and vibration) (Heleta, 2010). During steady analysis and monitoring of workplace conditions, timely detection of potential hazards, risk assessment, impact on reducing and eliminating of hazards.

The risk assessment is carried out through a several of steps (Međunarodna organizacija rada i Avstriska agencija za razvoj, 2009).

Step 1. Identify the hazards and exposure of workers, which includes:

- Hazards determination. How an accident might happen? What or how things could go wrong?
- Determination who is involved in the hazard? Who is involved in activities in whose execution exist risk? Who else could be at hazard?
- Hazards elimination. Can the activity be carried out in another way so as to eliminate the hazard?

Step 2. Evaluation or risk assessment and risk ranking or assessment of whether the risk is low, moderate or high. This step should answer on the following questions:

- How likely is an accident to happen?
- How serious would the injury be if there is an accident?

Step 3. Decide on control measures. Registration or recording of data on estimated risk and measures which should be taken (documentation of the risk assessment).

Step 4. Monitoring and control of risk assessment. The efficiency of preventive and corrective measures should be continuously monitored. Risk assessment should be revised and re-tested in the case of:

- when you have made significant organizational changes in the work process;
- as a result of new information related to the investigation of injuries and accidents;
- when taken preventive measures are inadequate or not effective;
- to ensure that the findings of risk assessment is still relevant;
- checks that you need to make some changes in employed workers, new equipment, new systems and the like.

2.3. Strategy for risk reducing in mining

When we talk about the strategy for risk reduction in mining, it should be noted that there are basically two types of strategies:

- strategy for historical pollution (abandoned mines and situation in companies with serious environmental damage);
- strategy for new mining projects (strict regulations and policies for companies which want to develop new projects).

Strategy for risk reduction which are associated with the execution of mining operations is focused on the following activities:

1. ore excavation by cut and fill method;
2. improvement of technological processes, technologies for ore excavation;
3. management of waste water.

In addition to the basic activities, the important role there are the following activities:

- periodical testing;
- reporting: periodic reporting to the competent authorities: special incidents, major accidents, threats;
- health and safety (in the past health and safety activities were related only to accident prevention. Today, this issue concerns on environmental pollution hazards);
- employee training;
- land reclamation and remediation;
- post-closure monitoring.

Goals of mining risks reduction strategies (Figure 1) are: economic growth, ecological balance and social responsibility.



Figure 1 - Goals of mining risks reduction strategies

3. RELEVANCE OF APELL PROGRAM TO RISK REDUCING IN MINING - APPEL FOR MINING

APELL – (The Awareness and Preparedness for Emergencies at Local Level) is program which used to help the communities in prevention, preparation and respond appropriately in the case of accidents and emergencies.

APELL was developed by the United Nations Environmental Programme, in partnership with industrial associations, communities and governments, as a result of some major industrial accidents with significant impact upon human health and environment. APELL today is implemented in almost 30 countries around the world.

APELL for Mining, published in 2001 by UNEP, provides guidance for the mining industry in raising awareness and preparedness for responding to emergencies at the local level (UNEP, 2001).

The following algorithm shows the ten steps of the APPEL process (Figure 2).

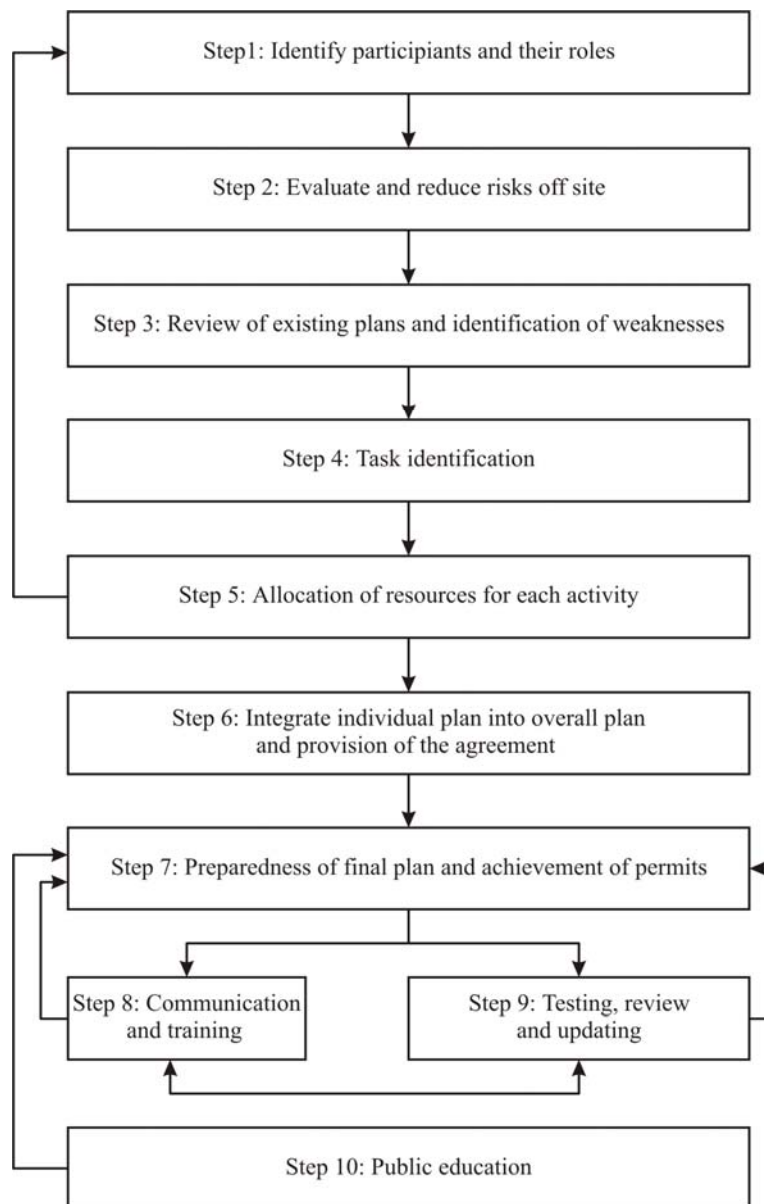


Figure 2 – Ten steps of the APELL process (UNEP, 1998)

3.1. The importance of APELL for risk reduction policies

Mining, like many other industries, faces the challenge of doing more to prevent accidents and to ensure that contingency planning, awareness and communication reduce their impact. The importance of APELL for risk reduction policies is following (Heleta, 2010):

- implementation of regional policies at community level and the provision of informational flow for all the stakeholders;
- integrated application of the European legislative provisions (SEVESO);
- identification and awareness of risks within the industrial communities;
- improvement of the mechanisms of crisis management;
- development of some strong local relationships involving different groups of interest in mutual actions, developing structural relationships;
- preparedness of an Integrated Emergency Response Plan to be used by all the stakeholders;
- initiating the risks mitigation measures and coordination of the preparedness activities regarding industrial risks.

3.2. Handbook for APELL in the Mining

APELL concepts are equally relevant to mines and to refineries and smelters, but Guidance for the Mining Industry in Raising Awareness and Preparedness for Emergencies at Local Level), published by UNEP, 2001 concentrates on mining situations. Handbook for APPEL in the Mining includes (UNEP, 2001):

- the generic objectives and organizational framework of UNEP's Awareness and Preparedness for Emergencies at Local Level (APELL) Programme in the framework of UNEP;
 - the risk factors specific to the mining industry;
 - describes how APELL can be applied to the mining industry.
- Relevance of APELL to the mining industry:
- enhances the efforts made for preventing accidents and mitigating their impact by planning, awareness and communication;
 - identifies hazards involved in mining operations;
 - examines some of the past accidents.

4. CONCLUSION

Risk assessment is the process of decision making in relation to whether existing risks can be tolerated and whether existing procedures for controlling risk are adequate and if don't, whether you need new alternative procedures to control risk.

The key issues can be resolved using APELL program are:

- risk assessment and proactive risk reduction;
- operational monitoring, early identification and warning, and the need to take action when problem becomes an urgent;
- the need for contingency planing even when accident probabilities are very low but potential consequences are high;
- the need for effective planning and communications across national or administrative boundaries.

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