

13th INTERNATIONAL CONFERENCE
MANAGEMENT AND SAFETY

M&S 2018

OHRID, MACEDONIA, June 15th and 16th, 2018
PROJECT MANAGEMENT AND SAFETY

PROCEEDINGS CD1

THE EUROPEAN SOCIETY
OF SAFETY ENGINEERS

EUROPEAN
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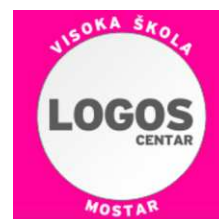
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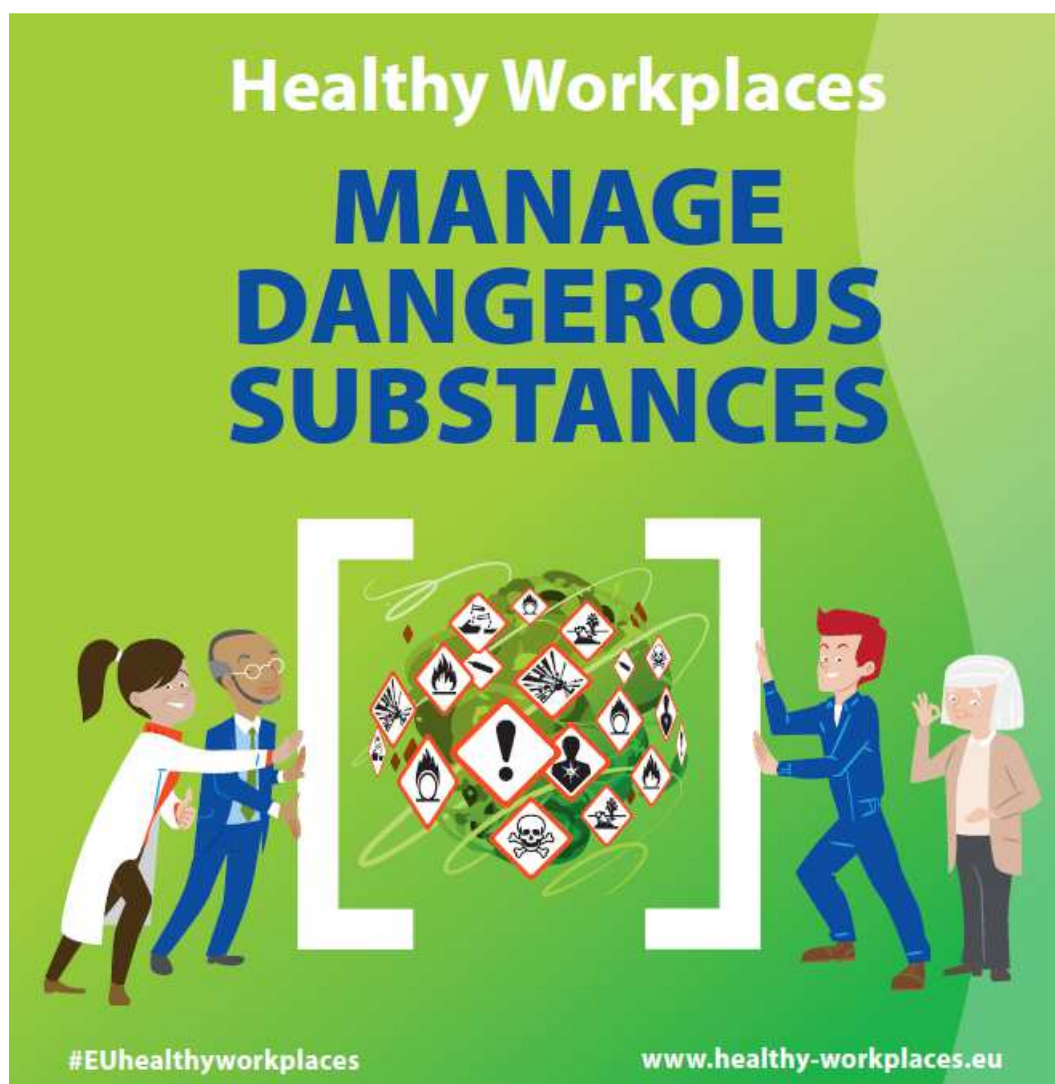


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HEALTH AND SAFETY RISKS IN MINING INDUSTRY – CAN POSITIVE EXAMPLES MAKED DIFFERENCE

Abstract

Mining industry has a reputation for being a risky business, with health and safety risks that are varied and often quite serious, so it is important for miners to protect accordingly. Nevertheless, mining doesn't have to be unsafe. Introduction of strict safety rules and procedures, as well as advanced safety equipment, the mining industry has seen its fatality rate drop over time. To be successful, best practices in any organization must be deeply ingrained into the corporate culture and supported from top management on down through the ranks. This is especially important in mining and other high-risk industries where safety awareness and consistency are essential in helping to prevent accidents, injuries and fatalities. The paper describe the Sasa Mine example, where successful implementation of tailor made safety improvements led to 483 days without LT injuries during the last two years. Sasa mine works on continuous improvement of H&S conditions by introducing a variety control and improvement tools, through an open process that never ends, using "we can always do better" approach.

Key words: health and safety, risk management, good practice, mining.

INTRODUCTION

The issue of health, safety and environment (HSE) remains one of the top priorities in the local, regional and global mining industry. Efficient health and safety at workplace not only ensures that employees are happy and productive, but can also help to reduce both the human and business costs of injuries and unnecessary lawsuits. By making health and safety the priority, mining companies are effectively communicating that competent employees are a valuable resource in the industry. Additionally, improved health and safety standards help companies become more effective to finish projects on time and improve their business profile with customers and clients. By introducing basic health and safety standards, mining companies can understand the human capital benefits this has across the company [1].

Mine managers and individual miners need to adhere strictly to operational safety procedures. Employers need to provide the right tools and training to every employee to protect the life, health and safety, as well as to protect valuable worksites and assets. As leading mining organizations already know, creating a safe working environment means a more productive and profitable mining operation. It also leads to higher levels of worker morale and job satisfaction, which in turn improves employee retention. Taking a holistic view toward improving worker safety education and safe work practices is a sound business investment that pays dividends for long-term success.

HSE standards and technical specifications must first be discussed and implemented before any person steps onto any mining site, whether in an established facility or a new site. Also, gaps between local and international HSE standards can be bridged through an approach that involves a method statement, risk assessment and job safety analysis.

Understanding and being aware of your environment is the first step to preventing illness or injury in the workplace,"[2] reveals mining medicine researcher Megan Clark, who outlines the following 7 common health risks to watch out for in the mining industry: dust [15], noise [13,14,15], vibration [16], UV exposure in surface mines, Musculoskeletal disorders, thermal stress, chemical hazards (gases and dust) [9,10].

Management must not only provide their workers good H&S practices at work, but also to enable and involve them in training for the proper usage and continuous improvement of these practices [6].

Sasa mine, having in mind the importance of health and safety working environment, focus on educating and explaining HSE rules and regulations to workers, contractors, as well as utilizing industry experience to implement such standards.

BACKGROUND

Sasa mine dates back to the 17th century. First geological investigations of mine site began in 1954 when the first elaborate for geological and ore reserves in Osogovo region was prepared. In the period 1960/61 a decision was made for construction and opening of a mine that lasts until 29.11.1966 when the mine is put into production, with an annual production capacity of 300,000 tons of dry ore.

After the sale, in 2005, Sasa mine began with its renewal. New equipment, ie mining machines from the world's leading mining equipment company Atlas Copco, was purchased, and new equipment from the world manufacturer of appropriate Metso Minerals technique was installed, existing equipment was repaired, and new facilities were built that was necessary for normal operation of mine and all started projects were realized until the mine restarted. On June 12, 2006, the Sasa Mine was officially released in full-time operation and first quantities of lead and zinc concentrate were produced, thus launching the new history of Sasa Mine. With great capital investments, Sasa mine has been transformed into a one of the most modern underground lead and zinc mine in Europe and the largest in the Republic of Macedonia.

After re-launching and modernization, the mine has grown into one of the most modern mining companies in Europe and has seen further positive development with an average annual production of about 770,000 tons of dry ore. Last several years Sasa mine continuously is entering the top 10 most successful Macedonian companies. In last 3-4 years, additional means has been invested in equipping and replacing the old one (purchased in 2006-2007) with new underground equipment (underground trucks, drilling equipment, LHD loaders) that is the latest generation and meets the highest safety standards [3].

The company's management is certified with ISO 9001 Quality Management Standard, implemented in 2008, properly maintained and regularly recertified by the Slovenian Institute of Quality SIQ-Slovenia. Environmental management system is implemented in accordance with ISO 14001 standard, which has been applied in Sasa mine since 2007 and in April 2008 was also awarded a certificate by SIQ-Slovenia. OSH management is implemented in accordance with BS OHSAS 18001: 2007, which is applied in Sasa mine from June 2014, when SIQ-Slovenia is awarded. In February 2017, Sasa mine successfully renewed certificates for all three standards through SIQ (Slovenia), a body accredited by the International Accreditation Forum (IAF).

But? Mining is a risky business !!!

From the begin of restarting SASA mine, in 2006, in addition to all efforts and compliance with regulations, H&S condition becomes a major problem in mining operation. Since the re-start of the mine by mid-2013, there have been eight fatal accidents (caused by several factors), such as: breakdown, standing in unsafe places, uncontrolled access to hazardous areas, falling materials, fall from height. In the same period, on average, approximately 25 injuries per year are recorded, and as main reasons there are: negligence, violation of procedures / obligations, inadequate hazard control / unexpected hazards` exposure.

METHODS FOR IMPROVING SAFETY

Faced with the upward trend of injuries, in 2011, Sasa`s mine management, complete reorganization of health and safety system was initiated, based on principle of "0" tolerance across 4 main topics:

1. Reorganization of roles and responsibilities and introduction of formal H&S system (OHSAS 18000)
2. Full harmonization of H&S measures with legal provisions (100% without justifications and deadlines).
3. Improve working conditions, equipment and tools.

4. Improve training of staff through a full introduction of regulations, rules and guidelines for safety working [7].

Improve Training!

Improving OSH training involve, continuous monthly trainings on rescue squad, first aid training, emergency response training, training for handling explosive materials, as well as OHS training for workers. Continuous monthly trainings for underground mining equipment operators were conducted and its maintenance by equipment manufacturers.

Harmonization with legal regulations!

Risk assessment and OHS statement for all workplaces was prepared [11,18]. Periodic measurements of exhaust gases, ambient air quality in underground site and industrial site, as well as personal exposure to certain hazards are performed. It operates exclusively in accordance with approved technical documentation from Ministry of Economy, with permits for use new equipment, including equipment directly intended for implementation of safety measures and increased safety in underground site and outside. Regular medical examinations are carried out by an authorized medical institution.

H&S systems!

BS OHSAS 18001: 2007 (certified by SIQ June 2014) was introduced, so Sasa is unique mine with this certificate in the region. The number of workers / engineers in OHS Department has increased. System of periodic (weekly) continuous OSH meetings was introduced.

System for punishment of managers and workers - violators of H&S regulations has been introduced. Performing of any extraordinary work during the night shift and without presence of responsible person is forbidden.

Improve working conditions and equipment!

A new improved ventilation system on underground site was introduced and a main ventilator was dislocated [17]. Raise boring machines have been introduced for raise construction between all horizons, for ventilation of underground rooms, as well as for storing and transporting ore and waste rock. New transportation system with trolley locomotives on horizon 830 has been introduced. Improved support system in underground site with Split Set Stabilizer and shotcrete has been introduced; usage of a wooden support is reduced to a minimum. Nonel blasting system and emulsion patronized spraying was introduced. Old mining equipment has been replaced with new (underground trucks, drilling equipment, LHD loaders), the latest generation that meets highest safety standards.

Improve active H&S!

In 2016, Sasa Mine starts implementing new OSH Strategy [4]. Strategy's Objectives as follows:

1. Continuous improvement of OHS hazard recognition and management during working activities.
2. Continuous reduce the number of injuries and occupational diseases as well as their severity.
3. Preventing fatal accidents.
4. Application and improvement of Integrated Management Systems based on ISO 9001: 2015, ISO 14001: 2015 and OHSAS 18001: 2007 standards.
5. Harmonization on General Guidelines of Environmental Protection and OSH and Guidelines for Environmental Protection and OSH in Mining in accordance with Law on Mineral Resources with those of the IFC Group / World Bank referred by the Equator Principles from June 2016.
6. Fulfill all other set goals in Sasa's S&H Policy.

Compulsory prior to commencement of working activities, Job Safety Analysis, as well as, 5 steps to Safety Work Worksheets have must completed.

Job Safety Analysis is a simple risk assessment technique that focuses on work tasks as a way of identifying hazards and controlling their risks. The focus is on relationship between worker, task, tools it uses and working environment. Usually results in a written document that is used to standardize the task, for example, Standard operating procedure (SOP) that points to several problems related to task, for example, process, specifications, materials, time, quality, costs, etc [5].

Five steps to Safety work Worksheet involves these steps: Stop, Think, Determinate, Plan, Continue. The worker looks round workplace regarding the Safety, if identified risks, plan and take measures for their removal, and even then continues with working activities.

According to H&S Improving Strategy, new initiatives in 2016 were introduced, as follows:

- Permit for hot work;
- Compulsory Alco test for workers and all contractors in mine;

- Risk assessment via "5 Steps to Safety Work" Worksheet ;
- Preparation of Control Sheets for Planned Observations of Work Tasks;
- Ongoing development of Basic Mining Danger Management Plans.
- Continue with increased controls by the H&S Department and reduction of observed safety offenses (unsafe conditions and practices).

In 2017, following new initiatives have been implemented:

1. Preparation of Job Safety Analysis with all contractors as well as for those working tasks for which no standard operating procedures or appropriate instructions have been developed.
2. Reduction of mechanical hazard / regarding moving equipment (minimum distance 2 m from moving equipment).
3. Improved training of workers and their skills for identifying hazards by upgrading and harmonizing the training with established hazard and risk assessment registry at Sasa.mine.
4. Development and implementation of 43 new Standard Operating Procedures (SOP).
5. Planned monitoring of working activities for all 43 SOPs has been introduced.
6. Investigation of high-risk hazards.

Planned monitoring of working activities presents structured worker` monitoring by all liable managers. Liable manager checks knowledge and compliance with Standard Operative Procedures and gives corrective feedback to the worker when he notices unsafe practices. All liable managers are required to monitor, to improve their personal leadership capability and to incorporate safety practices. Investigation of high-risk hazards presents a structural investigation of the causes, consequences, and other factors in observed unsafe conditions and practices. All liable managers should carry out such a hazard investigation to improve personal identification of hazards and expertise for safety working practices.

In order to verify improvement process of OSH system in Sasa mine, specialized Nordic Safety Climate Questionnaire (NOSACQ-50) was distributed to different groups of workers, primarily with the focus on underground personnel.

A specialized Nordic Safety Climate Questionnaire (NOSACQ-50) is a tool for diagnosing the safety environment and assessing the effectiveness of safety systems. There is a strong scientifically proven link between safety environment and performance of safety systems (low level of injuries).

This questionnaire has been tested in various industries and its validity and reliability has been proven in the Nordic countries. The questionnaire is partially modified to test the trend of changing the safety culture.

Nordic Safety Climate Questionnaire (NOSACQ-50) was developed by a team of Nordic occupational safety researchers based on organizational and safety climate theory, psychological theory, previous empirical research, empirical results acquired through international studies, and a continuous development process. Safety climate is defined as workgroup members' shared perceptions of management and workgroup safety related policies, procedures and practices. NOSACQ- 50 consists of 50 items across seven dimensions/ categories [8].

The questionnaire defines 7 categories that are evaluated. For a positive assessment is considered 2.5 score, while 2.5 to 3 means good.

Table 1: 7 categories that are evaluated through NOSACQ-50 [8]

1	Management safety priority, commitment and competence
2	Management safety empowerment
3	Management safety justice
4	Workers' safety commitment
5	Workers' safety priority and risk non-acceptance
6	Safety communication, learning, and trust in co-workers' safety competence
7	Workers' trust in the efficacy of safety systems

RESULTS

Different groups of workers were analyzed, primarily with the focus on workers in underground site. The data indicate that in 4 categories, situation that was negative before 2011 is in a positive zone, now. In the other three have further improvement with a special emphasis on good communication and training system (with score over 3).

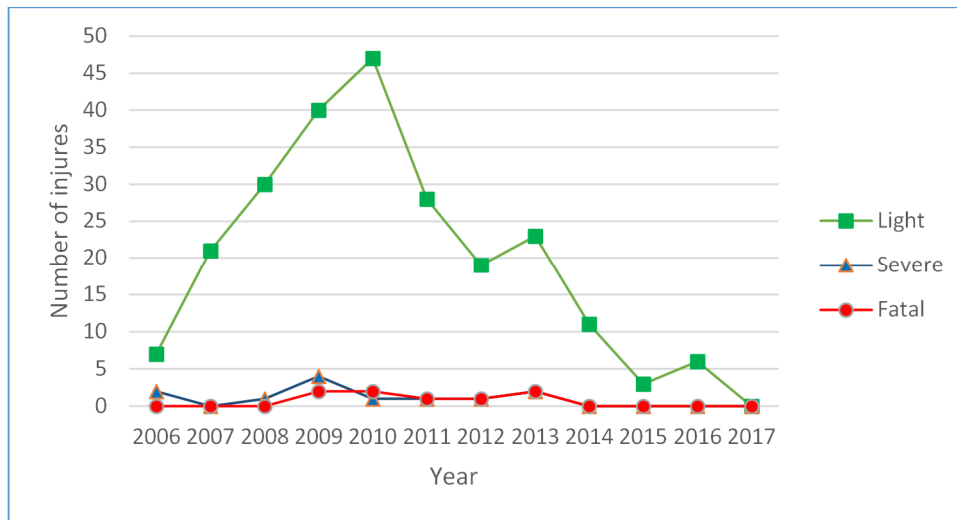
Motivation of management and the ability to motivate are also highly valued. In other categories, there is prospects for improvement, especially in the acceptance of risks and unsafe conditions by workers.



Real and sincere desire to increase capacity and improve performance in terms of safety management gave expected results:

- Significant reduction on number of injuries from re-starting the Sasa mine to date (Figure 1).
- 2017 has been finished with 0 light, severe and fatal injuries.
- 483 days continuously without injury during 2017 to date (Figure 2).
- Risk awareness has been built up, and reduced tolerance to unsafe conditions and actions.
- "Thinking" about safety is on a higher level.
- There are striking benefits regarding the technology improvement and upgrading of equipment as well as working conditions.

Figure 2. Trend of injuries in Sasa Mine during (2006-2017)



Source: own source

Safety awareness in SASA mine has been raised to the highest level and all workers have aware of importance of applying all safety measures while performing working activities. All workers in SASA mine are involved in increasing safety level through holding safety meetings, also they are aware that: **NO ONE WORK IS NOT SO URGENT TO BE PERFORM ON UNSAFE MANNER**

Table 2. Key safety statistics for 2017

Key H&S statistics	Quantity
Number of days since the last injury with sick leave	431
Number of total recorded incidents – monthly / by the end of 2017	0/0
Number of injury with sick leave – monthly / by the end of 2017	0/0
Lost working days due to an injury at work – monthly / by the end of 2017	0/0
Total working hours of contractors without injury with sick leave for 2017	368,664
Total working hours without injury with sick leave to the end of December 2017	1.410,792
Number of incidents (with first aid/ or equipment damage) for 2017	05/02
Number of incidents with high incidence potential	03

DISCUSSION

Sasa mine, after achieving outstanding results in H&S Management, continues with improving H&S Policies, including:

- Improving skills for hazard identification and risks non-acceptance.
- Improving risks analysis and safety rules.
- Improve the safety of all equipment.
- Integration and automation of H&S management systems.

Key Safety Initiatives for 2018

- Strengthening Key Capabilities in Functioning of H&S Management System;
- Audit program for critical controls;
- Merging the SASA H&S System with Contractors Management;
- Preparation of detailed Emergency Plan [12];

- Preparation of annual plan for H&S topics by months;
- Development of monthly plans of H&S topics;
- Installation of automatic fire-fighting system at key point in underground site, for example Explosives Warehouse;
- Training workers in underground site for usage of new mining self-helpers.
- Training of all Supervisors for detailed investigation of incidents or potential incidents in which a worker could be injured or greater damage to equipment or the environment through a standardized documentation.
- Upgrade the existing legal health monitoring program to align the classification of health issues and reporting with modern approaches, according to the International Council on Mining and Metallurgy.

CONCLUSION

Although mining is one of the most risky industries, the Sasa mine example shows that application of good safety practice as well as unconditional commitment of Management and all workers, using “we can always do better” approach can make difference and gave positive example as mines can be a safety place to carry out working activities. The goal of Sasa mine is continuous improvement of H&S situation through the introduction of various control tools. H&S enhancement is an open process that does never ends, always, there is chance for its improvement. H&S Improvement Strategy is structured approach to the implementation of internationally recognized good practices in H&S management, taking care not to override the existing systems and safety approaches that exist at the moment in accordance with requirements in Macedonian legislation.

REFERENCES

- [1] Mosaic Management Systems, **Importance of managing and implementing health & safety measures in construction**, 2016
- [2] Mining Review Africa, Spintelligent (PTY) Ltd, **Mining health safety – 7 common risks to protect yourself against**, 2015
- [3] Rakov, A., Gocevski, B., Mirakovski, D., Panov, Z., Hadzi-Nikolova, M., **Mining = Risk ? How to achieve greater safety? The experiences of Sasa mine**, M. Kamenica, Improvement of H&S Managemet, Istanbul, Turkey, 2015
- [4] Gocevski, B., Taskovski, S., Mirakovski, D., Hadzi-Nikolova, M., **OHS in Sasa mine**, Personal exposure on chemical and physical hazards in mining, Ohrid, 2018
- [5] Hethmon, T. **Risk & Change Management in Mining**, Center for Mining Safety & Health Excellence, University of Utah, 2015
- [6] Principal Mining Hazard Management Plan Guidance Material, Workplace Standards, Tasmanian Government, GB326, 2013
- [7] Managing Risk in Mining, NSW Department of Industry, Division of Resources and Energy, Mine Safety, 2016
- [8] Kines, P., Lappalainen, J., Lyngby Mikkelsen, K., Olsen c, E., Pousette, A.,Tharaldsen, J., Tómasson, K., Törner, M., **Nordic Safety Climate Questionnaire (NOSACQ-50): A new tool for diagnosing occupational safety climate**, International Journal of Industrial Ergonomics 41, 2011
- [9] Mirakovski, D., Hadzi-Nikolova, M., Panov, Z., Despodov, Z., Mijalkovski, S., Vezenkovski, G., **Miners` Exposure to Carbon Monoxide and Nitrogen Dioxide in Underground Metallic Mines in Macedonia**. Occupational Safety and Hygiene. p. 449. ISSN 978-1-138-00047-6, 2013
- [10] Mirakovski, D., Hadzi-Nikolova, M., Doneva, N., Mijalkovski, S., Vezenkovski, G., **Miners` exposure to gaseous contaminants current situation and legislation**. 5th Balkan Mining Congress, 18-21 Sept, Ohrid, Macedonia, 2013.
- [11] Hadzi-Nikolova, M., Mirakovski, D., Doneva, N., **Risk Assessment and Guidelines for Risk Reduction in Mining**, Podzemni radovi (20). pp. 21-27. ISSN YU ISSN 03542904, 2012.
- [12] Hadzi-Nikolova, M. Mirakovski, D., Doneva, N., Gocevski, B., Taskovski, S. (2017) **Emergency Plan- Essential part of Occupational Health & Safety Management System**, X Professional counseling with international participation PODEKS-POVEKS '17, 03-05 November, Ohrid, Macedonia, 2017.

- [13] Mirakovski, D., Hadzi-Nikolova, M., Doneva, N., Kepeski, A., **Miners Personal Noise Exposure in Metal and Non-Metal Mines in Macedonia**, 6th International Symposium Mining and environmental protection, 21-24 June, Vrdnik, Serbia, 2017.
- [14] Hadzi-Nikolova, M., Mirakovski, D., Doneva, N., **Noise Induced Hearing Loss (NIHL) in mining**, IX Professional counseling with international participation PODEKS-POVEKS'16, 11-13 November Strumica, Macedonia, 2016.
- [15] Mirakovski, D., Hadzi-Nikolova, M., Doneva, N., Vezenkovski, G., **Monitoring of personal exposure on physical and chemical hazards in real mining areas**. In: VII Professional counseling with international participation PODEKS-POVEKS '14, 14-15 November 2014, Radovis, Macedonia, 2014.
- [16] Hadzi-Nikolova, M., Mirakovski, D., Doneva, N., **Prevention of mechanical vibration risks in mining**, VI Professional counseling with international participation PODEKS-POVEKS `12, 2012.
- [17] Mirakovski, D., Hadzi-Nikolova, M., Doneva, N., Vezenkovski, G., (2012) **Ventilation management in underground metallic mines**, VI Professional counseling with international participation PODEKS-POVEKS `12, 23-25 November, Stip, 2012.
- [18] Hadzi-Nikolova, M., Mirakovski, D., Doneva, N., (2011) **Professional Risk Assessment in Mining**, V Professional counseling with international participation PODEKS-POVEKS, 11, Makedonska Kamenica, 2011.

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