



AN OVERVIEW AND APPROACH FOR HYBRID IMAGE GOLD MINING HAZARD ANALYSIS

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ABSTRACT

To ensure sustainable long-term functioning, modern mining enterprises must constantly increase not only efficiency, but also ensure safety at every stage of the technological process and conduct professional risk assessments in accordance with the requirements of modern legislation. Any production process is a complex of various technological operations that carry certain risks and dangers that can, to one degree or another, cause harm to the life and health of personnel

Keywords : Gold, risk, technological process, personnel, safety

INTRODUCTION

The value of gold for industrial production is determined by its special properties: malleability and ductility, a high degree of resistance to aggressive environments. In modern industry, gold is often used in electronics and the manufacture of measuring instruments, telecommunications, aviation and the space industry, nanotechnology. Metal has become widespread as a welding material in the production of the latest models of technology, the production of thermocouples, and galvanometer parts. In the field of microelectronics, both gold conductors and the galvanic gold coating of individual surfaces, boards and connectors are widely used.

Examples of the use of gold in medicine include water-soluble preparations containing precious metals, which are injected into a patient with chronic arthritis, gold thiosulfate administered to patients with erythematous lupus, and organic metal compounds used in tuberculosis. Radioactive gold used in oncology for the diagnosis and treatment of malignant tumors, gold threads in aesthetic cosmetology, gold-containing skin care products that, thanks to the antimicrobial action of the metal, help to eliminate skin problems and their rejuvenation.

Jewelry production has always been and remains the largest consumer of gold. Gold jewelry has been around for centuries and has been passed down from generation to generation.

Every year, world gold reserves are declining. So in 2017 the world level of gold mining reached, according to various sources, from 3246.5 (GFMS GoldSurvey 2018) to 3268.7 tons (Gold Demand Trends Full Year 2017, GFMS Thomson Reuters), which corresponds to the level of previous years (from -0.1% up to +0.2%) [1].

It has been established that all the professions studied are classified as high risk. To minimize occupational risks, it is proposed to provide for the implementation of the following measures:

- Mandatory briefing, training at the workplace;
- providing employees with effective means of collective and individual protection, especially for protection against noise.

- conducting mandatory medical examinations, both primary when applying for a job, and periodic for early diagnosis of professional pathologies.

Attention should be paid to the need to create a professional risk management system at the mining enterprises of Uzbekistan, as required by the international standard ISO 45001, "Occupational safety and health management systems. Requirements and usage guide." This standard is intended to improve safety performance, reduce risk in the workplace, and improve health outcomes. In the future, the field of health and safety in the workplace will expand, including also psychological health, with new standards that are being developed. It is expected that ISO 45003, Occupational Health and Safety Management Systems. Psychological health and safety in the workplace. The manual will be published in 2021.

To ensure sustainable long-term functioning, modern mining enterprises must constantly increase not only efficiency, but also ensure safety at every stage of the technological process and conduct professional risk assessments in accordance with the requirements of modern legislation. Any production process is a complex of various technological operations that carry certain risks and dangers that can, to one degree or another, cause harm to the life and health of personnel [2,3].

The personnel providing the implementation of technological processes are affected by a set of unfavorable factors of the working environment and the workload of a chemical, physical and psychophysiological origin. The dust factor is represented by dust of complex chemical composition with a predominance of aerosols predominantly of fibrinogenic action, as a rule, the content of SiO₂ ranges from 10 to 70%. Harmful gases from blasting operations, working vehicles, as well as the release of gases from the rocks enter the air of the working zone. Personnel involved in transporting the rock are exposed to the combined effects of such physical factors as noise, infrasound, general and local vibration, and significant sensory and emotional stresses occur. Mountain workers are also exposed to adverse microclimate combined with significant physical exertion [4,5].

Conducting a risk assessment is a mandatory step before commissioning a production facility, as well as when creating a safety management system in an organization. In accordance with interstate standards at each enterprise, the first step in carrying out the procedure for assessing occupational risks [6,7].

When considering the stages of the process for the extraction of gold ore, the following hazards can be identified (see. Fig. 1):

1. Mechanical hazards (sources - moving parts of equipment, transport);
2. Hazards associated with microclimate and climatic hazards (elevated temperatures in the summer and lower temperatures in the winter);
3. Barometric hazards (quarries are located at a high altitude, therefore, there is a fairly low pressure);
4. Dangers associated with exposure to noise (source - operating equipment, vehicles, explosion process);
5. Dangers associated with the impact of APFD (source - the processes of drilling, blasting, loading and transportation of ore);
6. Dangers associated with exposure to vibration (source - operating equipment, transport);
7. Dangers associated with exposure to light (loading and transportation work is carried out around the clock);
8. Dangers of transport (the possibility of being unnoticed driver of heavy vehicles);

9. Electrical hazards (quarry has its own station);
10. Thermal hazards (the quarry is an open production site, so it is possible to get heat stroke by workers who are in the sun for a long time);
11. Explosion hazards (work with explosives and means of initiation);
12. Fire hazards (work with explosives and means of initiation);
13. Dangers associated with exposure to a chemical factor (danger of the spread of vapors of harmful and dangerous substances in case of explosion and / or fire);
14. Dangers associated with the impact of the severity and intensity of the labor process (drivers and drivers are in a forced working position for a long time).

The levels of general risks for each stage of the technological process are presented in table 1.

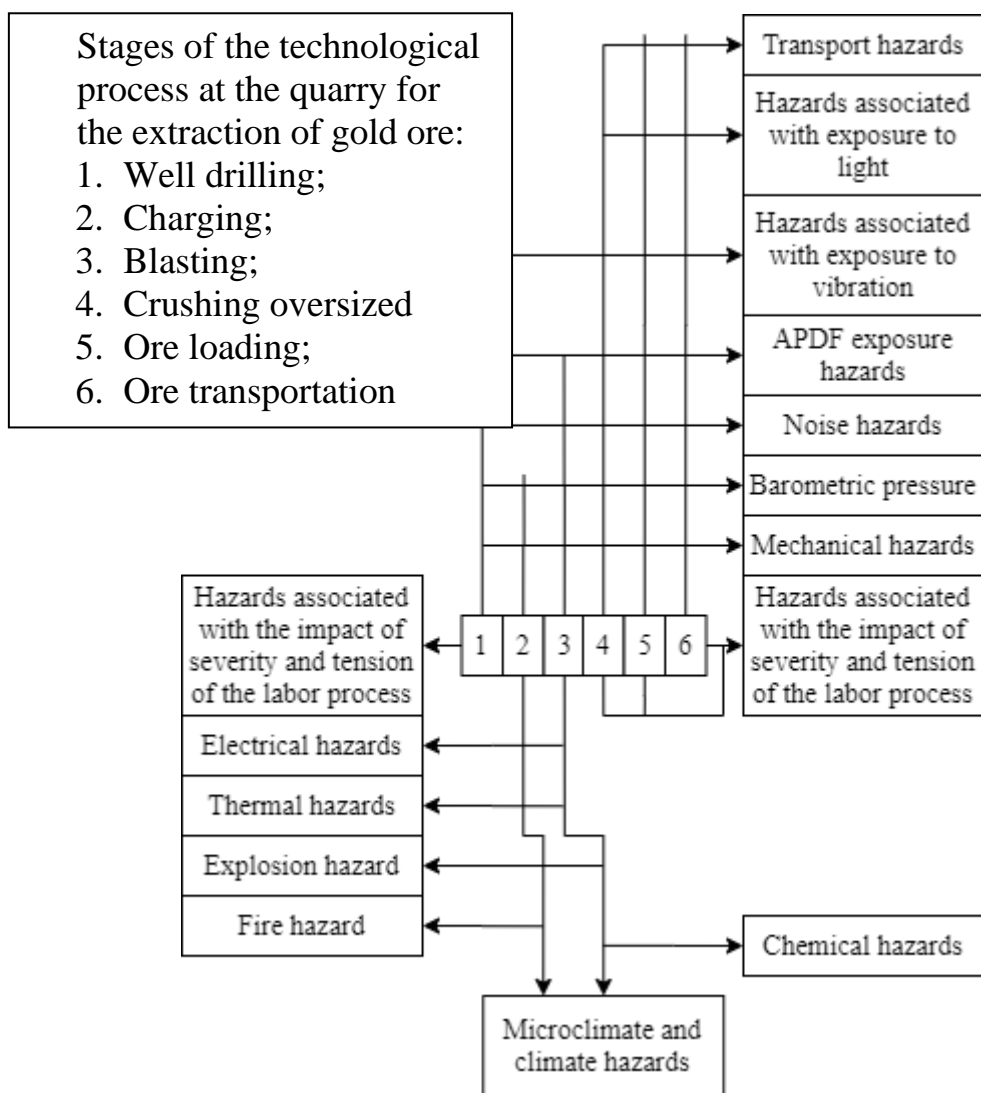


Figure 1 – The distribution scheme of the types of hazards at the main stages of the technological process for the extraction of gold ore at a quarry

Table 1 - A summary sheet of the hazard identification card and risk assessment at each stage of the quarry mining process

No	Process stage	Risk indicator	Risk level	Urgency of events
1	Well drilling	8,31	Small (acceptable)	To be investigated
2	Charging	2,44	Small (acceptable)	To be investigated
3	Blasting	5,82	Small (acceptable)	To be investigated
4	Oversized crushing	7,27	Small (acceptable)	To be investigated
5	Ore loading	8,1	Small (acceptable)	To be investigated
6	Ore transportation	11,06	Small (acceptable)	To be investigated
	Total	7,17	Small (acceptable)	To be investigated

As can be seen from table 1, the most dangerous stage in the extraction of ore gold by open pit mining is ore transportation, the least loading and blasting of wells. At these two stages, risk indicators are less than average.

The average level of risk in ore mining is 7.17, which is a small (acceptable) level and does not require urgent measures to reduce it at this stage.

The ranking of the stages of the process for the extraction of gold ore in quarries by risk level (see Fig. 2):

1. Transportation of ore;
2. Well drilling;
3. Ore loading;
4. Crushing oversized;
5. Blasting;
6. Charging.

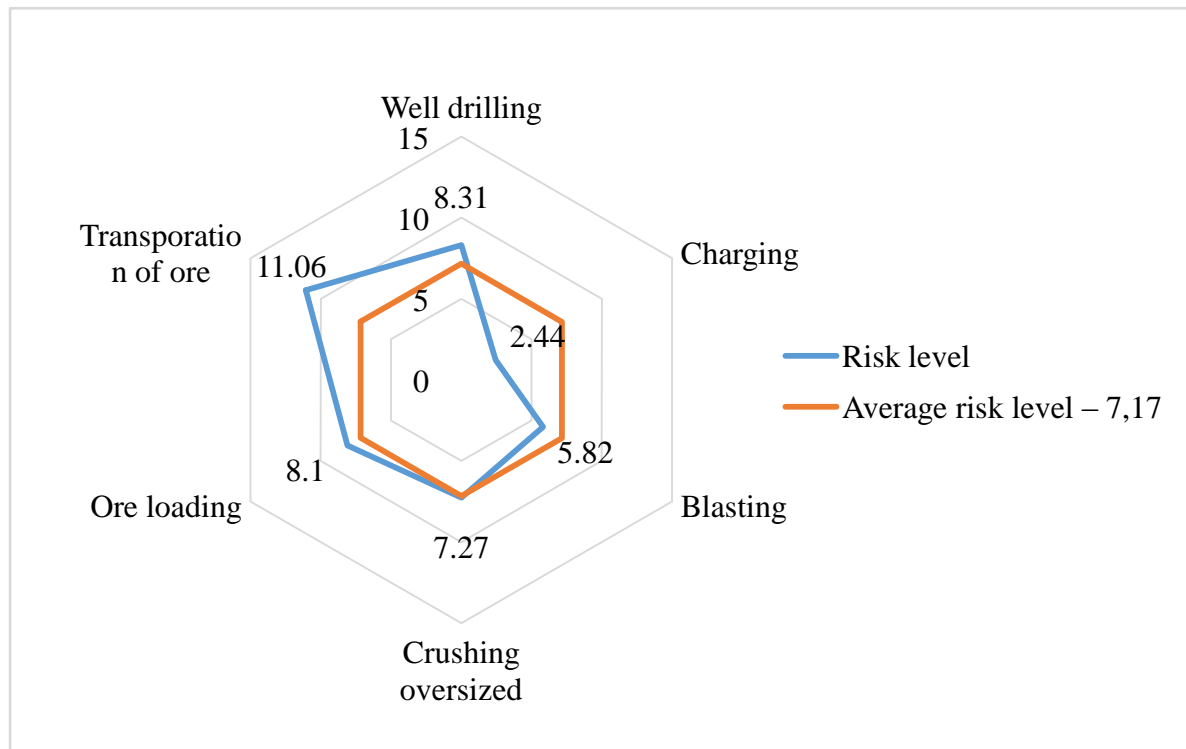


Figure 2 – Open-pit mining of risk stages of a process for the extraction of gold ore

Thus, at all stages of the process under consideration, risk levels are acceptable.

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