

**ANALYSIS OF OCCUPATIONAL SAFETY IN METALLURGICAL ENTERPRISES**

**Z.Mukhamedova**

PhD assistant

Tashkent Institute of Textile and Light Industry

**Annotation:** This paper presents an analysis of occupational safety in metallurgical enterprises, focusing on the identification of risk factors and evaluation of existing safety management systems. The study examines main occupational hazards in metallurgy, including high-temperature processes, heavy machinery operation, and exposure to harmful substances. Statistical data and case studies are used to assess workplace safety and identify weaknesses in safety practices. Modern approaches to risk prevention, implementation of safety standards, and the role of safety culture in improving production efficiency are discussed. Recommendations for enhancing occupational safety management and reducing workplace injuries are provided.

**Key words:** Occupational safety, metallurgical industry, risk assessment, safety management, workplace hazards, safety culture.

**АНАЛИЗ СОСТОЯНИЯ ПРОИЗВОДСТВЕННОЙ БЕЗОПАСНОСТИ НА  
МЕТАЛЛУРГИЧЕСКИХ ПРЕДПРИЯТИЯХ**

**Аннотация:** В статье представлен всесторонний анализ производственной безопасности на металлургических предприятиях с акцентом на выявлении ключевых факторов риска и оценке существующих систем управления безопасностью. Исследование рассматривает основные источники профессиональных опасностей в металлургии, включая высокотемпературные процессы, работу с тяжёлым оборудованием и воздействие вредных веществ. Для оценки текущего состояния охраны труда и выявления типичных нарушений и слабых мест в практике безопасности использованы статистические данные и анализ конкретных случаев. Также рассматриваются современные подходы к предотвращению рисков, внедрению стандартов безопасности и роль культуры безопасности в повышении общей эффективности производства. В заключение даны рекомендации по совершенствованию управления производственной безопасностью и снижению уровня травматизма на металлургических предприятиях.

**Ключевые слова.** Охрана труда, металлургическая отрасль, оценка рисков, управление безопасностью, производственные опасности, культура безопасности.

Industrial injuries as a consequence of accidents and emergencies have long been an urgent problem in all countries of the world. Workplace accidents occupy a significant place among the causes of death [1].

The industrial statistics of the Republic of Uzbekistan indicate a persistently high level of risk at industrial facilities, particularly in the metallurgical sector. In 2022, the Inspectorate for Mining, Geological, and Industrial Safety Control registered 81 occupational accidents, 28 of which (34.5%) resulted in fatalities, along with 5 group incidents. The analysis showed that more than 60% of these incidents were caused by organizational factors—improper work organization, insufficient worker training, and low levels of discipline. Approximately 30% of accidents were attributed to technical issues, including equipment wear, structural non-compliance with standards, and deficiencies in technical maintenance [2].

In metallurgical production environments, where workers are exposed to high temperatures, thermal radiation, and splashes or droplets of molten metal, failure to comply with requirements for wearing protective clothing significantly increases the risk of severe injuries. Improperly selected or untimely replaced protective equipment reduces the effectiveness of preventive measures and contributes to a rise in the number of incidents. Statistical data confirm that the absence or incorrect use of protective clothing is one of the key factors influencing the severity of occupational accidents.

The analysis of the identified incidents underscores the necessity of systematic oversight to ensure that workers are provided with high-quality protective clothing appropriate for metallurgical production conditions, as well as the need to reinforce discipline in its mandatory use. This approach represents one of the most effective measures for reducing occupational injury rates and preventing serious industrial accidents.

**Hazardous and Harmful Production Factors**

1- table

Physical	Chemical	Biological	Psychophysiological
Moving machinery, vibration, voltage, transport, dust, and metal splashes.	Dust, noise, chemicals, high vapors, in-shop ammonia, metal acrolein, molten formaldehyde, furfural.	harmful gases, aerosols, acetone, phenol, and	pathogenic Physical overload, mental and emotional stress, monotony of work activity.

Hazardous and harmful production factors are divided into three components:

- Production factors — include hazardous (injury-causing) and harmful (disease-causing) factors;
- Factors increasing the risk of occupational diseases and industrial injuries — are the cause of accidents;
- Work-related factors — take into account ergonomics (work rhythm, labor movements) and psychological stress (overtime work, lack of information) [3,4].

The biggest influence factor on the human body is dust-80%. The effect of dust depends on many factors: its physical and chemical properties; the size and shape of dust particles; the concentration in the air of the workplace; the duration of its action during the shift and professional experience; other unfavorable production factors and the peculiarities of the labor activity of miners.

The smallest impact on the health of miners is caused by the collapse and impact of objects, moving cars and mechanisms - 25%, electric current, noise, vibration effect - 18%.

In this regard, during the work of miners, a survey was conducted on the most characteristic actions. Based on the studies carried out, the following characteristic main actions were identified:

- forward tilt of the body; handshake - 50%;
- lateral flexion of body 33%
- the position in which the hands are stretched up, forward, backward - 55%;
- bending of the body to the waist-74%;
- knee movement-40%.

Basically, the work of miners was associated with the movement of the lumbar part of the body, which was 73%. The most common occupational disease is radiculitis.

**Areas where existing work clothes are most susceptible to friction and pollution**

2- table

t/r	Custom clothing parts	Friction(in percent)	Pollution (in percent)
1	Shoulder part	44%	53%
2	Upper front	21%	67%
3	Upper middle part	15%	30%
4	Took pants (knee)	80%	70%
5	Side (elbows)	25%	38%

According to Table 1, the most rubbed and, accordingly, contaminated areas are the lower parts of the trousers, as a result of which special clothes become unusable in 3-4 months, not at the required level.

One of the main ones to be applied to the design is the ergonomic requirement. The decisive factor in the choice of constructive parameters of miners' work clothes is to ensure its dynamic compliance with the characteristic and extreme actions of the worker under certain conditions.

In order to analyze the dynamics of movements, the Navoi mine Metallurgical Combine in Navoi, the Republic of Uzbekistan was carried out in the performance of daily work planned on the shift. The study consisted of studying the condition and types of movement of underground and surface mining workers. Studies have excluded non-character actions and introduced more fast-paced actions.

**A special dress of a mining metallurgical worker.**

3-table



It was determined from the results of the survey that miners are not very satisfied with the current workwear. Most were protested against the materials produced.

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