Thesis

Prevention of occupational injuries of employees LLC Gazprom Dobycha Orenburg based on the risk-based approach and the modernization of local regulations

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Declaration of Authorship

„I declare in lieu of oath that this thesis is entirely my own work except where otherwise indicated. The presence of quoted or paraphrased material has been clearly signaled and all sources have been referred. The thesis has not been submitted for a degree at any other institution and has not been published yet.”

Preface, Dedication, Acknowledgement

To date, according to the analysis of the annual report of the State Department responsible for labor protection, Rostekhnadzor, the human factor is the main cause of industrial injuries. This dissertation examines the main problems of labor protection in Russia, as well as the foundations of a risk-based approach and the problems of implementing this approach. An innovative training program for employees to apply a risk-based approach in the course of work has been developed. Occupational risk maps have also been developed as an effective tool for joint work of labor protection specialists and workers in the framework of ensuring industrial safety. Occupations of LLC "GDO" of the DKS shop were chosen as the initial data, since the injury rate at this place is the highest. This work is expected to reduce this major driver of work-related injuries.

Devotion:

This thesis is dedicated to my family, who have been invaluable during my academic journey thanks to their unwavering support and encouragement. Faith in my abilities and the constant motivation they provided was the main reason for my achievements. I am infinitely grateful to them for their love, patience and understanding.

Confirmation:

I would like to express my sincere gratitude to St. Petersburg Mining University for providing me with a grant to study under the triple diploma program. I would also like to thank the International Department for prompt communication and comprehensive organizational support throughout the training and program.

Much gratitude is also given to the faculty of the Mining University for their valuable contribution to this dissertation. Special thanks go to Elena Gridina for her experience and valuable ideas.

In addition, I express my deep gratitude to the University of Leoben for their support in the process of writing the work, as well as for the grant support provided for studying at the University of Freiburg. I am also grateful to them for their help during my adaptation at the new university, as well as for organizing excursions and events.

I would like to express my sincere gratitude to the International Department and especially to Birgit Knoll and Prof. Dr. Peter Moser for their support and coordination of my studies.

Finally, I would like to express my gratitude to the University of Freiburg for their help and support they provided during my studies. Their guidance and available resources have played an important role in my academic growth.

I want to emphasize that this dissertation would not have been possible without the generous support and cooperation of these institutions and individuals. I am sincerely grateful to them for their significant contribution to my research and development.

Abstract

The main objective of this graduation thesis is to develop a project of a comprehensive set of measures aimed at reducing occupational injuries through the implementation of a risk-oriented approach and the modernization of local regulatory acts at LLC "Gazprom Dobycha Orenburg". To achieve this goal, several tasks need to be addressed. These tasks include examining the general characteristics of the company, assessing the relevance and extent of research on the identified problem through the analysis of international and Russian scientific literature, determining suitable research methodologies, developing measures based on a risk-oriented approach, and modernizing the existing local documentation at LLC "Gazprom Dobycha Orenburg" to reduce occupational injury rates. Additionally, an economic evaluation of the proposed solutions is conducted.

Zusammenfassung

Das Hauptziel dieser Abschlussarbeit ist die Entwicklung eines Projekts eines umfassenden Maßnahmenpakets zur Reduzierung von Arbeitsunfällen durch die Umsetzung eines risikoorientierten Ansatzes und die Modernisierung lokaler Regulierungsgesetze bei LLC „Gazprom Dobycha Orenburg“. Um dieses Ziel zu erreichen, müssen mehrere Aufgaben gelöst werden. Zu diesen Aufgaben gehören die Untersuchung der allgemeinen Merkmale des Unternehmens, die Beurteilung der Relevanz und des Umfangs der Forschung zu dem identifizierten Problem durch die Analyse internationaler und russischer wissenschaftlicher Literatur, die Festlegung geeigneter Forschungsmethoden, die Entwicklung von Maßnahmen auf der Grundlage eines risikoorientierten Ansatzes und die Modernisierung der bestehende lokale Dokumentation bei LLC „Gazprom Dobycha Orenburg“ zur Reduzierung der Arbeitsunfallraten. Darüber hinaus erfolgt eine wirtschaftliche Bewertung der Lösungsvorschläge.

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Introduction

The oil and gas industry is characterized by an increased level of danger in the workplace. Despite the high level of automation and introduction of innovative developments in the field of occupational safety and health, which contributes to the reduction of risk indicators, their complete elimination is not practicable at the moment.

Occupational injuries are an urgent problem in industrial sectors. This aspect requires increased attention and implementation of preventive measures because it has a direct impact on the lives and health of employees as the main resource of the enterprise. Moreover, occupational injuries affect the economic and social well-being of the company.

The oil and gas industry is characterized by an increased level of danger in the workplace. Despite the high level of automation and implementation of innovative developments in the field of occupational health and safety, which contributes to the reduction of injury rates, their complete elimination is not practicable at the moment.

It is important to determine the main causes of injuries in the oil and gas sector and to develop measures aimed directly at their elimination or minimization.

Today Gazprom Dobycha Orenburg demonstrates an unsatisfactory state of occupational injuries. The high number of occupational injuries leads to significant economic losses of the company and a decrease in the company's social status.

Relevance

- One of the main causes of occupational injuries at Russian oil and gas companies is the human factor;
- Statistical indicators of occupational injuries at OOO Gazprom Dobycha Orenburg (OOO GDO) show no dynamics in the reduction of this indicator;
- The main cause of occupational injuries at GDO LLC is the human factor, which is due to lack of knowledge in the field of safe working in conditions of existing hazards and deliberate neglect of safety rules;
- In 2020. PJSC Gazprom obligated OOO GDO to develop a program to train employees in safe work practices and build commitment to safety rules in order to reduce the frequency of occupational injuries caused by human factors as part of the Safety Culture program.

Scientific novelty

1. The developed activities are an effective set of tools that allows employees to acquire the necessary knowledge and skills to successfully apply the risk-based approach.

2. The proposed solutions are a convenient format for a health and safety specialist and an employee to work together to ensure safe working conditions
3. The developed activities help to provide employees not only with theoretical knowledge, but also with the practical skills needed to effectively apply the risk-based approach to occupational safety.
4. The proposed measures include the use of modern technological tools, such as virtual reality or interactive simulations, to create more realistic and effective training environments where workers can apply their knowledge in a controlled environment before encountering real dangers.

Practical significance

- The measures developed contribute to minimizing the main cause of occupational injuries in the oil and gas sector and in Gazprom Dobycha Orenburg in particular;
- The proposed measures are a solution to PJSC Gazprom's objective of creating a safety culture in relation to its subsidiaries;
- The developed activities contribute to compliance with the requirements presented in international and national standards in the field of occupational health and safety;
- The solutions presented are a valuable tool for improving workplace safety, as the tools offered clearly demonstrate how workers can actively participate in improving working conditions.

Goal of the work – reduce occupational injuries in LLC "GDO" by attracting risk-based approach based on assessment of occupational risks and modernization of local normative documentation.

To achieve this goal, it is necessary to solve the following **tasks:**

- to study the existing problems of the gas production sector of the Russian Federation;
- determine the section of the production chain of LLC "GDO", whose employees are exposed to the greatest number of harmful and dangerous production factors;
- assess occupational risks for the occupations of the selected site;
- generate occupational risk maps for all occupations in the allocated area;
- Create a training program aimed at understanding and anticipating occupational risks for the professions in question.

Object of study – occupations of the shop of the booster compressor station LLC "GDO".

Subject of study – the application of a risk-based approach to improve the safety of working conditions.

Technological section

1.1 General characteristics of the object of study

Gazprom dobycha Orenburg is one of the most important economic enterprises in the region, since it is the company developing the largest oil and gas condensate field in the region.

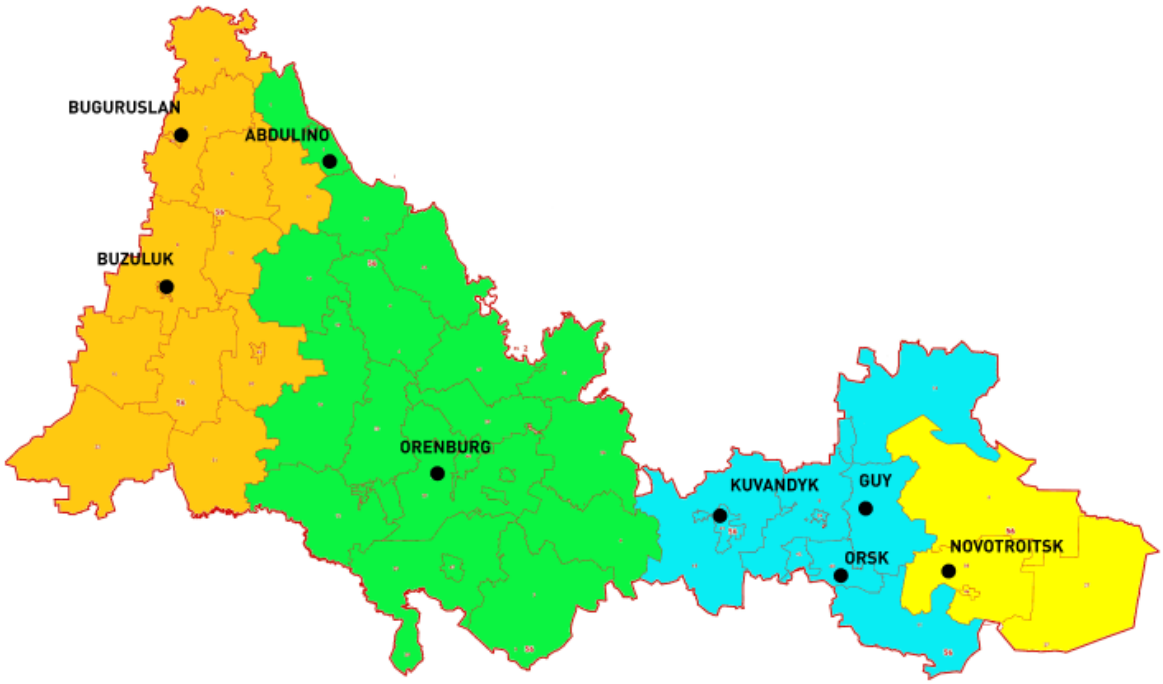

Figure 1: Orenburg region map

OOO Gazprom dobycha Orenburg industrial complex is located in the Orenburg region in the Orenburgsky district of the same name. The area of the Orenburg district is 5,022 square kilometers. The communities of this district include the regional center of Orenburg.

The Orenburg region has many reserves of minerals, such as: lignite, iron ores, nonferrous metal ores. However, the backbone of Gazprom Dobycha Orenburg production is the resources of the oil and gas condensate field.

The Orenburg oil, gas and condensate field, discovered in 1966 on the outskirts of the city of Orenburg, is located in the southeastern part of the VolgaUrals oil and gas province. The gas-bearing stratum in the ONGCF is about 550 m thick. The initial reserves of the Orenburg gas condensate field amount to about 2,000 billion cubic meters of gas and about 600 million tons of oil and condensate. The field currently produces around 12 billion cubic metres of gas and almost 200,000 tonnes of liquid hydrocarbons annually. The gas contains hydrogen sulfide, mercaptan sulfur and helium in addition to hydrocarbon components.

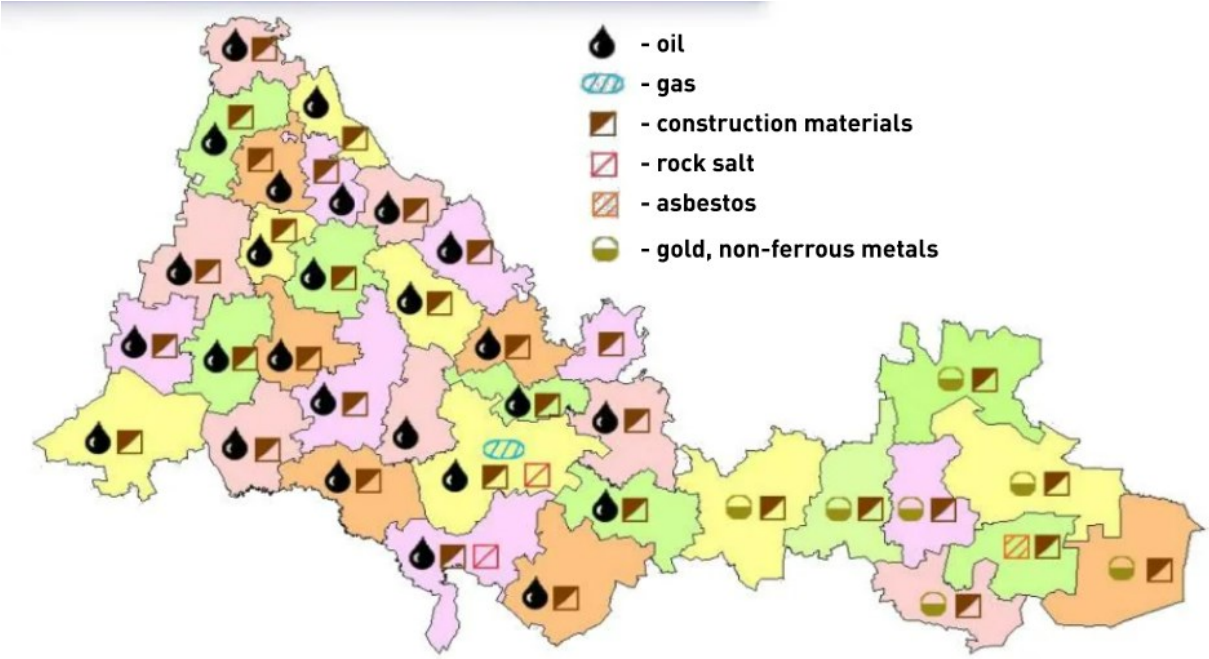

Figure 2: Geological map of the Orenburg region

Gas is produced by horizontal wells using hydraulic fracturing. Hydraulic fracturing technology is implemented by increasing the permeability of the bottomhole zone of the productive formation by creating fractures or expanding and deepening already existing natural fractures.

The GTU collects and processes natural gas and gas condensate. The **BCS** supplies gas to the gas processing plant of the GPP.

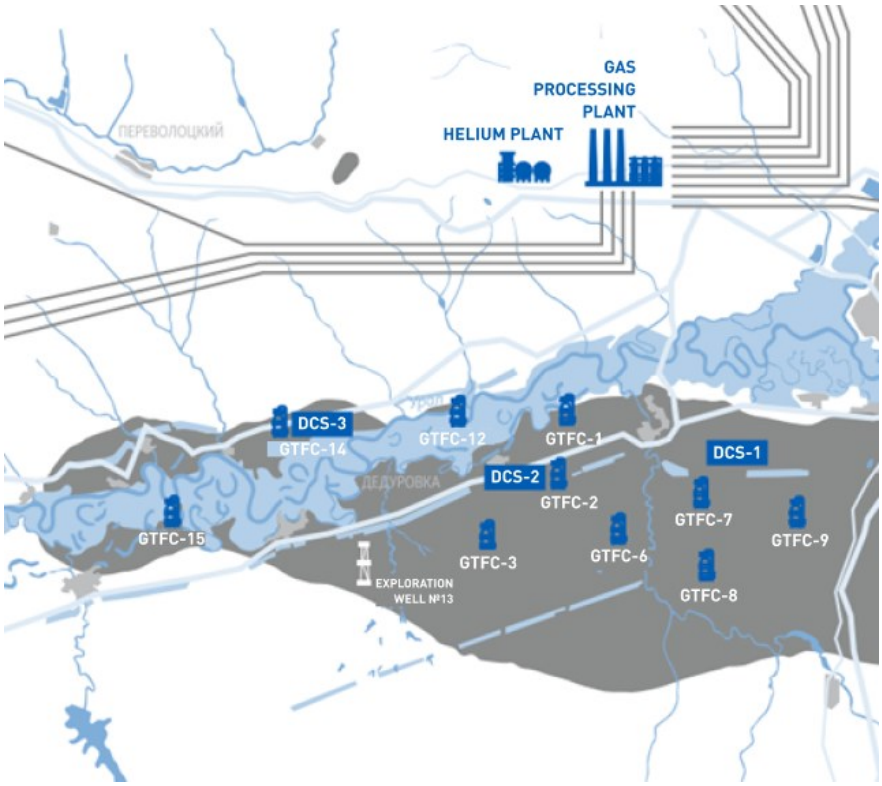

Figure 3: Location map of the main production facilities

The gas processing plant performs deep dehydration and purification of gas from H2S, mercaptan sulfur, CS2, CO2, COS, separation of heavy hydrocarbons from gas by low-temperature absorption, purification and stabilization of hydrocarbon condensate and separation of NGL and gasoline from condensate. Hydrogen sulfide is used for production of sulfur and mercaptans for production of odorants.

All commercial products manufactured at the plant are certified and produced in accordance with the requirements of regulatory documents:

- Combustible natural gas - supplied and transported through the Soyuz, Orenburg-Samara, Orenburg-Zainsk and GFD trunk gas pipelines;
- feed gas - fed from the GPP to the helium plant for further purification from mercaptans and additional dehydration and further to helium units G3;
- stable gas condensate mixed with oil from Gazprom Dobycha Orenburg LLC - transported to the refining facilities of Gazprom Neftekhim Salavat and the Ufa Refinery;
- hydrocarbon liquefied fuel gases for municipal consumption (mark SPBT) and hydrocarbon liquefied fuel gases (mark PBT);
- sulfur technical gas liquid, lump, granulated - supplied to chemical industry (for production of mineral fertilizers), pharmaceutical industry, agriculture;
- Orenburggazprom's natural odorant - a mixture of natural mercaptans - is used for odorizing natural gas supplied to the utility network;
- hydrocarbon gases - used for road transport;

natural combustible gas - used as fuel at Kargaly CHPP (KTETs).

1.2 Analysis of basic technology

Industrial safety of GDO LLC is ensured by occupational health and safety management systems. The company also applies four-stage production control.

The main local regulatory act in the field of OHSMS is the "Regulations on OHSMS", which contains the policy and objectives of the company in the field of HPF, OHS, road safety, the order of operation, planning and control of OHSMS, procedures aimed at achieving the goals, the order of response to accidents and injuries, as well as management of documents of OHSMS.

Measures aimed at the formation of safe working conditions can be divided into technical, organizational and hygienic.

Technical activities carried out at GDO LLC include:

- the use of serially produced complete equipment (GRPSh), fully prefabricated, equipped with the necessary technical devices for safe operation;
- installation of shut-off valves of leakage class "B" with resistance to the transported medium during the service life specified by the manufacturer.
- use of certified equipment, materials and products that have a permit from Rostechnadzor for their use.
- A set of organizational and technical measures laid down in the project, ensuring the safety of people and the prevention of accidents:
- rational choice of the pipeline route;
- laying of the pipeline with the minimum possible slopes that exclude erosion erosion of the soil with subsequent damage to the structures of the pipeline;
- quality control of welded joints by physical methods and leak testing of the gas pipeline in full compliance with the requirements of SP 62.13330.2011 "Gas distribution systems";
- by installing disconnecting devices.

Organizational measures for occupational safety and health include selection, training, and instruction.

Personnel selection is carried out by experienced HR specialists. The key selection criteria are special technical education or work experience in the oil and gas industry. The employees are then trained under the close supervision of a senior specialist in the department to which the newly hired employee is assigned.

Of great importance for the implementation of safe production is to conduct briefings. According to the nature and timing of the briefings are divided into types:

- introductory;
- primary in the workplace;
- repeat;
- unscheduled.

Each of the above-mentioned types of briefings is carried out at the enterprise "GDO" in due time. This fact is confirmed by the logs of briefings. Induction briefing shall be carried out by an occupational safety specialist or an employee assigned these duties by the employer's order. Water safety briefing shall be carried out according to the program developed on the basis of legislative and other regulatory legal acts of the Russian Federation taking into account the specifics of the organization and approved by the employer (or its authorized person).

Primary training in the workplace shall be carried out by the direct supervisor of works according to the programs developed and approved in accordance with the established procedure in accordance with the requirements of legislative and other normative acts on labor protection, local normative acts of the organization, instructions on labor protection, technical and operational documentation.

All employees of the organization, regardless of their qualifications, length of service and education, except for those exempted from the initial briefing, undergo a second briefing.

Instruction shall be conducted at least once every six months according to the programs developed for primary workplace instruction.

An unscheduled briefing is conducted:

- when new or amended legislative and other regulatory legal acts containing labor protection requirements, as well as instructions on labor protection;
- when changing technological processes, replacing or upgrading equipment, fixtures, tools and other factors that affect workplace safety;
- when employees violate labor protection requirements, if these violations have created a real threat of serious consequences (industrial accident, accident, etc.);

Sanitary and hygienic conditions include:

1. Condition of technical facilities and equipment,
2. Workplace lighting,
3. Dusty and ventilated rooms,
4. Temperature and humidity,
5. Noise, vibration, etc.

Sanitary and hygienic measures play an important role in ensuring the safety and health of workers in oil and gas production. They are aimed at prevention of occupational diseases and minimization of risks associated with oil and gas fields operation. One of the key aspects of sanitary and hygienic measures is to ensure a clean and hygienic working environment. This may include regular cleaning and disinfection of work sites, installation of ventilation and air conditioning systems to ensure optimal air quality, and ensuring access to clean drinking water and hygiene products.

In addition, health and hygiene measures also include regular medical examinations and tests for workers to identify potential illnesses and identify occupational risks beforehand. An important part of these activities is staff training in safety, hygiene, and prevention.

GDO LLC operates 77 industrial facilities. The "Regulations on the SMS" contain a list of these facilities, tasks of the SMS, description of the SMS structure, procedure for analysis and operation of the SMS, development of corrective actions, as well as the procedure for organization of document support.

As part of the operation of the BMS is conducted:

- Organization and implementation of the administrative and production control in accordance with the Unified system of industrial safety (STO Gazprom 18000.1-001-2021, RD 39-1.14-021-2001) and STO 26-7.10 "Regulations on the organization and implementation of administrative and production control of compliance with industrial safety requirements at the facilities of Gazprom dobycha Orenburg";
- internal audits of the Company's occupational safety management system (as part of the Company's IMS) in accordance with the requirements of ISO 45001:2018 "Occupational Health and Safety Management Systems. Requirements", STO Gazprom 18000.3-004-2020 "Unified industrial safety management system. Organization and Conduct of Audits" and STO IMS 8.2-01 "Procedure for Internal IMS Audits".

The Industrial and Fire Safety Service ensures the functioning of the ISMS, including:

- development and implementation of a set of organizational and technical measures aimed at improving industrial safety and reducing the risk of accidents and incidents at hazardous production facilities;
- Licensing of the type of activity to operate a hazardous industrial facility;
- identification and registration, declaration of hazardous industrial facilities;
- organization and implementation of the AIC in the operation of hazardous industrial facilities;
- organization of work with state supervision and corporate control bodies supervising hazardous industrial facilities;
- conducting a periodic analysis of the state of industrial and fire safety in structural units and submitting the results of the analysis to the Company's management, as well as organizing the development of preventive corrective measures and proposals;
- implementation, development and improvement of the Company's policy in the field of occupational, industrial and fire safety and road safety;

- organization of work with research institutes and other organizations on industrial and fire safety.

Measures developed by services (departments) of separate structural subdivisions and the Company to eliminate violations of industrial safety requirements include:

- Elimination of irregularities (if irregularities that could lead to accidents, incidents, and accidents are identified immediately);
- study and analysis of the causes of violations of industrial safety requirements;
- development of measures to eliminate the causes of violations of industrial safety requirements;
- making management decisions that guarantee the elimination of the causes and prevention of violations of industrial safety requirements.
- Use of relevant sources of information (processes; work operations affecting the state of industrial safety; inspection results; maintenance reports, etc.) to identify, analyze and eliminate potential causes of violations of industrial safety requirements;
- Providing information on the preventive and corrective actions taken to the chief engineer.

The company also maintains a register of occupational hazards and risks. The register contains information on possible harmful factors related to work processes, equipment used, chemicals, environmental conditions and other aspects that may have a negative impact on the health and safety of employees. This register is part of the implementation of the risk-based approach, but the development of OHS measures on the basis of the analysis of the information presented in the register is caused by a number of difficulties, since there is no risk assessment. Thus, this register describes occupational risks, but there is no systematic prioritization of these risks.

1.3 Justification of the technical problem-solving method

Occupational risk assessment is an important tool in the field of occupational safety and health of workers. Through the assessment of hazards, qualitative characteristics are acquired that allow the comparison of different risks on the basis of their numerical values. Moreover, the advantage is also the ability to prioritize risks and determine which ones require the urgent development of an action. Occupational risk assessment can be performed using a variety of methods, including direct and indirect.

Direct methods of risk assessment are based on the use of statistical data, which reflect the selected risk indicators or directly show the level of damage and the probability of its occurrence. Direct methods of risk assessment can include the method of weighting coefficients, the method of Fine and Kinney, as well as the matrix method.

The direct method of risk assessment has a number of features that should be considered in its application. This method of risk assessment is based on direct measurements of risk factors in the workplace. Moreover, the direct method of risk assessment takes into account the context and characteristics of the workplace. It allows for the consideration of various factors, such as the type of work, production processes, equipment characteristics and working conditions. This allows for a more accurate assessment of the risks associated with a particular work environment. Also, the direct method of risk assessment requires regular updating and reassessment, especially when working conditions change or new technologies are introduced.

Despite the advantages of direct risk assessment methods, there are also some disadvantages:

- Limited versatility: Some direct methods may only be applicable to certain types of risks or sectors of activity. This can create difficulties when assessing complex or new risks for which there are no established methodologies.
- Time and resource costs: Direct methods can require significant time and financial resources. Conducting measurements, data analysis, and risk assessments can be a time-consuming process, especially for large enterprises or complex work environments.
- Need for Expertise: Some direct methods require specialized knowledge and skills to apply. This may limit the accessibility and comprehensibility of the methods for ordinary workers or small businesses.
- Lack of consideration of individual susceptibility: Direct methods of risk assessment usually do not take into account the individual susceptibility of workers to certain risk factors. Risk perception and exposure can vary depending on each person's physiological, psychological, and genetic characteristics.

Indirect methods of risk assessment for health and life of workers are based on the use of indicators that reflect the differences of current (controlled) conditions (parameters) from the established standards and have a causal relationship with the risks. This group of methods includes the method of checklists, interviews and the Elmery method.

Indirect methods often include expert opinion and assessment by occupational safety and health professionals. Experts can use their experience and knowledge to assess workplace risks, their consequences, and their likelihood of occurrence. This may include interviewing workers, discussing with occupational safety and health committees or other stakeholders.

Nevertheless, it should be noted that indirect methods of risk assessment may also have limitations, including the possibility of subjective perception of information, limited data availability, and dependence on the quality of expert evaluations. This requires a careful and comprehensive approach to their application and evaluation of results.

Within the framework of this work, the group of direct assessment methods has been chosen as the assessment of occupational risk, since the formation of the existing register of hazards and risks of the LLC "GDO" is based on the application of indirect methods. Descriptive information presented in this document reflects the conditions of hazards quite fully, but does not allow to determine the hierarchical position of risks. Thus, in this regard, the identification of more significant hazards and identification of areas requiring special attention is not defined.

Research section

1.4 Scientific review and state of research in the area of scientific

1.4.1 Theoretical investigation of the solution to the problem

1.4.1.1 Implementation of a risk-based approach

Despite the intensive development of technological progress and automation of production processes, the complete elimination of human beings from the production chain is impossible. The need to ensure safe working conditions is a top priority for employers, because human life is the highest value. Thus, it is necessary to develop technologies and organizational concepts in the field of occupational health and safety (OHS). In his work "Basic Problems of Safety Science" Ge Gee considers aspects of occupational health and safety as a new scientific field [1]. According to the cited research, the level of ensuring safe working conditions has developed significantly over the past decades mainly due to global cooperation and technological development.

Mining, which is characterized by increased harm and danger, is also impossible without the use of human labor. The reasons are mainly the complexity and variety of tasks to be solved, as well as the variability of external conditions [2,3]. Mining is the industry with the highest hazard class. Skislevski A. and Zuddas P. in the article "Risk assessment of uranium mining: a new kinetic approach" emphasize the influence of scientific and technological progress on the reduction of harmful and hazardous production factors affecting miners [4]. The introduction of remote equipment control and the development of collective and personal protective equipment reduced the injury rate from 2,493 cases per year to 364 between 1960 and 2000. In the publication Noraishah Ismail S., Ramli A., and Abdul Aziz H. "Research directions in the study of mining accidents: a systematic review of the literature" focuses on the impact of software applications in the mining industry [5]. Simulation of potential hazards has become an effective tool for predicting the occurrence of accidents and accidents.

Over the past decade, the risk-based approach has been widely used in the field of safe working conditions. International regulations, such as ISO4500:2018, require occupational health and safety management systems (OHSMS) to focus on risk identification, assessment and management.

In "Developing Countries and the Use of ISO 11228-3 for Work-Related Musculoskeletal Upper Extremity Disease Risk Management (WRMSDs-ULs): The Case of

Chile," Castellucci J.I. emphasizes that the implementation of a risk-based approach has led many Chilean industrial companies to work on preventive measures that have significantly reduced the occurrence of occupational diseases, particularly musculoskeletal disorders of the upper extremities [6].

The effectiveness of the use of preventive measures is also studied in the work by Nadalyn V., Mastard S., Smith P.M. "The impact of adverse employment and working conditions on the risk of occupational accidents in Canada". [7]. The authors drew the following conclusion: the worse the working conditions, the higher the injury rates. Thus, investment in preventive methods demonstrates its effectiveness.

ISO4500:2018 contains the basic elements of the OSH management system, but does not regulate the use of specific methods and tools as part of the implementation of these elements. Thus, the lack of regulation in the field of OHSMS provided an opportunity for managers and OHS specialists to develop their own methods. The publication Jenke T. "Fatal Risk Management: application of Quinlan's Ten Ways to Death and Disaster in the Western Australian Mining Industry" describes a methodology based on Michael Quinlan's "Ten Ways to Death and Disaster" that helps identify the causes of major accidents in mining and other high-risk industries [8].

Based on an analysis of 71 national reports of workplace fatalities in Western Australia, the authors concluded that fatalities typically involve four or five of the Ten Ways. As part of reducing the frequency of such accidents, the authors recommend benchmarking safety performance, investigating accidents, and reviewing the effectiveness of safety management systems.

The development of digital layouts as tools for risk control and assessment is also widely used. Tedoncio C.T. in his article "Digital layouts as tools to support the prevention of risks associated with energy sources at the stage of operation of industrial facilities through design" describes the use of digital layouts as support tools for the prevention of risks at the stage of operation of industrial facilities through design [9]. This approach allows the visualization of elements in digital layouts in order to identify critical elements and consequently reduce the time required for analysis by automating some steps and, in turn, increasing efficiency as a result of reducing the probability of error. In addition, the proposed design approach identifies design errors, which helps consider the impact when developing health and safety measures.

In Pohlmeier F. "Interpretive Failure Risk Assessment for Continuous Production Processes Based on Associative Rule Analysis," the author presented a risk assessment methodology based on associative rule analysis [10]. The methodology includes data preparation, modeling of production states and evaluation of root causes using the associative classification algorithm. Using this method in real production, the cause of failures can be detected and identified. Process simulation for

error risk assessment identifies important trends necessary to optimize production process parameters.

The authors of "The Integrative Conceptual Framework of Security Culture: The Egg Aggregate Model (TEAM) of Security Culture" developed a general conceptual model of security culture as a whole [11]. This model, called the aggregate model, provides a clear picture of how safety culture can be viewed in an organization and how the various safety factors and parameters that make up safety culture are interrelated in a cyclical way.

The introduction of a risk-based approach to industrial safety represents significant progress, as it opens up new perspectives to look at problems from a new perspective and apply new and effective tools. Moving away from the traditional reactive safety model focused on dealing with incidents that have already occurred, the risk-based approach allows organizations to anticipate potential hazards and systematically assess risks associated with work processes and the environment. This perspective enables management and safety professionals to develop and apply new and effective tools and techniques to prevent accidents and minimize exposure to risk factors. Adopting a risk-based approach opens up opportunities to progressively improve industrial safety and protect workers and the environment.

1.4.1.2 "Safety Culture" concept development

Together with the application of the risk-oriented approach, the introduction of the concept of "Safety Culture" is widespread. Culture is an integrative system that helps sustain society. Through the integrative system, common patterns of behavior and emotions are adopted among people, and the need to follow unwritten rules is internalized by people. This sense of necessity provides a systematic order, and the order operates automatically without any external intervention [12].

The main cause of most accidents in the industrial sector is related to problems of a low safety culture, as well as a lack of effective HPF management. [13]. Most large-scale industrial accidents (e.g., the Deepwater Horizon oil spill) are the result of a combination of failures in technical devices and neglected social structures with the workplace [14]. An analysis of the scientific literature demonstrates an undeniable relationship between the psychosocial state of workers and safety [15].

Tetzlaff, E.J., in "Safety Culture: A Retrospective Analysis of Mine Health and Safety Reports," analyzed 50 years of reporting by mining companies to determine whether safety culture has been historically established in the mining industry and how it relates to the causes of accidents [16]. The author found that the general concept of behavioral aspects in relation to safe work practices had existed for a long time, but lacked a clear definition and activities aimed at its development.

Ismail S.N., Ramli A. and Aziz H.A. in "Factors affecting safety culture in the mining industry: a systematic review of the literature" presented factors affecting safety

culture in the mining industry [17]. The study found that the behavioral aspect had the greatest influence on creating a positive safety culture (47%), followed by the situational aspect (29%) and the psychological aspect (24%). Management commitment was the biggest contributing factor to the creation of safety culture.

Moreover, the importance of effective communication between employees and management plays an important role [18]. It is of great importance for workers to encourage a responsible approach to safety on the part of the manager. A similar conclusion was reached by the authors of "The Way to Successful Safety Performance Measurement" by Jaeskeläinen A., Tappura S. Pirhonen J. The authors conducted a survey, which received 270 responses from five industrial organizations [19]. An important conclusion is that management commitment has a greater impact on employees than performance efficiency. Thus, it can be noted the priority of social relationship between employees and the manager over monetary rewards.

In "The Effectiveness of Scientific Industrial Safety Designs for Addressing Serious Injury and Fatalities (SIF)," the authors investigated a number of scientific safety concepts, legislative changes, and voluntary initiatives to reduce injuries [20]. They concluded that only the concepts of safety culture and corporate social responsibility had a clear impact.

Thus, safety culture plays a key role in ensuring a safe and healthy work environment in an organization. It is a system of values, beliefs and practices that shape the attitudes and behaviors of all workers regarding safety. Safety culture is important for several reasons [21].

A safety culture helps reduce risks and prevent accidents. When safety becomes an integral part of the work culture, workers pay more attention to hazards, take responsibility for their actions, and take action to eliminate them [22]. Notably, the development of safety culture in the context of the work environment has a strong correlation with geographic location [23].

What's more, a culture of safety also improves productivity and performance. When workers know that their safety is a priority, they can focus on their responsibilities without constantly worrying about possible risks [24-26]. As a result, an increased focus on job responsibilities has an impact on job quality and overall process efficiency.

Safety culture represents a new phase in the development of occupational safety, as it moves from formal procedures and requirements to the integration of safety into all aspects of an organization [27]. The concept involves the active participation of all workers, ongoing training and awareness of safety, and the encouragement and support of management.

1.4.2 Theoretical investigation of the solution to the problem

1.4.2.1 Analysis of current issues in an OSHA

Despite the fact that today the OT system is characterized by significant progress in comparison with other production systems, there are still a number of significant problems in this area. The main ones are the conflict of the concept of "lean production" and increasing productivity. Under the latter concept, HPF issues are not a priority for managers, which leads to the problem of the need to have not only the relevant competencies, but also a number of personal qualities.

Despite the identified dependence of the impact of the concept of "lean production" on productivity and profit increase, the vast majority of enterprises consider the lack of development in the field of improving working conditions of employees acceptable [28,29].

The active application of the risk-oriented approach has helped to improve HPF management, but still has a number of shortcomings, one of which is the lack of objective methods for evaluating the effectiveness of implemented activities.

The risk-based approach to occupational health and safety does not pay enough attention to the aspects of the psychological state of workers that can also affect safety in the workplace.

The psychological state of workers can be related to levels of stress, fatigue, depression, aggression, and other factors that can lead to mistakes and carelessness in the workplace. These factors can be especially important in industries where work is characterized by high levels of danger.

Although the rapid pace of technological development has greatly improved industrial safety, progress has also brought a number of potential threats [30]. In Badri A., Boudreau-Trudel B., and Suissi A.S., "Health and Safety in the 4.0 era: A cause for serious concern?" the authors raise the question of the impact of Industry 4.0 on occupational safety and health [31]. The term "Industry 4.0" defines a new stage of scientific and technological development, which includes the growth of digital technology, artificial intelligence, the Internet of Things and networked, "smart" and responsive devices. The authors point out that ignoring the results of Industry 4.0 in HPF can contribute to a large number of hazards and a lack of understanding of the mechanisms for managing them.

The social and economic development of a country is inextricably linked to the development of industrial potential, which, in turn, is impossible without industrial safety. Economic well-being is a global goal. As part of an international partnership to maintain and strengthen international peace and security, 193 states, including the Russian Federation, created the international United Nations.

Since 1983, the main agenda of the UN is the introduction and widespread dissemination of the concept of sustainable development. Sustainable development is a set of measures aimed at meeting current human needs while preserving the environment and resources, that is, without compromising the ability of future generations to meet their own needs. Sustainable development is possible with the balance of three main components: economic growth, social responsibility and ecological balance.

In "Mining Companies and Communities: Collaborative Approaches to Reducing Social Risk and Promoting Sustainability," Fraser, J., emphasizes that the issue of sustainability orientation is a significant challenge for hazard-prone businesses, particularly in the mining industry. [32].

The conflict between the concepts of increasing productivity and ensuring safe working conditions is central to the retrospective achievement of the Sustainable Development Goals (SDGs). CEOs are predominantly focused on achieving the SDGs based on economic development. In the publication "Industrial Safety and Occupational Health Innovation for Sustainable Development." Jilcha K. and Kitau D. noted that industrial safety is threatened by the change in companies' focus on increasing economic benefits [33]. The authors highlighted the problem of the lack of normative regulation of HPF issues in the SDG agenda.

The strong dependence of the state of occupational safety on the economic policies of states has also been of concern to many authors. Jenke T., Oosthuizen J., and Cattani M., in "A Study of the Impact of Economic Cycles on Safety Performance in Western Australia," determined that occupational injury rates are sensitive to changes in a country's economic condition [34]. In periods of economic growth, the rate of occupational injuries in the mining industry declines. Economic cycles can affect safety performance because of the sharp withdrawal of funds from an organization's income during an economic downturn, as reduced resources cause people to leave their jobs during a recession. According to the analysis, HPF employees are the first to be laid off.

A similar dependence was found by Jonek-Kowalska I. in "Consolidation as a method of risk management in the life cycle of a mining company: a new methodological approach and the experience of the Polish coal industry". [35]. With the economic recession and falling prices for hard coal, the financial results were rapidly falling, and the enlarged enterprises were on the verge of bankruptcy, unable to stop the steady growth of production costs, caused by pressure from society and industry trade unions.

In his article "Innovative methodology for measuring the effectiveness of the implementation of occupational health and safety management system in the European Union," Bianchini A. emphasized the particularly strong impact of this problem on small and medium-sized businesses [36]. Under such conditions, investments in

safety are not competitive in comparison with other investments. An adequate policy of financial incentives by the state can significantly improve the situation of these companies [37].

In addition to the mining giants, there are also smaller companies that have much higher injury rates than their monopoly counterparts. Small and medium-sized companies are eight times more likely to have fatal accidents and 50 percent more likely to be injured. Alec Tremblay and Adel Badri in their paper "Evaluating Health and Safety Performance Tools: Current Status and Challenges for Small and Medium-Sized Enterprises" analyzed existing methods for evaluating the effectiveness of the EMS [38]. The scientists concluded that despite the variety of assessment methods, their application is focused exclusively on large enterprises.

Such a conclusion was made by the author of the article "Ranking health and safety risks from a multi-criteria point of view: consideration of the human factor and application of VIKOR" La Fata K.M. Specialists in small and medium enterprises emphasize that weighting methods of assessment, which are mainly used worldwide, are subjective, and have a particularly strong influence on the results of risk management in small and medium enterprises [39]. The author of "An Improved Alternative Queuing Method for Health and Safety Risk Assessment and its Application to Fieldwork," Liu R described a best worst-case methodology for obtaining relative risk criteria weights [40]. In this case, the influence of subjective attitude can be reduced, but it is impossible to eliminate completely.

Also one of the most common occupational safety problems in medium- and small-sized firms is inadequate worker training. The authors of "Differences in Safety Training between Small and Large Construction Firms with Nonresident Workers: Evidence of Overlapping Vulnerabilities" state that workers in small firms received fewer hours of both initial safety training and monthly ongoing safety training [41].

In small and medium-sized enterprises, occupational safety specialists and union representatives play an important role in protecting workers' rights to safe working conditions. [42]. The reason is the lack of legislative enshrinement of the duties and rights of trade union representatives.

That said, businesses that are open to working with unions may see some long-term benefits (e.g., return on investment, increased job satisfaction) [43].

The lack of a legal framework with regard to the concept of "HPF specialist" is a separate area of current HPF issues. Gennock F., Chauvin C. and Le Coz J.-C. in the article "Activities of occupational safety specialists in high risk production" made a number of observations on the work of occupational safety and health specialists [44]. The authors came to the conclusion that much in the work depends not only on professional competence, but also on personal qualities. The study showed that leadership qualities are a necessary component in making strategic decisions at the general level, because safety issues are often not a priority for companies. A similar

conclusion was reached by Madigan S. in "Influencing Organizational Decision Makers. What Influencing Tactics Are Health and Safety Professionals Using?" [45]. Moreover, to be effective, HPF professionals need management and analytical skills beyond those that are traditionally part of training [46].

In Madigan, K., "How Do Safety Professionals Influence Managers in Organizations? - A Critical Approach to the Incident," the author examines the tactics employed by OT professionals [47]. Qualitative analysis revealed that rational persuasion was the dominant influence strategy in initial attempts, while coalition tactics were most often used in subsequent attempts. New influence tactics used by safety professionals (coaching, storytelling, social proof) were also identified.

Vukadinovich S., in his article "Early Human Factor Management in Lean Production Systems," argues that there needs to be a change in the HPF specialist curriculum [48]. The existing requirements do not correspond to reality. As a result, millions of specialists, whose knowledge and skills have no application, graduate annually. In P. Pryor's work "Development of basic knowledge for general labor protection specialists" the example of the solution of such a problem in Australia is given. [49]. There since 2009 the rights, duties and the status of HPF specialist in the company have been legislated.

Also a relevant problem is the separation of occupational safety and technological safety [50]. However, occupational health and safety and process safety complement rather than replace each other, and their integration can provide organizations with complete safety excellence.

The introduction of the risk-based approach is also reflected in the occupational safety and health management system. [51]. Regulatory documentation defines the position of the ESMS system in the company. Nevertheless, this approach is still imperfect.

Evaluating the effectiveness of HPF measures is an urgent area of development, since it requires taking into account parameters that are often difficult to quantify [52]. The scientific community proposes a variety of methods that take into account the influence of various factors and their interaction with each other.

The authors of "Reliability and Validity of the Employer Questionnaire for Assessing Safety and Management Threats" examine the use of one of the most common methodologies, based on the use of lagging indicators (such as injury rates and costs) as well as leading indicators (such as safety hazards and management practices assessed through questionnaires) [53]. Nevertheless, there are difficulties in the relationship between these types of indicators, which significantly affects the objectivity of the evaluation.

Also, international standards do not address occupational health issues. Inan U.H., Gul S. and Yilmaz H. in "A multiple attribute decision-making model for comparing

perspectives on occupational health and safety management" emphasize that measuring the effectiveness of the occupational health system is important because the continuity of the production process is directly related to the health of workers [54]. However, no such evaluation methodologies currently exist.

The insufficient elaboration of occupational health issues is also addressed in the publication by Shenoy E.S. and Weber D.J. "Occupational Health Update: An Approach to Health Personnel Assessment and Pre-Contact Prophylaxis" [55]. [55]. The authors drew attention to the situation of occupational physicians, who have no special normative base regulating their activity.

Speaking of health, it is important to consider not only the physical, but also the psychological state of workers. Silva S.L.S. and Amaral F.G. in their article "Critical success factors and barriers to the implementation of occupational health and safety management systems: a systematic literature review" came to the conclusion that the issue of the psychological climate of the work environment is often ignored by management [56]. A similar result was obtained by Asare-Doku V. in "Mental health is not our core business: a qualitative study of mental health support in the mining industry in Ghana" [57]. Information provided by managers of international mining companies in Ghana confirmed the lack of support for workers' mental health.

In Löw J. and Nygren M., "Safety Improvement Initiatives in the Swedish Mining Industry: A Study of 30 Years of Accident Reduction," leading mining company managers outlined the importance of maintaining a priority on problems related to the psychosocial work environment [58]. A person under stress may make choices he or she would not otherwise make, which can ultimately have negative consequences for safety.

When creating a favorable work climate, management leadership in the implementation of HPF requirements is an important factor. [59]. Often employers do not take action in this direction due to the lack of practical skills [60].

The authors of "A Training Exercise to Improve Advanced Construction Leaders' Safety Practices and Overall Construction Site Safety Climate" cite a curriculum to address the problem at hand [61]. The authors claim that the developed plan helps to reduce the number of accidents by 15%, and is applicable not only to the construction industry.

Not only employees of enterprises are subjected to psychological stress. Arikan F. and Sozen S.K. in the article "Hierarchical approach to solving the problem of task setting by labor protection inspectors" reveal the problem of psycho-emotional stress of employees of control and supervisory bodies [62]. According to the authors, this circumstance significantly affects the effectiveness of the control system. When developing a schedule of inspections it is necessary to take into account the distances traveled by inspectors, the number of workplaces to be inspected, and taking into account the human factor.

Méndez Rivero F. in the publication "Abnormal Employment, Psychosocial Risk Factors and Mental Illness: A Cross-Sectional Analysis of Mediation" paid special attention to the situation of women in the issue at hand [63]. According to the results of the IV European Survey of Working Conditions, the author found gender differences in the mediating effect of psychosocial risk factors, which suggest that women's employment and working conditions are more heterogeneous than among men.

Claxton G., Hosie P., and Sharma P., in "Toward an Effective Health and Safety Culture: A Multi-stakeholder Perspective," cited results from two groups, managers and workers, in Western Australia [64]. Both groups expressed concern about the negative impact of temporary staff on a positive safety culture.

Existing HPF problems are significant because they affect both the global economy and, predominantly, the health of workers. The aspects under consideration are most typical for the countries whose GDP is mainly based on the industrial sector. The Russian Federation also belongs to such countries.

1.4.2.2 Analysis of current problems of the extractive sector of the Russian Federation

Scientific and technological progress (STP) has contributed to the development of a number of technical measures aimed at improving working conditions for workers. Nevertheless, in his work "Modern Problems of Technosphere Safety in Russia" E.V. Sugak argues that the NTP also had negative consequences [65]. Over the last century, more than half of large accidents occurred during the last two decades. At the same time, their destructive effect has increased– the last decade accounts for almost half of the deaths and 40% of the victims.

Sources of increased danger in the mining industry, as a rule, are physical factors. In the publication "Ensuring labor safety at a mining enterprise," A.O. Zavyalova notes that elevated methane levels are the most common cause of fatal accidents in the mining industry [66]. In article "Modern approaches to industrial safety system at coal enterprises" Savon D.Y. emphasizes that the increased dustiness of a workplace determines the greatest percent of professional diseases [67]. [67].

The NTP allows us to minimize risks, but it cannot completely eliminate them. The human factor is becoming one of the most common causes of accidents and incidents. Thus, the last decade has been characterized by a focus on the psychological and social aspects of the work environment. In the work "Management of Occupational Safety at Mining Enterprises in Kazakhstan", Gelmanova Z.S. considers the achievements of JSC "ArcelorMittal Temirtau" in the field of ensuring safe working conditions [68]. The author emphasizes the reduction of the level of occupational injuries as a result of systematic and extensive work in the field of occupational health and safety. Nevertheless, the indicators have not reached the desired values. The analysis of the accidents demonstrated the predominant division of the injured

into 2 groups: workers with five years of experience and workers with fifteen years of experience. With the first group, accidents occurred due to lack of necessary qualifications, i.e. due to inexperience, carelessness of the injured, and with the second group - due to blunted sense of danger as a result of many years of experience.

Over the past decade, the use of a risk-based approach has become widespread. International regulations, such as ISO4500:2018, require companies to focus on risk identification, assessment and management.

Foreign experience shows the effectiveness of the application of this principle, however, it also has some imperfections. One of such is considered in the work of Bokhovsky A. "Improvement of risk management principles in occupational safety and health". The author noted that the main problem of ISO 45001:2018, hindering the effective implementation of the PDCA (Plan-Do-Check-Act) process within HPF systems, is the uncertainty of the standard's requirements to the purpose, order and results of each procedure of the PDCA cycle [69].

First and foremost, the introduction of the risk-oriented approach has affected companies that carry out high-risk operations and operate hazardous production facilities (HPFs). Adapting the international standard to the domestic regulatory framework has led to a number of problems. In his work "Prospects for Ensuring the Safety of Mining Operations", author Filin A.E. points out the problem of "dual system". The legislative base, based on the achievements of the Soviet school, and progressive principles of world standards often contradict each other [70].

An important element of the risk-oriented approach is risk assessment. T.I. Ovchinnikova, E.P. Pototsky, and V.M. Firsova in their work "Risk-Oriented Approach to Hazard Assessment in Mining" analyzed the risk assessment methods developed to date [71]. The methods differ in the requirements for the initial information and the key features of the assessment. The authors focus attention on the problem of the lack of a unified methodology of risk assessment, which would be objective and reliable in terms of prediction. In Smirnyakov V.V., Kargapolova A.P., Smirnyakova V.V. "Risk-oriented approach as a tool to improve the quality of training and development of personnel of JSC "SUEK-Kuzbass" raises the problem of the influence of subjectivity factor on the final risk assessment [72]. A person tends to underestimate the damage of negative events in the absence of experience of their occurrence. This circumstance significantly distorts the initial data for applying the risk-oriented approach.

Application of the risk-oriented approach in the oil and gas industry is also characterized by a number of imperfections. In the work of Alekseev I.N. and Terekhov A.L. "Review and Analysis of Methods of Assessment of Professional and Man-Made Risks in Domestic and International Practice of Oil and Gas Industry" the authors revealed differences in the interpretation of certain terms in the field of labor

protection and industrial safety in domestic and foreign regulatory and technical documentation [73]. This circumstance makes it difficult for Russian and foreign companies to cooperate and apply foreign positive experience in improving safety.

Moreover, the decision to implement measures to improve safety is mainly based on an economic assessment of the effectiveness of measures. This methodology is not enshrined in regulatory documents, so companies use arbitrary methods. A.L. Mashkin in his work "Economic Efficiency of Measures in the Field of Life Safety" states that often the indicator of the cost of illness is used to analyze economic indicators, in which the total cost of health care and loss of production due to illness, injury or working conditions is calculated [74].

To date, OHS in Russia is at the stage of transition from the principles of the "Soviet school" to the application of international instruments in the field of industrial safety. Against this background, a number of problems arise that require timely solutions. In particular, this is reflected in the industrial complex, which is characterized by an increased danger of the work performed.

1.4.2.3 Analysis of the Problems of the Regulatory and Legal Framework of the Russian Federation in the Field of Occupational Health

The problems of the Russian regulatory framework in the field of occupational health and safety are determined not only by the complexity of implementing the risk-oriented approach. In his article "Modern Problems of Russian Legislation in the Field of Industrial Safety" D.V. Patsin pays special attention to the results of the regulatory guillotine of the last decade, where the repeal of some normative legal acts led to a legal vacuum, the adoption of others - created a real threat of destruction of the labor protection management system established over decades, as a separate most important type of activity of the organization [75]. In the work of V.A. Trifonov "The actual state of industrial safety at production facilities" the results of the survey of OHS specialists demonstrate that the regulatory framework of the Russian Federation in the field of safety is outdated [76]. [76]. Significant problems exist in terms of digitalization requirements. For example, there are still no requirements for the introduction of electronic work permits.

Similar problems exist in other industrial sectors. In the publication "Problems of Technological Modernization and Industrial Safety of Oil and Gas Processing Facilities" Skakalskaya I. G. and Valeeva V. N. describe the state of HPF provision in the oil and gas production industry today [77]. The authors emphasize that the low competitiveness of domestic enterprises in the world oil and gas market in the retrospective of the production process efficiency is also due to the low rate of innovation, including in the field of work safety.

Gusev A.I. and Kovalev M.N. in their publication "Improvement of the Industrial Safety System" emphasized that unresolved problems affect the economic position

of the Russian Federation in the world arena, as the level of functioning of domestic management systems still does not meet the world standards [78].

Imperfections exist in the normative regulation of OHS training of employees. Pursuant to Article 99 No. 116-FZ of 21.07.1997 "On Industrial Safety at Hazardous Production Facilities", employees must undergo training and certification in industrial safety. In Gontarenko A.F. and Klovach E.V. "On Improvement of Approaches to Training and Attestation of Employees of Organizations Carrying Out Activities in the Field of Industrial Safety" the authors emphasized that in addition to the lack, fixed in the regulatory framework, of the training and attestation procedure, there is also the issue of issuing documents confirming the successful mastering of the material [79]. However, in accordance with the Federal Law №404 of December 29, 2015. "On Education in the Russian Federation", qualification documents have the right to issue only the organizations carrying out educational activities.

Moreover, according to No. 116-FZ, employees of organizations operating hazardous industrial facilities are required to undergo training and certification. However, the documents establishing requirements for training and certification in the field of occupational safety establish requirements for training and certification for all employees carrying out activities in the field of occupational safety.

The complexity also arises in the training of employees of the extractive complex in the oil and gas industry. Tubdenov V.G. in his work "Topical issues of legal provision of industrial safety of extractive companies in the oil and gas complex" emphasizes that depending on the method of production and the equipment used the requirements for workers are different, which creates problems in the formation of training material [80].

The problem of training also directly affected the effectiveness of the risk-oriented approach in the Russian Federation. Smirnyakov V.V., Kargapolova A.P., Smirnyakova V.V. in the article "Risk-oriented approach as a tool to improve the quality of training and personnel development of JSC SUEK-Kuzbass" states that the implementation of this principle contributed to an increase in document flow, but had no effect on the attitude of employees to safety [72]. Moreover, an important obstacle in the implementation of risk management is the lack of the necessary skill among employees. The author noted that this problem can be solved by training employees.

An important element of the OHSMS is the implementation of control: both on the part of the state control and supervisory services and on the part of internal inspection structures. Balovtsev S.V. and Vorobyeva O.V. in their work "Improvement of the production control system - the key to the success of a mining enterprise" argue that domestic scientists and managers consider the concept of "control" exclusively as a supervisory function [81]. At the same time in foreign practice "control" is a method of improvement of the management system. Moreover, the supervisory

function is characterized by the implementation of inspections, registration of deviations and violations, without including the functions of prediction and proactive impact.

The world experience shows that the PC is a key link in the implementation of the risk-based approach. T.N. Gvozdkova in her article "Issues of Improvement of Industrial Control of Coal Mining Enterprises with Underground Mining" considers the UK experience in the field of PC implementation, the feature of which is the implementation of the principle of personal responsibility of employees for their health [82]. Thus, in order to improve the level of safety, employees are obliged to record the risks specific to their workplace in the registration forms. Subsequently, the measures developed to improve working conditions will be based primarily on the data obtained. This makes it possible to update the management system and increase the level of employee participation in ensuring a safe working environment.

In her publication "Organization of Industrial Control at Oil and Gas Enterprises" V.E. Abrosimova considers the problem of industrial control in the oil and gas industry as one of the most urgent [83]. The author thinks that more attention is paid to the most dangerous objects. Moreover, also the significant remoteness of different EI from each other even within the same production prevents the effective management of EI within the framework of ensuring the safety.

The publication of Semenovna T.S. and Alexandrovna P.N. "Innovations in labor protection for oil production" considers the system of industrial safety management at enterprises myObject, which allows planning and monitoring of industrial safety measures, remote control, as well as automatic generation of reports for Rostechnadzor [84]. In their paper, Fedosov A.V., Zakirova Z.A., and Abdrakhimova I.R., "Prospects for Applying the Risk-Oriented Approach to Industrial Safety," they argue that the implementation and use of this program, together with the information that the inspector has, makes it possible to organize comprehensive industrial safety assurance in Russia [85]. And, thus, the state and the business entity will have a dynamic risk map and assessment of the level of industrial safety, changing based on the state of the equipment and technologies used.

Despite the active implementation of the risk-oriented approach in the field of occupational health and safety in Russia, there are still a number of problems in the field of normative regulation that hinder the effective application of this principle. In particular, the problems are associated with a legal vacuum and lack of clear regulation of the elements of the implementation of the risk-oriented approach at the enterprise.

1.4.3 International and domestic experience in solving the problem

1.4.3.1 Experience of Western countries

Modernization of the international regulatory framework and active implementation of the risk-based approach obliges employers and HPF professionals to change tactics to ensure safe working conditions. Today, occupational risks are a central focus of the OHSMS.

The effectiveness of this approach is not only due to changes in workflow and improvements in the process chain, as it was a few decades ago. Current trends, which also include a focus on achieving the SDGs, indicate that employees and their behavioral traits are the key to security.

Thus, the risk-oriented approach is a comprehensive system, predominantly aimed at the contribution of employees to the formation of a safe working environment. Safety culture is an important aspect of it. Its development is necessary for the successful functioning of OHSMS.

Best practices in Western countries demonstrate that it is possible to move from a culture of neglect to an awareness and desire for safe work practices. The author of A Study of Oil Workers' Perceptions of "Paternal Masculinity" as a Path to Understanding Increased Offshore Oil Field Safety Behavior, based on interviews with oil company workers in the United Kingdom, concluded that identity reform led to a safer workplace culture that encouraged workers who engaged in safe work practices and demonstrated disapproval of employees who exhibited risky or dangerous workplace behaviors [86].

In the U.S., a system has been developed to systematize data on accidents across the country [87]. The principle of the system is as follows: a large set of data on accidents in which workers have been injured is collected from the U.S. Occupational Safety and Health Administration. Then, to improve the quality of the analysis, each record is evaluated on five dimensions. Machine learning models classify the injured body parts, the source of the injury, the type of event that caused the injury, whether hospitalization occurred, and whether amputation occurred. Finally, demonstrating generalizability, the trained models are used to analyze two additional sets of accident data from the construction industry and the mining and metals industry.

Moreover, some states in the United States have mandated 10 hours of training on occupational safety and health requirements for workers. [88]. Studies show that safety training benefits behavioral improvement. As a result, post-training fatality trends differ significantly from other groups of states, and the regression of nonfatal injuries indicates an almost statistically significant marginal effect of mandatory training.

A study by Antonsen, S., Nielsen, M., and Almklov, P.G., "Regulating the Intangible. The search for safety culture in the Norwegian oil industry" shows that the introduction of the concept of safety culture in regulation also has a positive effect not only in industrial companies, but also in the supervisory and control area [89]. The introduction of the concept of safety culture into the regulatory vocabulary has raised awareness for both the regulator and the industry, thereby empowering both parties to address the informal and systemic aspects of safety.

For a long period of time, a culture of disregard for workplace safety rules was also characteristic of Swedish mining companies, according to the authors of the article "Initiatives to Improve Safety in the Swedish Mining Industry: A Study of 30 Years of Accident Reduction," Löw J. and Nygren M. [31]. However, the development of safety culture and the introduction of the concept of "lean production" showed that safety was a top priority. Subsequently, employees demonstrated a greater commitment to safe work practices, and sought to be directly involved in the development of plans and activities in the field of health and safety.

Many authors conclude that management commitment is a key factor in shaping employees' positive attitudes toward HPF compliance [90,91].

Analysis of global practices in the field of building a culture of safety offers a number of effective teaching methods [92]. Their advantage is the special attention to the psycho-physiological state of workers. The application of such techniques has an immediate effect and contributes to the frequency of application of the acquired skills in practice.

"The Impact of Active and Passive Occupational Health and Safety (OHS) Training on Worker Safety Awareness and Opportunities for Participation in Injury Prevention in Ontario and British Columbia, Canada." Conine A.M. emphasizes that active education and training is much more effective than passive methods [93]. Development of training modules with elements of interactive interaction has greater efficiency compared to listening to lectures.

Erten B., Oral B., Ya**WCC** M.Z. in the publication "The Role of Virtual and Augmented Reality in Safety and Health Training for PV Workers, and Sustainability Assessment" states that training with elements of VR technology applications has significant effectiveness [94]. The author proves that when training through gamification the employee's desire for success is supported, the experience of failure, the feeling of competition with oneself and/or teammates is most vividly felt.

Moreover, Patriarca R., in "Serious Games for Industrial Safety: An Approach to Developing Early Warning Resilience Indicators," emphasizes that in addition to training, it will also allow for the collection of data [95]. Thus, the electronic game environment can be recommended to create a framework for dynamic data analysis, allowing for continuous improvement of information collection results and systems performance.

1.4.3.2 Experiences of Eastern countries

Ensuring industrial safety often depends on the geographical location of the company. Differences may consist in the technical solutions used, which are specific due to particular natural phenomena, such as the presence of seismic activity. Moreover, cultural differences between Western and European countries have a direct bearing on industrial safety. Eastern countries are still characterized by a relatively low safety culture.

China is one of the fastest growing economies in the world, and its economic growth in recent decades has been impressive. In spite of this, the rate of development of occupational safety and health has not matched the economic rate of development. An analysis of the scientific literature shows that the culture of economic growth and profit maximization, which can also negatively affect occupational safety and health. Companies are often forced to operate at the limit of their capabilities to stay in a competitive market, and this often leads to a disregard for safety measures.

One of the reasons for the low level of occupational safety and health in China is the weak legislation in this field. Although China has some regulations in the field of occupational safety, they are often not strict enough, and enforcement leaves much to be desired. This means that companies can fail to follow the necessary safety measures at work without worrying about the possible consequences.

Within the development of the concept of "safety culture," there are a number of problems. In Zhang J. "The main causes of accidents in coal mines: characterization of safety culture deficiencies based on accident statistics," the author raises the issue of employee commitment to safe work practices [96]. The author emphasizes the low level of motivation among miners. In addition, the application of risk-oriented approach tools is difficult for workers because they do not have practical skills.

Thus, the main obstacle to the formation and development of safety culture is the lack of interest among employees, who are confident in the lack of necessity of the proposed measures.

Lu Y., Taksa L., Jia X. in "The Impact of Management Practices on Safety Performance: The Case of the Mining Sector in China," based on a survey of employees at two mining companies, concluded that management commitment gives employees an overall picture of management commitment to HPF [97]. Commitment builds initiative among employees to participate in various safety activities. Personal contribution to shaping a safe working environment contributes to better compliance with HPF requirements. Moreover, safety improvement activities have the added effect of making employees more aware of new emerging issues. These practices create a dynamic HPF environment.

The scientific literature also includes a substantial amount of research on occupational health and safety in Pakistan. This phenomenon is related to several factors.

First of all, Pakistan has a large number of industries characterized by high hazards, such as the oil and gas industry. In addition, the large-scale sanctions of the 1990s affected all spheres of the state, especially the industrial sector, and consequently, the level of development of occupational safety and health.

Because of extensive economic and legal sanctions, Pakistan's industrial security situation is vulnerable [98]. Lack of access to global reporting on HPF achievements as well as insufficient understanding of processes and lack of access to the results of practical application of process safety management system affect the accident and injury rates, which are many times higher than the European values [99]. In the paper "Assessment of Process Safety Management Practices in the Petroleum Refining Sector of Pakistan", HPF managers of major oil producing companies in Pakistan were interviewed. Based on the results of the survey, the authors concluded the following: lack of state regulation of EHSMS, lack of awareness of EHSMS among companies, low rates of management commitment to occupational safety, lack of EHSMS implementation, unreliable reporting of accidents and process failures [100].

Thus, the level of development of labor protection in the Western countries is significantly higher in comparison with the Eastern countries. This phenomenon is caused by a number of factors, such as: economic, historical, cultural, political and educational. As the analysis of scientific literature shows, the condition of OHS in European countries several decades ago was characterized by the same features which are characteristic of the Russian Federation at present: low level of safety culture and predominant application of technical solutions. Global experience shows that the application of the risk-oriented approach demonstrates significant efficiency in reducing the number of accidents and occupational injuries. The main tool of this approach is training employees in safe work methods with an emphasis on working with occupational risks.

1.5 Research methodology

Over the last decades, the risk-based approach has been actively used in the field of HPF in Russia. This principle is based on the recognition that vulnerabilities and potential threats exist in any system. In this regard, it is necessary to have skills to manage the existing risks. To date, the main international documents in the application of the risk-based approach in organizations is ISO 45001:2018. GOST R ISO 45001-2020 "Occupational Safety and Health Management Systems. Requirements and guidelines for use" is the main Russian document regulating the use of risk-oriented approach in domestic enterprises. Thus, the application of the risk-oriented approach is a legal requirement in the field of occupational health and safety.

Not only managers but also employees should be involved in the risk-based approach processes for the following reasons [102]:

1. Employees have a more detailed knowledge of the processes and operations in place, enabling them to identify specific system vulnerabilities that are not obvious to managers;

2. Employees who are directly exposed to risk can offer practical solutions for managing risk;

3. Employee participation in the risk assessment and management process enhances their safety awareness and builds engagement to ensure safe working conditions;

4. Involving workers in risk assessment and management is also an opportunity to educate and raise their awareness of safety. This helps create a safety culture where every employee is aware of his or her role and responsibility in risk prevention.

The application of the risk-based approach includes the following steps:

- Hazard Identification. The process of identifying and describing potential hazards, dangers or adverse events that may affect working conditions. It aims to identify specific factors or conditions that could lead to negative consequences.
- Risk assessment. This process involves determining the likelihood of risks occurring and assessing their potential impact on operational safety. This step helps to assess vulnerabilities and prioritize risk management.
- Risk management. A systematic process that aims to develop and apply measures to minimize or eliminate risk.

Hazard identification is regulated by the Ministry of Labor Order 31.01.2022 N 36. "On Approval of Recommendations on the Classification, Detection, Recognition and Description of Hazards". The document contains the procedure of detection, classification of hazards, a list of legal acts and other documents for the analysis of hazard identification, as well as classifiers of hazards depending on the type of activity, causes of hazards and objects of occurrence of hazards.

Assessment is regulated by OST R ISO/IEC 31010-2011 "Risk Management. Risk assessment methods". The document contains general provisions in the field of risk assessment, the methodology for determining the method of risk assessment, and a direct description of the proposed methods.

Risk assessment methods are divided into:

1. Quality
2. Quantitative
3. Qualitative-quantitative

The latter method of risk assessment combines the advantages of both qualitative and quantitative approaches, making it a priority for application. The qualitative component allows you to describe the characteristics, properties and context of the hazard, while the quantitative assessment provides numerical values of probability and impact. The combination of both approaches provides more complete information about the risks being assessed and helps make more informed decisions.

Qualitative-quantitative methods of risk assessment include:

1) Multicriteria decision analysis
2) Risk indices
3) Matrix of consequences and probabilities

1.5.1 Multicriteria decision analysis

This method aims to use the ranking of criteria to objectively evaluate different decision options in order to determine the preferred options. When using this method, a matrix is developed that includes decision options and criteria that need to be ranked and combined to obtain an overall assessment of each option.

In this method, the input data is the set of solution options to be analyzed. The criteria defined on the basis of the objectives can be applied to all options to compare them and identify the differences between them.

The advantage of this method is the simple structure of effective decision-making and presentation of assumptions and conclusions, as well as the ability to solve complex problems. However, the main disadvantage is the narrow scope of application. The method is not intended for initial risk assessment.

1.5.2 Risk indices

The risk index is a numerical measure that quantifies the level of risk based on ordinal scales and scores. It allows risk values to be ordered by similar criteria, making them comparable.

Input data for calculating the risk index is formed by analyzing the system or a detailed description of the application area, which requires an accurate understanding of all sources of risk, possible paths of adverse events and their impact objects.

The first step is to study and describe the system. Then the point estimates for each component are determined so that they can be combined to produce a comprehensive risk index. The individual scores are combined according to a scheme that takes into account the physical nature of the system. Scores can be assigned to risk components such as probability, impact or consequences, and risk-increasing factors. Scores can be added, subtracted, multiplied, and divided according to the high-level risk model. The result is a set of comprehensive indices associated with a

particular risk source that can be compared with risk indices obtained for other sources in the same system or that can be subjected to modeling.

The advantage of this method is the possibility to assess multiple factors influencing the level of risk, a single point estimate of the level of risk. Nevertheless, the application of this principle is appropriate only if there is an underlying model to determine the linearity or non-linearity of the individual risk factor scales. Thus, this method is also not suitable for use as part of a preliminary risk assessment.

1.5.3 Matrix of consequences and probabilities

The consequence and probability matrix is used to rank risks, their sources, and risk treatment measures based on the level of risk. The inputs to the process are consequence and likelihood scales and the matrix that combines them. In determining occupational risk, the use of the weighting method is suggested.

The matrix method of risk assessment uses inputs that include scales for consequences and probabilities, and a matrix that combines these data. The consequence scale should be designed to cover the full range of possible consequence types, considering their probability from maximum to least probable. As a sampling example, Figure 4.

Rating	Financial impact	Investment return	Health and safety	Environmental and social fields	Organization reputation	Legislative prosecution
6	100 c.u. + loss or income	300 c.u. + loss or income	- a large number of victims; - significant and irreversible consequences for 10 people	- irreversible long-term damage to the environment; -social shock, the possibility of a large-scale protest of the population	-international resonance for several days; - cumulative loss of support from the parties involved, loss of capital investments; -change of heads of departments and boundaries of influence	-judicial prosecution with damages in the amount of 50 c.u. + cost of losses; - punishment associated with deprivation of liberty for the management of the organization; - prolonged ban on activities by the authorities.
5	10-99 c.u. + loss or income	30-293 c.u. + loss or income	-single casualties; -some permanent consequences for one or more people.	- prologirovannoe impact on the environment; -increased interest in the problem on the part of society, requiring significant measures to correct the situation	- national resonance for several days; -private impact on the reputation of the parties involved; - loss of stakeholder support and additional investment	-compensation for losses in the amount of 10 USD; - conducting an investigation by the authorities; - intervention in activities.
4	0 c.u. + loss or income	20 c.u. + loss or in	- extensive damage	-big		
3						
2						
1						

Figure 4: Example of an impact criteria table

The probability scale can be arbitrary and have any number of levels. Probability definitions should be as precise and unambiguous as possible. If numerical values are used to define different probabilities, the appropriate units of measurement must be specified. The probability scale should cover the full range of values appropriate to the study being conducted, with the lowest probability being acceptable for the

most serious defined consequences. An example of a probability scale can be seen in Figure 5.

Rating	Criteria
Possibly	- very likely to happen - happens once a week
Maybe	-may happen short term -happens once a month
Unlikely	-may happen theoretical
Rarely	-may happen randoml - expected frequency - just happen
Impossible	-may happen -will hap

Figure 5: Example of a risk assessment matrix

The matrix is constructed with consequences on one axis and probabilities on the other axis. Figure 6 shows part of an example matrix with a 6-point scale for consequence and a 5-point scale for probability.

Probability class							
	E	IV	III	II	I	I	I
	D	IV	III	III	II	I	I
	C	V	IV	III	II	II	I
	B	V	IV	III	III	II	I
	A	V	V	IV	III	II	II
		1	2	3	4	5	6
		Consequence class					

Figure 6: Example of probability criteria matrix

The established risk levels in the cells of the table depend on the definitions used for the probability and consequence scales. Risk levels can be linked to decision-making rules, e.g. based on the level of management attention or the time scale required for an appropriate response. The outputs are the class of each hazardous event or a list of hazardous events with a level of significance.

The main disadvantage of using the matrix method is very subjective and largely depends on the competence of the evaluator. However, the advantages include the ease of application and the rapid ranking of risk by level of significance.

This method is most suitable for use by employees because they have in-depth knowledge of the processes and operations available in the system, which allows them to identify specific vulnerabilities that may not be obvious to managers.

1.6 Theoretical and experimental studies

The management system of Gazprom dobycha Orenburg LLC includes the following structural subdivisions:

5. Gas Field Department (GFD)
6. Product Interconnection Pipeline Authority (PIPA)
7. Department of Technological Transport and Special Equipment (TT&S)
8. Logistics and Procurement Department (UMTS & K)
9. Office of Buildings and Structures Management (O&M)
10. Paramilitary unit (MPU)
11. Communications Management (CM)
12. Department of Emergency and Repair Works (DERW)

In this work, the shop of booster compressor station (BCS) of GFD subdivision was chosen as an object of improvement of working conditions, because the occupations of this section have the highest class of working conditions (**WCC**). The list of booster compressor station occupations is presented in Table 1. The professions under consideration are divided into 2 types: engineering and technical professions (ITP) and working professions (WT).

	No. n/a	**Job title**	**WCC**
ITR	1	Station chief	2
	2	Deputy station chief: for operation; for repair.	2
	3	Lead process engineer	2
	4	Engineering Technologist	2
	5	Gas Preparation Master	2
RB	6	Process compressor operator, engaged in gas compressor maintenance	3.2
	7	Engineer of process pumps	3.2
	8	Balancer of parts and units	3.1
	9	Technological unit repair mechanic	3.2
	10	Janitor of office and production premises	2

Table 1 - List of BCS professions

Also in 2020. PJSC Gazprom obliged OOO GDO to develop and implement a training program aimed at developing safety culture. According to the order of the working group on the implementation of this program, OOO GDO has defined a list of goals and measures to be taken. The main goal of the program is to create in the company an effective system of involvement of employees and formation of their style of safe behavior in the production process and outside it. The tool to achieve the goal is the development of a training program aimed at the formation of employees' commitment to safe working conditions.

1.6.1 Developing occupational risk maps

One of the tools of the risk-based approach is the Occupational Risk Map (ORM). It is a visual representation of the various risks associated with specific occupations. Occupational risk maps are developed for three modes: normal, abnormal and emergency. An example of the structural content of the map is shown in Figure 7.

Occupational risk map														
No.	1	2	3	4	5	6	7	8	9	10	eleven	12	13	14
Map point name	Structural subdivision	Work operation to be carried out (stage of technological operation)	Place of work operation	Operating mode _	Hazard type	Source of danger	negative event	The reason for the realization of a dangerous event (cause of danger)	Dangerous conditions	The severity of the consequences of a hazardous event	The probability of occurrence of the consequences of a hazardous event	Level and category of risk	Risk treatment measures a	Responsibility for the implementation of risk treatment measures

Figure 7: An example of the structural content of the CPS

In this paper, CRC is chosen as a suggested tool to be used because the map allows structuring, prioritizing, and most fully reflecting the existing risks. The CRC is versatile because it facilitates communication and knowledge sharing between management, the OHS service, and employees.

To date, GDO LLC has not yet implemented the application of the CRC. Existing hazards are reflected in the risk register. In this work, CRCs have been developed for all processions in the BF Shop with the purpose of further introduction into the OHS service practice. The CRC should be maintained by both OHS specialists and employees.

As part of the development of the maps, the following steps were carried out:

1. Hazard Identification;
2. Risk assessment;
3. Development of risk management measures;
4. The design of the CRC for each profession.

The following methods were used to identify the hazards:

13. Analysis of documented information about the hazards, the results of their contact effects on the human body;

14. Direct observation of hazards at their points of identification, including instrumental measurements, investigations, and/or visual observations and the use of their data;
15. Analysis of occupational safety and health instructions;
16. Analysis of technical documentation (technological regulations) for production processes;
17. The method of questioning employees on checklists.

The identified hazards were classified based on the classifiers specified in the order of the Ministry of Labor 31.01. 2022 N 36. "On approval of recommendations for classification, detection, recognition and description of hazards".

Identification of hazards of **BCS** occupations allowed us to distinguish the following types of hazards most typical for ITR: road vehicle and exposure to microorganisms. The types of hazards identified for RSs are: harmful chemicals in the air of the working area, formation of toxic vapors when heated, microclimatic, physical and mechanical factors.

The matrix method was chosen as a method of risk assessment. The probability of occurrence (Q) and severity of a negative event (P) are chosen as scales of assessment. Tables 2 and 3 present the characteristics of the severity and probability of occurrence of negative events, as well as their point ratios.

Frequency of event realization	**The value of the indicator of the probability of occurrence of a negative event Q, point**
once a year	5
once every 1 to 3 years	4
once every 3-5 years	3
once every 5 to 10 years	2
1 time in over 10 years	1

Table 2: Probability of negative events

Number of days of disability	The value of the indicator of the severity of the consequences of a negative event P, point
0	1
1-10	2
10-30	3
30-180	4
>180	5

Table 3: Indicator of the severity of the consequences of negative events

The product of the probability of occurrence by the severity of the consequence is the consequence severity index (formula 1).

$$Q = R \cdot P \quad (1)$$

It can also be determined visually by the risk matrix: the cell with the required indicator *R* is defined at the intersection of the established indicators of the severity of consequences *P* and the probability of the event *Q* (Figure 8).

The negative event consequences severity, P	Event occurring probability, Q				
	1 point	2 points	3 points	4 points	5 points
1 point	1	2	3	4	5
2 points	2	4	6	8	10
3 points	3	6	9	12	15
4 points	4	8	12	16	20
5 points	5	10	15	20	25

Figure 8: Risk assessment matrix

The zone colored green characterizes the acceptable level of risk, yellow - increased risk, requiring the development of measures to minimize or eliminate, and red - critical risk, which implies the suspension of work until the implementation of measures to minimize the risk.

An occupational risk assessment of ITIs in normal operation demonstrates a predominantly acceptable level of risk. An elevated level is observed for exposure to microorganisms, the occurrence of accidents and the possibility of slipping on slippery support surfaces. Analysis of abnormal and emergency situations demonstrates an elevated level of risk.

As part of the risk assessment of RB in normal operation, it was revealed that the increased noise level and exposure to vibration have critical values. It is these indicators that contribute to an increase in the CUT to 3.1 and 3.2, according to the analysis of special assessment maps of working conditions. The prevailing number of hazards have an elevated risk level. The level of risk in non-emergency situations is predominantly elevated, and in emergency situations it is acceptable. This fact is due to the high degree of importance of preventing emergencies, which is caused by significant economic losses.

The next stage is risk management, which consists in the development of measures aimed at reducing the level of risk, as well as the appointment of persons responsible for the implementation of developed measures. The main objective of the developed measures is to reduce the increased and critical risk to an acceptable level.

In order to reduce the level of risk for the working professions, the following are suggested: timely inspection of the serviceability of the used equipment and compliance with safety rules. For RB, the key measures are to train workers in safe work methods and to monitor the serviceability of the equipment used.

The developed occupational risk maps for all positions in the **BCS** shop are presented in Appendix 2.

1.6.2 Development of a training program on "Safe Methods and Techniques for Performing Work in a Risk-Based Approach

When developing the CRC as part of risk management, training is a key activity. To date, the applied technical measures do not have the ability to provide the necessary level of safety everywhere. Moreover, one of the basic principles of the risk-oriented approach is the understanding that the absolute elimination of risk is impossible, and it is necessary to create conditions that allow managing this risk. One of the main tools within the framework of achieving this goal is employee training.

Moreover, the analysis of the causes of injuries at LLC "GDO" allowed us to identify the main cause of injuries, which is characterized by the human factor. Employees do not have theoretical and practical skills of safe work performance or act in disregard of safety rules. The latter indicator indicates a low safety culture.

Training allows employees to develop a sense of responsibility for ensuring safe working conditions, which promotes engagement and increases safety culture.

Moreover, in Rostechnadzor report 2021 one of the proposed measures to prevent violations of industrial safety requirements at oil and gas production facilities is to hold webinars on industrial safety. Thus, training is a necessary element of safe working conditions.

This paper develops a training program entitled "Safe Methods and Techniques for Risk-Based Job Performance". The purpose of the program is to develop knowledge and skills in the application of the risk-based approach on an ongoing basis during work operations.

The training was developed taking into account the requirements contained in the Russian Federation Government resolution No. 2464 of 24 December 2021 "On the procedure for training in labor protection and testing knowledge of labor protection requirements Chapter 5 "Organization and conduct of training in labor protection requirements". According to clause 46 of the training program for safe methods and techniques of performing work under exposure to harmful and (or) dangerous production factors, sources of danger identified as part of a special assessment of working conditions and occupational risk assessment, the duration of the program should be at least 16 hours. The duration of training under the developed program is 18 hours.

The Risk-Based Approach Safe Work Methods and Techniques training takes place:

- Heads of departments (divisions, workshops, sectors) and their deputies;
- site supervisors);
- senior masters, masters;
- specialists;
- employees;
- employees of working professions.

Table 4 shows the thematic training plan.

No. n/a	**Name of sections and topics**	**Number of hours**
Lecture part		
1	Regulatory framework for the risk-based approach in the Russian Federation	1
2	Basic concepts of the risk-based approach	1
3	Classification of hazards. Identification of harmful and/or dangerous production factors in the workplace	1

4	Assessment of the level of occupational risk of identified hazards	2
5	Risk management methods: Development of measures to reduce occupational risk levels	2
6	Safe work methods and techniques	2
7	Familiarization with the method of working tool	2
8	Knowledge check	1
Practical part		
1	Practice with a work tool	2
2	Risk management in normal, abnormal and emergency situations	2
3	Knowledge check	2
	Total	**18**

Table 4: shows the thematic training plan

Training of employees is carried out on-the-job, both in full-time format and using distance technology, e-learning system, including participation of students in Internet conferences, webinars, as well as using virtual reality system as part of the practical part of the training.

Virtual reality (VR) is a powerful tool that is actively used in occupational safety training. VR systems allow the creation of immersive simulations that realistically reproduce various hazardous situations that workers may encounter.

Today, a number of international industrial companies use VR training as part of occupational safety training. Experience shows that the use of VR training is an effective tool. Managers note that there is a greater awareness of risks, accelerated learning, a higher level of employee involvement in safe working conditions, and improved skills in responding to different situations.

Moreover, this training is characterized by such advantages as:

18. Safety. VR enables safe learning environments where workers can learn skills and apply safety rules without real danger to their lives and health.
19. Realism. VR simulations create an environment that's as close to real-life working conditions as possible. Workers can experience and visually see dangerous situations such as falls from heights, fires, chemical spills, etc. This fact contributes to a better understanding of potential risks.
20. Interactivity. VR systems allow workers to actively interact with the simulation. They can perform tasks, apply safety rules, use the intended equipment and

tools, and participate in situations that may arise in the workplace. This helps develop practical skills and increase readiness for real-world situations.

21. Individualization of learning. With VR, you can create scenarios tailored to specific professions, roles, and tasks, allowing for more effective and targeted learning.
22. Commitment. The use of VR systems in health and safety training allows workers to acquire the necessary skills, improve their reactions to hazards and develop a culture of safety in the workplace. This helps to reduce accidents and improve overall workplace safety.

Training concludes with a knowledge test. The quality of the knowledge mastered and acquired by the employee during the Risk-Based, Safe Methods and Techniques for Job Performance training is determined by means of VR equipment and software.

Figure 9: Learning with the VR system

The knowledge test consists of simulating the work process in three modes: normal, abnormal and emergency. Each mode contains 3 cases of danger, which requires control actions on the part of the worker. Reducing or minimizing each hazard is evaluated by 1 point. The maximum number of points is 9.

An employee who shows unsatisfactory knowledge (less than 7 points) as part of the test of knowledge of labor protection requirements is not allowed to independently perform their job duties and within 30 calendar days is sent to repeat the test of knowledge of labor protection requirements. The results of testing of knowledge of labor protection requirements of employees after completion of training shall be formalized by the protocol of testing of knowledge of labor protection requirements. The protocol of checking knowledge of labor protection requirements of employees may be drawn up in hard copy or in electronic form and is evidence that the employee has undergone appropriate training in labor protection.

Local normative documents in the field of occupational health and safety should also be upgraded. The program "Safe Methods and Techniques for Performing Work Based on a Risk-Oriented Approach" should be included in the OHSMS as a required element of training. Among other things, there is a need to establish the mandatory completion of the program in job descriptions of employees.

Thus, the Safe Methods and Techniques for Risk-Based Job Performance program promotes the training of workers in the application of a risk-based approach in the work environment. The training program is primarily focused on the development of practical skills in the identification, assessment and management of occupational risks. Theoretical part includes familiarization with the regulatory framework of the Russian Federation in the field of implementation of risk-oriented approach in OHSAS and OHSMS, as well as familiarization with the regulatory regulation of each of the stages of risk-oriented approach. The practical part includes the use of VR equipment. As part of the training, employees should develop relevant knowledge and skills, as well as awareness of responsibility for organization of safe working conditions, thus forming commitment to industrial safety, which directly affects the human factor as the most frequent cause of occupational injuries in LLC "GDO".

1.7 Analysis of the results of the study

According to Rostechnadzor's 2021 report, the dynamics of fatal injuries at oil and gas facilities tends to decrease, but still shows unsatisfactory indicators. Analysis of the causes of accidents and injuries at the facilities supervised by Rostechnadzor allowed us to identify two main interrelated problems affecting safety: systemic violations of mandatory industrial safety requirements due to unsatisfactory organization of production processes, and violations of mandatory industrial safety requirements due to conscious neglect of mandatory requirements and elementary safety rules by employees involved in facility operations Thus, minimization of the human factor is one of the main tasks to ensure industrial safety.

OOO Gazprom Dobycha Orenburg is a subsidiary of PJSC Gazprom, Russia's largest transnational energy company, which makes improving industrial safety one of its priorities. As part of this goal, the company obliged a number of its subsidiaries to develop and implement a safety culture development program in 2020.

As of today, the current regulatory and legal framework of the Russian Federation in the area of occupational health and safety requires companies to implement a risk-oriented approach. The basic elements of this principle are the identification, assessment and management of occupational risks. Particular attention is paid to the participation of employees in forming safe working conditions. In this regard, there is a need to train employees to apply this approach in their daily work practice.

The legislative and regulatory framework offers a number of methods of risk assessment, but not all of them are applicable in the implementation of labor activity due

to the complexity and availability. The "Matrix of Consequences and Probabilities" methodology was chosen as the one to be applied, as it is characterized by simplicity of application and completeness of information reflection.

The result of applying the risk-oriented approach in daily work activities is the creation of an occupational risk map, which reflects complete information on the causes, level of risk and measures to manage these risks. Structured and visual presentation contributes to a better understanding of existing risks and activities. To date, occupational risk maps are not used in LLC "GDO".

As an object of the study in this work, the shop of DWH LLC was chosen, because some professions of this site have the highest class of working conditions at the enterprise (**WCC** - 3.1 and 3.2). The work presents the developed CRC for all positions. Subsequently, these maps are maintained both by the OHS specialists and by the employees.

An important element of the implementation of the risk-based approach is the training of employees. This paper presents the developed training program "Safe Methods and Techniques of Work Based on the Risk-Based Approach". The program includes familiarization of employees with the regulatory and legal framework of the Russian Federation in the field of application of the risk-based approach, as well as training in methods of hazard identification, assessment and management of risks.

An important element of training is the practical part, which is carried out with the help of VR-systems. The advantage of this format is visibility, safety, interactivity, and, as a consequence, an increase in the speed of formation of practical skills.

The main goal of the program is to develop employees' knowledge, skills and abilities to safely perform work under the influence of harmful and (or) dangerous production factors, sources of danger, identified in the special assessment of working conditions and occupational risk assessment.

The objectives of the training on the developed program can include the formation of conscious employees within the framework of ensuring safe working conditions. This element contributes to the development of safety culture and, as a consequence, reduction of the frequency of occupational injuries caused by human factor.

Thus, training of employees is the initiating stage of the risk-oriented approach, and CRC is a working tool within the framework of practical application of the obtained knowledge and skills. Comprehensive work on the formation of employees' competencies in the field of safe working conditions will be a key element in achieving the reduction of occupational injury rate of LLC GDO.

Economic section

1.8 Assessment of economic losses from occupational injuries

An accident occurred in which the upper hand (arm) of a process compressor (TC) machinist was trapped and severely impacted by a moving piece of equipment. The accident was caused by deliberate disregard for safety rules and personal negligence on the part of the worker.

Wages for TC driver: 55,000 rubles

Salary of HPF officer: 65,000 rubles

Work shift duration: 6h

The company's revenue for the year - 436 million rubles

Loss Calculation:

1. **Immediate costs and losses incurred on the day of the accident.**

Calculated according to the formula:

$$П_1 = k \cdot ЗП_n + ЗП_n + УПД_n \quad (2)$$

Where:

$ЗП_n$- The victim's salary for the hours not worked on the day of the industrial accident;

k- coefficient, which takes into account insurance contributions for pension, health and social insurance:

$$k = (1 + 0{,}01 \cdot (CCB_n + CCB_m + CCB_c) \quad (3)$$

$$k = (1 + 0{,}01 \cdot (\text{ССВ}_n + \text{ССВ}_m + \text{ССВ}_c))$$

where $\text{ССВ}_n, \text{ССВ}_m, \text{ССВ}_c$- are the rates of insurance contributions for pension, health, and social insurance (22%, 5.1%, and 2.9%), respectively [103];

$ЗТ_n$- the cost of transporting the injured person to a medical facility;

$УПД_n$- lost potential income of the organization.

$$k = (1 + 0{,}01 \cdot (22 + 5{,}1 + 2{,}9) = 1{,}3$$

$$ЗП = (ЗП_{n(м)} / ОЧ_{n(м)}) \cdot (ДРС - ОЧ_n) \quad (4)$$

Where:

$ЗП_{n(м)}$- The victim's salary accrued for the month in which the accident occurred;

$ОЧ_{n(м)}$-number of hours worked during the month when the accident occurred;

ДРС- the length of the work shift;

$ОЧ_n$- the number of hours worked by the victim on the day of the accident.

$$ЗП_n = \left(\frac{35000}{14}\right) \cdot (6-1) = 12\,500\ руб.$$

Since the victim was taken away by ambulance, the cost of transportation is zero.

Lost potential income of an organization refers to the income that the organization did not receive as a result of the victim's failure to perform work from the time of the work accident until the restoration of work at the expense of other workers.

Then:

$$П_1 = 1{,}3 \cdot 12\,500 + 0 + 70\,000 = 86\,250\ руб.$$

2. Costs and losses associated with the disruption of the production process

$$П_1 = k \cdot ЗП_{ор} + ЗВБУТ + УПД_{ор} \quad (5)$$

Where:

$ЗП_{ор}$ - Wages of employees diverted from their main job on the day of the accident, for the time during which they did not perform their main job functions;

ЗВБУТ- the cost of restoring safe working conditions at the scene of the accident;

$УПД_{ор}$ - lost potential income of the enterprise due to the diversion of employees from their main activities.

$$ЗП_{ор} = \sum_{i=1}^{n} \frac{ЗП_i^м}{ОЧ_i^м} \cdot (ДРС - ОЧ_i) \quad (6)$$

where n - is the number of workers diverted from their main job;

$ЗП_i^м$ - actual accrued salary of the distracted worker i-th for the month when the accident occurred;

$ОЧ_i^м$ - m is the number of hours worked by the i-th employee in the month when the industrial accident occurred;

ДРС - the length of the work shift;

$ОЧ_i$- is the number of hours worked on the day of the accident by the i-th employee who was distracted from his main work.

Then the costs and losses associated with the disruption of the production process are:

$$П_2 = 1{,}3 \cdot 11956 + 3\,500 + 70\,000 = 73\,500 руб.$$

3. Damage to property

$$П_3 = У_n + PHP \quad (7)$$

where $У_n$- damage to the organization due to damage to equipment, tools, raw materials, materials, finished products, destruction of buildings and structures;

PHP - the cost of repair and adjustment work to eliminate the consequences of the accident.

As a result of the accident, a piece of equipment worth 54,000 rubles was broken, repair work amounts to 30,000 rubles:

$$П_3 = 54\,000 + 30\,000 = 74\,000\ руб.$$

4. Costs of the organization for the reorganization of the production process

The organization's costs for the reorganization of the production process ($П_4$) include expenses for rent of equipment, tools, for the period of absence or repair of own equipment ($АО$); payment of overtime work to the worker of the organization performing the work of the injured person (-s) during his temporary disability ($СУ = 0$) and (or) additional payments for internal combining ($ДВ_{вс} = 0$) and (or) the salary of a hired worker in case an additional worker has been hired to perform the work of the injured person during his/her temporary incapacity for work ($ЗП_н$); expenses for the organization of adequate working conditions of the hired worker (providing the hired worker with personal protective equipment, conducting briefings, etc.) ($ОНУ_н$):

$$П_4 = АО + k \cdot (СУ + ДВ_{ВС} + ЗП_Н) + ОНУ_Н \quad (8)$$

$$ОНУ_Н = СИЗ + k \cdot И$$

where $СИЗ$ - the cost of providing the hired worker with personal protective equipment;

$И$ - the cost of unscheduled briefings.

The cost of unscheduled briefings includes the cost of labor of the personnel conducting the briefing and the employees being briefed:

$$И = \left(\frac{ЗП_И^М}{ОЧ_И^М} + \frac{ЗП_И^М}{ОЧ_И^М} \right) \cdot t \quad (9)$$

where $ЗП_{и}^{м}$ и $ЗП_{и}^{м}$ - is the actual accrued salary of the instructor and the instructed hired worker for the month when the briefing was conducted;

$ОЧ_{и}^{м}$ и $ОЧ_{и}^{м}$ - is the number of hours worked by the instructor and the instructed i-th employee in the month when the instruction was given;

t - the time spent on the briefing.

The equipment that broke down as a result of the breakdown was rented for 320,000 rubles, the salary of the substitute worker was 65,000 rubles per month, and the cost of unscheduled training cost 910 rubles then:

$$П_4 = 320\,000 + 1{,}3 \cdot (0 + 0 + 65\,000) + 1{,}3 \cdot 910 = 405\,410\ руб.$$

5. Costs of accident investigation

The costs of the investigation of the accident *P5* include the costs of providing the work of the commission members (ОК), payment for the work of experts ($ОТ_{э}$) and expert examinations (FE), travel expenses of managers of various management levels for participation in investigations and checks in the units where severe and fatal accidents occurred (КР):

$$П_5 = ОК + k \cdot ОТ_{Э} + КР \quad (10)$$

$$П_5 = 30\,000 + 1{,}3 \cdot 42\,000 + 25\,000 = 109\,600\ руб.$$

6. Costs of implementing measures aimed at preventing accidents at work, based on the results of the investigation

The costs of implementing measures aimed at preventing occupational accidents, based on the results of the investigation ($П_6$) include the cost of unscheduled briefings for employees (И); cost of elimination of causes of production accidents, i.e. rearrangement of workplaces, purchase and installation of protective devices, etc. ($ЛП_{нс}$); court expenses and expenses for legal services (СИ):

$$П_6 = И + ЛП_{НС} + СИ \quad (11)$$

$$И = \left(\sum_{i=1}^{n} \frac{ЗП_{И}^{М}}{ОЧ_{И}^{М}} + \frac{ЗП_{И}^{М}}{ОЧ_{И}^{М}} \right) \cdot t \quad (12)$$

where n - the number of employees present at the briefing

Then the cost of instructing and installing a warning sign will be:

$$П_6 = 10\,500 + 5\,000 + 45\,000 = 60\,500\ руб.$$

7. Costs associated with treatment and rehabilitation of the victim

$$П_7 = ДМВ_n + ЗО_{МОП} \quad (13)$$

where $ДВМ_n$ - additional payments to the victim of an industrial accident to pay for medical procedures, treatment, medicines and other expenses stipulated by the collective agreement or industry agreement (in addition to receiving appropriate compensation from the Russian Federation Social Insurance Fund);

$ЗО_{моп}$- the organization's costs associated with the organization of medical support for injured workers (providing specialized medical care to the injured, the delivery of the injured to medical centers, etc.).

$$П_7 = 13\,000 + 10\,000 = 23\,000 руб.$$

8. Costs associated with the transfer of the injured person to a lighter (lower-paid) job

With this injury, physical activity (physical work) is prohibited, so there are no costs in this part.

9. Additional payments and expenses related to the place where the accident occurred

In this case, the benefits and costs are zero because the accident was not fatal.

10. Wages not paid to the injured person

Wages and salaries not paid to the injured person, including insurance premiums thereon, are to be deducted from costs and losses:

$$П_{10} = k \cdot НЗП_n \quad (14)$$

where$НЗП_n$ - wages unpaid to the injured person:

$$НЗП_n = В_n : 730 \cdot Д_{ВНТ} \quad (15)$$

where $В_n$ - is the victim's salary for the two preceding years;

$Д_{внт}$ - the number of days of temporary disability.

$$П_{10} = 1{,}3 \cdot (84\,000 : 730 \cdot 33) = 49\,364 руб.$$

11. Contingent losses of production (added value of lost products and services) due to stoppage of the production process and temporary or permanent withdrawal of an employee from the production process as a result of an accident or exacerbation of an occupational disease*.

Conditional loss of production (added value of lost products and services) due to the stoppage of the production process and temporary or permanent withdrawal of an employee from the production process as a result of an accident or exacerbation of an occupational disease ($П_{11}$) is composed of:

– conditional losses of production associated with minor accidents and cases of temporary disability due to exacerbation of occupational diseases, in which

no replacement of the employee is carried out, and there are no employees duplicating the functions of the injured (sick) (UP_1 =0).

– conditional losses of production associated with severe accidents at work or fatal accidents at work, in which the workplace of the victim remains vacant for some time (UP):2

$$УП_2 = \frac{\left(Д_В + \left(1 - ОЧ_П / ДРП_П\right)\right)}{365} \cdot ПТ \quad (16)$$

E_B - the number of calendar days during which the injured person's job remained vacant;

PT - added value of products and services per one employee of the core staff:

$$ПТ = ДСП / ЧЗ \quad (17)$$

where CPD is the annual value added of products and services;

CZ - average headcount of the core staff

Then:

$$УП_2 = \frac{\left(1 + \left(1 - 1/6\right)\right)}{365} \cdot \frac{4360000000}{9500} = 19\ 070\ руб.$$

– conditional losses of production associated with the performance of the function of the victim by the duplicate staff in the presence of employees who can perform the duplicate functions of the victim, but not during the entire period of absence of the victim from the workplace (UP). 3

$$УП_3 = УП_2 = 19\ 070\ руб.$$

– conditional losses of production due to diversion from work because of an accident at work or exacerbation of occupational disease of other workers (UP): 4

$$УП_4 = \frac{\sum_{i=1}^{n} Доп_i}{365} \cdot ПТ \quad (18)$$

Где $Доп_i$- the time during which *i-employee* was diverted from work due to an accident at work or exacerbation of an occupational disease, in calendar days.

n - the number of employees diverted from their main job.

$$П_{11} = УП_1 + УП_2 + УП_3 + УП_4 \quad (19)$$

$$П_{11} = 0 + 19070 + 19070 + 32426 = 70567\ руб.$$

12. Financial losses associated with the payment of penalties imposed on the legal entity (organization) for violations of labor legislation that led to the accident ($П_{12}$)

The fine for the lack of a warning sign was 50,000 rubles.

$$П_{12} = 50\ 000 руб.$$

13. Financial losses associated with the payment of penalties for late delivery of manufactured products or services as a result of an accident and exacerbation of an employee's occupational disease ($П_{13}$).

The delivery time was broken. $П_{13} = 0$

14. Possible indirect financial losses of the organization related to the implementation of the legislation of the Russian Federation on compulsory social insurance against accidents at work.

Possible indirect financial losses associated with the implementation of the legislation of the Russian Federation on compulsory social insurance against accidents at work are formed from losses associated with a reduction in the amount of funds that can be used to finance preventive measures to reduce occupational injuries at the expense of amounts of insurance contributions, and losses associated with the establishment of discounts and premiums to insurance rates:

$$ФС_{фссРФ} = П_{фпм.фссРФ} + Н_{ДСТ} - С_{КСТ} \quad (20)$$

where$ФС_{фссРФ}$- financial losses associated with the implementation of the legislation of the Russian Federation on compulsory social insurance against accidents at work;

$П_{фпм.фссРФ}$ - losses associated with a reduction in the amount of funds from the amount of the insurance premium, which can be allocated to finance preventive measures;

$Н_{дст}$- premium to the insurance rate in value terms, set for the following year after the reporting year;

$С_{кст}$- discount to the insurance rate in value terms, set for the next year after the reporting year.

$$П_{фпм.фссРФ} = ВП_{фссРФ} \cdot k_{фсс} \quad (21)$$

where$ВП_{фссРФ}$- the employer's expenditures on insurance coverage for victims of accidents at work on insured accidents in the reporting year;

$k_{фсс}$ - the coefficient approved in the FSS RF budget.

$$П_{фпм.фссРФ} = 60\ 000 \cdot 0{,}2 = 12\ 000\ руб.$$

$$ФС_{фссРФ} = 12\ 000 + 0 - 2\ 400 = 14\ 400 руб.$$

15. The size of the organization's economic losses from occupational injuries.

Defined as the sum of losses for all accidents that occurred in the reporting year; financial losses associated with the specifics of social insurance against accidents at work, and financial losses of the organization associated with the implementation of the legislation of the Russian Federation on compulsory insurance of civil liability of the owner of a hazardous facility for causing harm as a result of an accident at a hazardous facility:

$$ЭП = \sum_{i=1}^{k} П_{ij} + ФП_{ФССРФ} \quad (22)$$

where ЭП - annual economic losses of the organization from occupational injuries;

$П_{ij}$ - costs and losses on j -th item i The -th accident;

k - Number of occupational accidents

$$ЭП = 86\,250 + 73\,500 + 84\,000 + 405\,410 + 109\,600 + 60\,500 +$$
$$+ 23\,000 + 0 + 0 + 49\,364 + 70\,567 + 50\,000 + 0 + 14\,400 = 1\,026\,592\ руб.$$

1.9 Equipment valuation

The cost of purchasing and installing VR equipment for 5 users can vary depending on many factors, such as the brand and model of the equipment, the desired features and capabilities, and the location in Russia. Here is an example of calculating the purchase of VR equipment by Oculus Rift S for a group of trainees consisting of 5 employees.

The VR equipment set includes:

VR headset (80 thousand rubles)

Computer or laptop with sufficient performance (90 thousand rubles)

Additional equipment: motion controllers, trackers, headphones. (40 thousand rubles.)

Thus, a total estimate of the cost of buying and installing VR equipment for 5 users can be about 1,050 thousand rubles.

The Russian Federation has a mechanism for reimbursing the costs of providing safe working conditions from the insurance fund. According to current legislation, employers are obliged to create and maintain safe working conditions for their employees. However, if it is necessary to perform large-scale safety measures related to repair, modernization or construction of facilities, employers can receive reimbursement of costs from the social insurance fund.

To receive compensation, employers must apply to a territorial body of the Pension Fund of the Russian Federation and submit relevant documents confirming the fact

and scope of security measures taken. It is important to note that insurance payments are made only if there is an insurance policy, which is concluded with the employer. The amount of compensation is determined based on the volume and complexity of the work performed, as well as their compliance with labor safety requirements.

According to the rules for financial support of preventive measures to reduce occupational injuries and occupational diseases of employees and health resort treatment of employees engaged in work with harmful and (or) dangerous production factors, approved by Order of the Ministry of Labor of Russia of 14.07.2021 № 467 companies are entitled to reimbursement of the cost of purchasing individual devices, devices, equipment and (or) sets (systems) of devices, equipment, directly providing training on the The amount of reimbursement is 20% of the costs incurred. Thus, the actual costs of providing the practical part of the training will be:

$$П_{ФОМС} = 1050000 - 20\% = 840000 = 840\,тыс.руб.$$

In this regard, the implementation of preventive measures through the training of employees on the developed program "Safe methods and techniques of work on the basis of the risk-based approach" demonstrates cost-effectiveness.

Conclusion

According to the annual report of Rostechnadzor for 2021, there is a downward trend in fatal occupational injuries in the oil and gas production industry, as evidenced by the graph of the dynamics of accidents and fatal occupational injuries at oil and gas production facilities.

Analysis of the causes of accidents and injuries at facilities supervised by Rostechnadzor allowed us to identify two main interrelated problems affecting the state of safety:

1. unsatisfactory organization of production processes;
2. conscious disregard for mandatory requirements and elementary safety rules by employees.

The international scientific community distinguishes stages of industrial safety development, which include the application of technical and organizational measures, production control, safety culture and adaptation to external conditions. At the moment many domestic companies are at the stage of application of production control, but effective impact on the underlying cause of industrial injuries, determined by the conscious neglect of safety rules, is possible only through the development of safety culture. A safety culture is the collective thinking, values, beliefs and behavior of people in an organization regarding safety, where the implementation of safe work practices is a conscious decision on the part of employees

The last decades in the field of occupational safety have been characterized by an active tendency to implement a risk-oriented approach. The global health and safety community has come to the conclusion that achieving zero accidents, incidents and injuries is unattainable. The optimal solution is to deal with existing risks that can no longer be eliminated or minimized.

Moreover, the basic principle of the risk-oriented approach is the belief that ensuring safe working conditions is the responsibility not only of the OHS specialist, but equally of the employee. Thus, effective implementation and application of the risk-oriented approach within the framework of occupational safety is possible only with the direct participation of employees.

The main international standard is ISO 45001, which previously was a recommendation. After the entry into force of GOST R ISO 45001-2020 "National Standard of the Russian Federation. Occupational Safety and Health Management Systems. Requirements and Guidance for Use" the implementation of the risk-oriented approach became mandatory.

The oil and gas sector is characterized by increased danger. A significant number of hazardous production facilities in operation pose a direct threat to employee safety. In this regard, it is especially important to ensure the safety of personnel.

As part of this project the company OOO "Gazprom Dobycha Orenburg", which produces, stores and transports hydrocarbon products, was selected. The **BCS** shop was selected as the input data, because its workplaces of this section are characterized by the highest **WCC**, as well as a high frequency of injuries compared to all divisions.

Within the framework of the performance of the EWC the program "Safe methods and techniques of work performance on the basis of risk-oriented approach" was developed, the main purpose of which is to form the skill of employees to apply risk-oriented approach in the implementation of daily work processes. The lecture part contributes to familiarization with the principles of risk-oriented approach, as well as with the elements of the risk management cycle. The practical part with the use of VR contributes to the formation of skills.

After receiving training, employees are required to maintain occupational risk maps in conjunction with OHS specialists. This format allows you to visualize the risks, arrange them in a hierarchy, and is convenient for working together.

Research shows that educating workers about safety and gaining practical skills helps embed safe behavior in the workplace and make it a habit. In addition, shifting responsibility for safe working conditions not only to safety professionals, but also to the workers themselves leads to greater responsibility. If an injury occurs, the worker also bears part of the responsibility, and this prevents a situation where one person could be blamed. This distribution of responsibility encourages workers to choose the safest way to perform their jobs. As a result, the human element, which is one of the main causes of injuries in the workplace, is reduced, leading to an overall decrease in injuries.

The developed program can become a new tool in the area of ensuring safe working conditions in the GDO. Approval of the program leads to modernization of the existing local documentation, namely regulations on the occupational safety management system, job descriptions, occupational safety training plans, and professional training documents.

The economic effect of other companies in the application of cultural safety as one of the main aspects of the production process is also considered. In addition to the obvious elimination of the costs of reorganization work due to accidents and incidents, companies acquire additional income in the form of investment, which is an undeniable advantage of this method of organizing work in the field of health and safety.

List of references

Aburumman, Mohammed/Newnam, Sharon/Fildes, Brian (2019): Evaluating the effectiveness of workplace interventions in improving safety culture: A systematic review. In: Safety Science, 115, 376–392.

Adams, Nicholas Norman (2022): Examining oilmen's notions of 'fatherhood masculinity' as a pathway to understand increased offshore oilfield safety behaviours. In: Safety Science, 145, 105501.

Antonsen, Stian/Nilsen, Marie/Almklov, Petter G. (2017): Regulating the intangible. Searching for safety culture in the Norwegian petroleum industry. In: Safety Science, 92, 232–240.

Anwar, Zain/Mustafa, Atif/Ali, Muhammad (2019): Appraisal of process safety management practices in refining sector of Pakistan. In: Process Safety and Environmental Protection, 128, 36–40.

Anyfantis, I.D./Leka, S./Reniers, G./Boustras, G. (2021): Employers' perceived importance and the use (or non-use) of workplace risk assessment in micro-sized and small enterprises in Europe with focus on Cyprus. In: Safety Science, 139, 105256.

Arikan, Feyzan/Sozen, Songul K. (2021): A Hierarchical Solution Approach for Occupational Health and Safety Inspectors' Task Assignment Problem. In: Safety and Health at Work, 12 (2), 154–166.

Asare-Doku, Winifred/James, Carole/Rich, Jane Louise/Amponsah-Tawiah, Kwesi/Kelly, Brian (2022): "Mental health is not our core business": A qualitative study of mental health supports in the Ghanaian mining industry. In: Safety Science, 145, 105484.

Ayob, Aida Normardiana/Che Hassan, Che Rosmani/Hamid, Mahar Diana (2022): Safety culture maturity measurement methods: A systematic literature review. In: Journal of Loss Prevention in the Process Industries, 80, 104910.

Badri, Adel/Boudreau-Trudel, Bryan/Souissi, Ahmed Saâdeddine (2018): Occupational health and safety in the industry 4.0 era: A cause for major concern? In: Safety Science, 109, 403–411.

Bianchini, Augusto/Donini, Filippo/Pellegrini, Marco/Saccani, Cesare (2017): An innovative methodology for measuring the effective implementation of an Occupational Health and Safety Management System in the European Union. In: Safety Science, 92, 26–33.

Çalış, Serenay/Küçükali, Ufuk Fatih (2019): The Work Safety Culture as a Subculture: The Structure of Work Safety Culture in Turkey. In: Procedia Computer Science, 3rd WORLD CONFERENCE ON TECHNOLOGY, INNOVATION AND ENTREPRENEURSHIP"INDUSTRY 4.0 FOCUSED INNOVATION, TECHNOLOGY, ENTREPRENEURSHIP AND MANUFACTURE" June 21-23, 2019, 158, 546–551.

Castellucci, Héctor Ignacio/Viviani, Carlos/Hernández, Paulina/Bravo, Gonzalo/Martínez, Marta/Ibacache, Jaime/Bartsch, Ángelo (2021): Developing countries and the use of ISO Standard 11228-3 for risk management of Work-Related Musculoskeletal Disorders of the Upper Limbs (WRMSDs-ULs): The case of Chile. In: Applied Ergonomics, 96, 103483.

Claxton, Garry/Hosie, Peter/Sharma, Piyush (2022): Toward an effective occupational health and safety culture: A multiple stakeholder perspective. In: Journal of Safety Research, 82, 57–67.

Cooper, M. Dominic (2019): The efficacy of industrial safety science constructs for addressing serious injuries & fatalities (SIFs). In: Safety Science, 120, 164–178.
Cooper, M.D./Collins, M./Bernard, R./Schwann, S./Knox, R.J. (2019): Criterion-related validity of the cultural web when assessing safety culture. In: Safety Science, 111, 49–66.
Coulson, Nancy/Christofides, Nicola Joan (2020): Worker health and safety representatives on South African mines: A compassionate voice in the face of employer dominance and health complexity. In: The Extractive Industries and Society, 7 (1), 161–169.
Cunningham, Thomas R./Guerin, Rebecca J./Keller, Brenna M./Flynn, Michael A./Salgado, Cathy/Hudson, Dennis (2018): Differences in safety training among smaller and larger construction firms with non-native workers: Evidence of overlapping vulnerabilities. In: Safety Science, 103, 62–69.
da Silva, Sabrina Letícia Couto/Amaral, Fernando Gonçalves (2019): Critical factors of success and barriers to the implementation of occupational health and safety management systems: A systematic review of literature. In: Safety Science, 117, 123–132.
Dekker, Sidney W.A./Breakey, Hugh (2016): 'Just culture:' Improving safety by achieving substantive, procedural and restorative justice. In: Safety Science, 85, 187–193.
Derdowski, Lukasz Andrzej/Mathisen, Gro Ellen (2023): Psychosocial factors and safety in high-risk industries: A systematic literature review. In: Safety Science, 157, 105948.
Erten, Begüm/Oral, Bülent/Ya**WCC**, Melik Ziya (2022): The role of virtual and augmented reality in occupational health and safety training of employees in PV power systems and evaluation with a sustainability perspective. In: Journal of Cleaner Production, 379, 134499.
Ezerins, Maira E./Ludwig, Timothy D./O'Neil, Tara/Foreman, Anne M./Açıkgöz, Yalçın (2022): Advancing safety analytics: A diagnostic framework for assessing system readiness within occupational safety and health. In: Safety Science, 146, 105569.
Fraser, Jocelyn (2021): Mining companies and communities: Collaborative approaches to reduce social risk and advance sustainable development. In: Resources Policy, 74, 101144.
Gao, Yuan/Fan, Yunxiao/Wang, Jing/Li, Xi/Pei, Jingjing (2019): The mediating role of safety management practices in process safety culture in the Chinese oil industry. In: Journal of Loss Prevention in the Process Industries, 57, 223–230.
Ge, Ji/Xu, Kaili/Zheng, Xin/Yao, Xiwen/Xu, Qingwei/Zhang, Bohan (2019): The main challenges of safety science. In: Safety Science, 118, 119–125.
Goldberg, David M. (2022): Characterizing accident narratives with word embeddings: Improving accuracy, richness, and generalizability. In: Journal of Safety Research, 80, 441–455.
Guennoc, Fanny/Chauvin, Christine/Le Coze, Jean-Christophe (2019): The activities of occupational health and safety specialists in a high-risk industry. In: Safety Science, 112, 71–80.
İnan, Umut Hulusi/Gül, Sait/Yılmaz, Hafize (2017): A multiple attribute decision model to compare the firms' occupational health and safety management perspectives. In: Safety Science, 91, 221–231.

Ismail, Siti Noraishah/Ramli, Azizan/Aziz, Hanida Abdul (2021): Influencing factors on safety culture in mining industry: A systematic literature review approach. In: Resources Policy, 74, 102250.
Jääskeläinen, Aki/Tappura, Sari/Pirhonen, Julius (2022): The path toward successful safety performance measurement. In: Journal of Safety Research.
Javanmardi Kashan, Alireza/Wiewiora, Anna/Mohannak, Kavoos (2021): Unpacking organisational culture for innovation in Australian mining industry. In: Resources Policy, 73, 102149.
Jenke, Tanya/Boylan, Jessica L./Beatty, Shelley/Ralph, Martin/Chaplyn, Andrew/Penney, Greg/Cattani, Marcus (2022): Fatality risk management: Applying Quinlan's Ten Pathways in Western Australia's mining industry. In: Safety Science, 146, 105494.
Jenke, Tanya/Oosthuizen, Jacques/Cattani, Marcus (2021): An investigation of the influence of economic cycles on safety performance in Western Australia. In: Safety Science, 138, 105230.
Jilcha, Kassu/Kitaw, Daniel (2017): Industrial occupational safety and health innovation for sustainable development. In: Engineering Science and Technology, an International Journal, 20 (1), 372–380.
Jonek-Kowalska, Izabela (2019): Consolidation as a risk management method in the lifecycle of a mining company: A novel methodological approach and evidence from the coal industry in Poland. In: Resources Policy, 60, 169–177.
Klein, Johannes/Käyhkö, Janina/Räsänen, Aleksi/Groundstroem, Fanny/Eilu, Pasi (2022): Climate risk perception, management, and adaptation in the Nordic mining sector. In: The Extractive Industries and Society, 10, 101092.
Konijn, Astrid M./Lay, A. Morgan/Boot, Cécile R.L./Smith, Peter M. (2018): The effect of active and passive occupational health and safety (OHS) training on OHS awareness and empowerment to participate in injury prevention among workers in Ontario and British Columbia (Canada). In: Safety Science, 108, 286–291.
Kruse, Travis/Veltri, Anthony/Branscum, Adam (2019): Integrating safety, health and environmental management systems: A conceptual framework for achieving lean enterprise outcomes. In: Journal of Safety Research, 71, 259–271.
La Fata, C.M./Giallanza, A./Micale, R./La Scalia, G. (2021): Ranking of occupational health and safety risks by a multi-criteria perspective: Inclusion of human factors and application of VIKOR. In: Safety Science, 138, 105234.
Le, Aurora B./Wong, Su-Wei/Lin, Hsien-Chang/Smith, Todd D. (2021): The association between union membership and perceptions of safety climate among US adult workers. In: Safety Science, 133, 105024.
Leuridan, Geoffrey (2020): Bridging the gap between culture and safety in a critical care context: The role of work debate spaces. In: Safety Science, 129, 104839.
Li, Xinze/Wu, Qingbai/Jin, Huijun (2022): New Methods for Predicting Strain Demand of Arctic Gas Pipelines across Permafrost under Frost Heave Displacement. In: Geofluids, 2022, e9094890. https://doi.org/10.1155/2022/9094890.
Liu, Ran/Liu, Zheng/Liu, Hu-Chen/Shi, Hua (2021): An improved alternative queuing method for occupational health and safety risk assessment and its application to construction excavation. In: Automation in Construction, 126, 103672.
Lööw, Joel/Nygren, Magnus (2019): Initiatives for increased safety in the Swedish mining industry: Studying 30 years of improved accident rates. In: Safety Science, 117, 437–446.

Madigan, Cassandra/Johnstone, Kelly/Way, Kïrsten A./Capra, Mike (2021): How do safety professionals' influence managers within organizations? – A critical incident approach. In: Safety Science, 144, 105478.
Madigan, Cassandra/Way, Kïrsten/Capra, Mike/Johnstone, Kelly (2020): Influencing organizational decision-makers – What influence tactics are OHS professionals using? In: Safety Science, 121, 496–506.
Méndez Rivero, Fabrizio/Padrosa, Eva/Utzet, Mireia/Benach, Joan/Julià, Mireia (2021): Precarious employment, psychosocial risk factors and poor mental health: A cross-sectional mediation analysis. In: Safety Science, 143, 105439.
Moore, Libby L./Wurzelbacher, Steven J./Chen, I.-Chen/Lampl, Michael P./Naber, Steven J. (2022): Reliability and validity of an employer-completed safety hazard and management assessment questionnaire. In: Journal of Safety Research, 81, 283–296.
Nadalin, Victoria/Mustard, Cameron/Smith, Peter M. (2021): The Impact of Adverse Employment and Working Conditions on the Risk of Workplace Injury in Canada. In: Safety and Health at Work, 12 (4), 471–478.
Nilsen, Marie/Kongsvik, Trond (2023): Health, Safety, and Well-Being in Platform-Mediated Work – A Job Demands and Resources Perspective. In: Safety Science, 163, 106130.
Noraishah Ismail, Siti/Ramli, Azizan/Abdul Aziz, Hanida (2021): Research trends in mining accidents study: A systematic literature review. In: Safety Science, 143, 105438.
Nwankwo, Chizaram D./Theophilus, Stephen C./Arewa, Andrew O. (2020): A comparative analysis of process safety management (PSM) systems in the process industry. In: Journal of Loss Prevention in the Process Industries, 66, 104171.
Omidi, Leila/Dolatabad, Khadijeh Mostafaee/Pilbeam, Colin (2023): Differences in perception of the importance of process safety indicators between experts in Iran and the West. In: Journal of Safety Research, 84, 261–272.
Patriarca, R./Falegnami, A./De Nicola, A./Villani, M.L./Paltrinieri, N. (2019): Serious games for industrial safety: An approach for developing resilience early warning indicators. In: Safety Science, 118, 316–331.
Peace, Christopher/Lamm, Felicity/Dearsly, Greg/Parkes, Helen (2019): The evolution of the OHS profession in New Zealand. In: Safety Science, 120, 254–262.
Pohlmeyer, Florian/Kins, Ruben/Cloppenburg, Frederik/Gries, Thomas (2022): Interpretable failure risk assessment for continuous production processes based on association rule mining. In: Advances in Industrial and Manufacturing Engineering, 5, 100095.
Pryor, Pam (2019): Developing the core body of knowledge for the generalist OHS professional. In: Safety Science, 115, 19–27.
Rae, Andrew/Provan, David/Aboelssaad, Hossam/Alexander, Rob (2020): A manifesto for Reality-based Safety Science. In: Safety Science, 126, 104654.
Renecle, Michelle/Curcuruto, Matteo/Gracia Lerín, Francisco Javier/Tomás Marco, Inés (2021): Enhancing safety in high-risk operations: A multilevel analysis of the role of mindful organising in translating safety climate into individual safety behaviours. In: Safety Science, 138, 105197.
Saracino, A./Antonioni, G./Spadoni, G./Guglielmi, D./Dottori, E./Flamigni, L./Malagoli, M./Pacini, V. (2015): Quantitative assessment of occupational

safety and health: Application of a general methodology to an Italian multi-utility company. In: Safety Science, 72, 75–82.
Sarkheil, Hamid (2021): Risk and incident analysis on key safety performance indicators and anomalies feedback in south pars gas complex. In: Results in Engineering, 9, 100210.
Schulman, Paul R. (2020): Organizational structure and safety culture: Conceptual and practical challenges. In: Safety Science, 126, 104669.
Schwatka, Natalie V./Goldenhar, Linda M./Johnson, Stefanie K. (2020): Change in frontline supervisors' safety leadership practices after participating in a leadership training program: Does company size matter? In: Journal of Safety Research, 74, 199–205.
Schwatka, Natalie V./Goldenhar, Linda M./Johnson, Stefanie K./Beldon, Marissa A./Tessler, Jamie/Dennerlein, Jack T./Fullen, Mark/Trieu, Hao (2019): A training intervention to improve frontline construction leaders' safety leadership practices and overall jobsite safety climate. In: Journal of Safety Research, 70, 253–262.
Scislewski, Alexandro/Zuddas, Pierpaolo (2013): Risk Evaluation of Uranium Mining: A New Kinetic Approach. In: Procedia Earth and Planetary Science, Proceedings of the Fourteenth International Symposium on Water-Rock Interaction, WRI 14, 7, 778–781.
Semenova, Tatyana/Al-Dirawi, Ali/Al-Saadi, TaHPFen (2022): Environmental Challenges for Fragile Economies: Adaptation Opportunities on the Examples of the Arctic and Iraq. In: Agronomy, 12 (9), 2021.
Shenoy, Erica S./Weber, David J. (2021): Occupational Health Update: Approach to Evaluation of Health Care Personnel and Preexposure Prophylaxis. In: Infectious Disease Clinics of North America, Infection Prevention and Control in Healthcare, Part I: Facility Planning, 35 (3), 717–734.
Stefana, Elena/Ustolin, Federico/Paltrinieri, Nicola (2022): IMPROSafety: A risk-based framework to integrate occupational and process safety. In: Journal of Loss Prevention in the Process Industries, 75, 104698.
Stransky, Jeffrey/Bodnar, Cheryl/Bassett, Landon/Cooper, Matthew/Anastasio, Daniel/Burkey, Daniel (2023): Engineering process safety research instrument: Assessing students' moral reasoning in process safety contexts. In: Education for Chemical Engineers, 42, 44–53.
Tappura, Sari/Jääskeläinen, Aki/Pirhonen, Julius (2022): Creation of satisfactory safety culture by developing its key dimensions. In: Safety Science, 154, 105849.
Tawfik, Daniel S./Adair, Kathryn C./Palassof, Sofia/Sexton, J. Bryan/Levoy, Emily/Frankel, Allan/Leonard, Michael/Proulx, Joshua/Profit, Jochen (2023): Leadership Behavior Associations with Domains of Safety Culture, Engagement, and Health Care Worker Well-Being. In: The Joint Commission Journal on Quality and Patient Safety, 49 (3), 156–165.
Taylor, Edward L. (2015): Safety benefits of mandatory OSHA 10h training. In: Safety Science, 77, 66–71.
Tedonchio, Christian Tiaya/Nadeau, Sylvie/Boton, Conrad/Rivest, Louis (2022): Digital mock-ups as support tools for preventing risks related to energy sources in the operation stage of industrial facilities through design. In: Results in Engineering, 16, 100690.

Tetzlaff, Emily J./Goggins, Katie A./Pegoraro, Ann L./Dorman, Sandra C./Pakalnis, Vic/Eger, Tammy R. (2021): Safety Culture: A Retrospective Analysis of Occupational Health and Safety Mining Reports. In: Safety and Health at Work, 12 (2), 201–208.

Tremblay, Alec/Badri, Adel (2018): Assessment of occupational health and safety performance evaluation tools: State of the art and challenges for small and medium-sized enterprises. In: Safety Science, 101, 260–267.

Trianni, Andrea/Cagno, Enrico/Neri, Alessandra/Howard, Mickey (2019): Measuring industrial sustainability performance: Empirical evidence from Italian and German manufacturing small and medium enterprises. In: Journal of Cleaner Production, 229, 1355–1376.

van Nunen, Karolien/Li, Jie/Reniers, Genserik/Ponnet, Koen (2018): Bibliometric analysis of safety culture research. In: Safety Science, 108, 248–258.

Vierendeels, Geert/Reniers, Genserik/van Nunen, Karolien/Ponnet, Koen (2018): An integrative conceptual framework for safety culture: The Egg Aggregated Model (TEAM) of safety culture. In: Safety Science, 103, 323–339.

Vukadinovic, Saveta/Macuzic, Ivan/Djapan, Marko/Milosevic, Marko (2019): Early management of human factors in lean industrial systems. In: Safety Science, 119, 392–398.

Zhang, Jiangshi/Fu, Jing/Hao, Hongyu/Fu, Gui/Nie, Fangchao/Zhang, Wenyue (2020): Root causes of coal mine accidents: Characteristics of safety culture deficiencies based on accident statistics. In: Process Safety and Environmental Protection, 136, 78–91.

Abrosimova, Victoria Eduardovna/Khachatryan, Grigor Tigranovich/Melnikova, Daria Aleksandrovna/Yagovkin, German Nikolaevich (2019): Organization of Production Control in Oil and Gas Industry Enterprises. In : Electronic Scientific Journal Oil and Gas Business, (5).

Alekseev, I.N./Terekhov, A.L. (2018): Review and analysis of methods for assessing professional and technogenic risks in domestic and international practice in the oil and gas industry. In : Gas Industry, (10(775)), 82–89.

Balovtsev, Sergey Vladimirovich / Vorobyeva, Oksana Vladimirovna (2017): Improving the Production Control System is the Key to the Success of a Mining Enterprise. In : Mining Newsletter (Scientific and Technical Journal), (2).

Bochovsky, A . (2020): Improving health and safety risk management. In : Naukovy V i nik of the National Geological University , 2020 (4).

Gvozdkova, T.N./Gvozdkova, I.D./Tyuleneva, T.A./Usova, E.O. (2020): Issues of improving the production control of coal mining enterprises with an underground mining method. In : Coal, (9 (1134)).

Gelmanova, Z.S./Bazarov, B.A./Mezentseva, A.V./Konakbaeva, A.N./Toleshov, A.K. (2021): Management of occupational safety at mining enterprises in Kazakhstan. In : Mining information and analytical bulletin (scientific and technical journal), (2–1), 184–198.

Gontarenko, A.F./Klovach, E.V. (2017): On improving approaches to the training and certification of employees of organizations operating in the field of industrial safety. In : Occupational Safety in Industry, (3).

Gusev, A.I./Kovalev, M.N. (2003): Improvement of the Industrial Safety Assurance System. In : Occupational Safety in Industry, (12).

Zavyalova, Alena Olegovna (2019): Ensuring Occupational Safety at a Mining Enterprise. In : Gaudeamus Igitur , (4).

Mashkin, A.L./Gogolina, E.S./Kazitskaya, N.V./Dreitsen, M.N. (2019): Economic efficiency of measures in the field of life safety. In : Proceedings of the All-Russian Scientific and Practical Conference "Science and Society", (10–2), 121–125.

Ovchinnikova, T.I./Pototsky, E.P./Firsova, V.M. (2021): A risk-based approach to hazard assessment in mining. In : Mining information and analytical bulletin (scientific and technical journal), (2–1), 199–208.

Patsin, D.V. (2017): Modern problems of Russian legislation in the field of industrial safety. 106–109.

Savon, Savon (2018): Modern approaches to the industrial safety system at coal mines. In : Mining information and analytical bulletin (scientific and technical journal), (11), 227–235.

Skakalskaya, I.G./Valeeva, V.N. (2013): Problems of technological modernization and industrial safety of oil and gas processing industries. In : Bulletin of the Kazan Technological University, 16 (22), 274–276.

Smirnyakov, V./Kargopolov, P./Smirnyakova, V./Kabanov, E./Almosova, Ya. (2022): Risk-based approach as a tool for improving the quality of training and development of suek-kuzbass staff. In : Mining information and analytical bulletin (scientific and technical journal), (6–1), 214–229.

Sugak, Evgeniy Viktorovich (2022): Modern Problems of Technospheric Security in Russia. 5–85.

Trifonov, V.A./Verzhansky, A.P./Zamriy, A.V./Rusetsky, R.A. (2020): The current state of industrial safety at manufacturing enterprises. In : Mining, (2).

Tubdenov, Vladislav Germanovich (2018): Topical issues of legal support of industrial safety of mining companies in the oil and gas complex. In : Legal Energy Forum, (1).

Fedosov, A.V./Zakirova, Z.A./Abdrakhimova, I.R. (2018): Prospects for the Application of a Risk-Based Approach in the Field of Industrial Safety. In : Electronic Scientific Journal Oil and Gas Business, (1).

Filin, Alexander Eduardovich (2016): Prospects for ensuring the safety of mining. In : News of Higher Educational Institutions. Mining Journal, (5).

5 List of Figures

6 List of Tables

7 List of Abbreviations

OOO GDO	OOO Gazprom dobycha Orenburg
OOGCF	Orenburg oil and gas condensate field
BCS	Booster compressor station
GPP	Gas processing plant
GFD	Gas Field Department
OHSMS	Industrial Safety Management System
OSHA	Office of Safety and Health Administration
ES	Emergency situation
HPF	Hazardous production facility
PPE	Personal protective equipment
WCC	Working conditions class

8 Annex Table of Contents

Annex

Annex 1: Training program "Safe methods and techniques of performing work based on the use of a risk-oriented approach"

1. General provisions

Training under the program "Safe methods and techniques for performing work based on the application of a risk-based approach" is a specialized process for obtaining knowledge, skills and abilities in the field of labor protection by employees of Gazprom dobycha Orenburg LLC (hereinafter referred to as GDO LLC) and refers to preventive labor protection measures aimed at preventing industrial injuries and occupational diseases, as well as reducing their consequences. This program was developed in accordance with the Rules for training in labor protection and testing knowledge of labor protection requirements, approved by Decree of the Government of the Russian Federation dated December 24, 2021 No. 2464, taking into account the specifics of the plant.

The training program contains information about the topics of training, practical exercises, forms of training, forms of knowledge testing, as well as the number of hours allotted for studying each topic, performing practical exercises and testing knowledge of labor protection requirements.

2. Audience category

Training under the program "Safe methods and techniques for performing work based on the application of a risk-based approach" is held:

- heads of departments (departments, workshops, sectors) and their deputies;
- section chiefs);
- senior masters, masters;
- specialists;
- employees;
- workers of working professions.

3. Duration, timing and frequency of training

The total duration of the program "Safe methods and techniques for performing work based on the application of a risk-based approach" is 14 hours. Planned training under this

program is carried out once every three years.

Training is carried out within 60 calendar days for newly hired employees after the conclusion of an employment contract and for employees transferred to another job, from the date of their personnel transfer.

Re-training and knowledge testing are not required if, when transferring an employee who has completed training to another position, as well as changing the name of his workplace or structural unit, he retains working conditions and previously identified sources of danger.

4. Form of study

Training of employees is carried out off-the-job, both in full-time format and using distance technologies, e-learning systems, including the participation of students in Internet conferences, webinars, as well as using a virtual reality system as part of the practical part of the training.

5. Conditions for the implementation of the program

the Safe Work Practices and Risk-Based Practices training program :

1. a classroom for organizing full-time learning (or other premises suitable for administering the learning process in the case of using distance technologies and an e-learning system);
2. computer;
3. projector;
4. access to the information and telecommunications network "Internet";
5. access to the internal local network;
6. access to the internal system of electronic (distance) learning;
7. access to the library of normative documents, the study of which is aimed at training;
8. educational materials (presentations, videos, memos, instructions, checklists, etc.);
9. materials for testing knowledge of labor protection requirements (description of practical tasks, cases, tests);

10. VR hardware and software.

6. Purpose and planned learning outcomes

The purpose of the training is to form the knowledge, skills and abilities of employees to safely perform work when exposed to harmful and (or) dangerous production factors, sources of danger identified in the framework of a special assessment of working conditions and occupational risk assessment.

After completing the training, employees **should know:**

1) types of harmful (dangerous) production factors;

2) causes of hazards in the workplace during the performance of work, in case of an emergency (emergency) situation;

3) occupational diseases, injuries arising from exposure to danger;

4) the procedure for identifying (identifying) hazards at workplaces in relation to the objects of study - types of work, workplaces (work areas), by profession, structural divisions and the territory of the plant as a whole;

5) rules for collecting information for finding and recognizing hazards;

6) sources of information to identify (identify) hazards;

7) the composition of regulatory legal acts and other documents for analysis in order to identify (identify) hazards;

8) methods to reduce the risk of the impact of hazards on the health of the worker.

should be able to:

1) collect the initial information necessary for finding and recognizing hazards;

2) identify hazards at their workplaces (in work areas);

3) assess the level of risk of identified (identified) hazards in the workplace;

4) apply preventive measures that reduce the risk of hazards affecting the health of the worker.

7. Forms of knowledge testing

The training ends with a knowledge test. Determination of the quality of knowledge learned and acquired by an employee during training under the program " Safe methods and techniques for performing work based on the use of a risk-based approach " is carried out using VR equipment and software.

Knowledge testing consists in simulating the workflow in three modes: regular, non-standard and emergency. Each mode contains 3 cases of danger, which requires management actions on the part of the employee. The reduction or minimization of each hazard is worth 1 point. The maximum number of points is 9.

An employee who has shown unsatisfactory knowledge (less than 7 points) as part of the knowledge test of labor protection requirements is not allowed to independently perform work duties and is sent for a re-test of knowledge of labor protection requirements within 30 calendar days. The results of checking the knowledge of the labor protection requirements of employees after the completion of the training are documented in a protocol for testing knowledge of the labor protection requirements. The protocol for checking the knowledge of the labor protection requirements of employees can be drawn up on paper or in electronic form and is evidence that the employee has received the appropriate training in labor protection.

8. Thematic plan

No. p / p	Name of sections and topics	Number of hours
Lecture part		
1	Regulatory framework for the application of a risk-based approach in the Russian Federation	1
2	Basic concepts of a risk-based approach	1
3	Hazard classification. Identification of harmful and (or) hazardous production factors in the workplace	1
4	Assessment of the level of occupational risk of identified (identified) hazards	2
5	Risk management methods: Development of measures to reduce the levels of professional risks	2
6	Safe working methods and practices	2
7	Familiarization with the working method of the working tool	2
	Check of knowledge	1
Practical part		
1	Practicing with a working tool	2
2	Risk management in normal, abnormal and emergency situations	2
3	Check of knowledge	2
	Total	18

9. Program content

LECTURE PART

Topic 1. Regulatory framework for applying a risk-based approach in the Russian Federation

State regulatory requirements in the application of a risk-based approach in the field of health and safety. Requirements in the scope of the risk-based approach, established by local regulations.

Decree of the Government of the Russian Federation of August 17, 2016 N 806 "On the application of a risk-based approach when organizing certain types of state control (supervision) and amending certain acts of the Government of the Russian Federation" (with amendments and additions). ISO 45001:2018 Occupational health and safety management systems. Requirements and guidelines for use. GOST R ISO 45001-2020 “Occupational safety and health management systems. Requirements and guidelines for use. Order of the Ministry of Labor of Russia dated January 31, 2022 No. 36 " Recommendations for the classification, detection, recognition and description of hazards ". The Ministry of Labor and Social Protection of the Russian Federation order of December 28, 2021 N 926 "On the approval of the Recommendations for the choice of methods for assessing the levels of occupational risks and for reducing the levels of such risks ". Interstate standard GOST 12.0.003-2015 “System of labor safety standards. Dangerous and harmful production factors. Classification" .

Topic 2. Basic concepts of a risk-based approach

Definition of terms: "Labor protection", "Working conditions", "Harmful (dangerous) production factor", "Safe working conditions", "Occupational risk", "Danger", "Risk-based approach", "Safety culture", " Commitment to safe work practices.”

The main directions of state policy in the field of applying a risk-based approach to health and safety. The policy of Gazprom and OOO Gazprom dobycha Orenburg in the field of labor protection, industrial and fire safety, and traffic safety.

Determination of the goals and principle of applying the risk-based approach. Advantages and limitations of the risk-based approach.

Topic 3. Hazard classification. Identification of harmful and (or) hazardous production factors in the workplace

Order of the Ministry of Labor of Russia dated January 31, 2022 No. 36 " Recommendations for the classification, detection, recognition and description of hazards ". Interstate standard GOST 12.0.003-2015 “System of labor safety standards. Dangerous and harmful production factors. Classification" .

Classification of hazards by type of activity, depending on the causes of occurrence, by hazardous events due to exposure to hazards (occupational diseases, injuries).

Definition of "identification of hazards". Sources of information for the identification (identification) of hazards. Primary list (register) of hazards.

Topic 4. Assessment of the level of occupational risk of identified (identified) hazards

The Ministry of Labor and Social Protection of the Russian Federation order of December 28, 2021 N 926 "On the approval of the Recommendations for the choice of methods for assessing the levels of occupational risks and for reducing the levels of such risks ". GOST 12.0.230.5-2018 International standard SSBT , “From the Occupational Safety and Health Management System “Methods of risk assessment to ensure the safety of work performance” . GOST R 12.0.010-2009 National standard RF " SSBT . Occupational safety management systems. Identification of hazards and risk assessment»

Methods for assessing the levels of professional risks and for reducing the levels of such risks. Matrix method based on scoring.

Stages of evaluation by the matrix method:

1) Evaluation of the likelihood of a hazard
2) Assessment of the severity of the consequences
3) Determining the degree of risk

Topic 5. Risk management methods: Development of measures to reduce the levels of professional risks

The Ministry of Labor and Social Protection of the Russian Federation order of December 28, 2021 N 926 "On the approval of the Recommendations for the choice of methods for assessing the levels of occupational risks and for reducing the levels of such risks ".

Risk management methods: regular monitoring of working conditions, regular health monitoring, systematic informing employees about existing health risks, regular inspection and maintenance of equipment, preventive work to prevent accidents, communication and participation in risk management, use of PPE.

An approximate list of measures to improve working conditions and labor protection, eliminate and reduce occupational risks or prevent their increase in levels.

Topic 6. Safe methods and techniques for performing work

Labor protection rules. Labor protection instructions. Rules for conducting safety briefings at OOO Gazprom dobycha Orenburg. The procedure for monitoring compliance with the requirements of labor protection, fire and industrial safety. Algorithm of actions in case of an incident.

Topic 7. Familiarization with the principles of operation of the equipment and tools used in the work

Description of the machine/tool, scheme of the machine/tool, principle of operation, modes of operation, frequency of maintenance and repair. Examples of machine/tool malfunctions and typical symptoms of malfunctions. Troubleshooting methods. Regular, abnormal and emergency situations resulting from a breakdown of the installation / tool.

EXAMINATION QUESTIONS TO TEST KNOWLEDGE ON GENERAL QUESTIONS OF THE TRAINING PROGRAM "SAFE METHODS AND TECHNIQUES OF PERFORMING WORK BASED ON THE USE OF A RISK-ORIENTED APPROACH"

1) State the purpose of this program.
2) What is the principle of a risk-based approach?
3) What are the advantages and limitations of a risk-based approach?
4) What steps are you taking to assess risks in the workplace?
5) Name the types of hazard classification.
6) List the types of hazards you face in your workplace.

place.

7) What is the difference between "dangerous factor" and "harmful factor"?
8) State the purpose of hazard identification.
9) What is the purpose of occupational risk assessment.
10) State the purpose of occupational risk management.
11) Explain how to use the results of occupational risk assessment.
12) Name the stages of occupational risk assessment.
13) Name the sources of information for identifying hazards in the workplace.

place.

14) Tell us how to determine the level of risk of the impact of identified hazards on the health of an employee.
15) How do you prioritize workplace risk management?
16) What types of equipment do you consider the most dangerous in the workplace?
17) How do you prepare for possible emergencies in the workplace?
18) How do you make sure that all equipment in the workplace meets safety standards?
19) How do you assess the risks associated with a fire in the workplace?
20) What actions should be taken in the event of a fire in the workplace?
21) What safety measures do you take regarding the use of chemicals in the workplace?
22) Name the labor protection rules that guide you in your work: what risks they are designed to prevent / reduce.
23) State the purpose of safety instructions.
24) Tell us the rules for conducting briefings at Gazprom Dobycha Orenburg.
25) What are the types of control over compliance with labor protection requirements implemented in OOO Gazprom dobycha Orenburg?
26) Describe the course of action in case of an incident.
27) What are the security measures in identifying the dangers associated with the professional activities of the employee.
28) What are the safety measures in identifying the hazards associated with the organization of production activities at your workplace.
29) What are the security measures in identifying hazards that are not related to the professional activities of the employee and the organization of production activities at your workplace.
30) What are the security measures in identifying the dangers associated with the professional qualities of the employee.
31) List the safety precautions for identifying physical hazards.
32) List the safety precautions for identifying chemical hazards.
33) List the safety precautions for identifying ergonomic hazards.
34) What are the safety measures in identifying biological and natural hazards.

35) Tell us about the requirements for your workplace: what hygiene standards must be observed.

36) Tell us what means of collective and individual protection you need to use at your workplace and for what purpose.

37) Tell us what training programs an employee of your profession / position needs to go through.

38) Name the time frame in which the employee must complete training in labor protection.

39) Name (propose / develop) measures to prevent the impact of occupational risks on the health of an employee at your workplace.

40) Tell us about the measures for the prevention of infectious diseases transmitted by direct contact with a person, his blood and other biological fluids.

Annex 2: Occupational risk maps

Annex 2: Occupational risk card

Station master occupational risk map														
No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Map point name	**Structural subdivision**	**Work operation**	**Work operation place**	**Operating mode**	**Hazard type**	**Danger origin**	**Negative event**	**Danger cause**	**Dangerous conditions**	**Negative event consequences severity indicator**	**Negative event occurrence probability**	**Risk value**	**Occupational risk management measures**	**Responsibility for the implementation of risk treatment measures**
1.	GFD	Working with a PC	Office	Normal	Electricity	Electricity	electrical injury	Electrical fault	High humidity	1	4	4	Decommissioning of faulty electrical equipment; timely repair and maintenance of electrical equipment	Chief Engineer of the GFD
2.	GFD	Working with a PC	Office	Normal	Exposure to radiation (ionizing and non-ionizing)	Alpha -, beta radiation, electron or ion and neutron radiation	Manifestation of radiation sickness	Lack of organization or planning of work	-	5	1	5	Compliance with the regime of work and rest; alternation of types of work	Chief Engineer of the GFD
3.	GFD	Company transport	Production areas	Normal	Vehicle	Traffic accident	Injury	Non-observance of traffic rules	Low light	4	2	8	Admission to transportation of licensed transport organizations; observance of traffic rules; compliance with the Key Safety Rules of Gazprom;	Chief Engineer of the GFD

													use of seat belts.	
4.	GFD	Company transport	Production areas	Normal	Vehicle	Injuries while entering or exiting a vehicle	Bruises, fractures	Deterioration of the health status of the employee, untimely repair of roads, incomplete stop of the vehicle	Low light, slippery ground	4	2	8	Personal caution. Involvement of licensed organizations in transportation. Compliance with traffic rules (landing and disembarking only after a complete stop of the vehicle)	Chief Engineer of the GFD
5.	GFD	Movement on surfaces of the same level, stairs	Office, production areas	Normal	Slippery ground surfaces	Personal negligence	Falls, bruises	Non-compliance by workers with the requirements of warning and information signs	Low light	3	4	12	Personal caution; use of anti-slip floor coverings; timely cleaning of coatings (surfaces) exposed to environmental factors (snow, rain, dirt)	Chief Engineer of the GFD
6.	GFD	Fulfillment of official duties	Office, production areas	Normal	Exposure to microorganisms	Pathogenic microorganisms	Disease	Failure to comply with personal hygiene requirements by employees	High air temperature, high humidity	3	4	12	Compliance with OSH and sanitary requirements	Chief Engineer of the GFD
7.	GFD	Fulfillment of official duties	Office, production areas	Normal	Exposure to microorganisms	Seasonal viral infections	Disease	Microorganisms, including pathogens; Colleagues	Low air temperature, high humidity	3	4	12	Compliance with OSH and sanitary requirements	Chief Engineer of the GFD
8.	GFD	Fulfillment of official duties	Dining room	Normal	Exposure to microorganisms	Food poisoning	Gastrointestinal disorder	Lack of places to store food (refrigerators), use of low-quality products; unsanitary conditions of cooking places	Pulsation of the light flux, high air temperature, psycho-	5	2	10	Timely check of cooling installations serviceability ; cooking by an	Chief Engineer of the GFD

									emotional overload				organiza-tion that has the ap-propriate conclusi-ons, certifi-cates. Compliance with food storage rules. Com-pliance with the rules of personal hygiene	
9.	GFD	Fulfillment of official duties	Office	Normal	Physical factors	Low illumina-tion of the workplace	Eye diseas	Decreased visual acuity due to low workplace il-lumination	-	4	1	4	The use of additional lighting, ti-mely re-placement of lamps.	Chief Engi-neer of the GFD
10.	GFD	Fulfillment of official duties	Office	Normal	Physical factors	Increased pulsation of the light flux	Eye diseas	Power failure, lighting fai-lure	Noise, psycho-emotional overload, in-creased brightness of light	1	5	5	Timely check of serviceabi-lity of electrical networks, as well as lighting equipment	Chief Engi-neer of the GFD
11.	GFD	Fulfillment of official duties	Office	Normal	Physical factors	Increased light brightness	Eye diseas	Change in voltage in the electrical network, exce-eding the power of the power source	Noise, psycho-emotional overload, in-creased pulsation of the light flux	1	5	5	Timely check of serviceabi-lity of electrical networks, selection of lamps in accordance with the characteris-tics of electrical networks	Chief Engi-neer of the GFD
12.	GFD	Fulfillment of official duties	Office	Normal	Microclima-tic	High air tem-perature	Heat stroke, diz-ziness	Increased outdoor tem-perature	Psycho-emotional overload, noise, pulsation of the light flux	1	5	5	Checking the correct operation of ventilation systems; equipment of rooms	Chief Engi-neer of the GFD

													with air conditio-ners	
13.	GFD	Fulfillment of official duties	Office	Normal	Microclima-tic	Low air tem-perature	Dise-ase	Heating system failure	High humi-dity and air speed	1	5	5	Checking the correct operation of the heating system; equipment of rooms with air conditio-ners	Chief Engi-neer of the GFD
14.	GFD	Working with a PC	Office	Normal	Exposure to radiation (ionizing and non-io-nizing)	electromag-netic fields	Heada-che, diz-ziness, drowsi-ness, irritabi-lity	Violation of the regime of work and rest	Increased noise, light pulsation, high air temperature	1	5	5	Compliance with the re-gime of work and rest; alter-nation of ty-pes of work	Chief Engi-neer of the GFD
15.	GFD	Fulfillment of official duties	Office	Normal	Ergonomic	The monotony of labor	Fati-gue, stress	Psycho-emotional over-load	Noise, excess light	1	5	5	Compliance with the re-gime of work and rest; alter-nation of ty-pes of work; com-pliance with the ergono-mic charac-teristics of the work-place	Chief Engi-neer of the GFD
16.	GFD	Fulfillment of official duties	Office	Regular	Mechanical	A cut on body parts, inclu-ding the edge of a sheet of paper, a cleri-cal knife, scis-sors	Injury	Personal negligence	-	1	5	5	Personal caution	Chief Engi-neer of the GFD
17.	GFD	Fulfillment of official duties	Office	Abnormal	Microcli-mate	Low air speed	Diz-ziness, weakne ss, pal-pitati-ons, nausea	Ventilation system mal-function	Increased air tempera-ture, high humidity, bright pulsa-ting light	4	2	8	Timely re-pair and mainte-nance of the ventila-tion system	Chief Engi-neer of the GFD

18.	GFD	Fulfillment of official duties	Office, production areas	Abnormal	Wild or domestic animals	Animal, snake, insect bite	Disease	Damage to the integrity of the enclosing structures of the production area	low light	2	3	6	personal caution; placement of noise repellents and necessary equipment near premises with dangerous animals; placement of posters (tablets) with warning inscriptions.	Head of Security Department
19.	GFD	Fulfillment of official duties	Office	Abnormal	Violence from hostile workers	Inadequate behavior of personnel as a result of exposure to toxic, alcohol-containing drugs, a disease that affects the mental state	Injuries, diseases	Violation of the mode of operation of the breathalyzer, formal medical examination	Psycho-emotional overload	3	2	6	Passage of medical examinations, psychiatric examinations; competitive selection of employees; organization of video surveillance of the working area and alarm device ("panic buttons"); exclusion of unwanted contacts during the performance of work; training employees in methods of overcoming conflict situations.	Head of Security Department

20.	GFD	Fulfillment of official duties	Office	Emergency	Electricity	Sparks from static electricity buildup	Burn	Spark ignition fire	Increased air speed, shutdown of the ventilation system, lack of fire extinguishers	3	2	6	Decommissioning of faulty electrical equipment; timely repair and maintenance of electrical equipment; checking the correct operation of fire detectors, checking the availability and expiration date of fire extinguishers	Chief Maintenance Engineer
21.	GFD	Fulfillment of official duties	Office	Emergency	Violence from hostile workers/third parties	Terrorist attack	Injury, death	Unsatisfactory work of security services	-	5	1	5	Strengthening control at checkpoints; camera equipment; installation of emergency buttons for security services	Head of Security Department
22.	GFD	Fulfillment of official duties	Office	Emergency	Exposure to unclassified hazards	Fire	Burn	Indoor smoking	High air speed, no fire extinguisher, presence of flammable objects	4	2	8	Training employees in fire safety rules; placement of information stands; installation of video surveillance cameras; checking the correct operation of smoke sensors; checking the availability	Chief OT Engineer

													and expiration date of fire extinguishers	
23.	GFD	Fulfillment of official duties	Office	Emergency	Mechanical	Violation of the integrity of the pipe with hot water	Burn	Pipeline wear, corrosion	Electrical works	3	2	6	Timely repair and maintenance of water pipes	Chief engineer of the energy department

Deputy station master occupational risk map

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Map point name	**Structural subdivision**	**Work operation**	**Work operation place**	**Operating mode**	**Hazard type**	**Danger origin**	**Negative event**	**Danger cause**	**Dangerous conditions**	**Negative event consequences severity indicator**	**Negative event occurrence probability**	**Risk value**	**Occupational risk management measures**	**Responsibility for the implementation of risk treatment measures**
1.	GFD	Working with a PC	Office	Normal	Electricity	Electricity	electrical injury	Electrical fault	High humidity	1	4	4	Decommissioning of faulty electrical equipment; timely repair and maintenance of electrical equipment	Chief Engineer of the GFD
2.	GFD	Working with a PC	Office	Normal	Exposure to radiation (ionizing and non-ionizing)	Alpha -, beta radiation, electron or ion and neutron radiation	Manifestation of radiation sickness	Lack of organization or planning of work	-	5	1	5	Compliance with the regime of work and rest; alternation of types of work	Chief Engineer of the GFD
3.	GFD	Company transport	Production areas	Normal	Vehicle	Traffic accident	Injury	Non-observance of traffic rules	Low light	4	2	8	Admission to transportation of licensed transport organizations; observance of traffic rules; compliance with the Key Safety Rules of Gazprom; use of seat belts.	Chief Engineer of the GFD
4.	GFD	Company transport	Production areas	Normal	Vehicle	Injuries while entering or	Bruises,	Deterioration of the health status of the	Low light, slippery ground	4	2	8	Personal caution. Involvement	Chief Engineer of the GFD

						exiting a vehicle	fractures	employee, untimely repair of roads, incomplete stop of the vehicle					of licensed organizations in transportation. Compliance with traffic rules (landing and disembarking only after a complete stop of the vehicle)	
5.	GFD	Movement on surfaces of the same level, stairs	Office, production areas	Normal	Slippery ground surfaces	Personal negligence	Falls, bruises	Non-compliance by workers with the requirements of warning and information signs	Low light	3	4	12	Personal caution; use of anti-slip floor coverings; timely cleaning of coatings (surfaces) exposed to environmental factors (snow, rain, dirt)	Chief Engineer of the GFD
6.	GFD	Fulfillment of official duties	Office, production areas	Normal	Exposure to microorganisms	Pathogenic microorganisms	Disease	Failure to comply with personal hygiene requirements by employees	High air temperature, high humidity	3	4	12	Compliance with OSH and sanitary requirements	Chief Engineer of the GFD
7.	GFD	Fulfillment of official duties	Office, production areas	Normal	Exposure to microorganisms	Seasonal viral infections	Disease	Microorganisms, including pathogens; Colleagues	Low air temperature, high humidity	3	4	12	Compliance with OSH and sanitary requirements	Chief Engineer of the GFD
8.	GFD	Fulfillment of official duties	Dining room	Normal	Exposure to microorganisms	Food poisoning	Gastrointestinal disorder	Lack of places to store food (refrigerators), use of low-quality products; unsanitary conditions of cooking places	Pulsation of the light flux, high air temperature, psycho-emotional overload	5	2	10	Timely check of cooling installations serviceability ; cooking by an organization that has the appropriate conclusi-	Chief Engineer of the GFD

													ons, certificates. Compliance with food storage rules. Compliance with the rules of personal hygiene	
9.	GFD	Fulfillment of official duties	Office	Normal	Physical factors	Low illumination of the workplace	Eye diseas	Decreased visual acuity due to low workplace illumination	-	4	1	4	The use of additional lighting, timely replacement of lamps.	Chief Engineer of the GFD
10.	GFD	Fulfillment of official duties	Office	Normal	Physical factors	Increased pulsation of the light flux	Eye diseas	Power failure, lighting failure	Noise, psycho-emotional overload, increased brightness of light	1	5	5	Timely check of serviceability of electrical networks, as well as lighting equipment	Chief Engineer of the GFD
11.	GFD	Fulfillment of official duties	Office	Normal	Physical factors	Increased light brightness	Eye diseas	Change in voltage in the electrical network, exceeding the power of the power source	Noise, psycho-emotional overload, increased pulsation of the light flux	1	5	5	Timely check of serviceability of electrical networks, selection of lamps in accordance with the characteristics of electrical networks	Chief Engineer of the GFD
12.	GFD	Fulfillment of official duties	Office	Normal	Microclimatic	High air temperature	Heat stroke, dizziness	Increased outdoor temperature	Psycho-emotional overload, noise, pulsation of the light flux	1	5	5	Checking the correct operation of ventilation systems; equipment of rooms with air conditioners	Chief Engineer of the GFD

13.	GFD	Fulfillment of official duties	Office	Normal	Microclimatic	Low air temperature	Disease	Heating system failure	High humidity and air speed	1	5	5	Checking the correct operation of the heating system; equipment of rooms with air conditioners	Chief Engineer of the GFD
14.	GFD	Working with a PC	Office	Normal	Exposure to radiation (ionizing and non-ionizing)	electromagnetic fields	Headache, dizziness, drowsiness, irritability	Violation of the regime of work and rest	Increased noise, light pulsation, high air temperature	1	5	5	Compliance with the regime of work and rest; alternation of types of work	Chief Engineer of the GFD
15.	GFD	Fulfillment of official duties	Office	Normal	Ergonomic	The monotony of labor	Fatigue, stress	Psycho-emotional overload	Noise, excess light	1	5	5	Compliance with the regime of work and rest; alternation of types of work; compliance with the ergonomic characteristics of the workplace	Chief Engineer of the GFD
16.	GFD	Fulfillment of official duties	Office	Regular	Mechanical	A cut on body parts, including the edge of a sheet of paper, a clerical knife, scissors	Injury	Personal negligence	-	1	5	5	Personal caution	Chief Engineer of the GFD
17.	GFD	Fulfillment of official duties	Office	Abnormal	Microclimate	Low air speed	Dizziness, weakness, palpitations, nausea	Ventilation system malfunction	Increased air temperature, high humidity, bright pulsating light	4	2	8	Timely repair and maintenance of the ventilation system	Chief Engineer of the GFD
18.	GFD	Fulfillment of official duties	Office, production areas	Abnormal	Wild or domestic animals	Animal, snake, insect bite	Disease	Damage to the integrity of the enclosing structures of the production area	low light	2	3	6	personal caution; placement	Head of Security Department

													of noise repellents and necessary equipment near premises with dangerous animals; placement of posters (tablets) with warning inscriptions.	
19.	GFD	Fulfillment of official duties	Office	Abnormal	Violence from hostile workers	Inadequate behavior of personnel as a result of exposure to toxic, alcohol-containing drugs, a disease that affects the mental state	Injuries, diseases	Violation of the mode of operation of the breathalyzer, formal medical examination	Psycho-emotional overload	3	2	6	Passage of medical examinations, psychiatric examinations; competitive selection of employees; organization of video surveillance of the working area and alarm device ("panic buttons"); exclusion of unwanted contacts during the performance of work; training employees in methods of overcoming conflict situations.	Head of Security Department
20.	GFD	Fulfillment of official duties	Office	Emergency	Electricity	Sparks from static electricity buildup	Burn	Spark ignition fire	Increased air speed, shutdown of the ventilation system, lack of fire	3	2	6	Decommissioning of faulty electrical equipment;	Chief Maintenance Engineer

									extinguis-hers				timely re-pair and mainte-nance of electrical equipment; checking the correct operation of fire detec-tors, che-cking the availability and expira-tion date of fire extin-guishers	
21.	GFD	Fulfillment of official duties	Office	Emergen cy	Violence from hostile work-ers/third parties	Terrorist at-tack	Injury, death	Unsatisfactory work of security services	-	5	1	5	Strengthen-ing control at check-points; camera equipment; installation of emergency buttons for security services	Head of Security Department
22.	GFD	Fulfillment of official duties	Office	Emergen cy	Exposure to unclassi-fied ha-zards	Fire	Burn	Indoor smoking	High air speed, no fire extin-guisher, presence of flammable objects	4	2	8	Training employees in fire sa-fety rules; placement of informa-tion stands; installation of video surveillance cameras; checking the correct operation of smoke sen-sors; che-cking the availability and expira-tion date of fire extin-guishers	Chief OT Engineer

23.	GFD	Fulfillment of official duties	Office	Emergency	Mechanical	Violation of the integrity of the pipe with hot water	Burn	Pipeline wear, corrosion	Electrical works	3	2	6	Timely repair and maintenance of water pipes	Chief engineer of the energy department

Lead Process Engineer occupational risk map

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Map point name	**Structural subdivision**	**Work operation**	**Work operation place**	**Operating mode**	**Hazard type**	**Danger origin**	**Negative event**	**Danger cause**	**Dangerous conditions**	**Negative event consequences severity indicator**	**Negative event occurrence probability**	**Risk value**	**Occupational risk management measures**	**Responsibility for the implementation of risk treatment measures**
1.	GFD	Working with a PC	Office	Normal	Electricity	Electricity	electrical injury	Electrical fault	High humidity	1	4	4	Decommissioning of faulty electrical equipment; timely repair and maintenance of electrical equipment	Chief Engineer of the GFD
2.	GFD	Working with a PC	Office	Normal	Exposure to radiation (ionizing and non-ionizing)	Alpha -, beta radiation, electron or ion and neutron radiation	Manifestation of radiation sickness	Lack of organization or planning of work	-	5	1	5	Compliance with the regime of work and rest; alternation of types of work	Chief Engineer of the GFD
3.	GFD	Company transport	Production areas	Normal	Vehicle	Traffic accident	Injury	Non-observance of traffic rules	Low light	4	2	8	Admission to transportation of licensed transport organizations; observance of traffic rules; compliance with the Key Safety Rules of Gazprom; use of seat belts.	Chief Engineer of the GFD
4.	GFD	Company transport	Production areas	Normal	Vehicle	Injuries while entering or	Bruises,	Deterioration of the health status of the	Low light, slippery ground	4	2	8	Personal caution. Involvement	Chief Engineer of the GFD

						exiting a vehicle	fractures	employee, untimely repair of roads, incomplete stop of the vehicle					of licensed organizations in transportation. Compliance with traffic rules (landing and disembarking only after a complete stop of the vehicle)	
5.	GFD	Movement on surfaces of the same level, stairs	Office, production areas	Normal	Slippery ground surfaces	Personal negligence	Falls, bruises	Non-compliance by workers with the requirements of warning and information signs	Low light	3	4	12	Personal caution; use of anti-slip floor coverings; timely cleaning of coatings (surfaces) exposed to environmental factors (snow, rain, dirt)	Chief Engineer of the GFD
6.	GFD	Fulfillment of official duties	Office, production areas	Normal	Exposure to microorganisms	Pathogenic microorganisms	Disease	Failure to comply with personal hygiene requirements by employees	High air temperature, high humidity	3	4	12	Compliance with OSH and sanitary requirements	Chief Engineer of the GFD
7.	GFD	Fulfillment of official duties	Office, production areas	Normal	Exposure to microorganisms	Seasonal viral infections	Disease	Microorganisms, including pathogens; Colleagues	Low air temperature, high humidity	3	4	12	Compliance with OSH and sanitary requirements	Chief Engineer of the GFD
8.	GFD	Fulfillment of official duties	Dining room	Normal	Exposure to microorganisms	Food poisoning	Gastrointestinal disorder	Lack of places to store food (refrigerators), use of low-quality products; unsanitary conditions of cooking places	Pulsation of the light flux, high air temperature, psycho-emotional overload	5	2	10	Timely check of cooling installations serviceability ; cooking by an organization that has the appropriate conclusi-	Chief Engineer of the GFD

													ons, certificates. Compliance with food storage rules. Compliance with the rules of personal hygiene	
9.	GFD	Fulfillment of official duties	Office	Normal	Physical factors	Low illumination of the workplace	Eye diseas	Decreased visual acuity due to low workplace illumination	-	4	1	4	The use of additional lighting, timely replacement of lamps.	Chief Engineer of the GFD
10.	GFD	Fulfillment of official duties	Office	Normal	Physical factors	Increased pulsation of the light flux	Eye diseas	Power failure, lighting failure	Noise, psycho-emotional overload, increased brightness of light	1	5	5	Timely check of serviceability of electrical networks, as well as lighting equipment	Chief Engineer of the GFD
11.	GFD	Fulfillment of official duties	Office	Normal	Physical factors	Increased light brightness	Eye diseas	Change in voltage in the electrical network, exceeding the power of the power source	Noise, psycho-emotional overload, increased pulsation of the light flux	1	5	5	Timely check of serviceability of electrical networks, selection of lamps in accordance with the characteristics of electrical networks	Chief Engineer of the GFD
12.	GFD	Fulfillment of official duties	Office	Normal	Microclimatic	High air temperature	Heat stroke, dizziness	Increased outdoor temperature	Psycho-emotional overload, noise, pulsation of the light flux	1	5	5	Checking the correct operation of ventilation systems; equipment of rooms with air conditioners	Chief Engineer of the GFD

13.	GFD	Fulfillment of official duties	Office	Normal	Microclimatic	Low air temperature	Disease	Heating system failure	High humidity and air speed	1	5	5	Checking the correct operation of the heating system; equipment of rooms with air conditioners	Chief Engineer of the GFD
14.	GFD	Working with a PC	Office	Normal	Exposure to radiation (ionizing and non-ionizing)	electromagnetic fields	Headache, dizziness, drowsiness, irritability	Violation of the regime of work and rest	Increased noise, light pulsation, high air temperature	1	5	5	Compliance with the regime of work and rest; alternation of types of work	Chief Engineer of the GFD
15.	GFD	Fulfillment of official duties	Office	Normal	Ergonomic	The monotony of labor	Fatigue, stress	Psycho-emotional overload	Noise, excess light	1	5	5	Compliance with the regime of work and rest; alternation of types of work; compliance with the ergonomic characteristics of the workplace	Chief Engineer of the GFD
16.	GFD	Fulfillment of official duties	Office	Regular	Mechanical	A cut on body parts, including the edge of a sheet of paper, a clerical knife, scissors	Injury	Personal negligence	-	1	5	5	Personal caution	Chief Engineer of the GFD
17.	GFD	Fulfillment of official duties	Office	Abnormal	Microclimate	Low air speed	Dizziness, weakness, palpitations, nausea	Ventilation system malfunction	Increased air temperature, high humidity, bright pulsating light	4	2	8	Timely repair and maintenance of the ventilation system	Chief Engineer of the GFD
18.	GFD	Fulfillment of official duties	Office, production areas	Abnormal	Wild or domestic animals	Animal, snake, insect bite	Disease	Damage to the integrity of the enclosing structures of the production area	low light	2	3	6	personal caution; placement	Head of Security Department

													of noise repellents and necessary equipment near premises with dangerous animals; placement of posters (tablets) with warning inscriptions.	
19.	GFD	Fulfillment of official duties	Office	Abnormal	Violence from hostile workers	Inadequate behavior of personnel as a result of exposure to toxic, alcohol-containing drugs, a disease that affects the mental state	Injuries, diseases	Violation of the mode of operation of the breathalyzer, formal medical examination	Psycho-emotional overload	3	2	6	Passage of medical examinations, psychiatric examinations; competitive selection of employees; organization of video surveillance of the working area and alarm device ("panic buttons"); exclusion of unwanted contacts during the performance of work; training employees in methods of overcoming conflict situations.	Head of Security Department
20.	GFD	Fulfillment of official duties	Office	Emergency	Electricity	Sparks from static electricity buildup	Burn	Spark ignition fire	Increased air speed, shutdown of the ventilation system, lack of fire	3	2	6	Decommissioning of faulty electrical equipment;	Chief Maintenance Engineer

									extinguis-hers				timely re-pair and mainte-nance of electrical equipment; checking the correct operation of fire detec-tors, che-cking the availability and expira-tion date of fire extin-guishers	
21.	GFD	Fulfillment of official duties	Office	Emergen cy	Violence from hostile work-ers/third parties	Terrorist at-tack	Injury, death	Unsatisfactory work of security services	-	5	1	5	Strengthen-ing control at check-points; camera equipment; installation of emergency buttons for security services	Head of Security Department
22.	GFD	Fulfillment of official duties	Office	Emergen cy	Exposure to unclassi-fied ha-zards	Fire	Burn	Indoor smoking	High air speed, no fire extin-guisher, presence of flammable objects	4	2	8	Training employees in fire sa-fety rules; placement of informa-tion stands; installation of video surveillance cameras; checking the correct operation of smoke sen-sors; che-cking the availability and expira-tion date of fire extin-guishers	Chief OT Engineer

23.	GFD	Fulfillment of official duties	Office	Emergency	Mechanical	Violation of the integrity of the pipe with hot water	Burn	Pipeline wear, corrosion	Electrical works	3	2	6	Timely repair and maintenance of water pipes	Chief engineer of the energy department

Process Engineer occupational risk map

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Map point name	**Structural subdivision**	**Work operation**	**Work operation place**	**Operating mode**	**Hazard type**	**Danger origin**	**Negative event**	**Danger cause**	**Dangerous conditions**	**Negative event consequences severity indicator**	**Negative event occurrence probability**	**Risk value**	**Occupational risk management measures**	**Responsibility for the implementation of risk treatment measures**
1.	GFD	Working with a PC	Office	Normal	Electricity	Electricity	electrical injury	Electrical fault	High humidity	1	4	4	Decommissioning of faulty electrical equipment; timely repair and maintenance of electrical equipment	Chief Engineer of the GFD
2.	GFD	Working with a PC	Office	Normal	Exposure to radiation (ionizing and non-ionizing)	Alpha -, beta radiation, electron or ion and neutron radiation	Manifestation of radiation sickness	Lack of organization or planning of work	-	5	1	5	Compliance with the regime of work and rest; alternation of types of work	Chief Engineer of the GFD
3.	GFD	Company transport	Production areas	Normal	Vehicle	Traffic accident	Injury	Non-observance of traffic rules	Low light	4	2	8	Admission to transportation of licensed transport organizations; observance of traffic rules; compliance with the Key Safety Rules of Gazprom;	Chief Engineer of the GFD

													use of seat belts.	
4.	GFD	Company transport	Production areas	Normal	Vehicle	Injuries while entering or exiting a vehicle	Bruises, fractures	Deterioration of the health status of the employee, untimely repair of roads, incomplete stop of the vehicle	Low light, slippery ground	4	2	8	Personal caution. Involvement of licensed organizations in transportation. Compliance with traffic rules (landing and disembarking only after a complete stop of the vehicle)	Chief Engineer of the GFD
5.	GFD	Movement on surfaces of the same level, stairs	Office, production areas	Normal	Slippery ground surfaces	Personal negligence	Falls, bruises	Non-compliance by workers with the requirements of warning and information signs	Low light	3	4	12	Personal caution; use of anti-slip floor coverings; timely cleaning of coatings (surfaces) exposed to environmental factors (snow, rain, dirt)	Chief Engineer of the GFD
6.	GFD	Fulfillment of official duties	Office, production areas	Normal	Exposure to microorganisms	Pathogenic microorganisms	Disease	Failure to comply with personal hygiene requirements by employees	High air temperature, high humidity	3	4	12	Compliance with OSH and sanitary requirements	Chief Engineer of the GFD
7.	GFD	Fulfillment of official duties	Office, production areas	Normal	Exposure to microorganisms	Seasonal viral infections	Disease	Microorganisms, including pathogens; Colleagues	Low air temperature, high humidity	3	4	12	Compliance with OSH and sanitary requirements	Chief Engineer of the GFD
8.	GFD	Fulfillment of official duties	Dining room	Normal	Exposure to microorganisms	Food poisoning	Gastrointestinal disorder	Lack of places to store food (refrigerators), use of low-quality products; unsanitary conditions of cooking places	Pulsation of the light flux, high air temperature, psycho-	5	2	10	Timely check of cooling installations serviceability ; cooking by an	Chief Engineer of the GFD

									emotional overload				organiza-tion that has the ap-propriate conclusi-ons, certifi-cates. Compliance with food storage rules. Com-pliance with the rules of personal hygiene	
9.	GFD	Fulfillment of official duties	Office	Normal	Physical factors	Low illumina-tion of the workplace	Eye diseas	Decreased visual acuity due to low workplace il-lumination	-	4	1	4	The use of additional lighting, ti-mely re-placement of lamps.	Chief Engi-neer of the GFD
10.	GFD	Fulfillment of official duties	Office	Normal	Physical factors	Increased pulsation of the light flux	Eye diseas	Power failure, lighting fai-lure	Noise, psycho-emotional overload, in-creased brightness of light	1	5	5	Timely check of serviceabi-lity of electrical networks, as well as lighting equipment	Chief Engi-neer of the GFD
11.	GFD	Fulfillment of official duties	Office	Normal	Physical factors	Increased light brightness	Eye diseas	Change in voltage in the electrical network, excee-ding the power of the power source	Noise, psycho-emotional overload, in-creased pulsation of the light flux	1	5	5	Timely check of serviceabi-lity of electrical networks, selection of lamps in accordance with the characteris-tics of electrical networks	Chief Engi-neer of the GFD
12.	GFD	Fulfillment of official duties	Office	Normal	Microclima-tic	High air tem-perature	Heat stroke, diz-ziness	Increased outdoor tem-perature	Psycho-emotional overload, noise, pulsation of the light flux	1	5	5	Checking the correct operation of ventilation systems; equipment of rooms	Chief Engi-neer of the GFD

													with air conditio-ners	
13.	GFD	Fulfillment of official duties	Office	Normal	Microclima-tic	Low air tem-perature	Dise-ase	Heating system failure	High humi-dity and air speed	1	5	5	Checking the correct operation of the heating system; equipment of rooms with air conditio-ners	Chief Engi-neer of the GFD
14.	GFD	Working with a PC	Office	Normal	Exposure to radiation (ionizing and non-io-nizing)	electromag-netic fields	Heada-che, diz-ziness, drowsi-ness, irritabi-lity	Violation of the regime of work and rest	Increased noise, light pulsation, high air temperature	1	5	5	Compliance with the re-gime of work and rest; alter-nation of ty-pes of work	Chief Engi-neer of the GFD
15.	GFD	Fulfillment of official duties	Office	Normal	Ergonomic	The monotony of labor	Fati-gue, stress	Psycho-emotional over-load	Noise, excess light	1	5	5	Compliance with the re-gime of work and rest; alter-nation of ty-pes of work; com-pliance with the ergono-mic charac-teristics of the work-place	Chief Engi-neer of the GFD
16.	GFD	Fulfillment of official duties	Office	Regular	Mechanical	A cut on body parts, inclu-ding the edge of a sheet of paper, a cleri-cal knife, scis-sors	Injury	Personal negligence	-	1	5	5	Personal caution	Chief Engi-neer of the GFD
17.	GFD	Fulfillment of official duties	Office	Abnormal	Microcli-mate	Low air speed	Diz-ziness, weakne ss, pal-pitati-ons, nausea	Ventilation system mal-function	Increased air tempera-ture, high humidity, bright pulsa-ting light	4	2	8	Timely re-pair and mainte-nance of the ventila-tion system	Chief Engi-neer of the GFD

18.	GFD	Fulfillment of official duties	Office, production areas	Abnormal	Wild or domestic animals	Animal, snake, insect bite	Disease	Damage to the integrity of the enclosing structures of the production area	low light	2	3	6	personal caution; placement of noise repellents and necessary equipment near premises with dangerous animals; placement of posters (tablets) with warning inscriptions.	Head of Security Department
19.	GFD	Fulfillment of official duties	Office	Abnormal	Violence from hostile workers	Inadequate behavior of personnel as a result of exposure to toxic, alcohol-containing drugs, a disease that affects the mental state	Injuries, diseases	Violation of the mode of operation of the breathalyzer, formal medical examination	Psycho-emotional overload	3	2	6	Passage of medical examinations, psychiatric examinations; competitive selection of employees; organization of video surveillance of the working area and alarm device ("panic buttons"); exclusion of unwanted contacts during the performance of work; training employees in methods of overcoming conflict situations.	Head of Security Department

20.	GFD	Fulfillment of official duties	Office	Emergency	Electricity	Sparks from static electricity buildup	Burn	Spark ignition fire	Increased air speed, shutdown of the ventilation system, lack of fire extinguishers	3	2	6	Decommissioning of faulty electrical equipment; timely repair and maintenance of electrical equipment; checking the correct operation of fire detectors, checking the availability and expiration date of fire extinguishers	Chief Maintenance Engineer
21.	GFD	Fulfillment of official duties	Office	Emergency	Violence from hostile workers/third parties	Terrorist attack	Injury, death	Unsatisfactory work of security services	-	5	1	5	Strengthening control at checkpoints; camera equipment; installation of emergency buttons for security services	Head of Security Department
22.	GFD	Fulfillment of official duties	Office	Emergency	Exposure to unclassified hazards	Fire	Burn	Indoor smoking	High air speed, no fire extinguisher, presence of flammable objects	4	2	8	Training employees in fire safety rules; placement of information stands; installation of video surveillance cameras; checking the correct operation of smoke sensors; checking the availability	Chief OT Engineer

													and expiration date of fire extinguishers	
23.	GFD	Fulfillment of official duties	Office	Emergency	Mechanical	Violation of the integrity of the pipe with hot water	Burn	Pipeline wear, corrosion	Electrical works	3	2	6	Timely repair and maintenance of water pipes	Chief engineer of the energy department

Gas preparation foreman occupational risk map

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Map point name	**Structural subdivision**	**Work operation**	**Work operation place**	**Operating mode**	**Hazard type**	**Danger origin**	**Negative event**	**Danger cause**	**Dangerous conditions**	**Negative event consequences severity indicator**	**Negative event occurrence probability**	**Risk value**	**Occupational risk management measures**	**Responsibility for the implementation of risk treatment measures**
1.	GFD	Working with a PC	Office	Normal	Electricity	Electricity	electrical injury	Electrical fault	High humidity	1	4	4	Decommissioning of faulty electrical equipment; timely repair and maintenance of electrical equipment	Chief Engineer of the GFD
2.	GFD	Working with a PC	Office	Normal	Exposure to radiation (ionizing and non-ionizing)	Alpha -, beta radiation, electron or ion and neutron radiation	Manifestation of radiation sickness	Lack of organization or planning of work	-	5	1	5	Compliance with the regime of work and rest; alternation of types of work	Chief Engineer of the GFD
3.	GFD	Company transport	Production areas	Normal	Vehicle	Traffic accident	Injury	Non-observance of traffic rules	Low light	4	2	8	Admission to transportation of licensed transport organizations; observance of traffic rules; compliance with the Key Safety Rules of Gazprom; use of seat belts.	Chief Engineer of the GFD
4.	GFD	Company transport	Production areas	Normal	Vehicle	Injuries while entering or	Bruises,	Deterioration of the health status of the	Low light, slippery ground	4	2	8	Personal caution. Involvement	Chief Engineer of the GFD

						exiting a vehicle	fractures	employee, untimely repair of roads, incomplete stop of the vehicle					of licensed organizations in transportation. Compliance with traffic rules (landing and disembarking only after a complete stop of the vehicle)	
5.	GFD	Movement on surfaces of the same level, stairs	Office, production areas	Normal	Slippery ground surfaces	Personal negligence	Falls, bruises	Non-compliance by workers with the requirements of warning and information signs	Low light	3	4	12	Personal caution; use of anti-slip floor coverings; timely cleaning of coatings (surfaces) exposed to environmental factors (snow, rain, dirt)	Chief Engineer of the GFD
6.	GFD	Fulfillment of official duties	Office, production areas	Normal	Exposure to microorganisms	Pathogenic microorganisms	Disease	Failure to comply with personal hygiene requirements by employees	High air temperature, high humidity	3	4	12	Compliance with OSH and sanitary requirements	Chief Engineer of the GFD
7.	GFD	Fulfillment of official duties	Office, production areas	Normal	Exposure to microorganisms	Seasonal viral infections	Disease	Microorganisms, including pathogens; Colleagues	Low air temperature, high humidity	3	4	12	Compliance with OSH and sanitary requirements	Chief Engineer of the GFD
8.	GFD	Fulfillment of official duties	Dining room	Normal	Exposure to microorganisms	Food poisoning	Gastrointestinal disorder	Lack of places to store food (refrigerators), use of low-quality products; unsanitary conditions of cooking places	Pulsation of the light flux, high air temperature, psycho-emotional overload	5	2	10	Timely check of cooling installations serviceability ; cooking by an organization that has the appropriate conclusi-	Chief Engineer of the GFD

													ons, certificates. Compliance with food storage rules. Compliance with the rules of personal hygiene	
9.	GFD	Fulfillment of official duties	Office	Normal	Physical factors	Low illumination of the workplace	Eye diseas	Decreased visual acuity due to low workplace illumination	-	4	1	4	The use of additional lighting, timely replacement of lamps.	Chief Engineer of the GFD
10.	GFD	Fulfillment of official duties	Office	Normal	Physical factors	Increased pulsation of the light flux	Eye diseas	Power failure, lighting failure	Noise, psycho-emotional overload, increased brightness of light	1	5	5	Timely check of serviceability of electrical networks, as well as lighting equipment	Chief Engineer of the GFD
11.	GFD	Fulfillment of official duties	Office	Normal	Physical factors	Increased light brightness	Eye diseas	Change in voltage in the electrical network, exceeding the power of the power source	Noise, psycho-emotional overload, increased pulsation of the light flux	1	5	5	Timely check of serviceability of electrical networks, selection of lamps in accordance with the characteristics of electrical networks	Chief Engineer of the GFD
12.	GFD	Fulfillment of official duties	Office	Normal	Microclimatic	High air temperature	Heat stroke, dizziness	Increased outdoor temperature	Psycho-emotional overload, noise, pulsation of the light flux	1	5	5	Checking the correct operation of ventilation systems; equipment of rooms with air conditioners	Chief Engineer of the GFD

13.	GFD	Fulfillment of official duties	Office	Normal	Microclimatic	Low air temperature	Disease	Heating system failure	High humidity and air speed	1	5	5	Checking the correct operation of the heating system; equipment of rooms with air conditioners	Chief Engineer of the GFD
14.	GFD	Working with a PC	Office	Normal	Exposure to radiation (ionizing and non-ionizing)	electromagnetic fields	Headache, dizziness, drowsiness, irritability	Violation of the regime of work and rest	Increased noise, light pulsation, high air temperature	1	5	5	Compliance with the regime of work and rest; alternation of types of work	Chief Engineer of the GFD
15.	GFD	Fulfillment of official duties	Office	Normal	Ergonomic	The monotony of labor	Fatigue, stress	Psycho-emotional overload	Noise, excess light	1	5	5	Compliance with the regime of work and rest; alternation of types of work; compliance with the ergonomic characteristics of the workplace	Chief Engineer of the GFD
16.	GFD	Fulfillment of official duties	Office	Regular	Mechanical	A cut on body parts, including the edge of a sheet of paper, a clerical knife, scissors	Injury	Personal negligence	-	1	5	5	Personal caution	Chief Engineer of the GFD
17.	GFD	Fulfillment of official duties	Office	Abnormal	Microclimate	Low air speed	Dizziness, weakness, palpitations, nausea	Ventilation system malfunction	Increased air temperature, high humidity, bright pulsating light	4	2	8	Timely repair and maintenance of the ventilation system	Chief Engineer of the GFD
18.	GFD	Fulfillment of official duties	Office, production areas	Abnormal	Wild or domestic animals	Animal, snake, insect bite	Disease	Damage to the integrity of the enclosing structures of the production area	low light	2	3	6	personal caution; placement	Head of Security Department

													of noise repellents and necessary equipment near premises with dangerous animals; placement of posters (tablets) with warning inscriptions.	
19.	GFD	Fulfillment of official duties	Office	Abnormal	Violence from hostile workers	Inadequate behavior of personnel as a result of exposure to toxic, alcohol-containing drugs, a disease that affects the mental state	Injuries, diseases	Violation of the mode of operation of the breathalyzer, formal medical examination	Psycho-emotional overload	3	2	6	Passage of medical examinations, psychiatric examinations; competitive selection of employees; organization of video surveillance of the working area and alarm device ("panic buttons"); exclusion of unwanted contacts during the performance of work; training employees in methods of overcoming conflict situations.	Head of Security Department
20.	GFD	Fulfillment of official duties	Office	Emergency	Electricity	Sparks from static electricity buildup	Burn	Spark ignition fire	Increased air speed, shutdown of the ventilation system, lack of fire	3	2	6	Decommissioning of faulty electrical equipment;	Chief Maintenance Engineer

									extinguis-hers				timely re-pair and mainte-nance of electrical equipment; checking the correct operation of fire detec-tors, che-cking the availability and expira-tion date of fire extin-guishers	
21.	GFD	Fulfillment of official duties	Office	Emergen cy	Violence from hostile work-ers/third parties	Terrorist at-tack	Injury, death	Unsatisfactory work of security services	-	5	1	5	Strengthen-ing control at check-points; camera equipment; installation of emergency buttons for security services	Head of Security Department
22.	GFD	Fulfillment of official duties	Office	Emergen cy	Exposure to unclassi-fied ha-zards	Fire	Burn	Indoor smoking	High air speed, no fire extin-guisher, presence of flammable objects	4	2	8	Training employees in fire sa-fety rules; placement of informa-tion stands; installation of video surveillance cameras; checking the correct operation of smoke sen-sors; che-cking the availability and expira-tion date of fire extin-guishers	Chief OT Engineer

23.	GFD	Fulfillment of official duties	Office	Emergency	Mechanical	Violation of the integrity of the pipe with hot water	Burn	Pipeline wear, corrosion	Electrical works	3	2	6	Timely repair and maintenance of water pipes	Chief engineer of the energy department

Technological compressor operator occupational risk card

No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Map point name	**Structural subdivision**	**Work operation**	**Work operation place**	**Operating mode**	**Hazard type**	**Danger origin**	**Negative event**	**Danger cause**	**Dangerous conditions**	**Negative event consequences severity indicator**	**Negative event occurrence probability**	**Risk value**	**Occupational risk management measures**
1.	GFD	Painting work	BCS	Normal	Harmful chemicals in the air of the work area	Vapors, fine suspension of harmful liquids	Contact of the respiratory organs, mucous membranes with a polluted environment	Damage to the hazardous substance storage container	Increased air temperature, humidity, gas contamination, dustiness	2	4	8	Air control of the working area, the use of PPE, periodic induction; installation of local fans.
2.	GFD	Painting work	BCS	Normal	Harmful chemicals in the air of the work area	Vapors, fine suspension of harmful liquids	Skin diseases (dermatitis)	Evaporation of paint materials	Increased air temperature, humidity, gas contamination, dustiness	2	4	8	Air control of the working area, the use of PPE, periodic induction; installation of local fans.
3.	GFD	Work in a confined space during repair, maintenance, inspection of containers.	BCS	Normal	Toxic fumes	Flammable materials	Poisoning by gaseous products of combustion	Spill of flammable materials	The appearance of a spark	2	4	8	Hermetic packaging of flammable substances, the use of less toxic oils, the use of PPE; installation of local fans.
4.	GFD	Work in a confined space during repair, maintenance, inspection of containers	BCS	Normal	Toxic fumes	Flammable materials	Occupational diseases of a carcinogenic nature as a result of prolonged exposure to fumes on a worker	Lubrication of equipment with compressor oil	Increased indoor air temperature	2	4	8	Hermetic packaging of flammable substances, the use of less toxic oils, the use of PPE; installation of local fans.

5.	GFD	All processes	BCS	Normal	Presence of microorganism-producers in the environment	Bacterial or viral infections, infection transmission, fungal infections	Disease	Non-compliance with hygiene requirements, negligence of workers	High air temperature, humidity	2	4	8	Vaccination, memos, information stands, information letters, inductions, timely seeking medical help; compliance with the requirements of OSH and sanitary and hygienic requirements.
6.	GFD	All processes	Office, production areas	Normal	Exposure to microorganisms	Seasonal viral infections	Disease	Microorganisms, including pathogens	Low air temperature, high humidity	3	4	12	Compliance with OSH and sanitary requirements
7.	GFD	All processes	Dining room	Normal	Exposure to microorganisms	Food poisoning	Gastrointestinal disorder caused by the consumption of low-quality drinks or foods	Lack of places to store food), use of low-quality products; unsanitary conditions of places where food is cooked	Pulsation of the light flux, high air temperature, psycho-emotional overload	5	2	10	Timely check of serviceability of cooling installations; cooking by an organization that has the appropriate conclusions, certificates. Compliance with food storage rules. Compliance with the rules of personal hygiene
8.	GFD	Maintenance, repair of equipment, work on machines, work with hand tools	BCS	Normal	Aerosols of predominantly fibrogenic action	Inorganic dust	Damage to the respiratory and vision systems	Halting of the ventilation system, halting of the dust suppression mechanisms	High air temperature, humidity, gas contamination, harmful chemicals	2	4	8	Air control of the working area, the use of RPE and PPE; periodic induction; installation of local fans.
9.	GFD	All processes	BCS	Normal	Physical factors	Low light	Fall, injury	Halting of the lighting devices	High noise, vibration, gas pollution, dustiness, the presence of harmful chemicals	2	4	8	Installation of local lighting fixtures; monitoring the health of lighting equipment.
10.	GFD	All processes	BCS	Normal	Physical factors	Lack of natural light	Decreased performance, fatigue, drowsiness	Insufficient number of windows, cloudiness	Increased noise, psycho-emotional overload	1	5	5	Compliance with the regime of work and rest; alternating indoor and outdoor activities

11.	GFD	All processes	BCS	Normal	Micro-climatic	Temperature conditions (high temperature)	Overheating of the body, heat stroke	Climatic features of the region	High humidity, dust, high wind speed, vibration, spill of harmful chemicals	2	4	8	Compliance with the regime of work and rest; compliance with the drinking regime; air conditioning
12.	GFD	All processes	BCS	Normal	Micro-climatic	Temperature conditions (low temperature)	Frostbite of various parts of the body, flu	Climatic features of the region	High humidity, dust, high wind speed, vibration, spill of harmful chemicals	2	4	8	Breaks in work for heating, use of PPE; air conditioning
13.	GFD	All processes	BCS	Normal	Increased noise level and other adverse noise characteristics	Compressor	Diseases, hearing loss	Technological features of the compressor	Vibration	3	4	12	Use of PPE; preventive medical examinations to detect occupational diseases; limiting the time spent in the zone of increased noise; compliance with the requirements of the instructions for health and safety; compliance work and rest regimes
14.	GFD	All processes	BCS	Normal	Exposure to general vibration	Compressor	Occupational diseases of the nervous and musculoskeletal systems	The occurrence of general vibration during the operation of compressors	Intense noise	5	3	15	Vibration damping means application; systematic check of serviceability of means of vibration damping ; use of PPE; organization of mandatory work breaks
15.	GFD	Operation, maintenance, repair of electrical and power equipment	BCS	Normal	Electricity	Electrical equipment	Electrical injury	Electrical fault	High humidity	1	4	4	Decommissioning of faulty electrical equipment, timely repair and maintenance of electrical equipment , implementation of safety measures set forth in regulatory documents; use of PPE
16.	GFD	Operation, maintenance, repair of electrical and power equipment	BCS	Normal	Physical factors	Adverse events (light radiation of extreme intensity)	Burn, blurred vision	Hardware failure	Increased noise, vibration	2	3	6	Production control over the state of equipment of electrical installations; conducting inductions; use of PPE; equipping the danger zone with warning signs.
17.	GFD	Performing non-destructive testing	BCS	Normal	Physical factors	Radiation radiation	Radiation sickness	Violation of the operating mode of the X-ray machine	Increased noise, vibration	4	3	12	Implementation of production control over the state of equipment; conducting inductions; equipping

													the danger zone with warning signs.
18.	GFD	Maintenance of BCS equipment, repair of ventilation units	BCS	Normal	Height difference	Fall of a worker while working at height	Injury	Lack of safety fences, safety belts, insufficient strength and stability of the flooring, impaired coordination of the worker's movements	Poor lighting, slippery surfaces	3	4	12	Installation of anti-slip strips on inclined surfaces; use of handrails or OSH her supports; exclusion of foreign objects on the floor, their timely cleaning; use of safety harnesses; training employees to work at height; ensuring a sufficient level of illumination and contrast in the workplace; placement of marked fences and / or nOSH ices (signs, plates, announcements)
19.	GFD	Maintenance, repair of equipment, work on machines, repair of ventilation units	BCS	Normal	Mechanical	Sharp edges of equipment, tools	Cut, injury	Technological features of the equipment	Vibration, low light	2	4	8	Production control over the condition of equipment, tools, machines; use of PPE; use of safety signs; inductions.
20.	GFD	Working with hand tools (including pneumatic , electric, gasoline)	BCS	Normal	Movable parts of machines and mechanisms	Pneumatic grease gun	Injury	Malfunction of the applied equipment, non-use of PPE	Low light	2	4	8	Production control of the state of equipment, serviceability of tools, use of PPE, inductions
21.	GFD	Operation, maintenance, repair of pumping and compressor equipment	BCS	Normal	Movable parts of machines and mechanisms	Compressor equipment	Injury	Malfunction of the applied equipment, non-use of PPE	Low light	2	4	8	Production control of the state of equipment, serviceability of tools, use of PPE, inductions
22.	GFD	Performance of work during the operation, maintenance, repair of equipment, installations, work on machines, machines, mechanisms, installations	BCS	Normal	Movable parts of machines and mechanisms	Movable (stationary) parts of production equipment, machines, moving (stationary) products, blanks, materials	Injury due to pinching between parts of equipment, machines, products, workpieces, materials	Malfunction of the equipment used, non-use of PPE, lack of symbols	Low light	2	4	8	Permanent control by the person responsible for the performance of work over access to the place of work, to equipment, over the regime, over the provision of protective equipment, over the safe performance of work, the use of PPE, inductions

23.	GFD	All processes	BCS	Normal	Cargo moving to a height	Falling objects	Injury	Lack of signs, lack of equipment lock and safety fences	Vibration, low light	2	4	8	Production control over the condition of buildings, structures, expertise of industrial safety; periodic induction; use of PPE; control of the condition of lifting structures, load-handling devices, slings, inductions
24.	GFD	Transportation, waiting for transport provided by the employer, walking on sidewalks, roadsides	BCS	Normal	Vehicle	Road traffic accident	Injury	Inattention of participants in the accident, low lighting	Fog, slippery road, increased noise	4	2	8	Compliance with traffic rules, the order of the director of the GFD on the appointment of bus supervisors, the use of seat belts, personal caution, inductions, the prohibition of the use of personal vehicles for production and official purposes
25.	GFD	All processes	BCS	Normal	Violence from hostile workers	Inadequate behavior of personnel as a result of exposure to toxic, alcohol-containing drugs, a disease that affects the mental state.	Injuries	Violation of the mode of operation of the breathalyzer , formal medical examination	Vapors of toxic substances	3	2	6	Conducting medical examinations, psychiatric examinations. Competitive selection of employees, Organization of video surveillance of the working area and alarm device ("panic buttons"), Exclusion of unwanted contacts during the performance of work, Training of employees in methods of overcoming conflict situations.
26.	GFD	All processes	BCS	Normal	Wild or domestic animals	Behavioral reactions of animals, bite of an animal (insect, reptile, mammal), poisoning, infection	Injury, health disorder, infection, poisoning with waste products of microorganisms, death	Damage to the integrity of enclosing structures	Low lighting, vapors of toxic substances, increased noise, vibration	2	3	6	Personal care, placement of noise repellents and necessary equipment near premises with dangerous animals, placement of posters (tablets) with warning inscriptions .
27.	GFD	All processes	BCS	Normal	Slippery, icy, greasy , wet ground	Personal negligence	Injury	Non-compliance by workers with the requirements of warning and information signs, the Key Safety Rules of LCC Gazprom	Low light, vibration	3	4	12	Personal caution; use of anti-slip floor coverings; timely cleaning of surfaces exposed to environmental factors (snow, rain, dirt).

28.	GFD	All processes	BCS	Normal	Height difference	Personal negligence	Injury	Non-compliance by employees with the requirements of warning and information signs, the Key Safety Rules of LCC Gazprom	Low light, vibration	3	4	12	Personal caution; installation of anti-slip strips on inclined surfaces; use of handrails or other supports
29.	GFD	Compressor maintenance	BCS	Abnormal	Thermal	Compressor overheating	Burn	Compressor wear	Increased air temperature	3	4	12	Timely repair of equipment; use of PPE; target induction
30.	GFD	Work in a confined space during repair, maintenance, inspection of vessels, containers.	BCS	Abnormal	Harmful chemicals in the air of the work area	Compressor gas leak	Poisoning, health problems	Hose rupture	Increased air temperature, humidity, gas contamination, dustiness	2	4	8	Timely repair of equipment; use of PPE; targeted instruction; installation of gas sensors
31.	GFD	Work in a confined space during repair, maintenance, inspection of vessels, containers.	BCS	Abnormal	Harmful chemicals in the air of the work area	Oil leakage from the compressor system	Poisoning	Hose rupture	Increased air temperature, the appearance of a spark	2	4	8	Timely repair of equipment; use of PPE; targeted instruction; installation of gas sensors
32.	GFD	Work in a confined space during repair, maintenance, inspection of vessels, containers.	BCS	Abnormal	Harmful chemicals in the air of the work area	Freon leak from the compressor system	Poisoning, loss of consciousness, impaired health	Hose rupture	elevated air temperature,	2	4	8	Timely repair of equipment; use of PPE; targeted instruction; installation of gas sensors
33.	GFD	Work in a confined space during repair, maintenance, inspection of vessels, containers.	BCS	Abnormal	Harmful chemicals in the air of the work area	Gas leak from the pump system	Poisoning, health problems	Pump wear, corrosion	Increased air temperature, humidity, gas contamination, dustiness	2	4	8	Timely repair of equipment; use of PPE; targeted instruction; installation of gas sensors
34.	GFD	All processes	BCS	Emergency	Thermal	Fire	Burn, death	Compressor overheating	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire extinguishing equipment in the immediate vicinity of the compressor

35.	GFD	All processes	BCS	Emergency	Physical	Explosion	Trauma, death	Gas leak from compressor, pump	Violation of the ventilation system, the occurrence of a spark	5	1	5	Timely repair and maintenance of the compressor; timely repair and maintenance of the ventilation system; installation of gas sensors.
36.	GFD	All processes	BCS	Emergency	Thermal	Fire	Burn, death	Pump overheating	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire extinguishing equipment in the immediate vicinity of the pump
37.	GFD	All processes	BCS	Emergency	Thermal	Fire	Burn, death	Pipeline rupture due to loss of power supply to the pump	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire extinguishing equipment in the immediate vicinity of the pump
38.	GFD	All processes	BCS	Emergency	Physical	Explosion	Burn, death	Violation of the technology of working with the pump	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire extinguishing equipment in the immediate vicinity of the pump
39.	GFD	All processes	BCS	Emergency	Thermal	Fire	Burn, death	Pump overheating	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire extinguishing equipment in the immediate vicinity of the compressor

Process pump operator occupational risk card													
No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Map point name	Structural subdivision	Work operation	Work operation place	Operating mode	Hazard type	Danger origin	Negative event	Danger cause	Dangerous conditions	Negative event consequences severity indicator	Negative event occurrence probability	Risk value	Occupational risk management measures
1.	GFD	Painting work	BCS	Normal	Harmful chemicals in the air of the work area	Vapors, fine suspension of harmful liquids	Contact of the respiratory organs, mucous membranes with a polluted environment	Damage to the hazardous substance storage container	Increased air temperature, humidity, gas contamination, dustiness	2	4	8	Air control of the working area, the use of PPE, periodic induction; installation of local fans.
2.	GFD	Painting work	BCS	Normal	Harmful chemicals in the air of the work area	Vapors, fine suspension of harmful liquids	Skin diseases (dermatitis)	Evaporation of paint materials	Increased air temperature, humidity, gas contamination, dustiness	2	4	8	Air control of the working area, the use of PPE, periodic induction; installation of local fans.
3.	GFD	Work in a confined space during repair, maintenance, inspection of containers.	BCS	Normal	Toxic fumes	Flammable materials	Poisoning by gaseous products of combustion	Spill of flammable materials	The appearance of a spark	2	4	8	Hermetic packaging of flammable substances, the use of less toxic oils, the use of PPE; installation of local fans.
4.	GFD	Work in a confined space during repair, maintenance, inspection of containers	BCS	Normal	Toxic fumes	Flammable materials	Occupational diseases of a carcinogenic nature as a result of prolonged exposure to fumes on a worker	Lubrication of equipment with compressor oil	Increased indoor air temperature	2	4	8	Hermetic packaging of flammable substances, the use of less toxic oils, the use of PPE; installation of local fans.
5.	GFD	All processes	BCS	Normal	Presence of microorganism-	Bacterial or viral infections, infection	Disease	Non-compliance with hygiene requirements, negligence of workers	High air temperature, humidity	2	4	8	Vaccination, memos, information stands, information letters, inductions, timely seeking medical help; compliance with the requirements

					pro-ducers in the en-viron-ment	transmis-sion, fun-gal infec-tions							of OSH and sanitary and hygienic requirements.
6.	GFD	All processes	Office, produc-tion areas	Normal	Expo-sure to micro-orga-nisms	Seasonal viral in-fections	Disease	Microorganisms, including patho-gens	Low air tem-perature, high humidity	3	4	12	Compliance with OSH and sa-nitary requirements
7.	GFD	All processes	Dining room	Normal	Expo-sure to micro-orga-nisms	Food poi-soning	Gastrointesti-nal disorder caused by the consumption of low-quality drinks or foods	Lack of places to store food), use of low-quality products; unsa-nitary conditions of places where food is cooked	Pulsation of the light flux, high air tem-perature, psycho-emoti-onal overload	5	2	10	Timely check of serviceability of cooling installations; cooking by an organization that has the appropri-ate conclusions, certificates. Com-pliance with food storage rules. Compliance with the rules of per-sonal hygiene
8.	GFD	Maintenance, repair of equipment, work on ma-chines, work with hand tools	BCS	Normal	Aero-sols of predo-mi-nantly fibroge-nic ac-tion	Inorganic dust	Damage to the respiratory and vision systems	Halting of the ventilation sys-tem, halting of the dust supp-ression mecha-nisms	High air tem-perature, humidity, gas contamination, harmful che-micals	2	4	8	Air control of the working area, the use of RPE and PPE; periodic in-duction; installation of local fans.
9.	GFD	All processes	BCS	Normal	Physi-cal fac-tors	Low light	Fall, injury	Halting of the lighting devices	High noise, vibration, gas pollution, dus-tiness, the presence of harmful che-micals	2	4	8	Installation of local lighting fixtures; monitoring the health of lighting equipment.
10.	GFD	All processes	BCS	Normal	Physi-cal fac-tors	Lack of natural light	Decreased performance, fatigue, drowsiness	Insufficient num-ber of windows, cloudiness	Increased noise, psycho-emotional overload	1	5	5	Compliance with the regime of work and rest; alternating indoor and outdoor activities
11.	GFD	All processes	BCS	Normal	Micro-climatic	Tempera-ture con-ditions (high tem-perature)	Overheating of the body, heat stroke	Climatic features of the region	High humidity, dust, high wind speed, vibration, spill of harmful chemicals	2	4	8	Compliance with the regime of work and rest; compliance with the drinking regime; air conditioning

12.	GFD	All processes	BCS	Normal	Micro-climatic	Tempera-ture con-ditions (low tem-perature)	Frostbite of various parts of the body, flu	Climatic features of the region	High humidity, dust, high wind speed, vibration, spill of harmful chemicals	2	4	8	Breaks in work for heating, use of PPE; air conditioning
13.	GFD	All processes	BCS	Normal	Increa-sed noise level and other ad-verse noise charac-teristics	Compres-sor	Diseases, hearing loss	Technological features of the compressor	Vibration	3	4	12	Use of PPE; preventive medical examinations to detect occupatio-nal diseases; limiting the time spent in the zone of increased noise; compliance with the require-ments of the instructions for health and safety; compliance work and rest regimes
14.	GFD	All processes	BCS	Normal	Expo-sure to general vibra-tion	Compres-sor	Occupational diseases of the nervous and musculos-keletal sys-tems	The occurrence of general vibra-tion during the operation of compressors	Intense noise	5	3	15	Vibration damping means applica-tion; systematic check of service-a-bility of means of vibration dam-ping ; use of PPE; organization of mandatory work breaks
15.	GFD	Operation, maintenance, repair of electrical and power equipment	BCS	Normal	Electri-city	Electrical equipmen t	Electrical in-jury	Electrical fault	High humidity	1	4	4	Decommissioning of faulty electri-cal equipment, timely repair and maintenance of electrical equipment , implementation of sa-fety measures set forth in regula-tory documents; use of PPE
16.	GFD	Operation, maintenance, repair of electrical and power equipment	BCS	Normal	Physi-cal fac-tors	Adverse events (light radi-ation of extreme intensity)	Burn, blurred vision	Hardware failure	Increased noise, vibra-tion	2	3	6	Production control over the state of equipment of electrical installati-ons; conducting inductions; use of PPE; equipping the danger zone with warning signs.
17.	GFD	Performing non-destruc-tive testing	BCS	Normal	Physi-cal fac-tors	Radiation radiation	Radiation sickness	Violation of the operating mode of the X-ray ma-chine	Increased noise, vibra-tion	4	3	12	Implementation of production con-trol over the state of equipment; conducting inductions; equipping the danger zone with warning signs.
18.	GFD	Maintenance of BCS equipment, repair of venti-lation units	BCS	Normal	Height diffe-rence	Fall of a worker while wor-king at height	Injury	Lack of safety fences, safety belts, insufficient strength and sta-bility of the floo-ring, impaired	Poor lighting, slippery surfaces	3	4	12	Installation of anti-slip strips on in-clined surfaces; use of handrails or OSH her supports; exclusion of for-eign objects on the floor, their ti-mely cleaning; use of safety har-nesses; training employees to work

								coordination of the worker's movements					at height; ensuring a sufficient level of illumination and contrast in the workplace; placement of marked fences and / or nOSH ices (signs, plates, announcements)
19.	GFD	Maintenance, repair of equipment, work on machines, repair of ventilation units	BCS	Normal	Mechanical	Sharp edges of equipment, tools	Cut, injury	Technological features of the equipment	Vibration, low light	2	4	8	Production control over the condition of equipment, tools, machines; use of PPE; use of safety signs; inductions.
20.	GFD	Working with hand tools (including pneumatic , electric, gasoline)	BCS	Normal	Movable parts of machines and mechanisms	Pneumatic grease gun	Injury	Malfunction of the applied equipment, non-use of PPE	Low light	2	4	8	Production control of the state of equipment, serviceability of tools, use of PPE, inductions
21.	GFD	Operation, maintenance, repair of pumping and compressor equipment	BCS	Normal	Movable parts of machines and mechanisms	Compressor equipment	Injury	Malfunction of the applied equipment, non-use of PPE	Low light	2	4	8	Production control of the state of equipment, serviceability of tools, use of PPE, inductions
22.	GFD	Performance of work during the operation, maintenance, repair of equipment, installations, work on machines, machines, mechanisms, installations	BCS	Normal	Movable parts of machines and mechanisms	Movable (stationary) parts of production equipment, machines, moving (stationary) products, blanks, materials	Injury due to pinching between parts of equipment, machines, products, workpieces, materials	Malfunction of the equipment used, non-use of PPE, lack of symbols	Low light	2	4	8	Permanent control by the person responsible for the performance of work over access to the place of work, to equipment, over the regime, over the provision of protective equipment, over the safe performance of work, the use of PPE, inductions
23.	GFD	All processes	BCS	Normal	Cargo moving to a height	Falling objects	Injury	Lack of signs, lack of equipment lock and safety fences	Vibration, low light	2	4	8	Production control over the condition of buildings, structures, expertise of industrial safety; periodic induction; use of PPE; control of the condition of lifting structures, load-handling devices, slings, inductions
24.	GFD	Transportation, waiting for transport provided by the employer, walking on sidewalks, roadsides	BCS	Normal	Vehicle	Road traffic accident	Injury	Inattention of participants in the accident, low lighting	Fog, slippery road, increased noise	4	2	8	Compliance with traffic rules, the order of the director of the GFD on the appointment of bus supervi-

													sors, the use of seat belts, personal caution, inductions, the prohibition of the use of personal vehicles for production and official purposes
25.	GFD	All processes	BCS	Normal	Violence from hostile workers	Inadequate behavior of personnel as a result of exposure to toxic, alcohol-containing drugs, a disease that affects the mental state.	Injuries	Violation of the mode of operation of the breathalyzer , formal medical examination	Vapors of toxic substances	3	2	6	Conducting medical examinations, psychiatric examinations. Competitive selection of employees, Organization of video surveillance of the working area and alarm device ("panic buttons"), Exclusion of unwanted contacts during the performance of work, Training of employees in methods of overcoming conflict situations.
26.	GFD	All processes	BCS	Normal	Wild or domestic animals	Behavioral reactions of animals, bite of an animal (insect, reptile, mammal), poisoning, infection	Injury, health disorder, infection, poisoning with waste products of microorganisms, death	Damage to the integrity of enclosing structures	Low lighting, vapors of toxic substances, increased noise, vibration	2	3	6	Personal care, placement of noise repellents and necessary equipment near premises with dangerous animals, placement of posters (tablets) with warning inscriptions .
27.	GFD	All processes	BCS	Normal	Slippery, icy, greasy , wet ground	Personal negligence	Injury	Non-compliance by workers with the requirements of warning and information signs, the Key Safety Rules of LCC Gazprom	Low light, vibration	3	4	12	Personal caution; use of anti-slip floor coverings; timely cleaning of surfaces exposed to environmental factors (snow, rain, dirt).
28.	GFD	All processes	BCS	Normal	Height difference	Personal negligence	Injury	Non-compliance by employees with the requirements of warning and information signs, the Key Safety Rules of LCC Gazprom	Low light, vibration	3	4	12	Personal caution; installation of anti-slip strips on inclined surfaces; use of handrails or other supports

29.	GFD	Pump maintenance	BCS	Abnormal	Ther-mal	Compres-sor over-heating	Burn	Compressor wear	Increased air temperature	3	4	12	Timely repair of equipment; use of PPE; target induction
30.	GFD	Work in a confined space during repair, mainte-nance, inspection of ves-sels, containers.	BCS	Abnormal	Harmful chemi-cals in the air of the work area	Compres-sor gas leak	Poisoning, health prob-lems	Hose rupture	Increased air temperature, humidity, gas contamination, dustiness	2	4	8	Timely repair of equipment; use of PPE; targeted instruction; installa-tion of gas sensors
31.	GFD	Work in a confined space during repair, mainte-nance, inspection of ves-sels, containers.	BCS	Abnormal	Harmful chemi-cals in the air of the work area	Oil leakage from the compres-sor sys-tem	Poisoning	Hose rupture	Increased air temperature, the appearance of a spark	2	4	8	Timely repair of equipment; use of PPE; targeted instruction; installa-tion of gas sensors
32.	GFD	Work in a confined space during repair, mainte-nance, inspection of ves-sels, containers.	BCS	Abnormal	Harmful chemi-cals in the air of the work area	Freon leak from the com-pressor system	Poisoning, loss of consci-ousness, im-paired health	Hose rupture	elevated air temperature,	2	4	8	Timely repair of equipment; use of PPE; targeted instruction; installa-tion of gas sensors
33.	GFD	Work in a confined space during repair, mainte-nance, inspection of ves-sels, containers.	BCS	Abnormal	Harmful chemi-cals in the air of the work area	Gas leak from the pump system	Poisoning, health prob-lems	Pump wear, cor-rosion	Increased air temperature, humidity, gas contamination, dustiness	2	4	8	Timely repair of equipment; use of PPE; targeted instruction; installa-tion of gas sensors
34.	GFD	All processes	BCS	Emergen cy	Ther-mal	Fire	Burn, death	Compressor overheating	Gas contami-nation, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; syste-matic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire ex-tinguishing equipment in the imme-diate vicinity of the compressor
35.	GFD	All processes	BCS	Emergen cy	Physi-cal	Explosion	Trauma, death	Gas leak from compressor, pump	Violation of the ventilation system, the occurrence of a spark	5	1	5	Timely repair and maintenance of the compressor; timely repair and maintenance of the ventilation sys-tem; installation of gas sensors.
36.	GFD	All processes	BCS	Emergen cy	Ther-mal	Fire	Burn, death	Pump overhea-ting	Gas contami-nation, high air velocity, presence of	5	1	5	Timely repair of equipment; syste-matic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the

									combustible materials				presence and suitability of fire extinguishing equipment in the immediate vicinity of the pump
37.	GFD	All processes	BCS	Emergency	Thermal	Fire	Burn, death	Pipeline rupture due to loss of power supply to the pump	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire extinguishing equipment in the immediate vicinity of the pump
38.	GFD	All processes	BCS	Emergency	Physical	Explosion	Burn, death	Violation of the technology of working with the pump	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire extinguishing equipment in the immediate vicinity of the pump
39.	GFD	All processes	BCS	Emergency	Thermal	Fire	Burn, death	Pump overheating	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire extinguishing equipment in the immediate vicinity of the compressor

Facility and assemblies balancer occupational risk card													
No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Map point name	**Structural subdivision**	**Work operation**	**Work operation place**	**Operating mode**	**Hazard type**	**Danger origin**	**Negative event**	**Danger cause**	**Dangerous conditions**	**Negative event consequences severity indicator**	**Negative event occurrence probability**	**Risk value**	**Occupational risk management measures**
1.	GFD	Painting work	BCS	Normal	Harmful chemicals in the air of the work area	Vapors, fine suspension of harmful liquids	Contact of the respiratory organs, mucous membranes with a polluted environment	Damage to the hazardous substance storage container	Increased air temperature, humidity, gas contamination, dustiness	2	4	8	Air control of the working area, the use of PPE, periodic induction; installation of local fans.
2.	GFD	Painting work	BCS	Normal	Harmful chemicals in the air of the work area	Vapors, fine suspension of harmful liquids	Skin diseases (dermatitis)	Evaporation of paint materials	Increased air temperature, humidity, gas contamination, dustiness	2	4	8	Air control of the working area, the use of PPE, periodic induction; installation of local fans.
3.	GFD	Work in a confined space during repair, maintenance, inspection of containers.	BCS	Normal	Toxic fumes	Flammable materials	Poisoning by gaseous products of combustion	Spill of flammable materials	The appearance of a spark	2	4	8	Hermetic packaging of flammable substances, the use of less toxic oils, the use of PPE; installation of local fans.
4.	GFD	Work in a confined space during repair, maintenance, inspection of containers	BCS	Normal	Toxic fumes	Flammable materials	Occupational diseases of a carcinogenic nature as a result of prolonged exposure to fumes on a worker	Lubrication of equipment with compressor oil	Increased indoor air temperature	2	4	8	Hermetic packaging of flammable substances, the use of less toxic oils, the use of PPE; installation of local fans.
5.	GFD	All processes	BCS	Normal	Presence of microorganism-	Bacterial or viral infections, infection	Disease	Non-compliance with hygiene requirements, negligence of workers	High air temperature, humidity	2	4	8	Vaccination, memos, information stands, information letters, inductions, timely seeking medical help; compliance with the requirements

					pro-ducers in the en-viron-ment	transmis-sion, fun-gal infec-tions							of OSH and sanitary and hygienic requirements.
6.	GFD	All processes	Office, produc-tion areas	Normal	Expo-sure to micro-orga-nisms	Seasonal viral in-fections	Disease	Microorganisms, including patho-gens	Low air tem-perature, high humidity	3	4	12	Compliance with OSH and sa-nitary requirements
7.	GFD	All processes	Dining room	Normal	Expo-sure to micro-orga-nisms	Food poi-soning	Gastrointesti-nal disorder caused by the consumption of low-quality drinks or foods	Lack of places to store food), use of low-quality products; unsa-nitary conditions of places where food is cooked	Pulsation of the light flux, high air tem-perature, psycho-emoti-onal overload	5	2	10	Timely check of serviceability of cooling installations; cooking by an organization that has the appropri-ate conclusions, certificates. Com-pliance with food storage rules. Compliance with the rules of per-sonal hygiene
8.	GFD	Maintenance, repair of equipment, work on ma-chines, work with hand tools	BCS	Normal	Aero-sols of predo-mi-nantly fibroge-nic ac-tion	Inorganic dust	Damage to the respiratory and vision systems	Halting of the ventilation sys-tem, halting of the dust supp-ression mecha-nisms	High air tem-perature, humidity, gas contamination, harmful che-micals	2	4	8	Air control of the working area, the use of RPE and PPE; periodic in-duction; installation of local fans.
9.	GFD	All processes	BCS	Normal	Physi-cal fac-tors	Low light	Fall, injury	Halting of the lighting devices	High noise, vibration, gas pollution, dus-tiness, the presence of harmful che-micals	2	4	8	Installation of local lighting fixtures; monitoring the health of lighting equipment.
10.	GFD	All processes	BCS	Normal	Physi-cal fac-tors	Lack of natural light	Decreased performance, fatigue, drowsiness	Insufficient num-ber of windows, cloudiness	Increased noise, psycho-emotional overload	1	5	5	Compliance with the regime of work and rest; alternating indoor and outdoor activities
11.	GFD	All processes	BCS	Normal	Micro-climatic	Tempera-ture con-ditions (high tem-perature)	Overheating of the body, heat stroke	Climatic features of the region	High humidity, dust, high wind speed, vibration, spill of harmful chemicals	2	4	8	Compliance with the regime of work and rest; compliance with the drinking regime; air conditioning

12.	GFD	All processes	BCS	Normal	Micro-climatic	Tempera-ture con-ditions (low tem-perature)	Frostbite of various parts of the body, flu	Climatic features of the region	High humidity, dust, high wind speed, vibration, spill of harmful chemicals	2	4	8	Breaks in work for heating, use of PPE; air conditioning
13.	GFD	All processes	BCS	Normal	Increa-sed noise level and other ad-verse noise charac-teristics	Compres-sor	Diseases, hearing loss	Technological features of the compressor	Vibration	3	4	12	Use of PPE; preventive medical examinations to detect occupatio-nal diseases; limiting the time spent in the zone of increased noise; compliance with the require-ments of the instructions for health and safety; compliance work and rest regimes
14.	GFD	All processes	BCS	Normal	Expo-sure to general vibra-tion	Compres-sor	Occupational diseases of the nervous and musculos-keletal sys-tems	The occurrence of general vibra-tion during the operation of compressors	Intense noise	5	3	15	Vibration damping means applica-tion; systematic check of service-a-bility of means of vibration dam-ping ; use of PPE; organization of mandatory work breaks
15.	GFD	Operation, maintenance, repair of electrical and power equipment	BCS	Normal	Electri-city	Electrical equipmen t	Electrical in-jury	Electrical fault	High humidity	1	4	4	Decommissioning of faulty electri-cal equipment, timely repair and maintenance of electrical equipment , implementation of sa-fety measures set forth in regula-tory documents; use of PPE
16.	GFD	Operation, maintenance, repair of electrical and power equipment	BCS	Normal	Physi-cal fac-tors	Adverse events (light radi-ation of extreme intensity)	Burn, blurred vision	Hardware failure	Increased noise, vibra-tion	2	3	6	Production control over the state of equipment of electrical installati-ons; conducting inductions; use of PPE; equipping the danger zone with warning signs.
17.	GFD	Performing non-destruc-tive testing	BCS	Normal	Physi-cal fac-tors	Radiation radiation	Radiation sickness	Violation of the operating mode of the X-ray ma-chine	Increased noise, vibra-tion	4	3	12	Implementation of production con-trol over the state of equipment; conducting inductions; equipping the danger zone with warning signs.
18.	GFD	Maintenance of BCS equipment, repair of venti-lation units	BCS	Normal	Height diffe-rence	Fall of a worker while wor-king at height	Injury	Lack of safety fences, safety belts, insufficient strength and sta-bility of the floo-ring, impaired	Poor lighting, slippery surfaces	3	4	12	Installation of anti-slip strips on in-clined surfaces; use of handrails or OSH her supports; exclusion of for-eign objects on the floor, their ti-mely cleaning; use of safety har-nesses; training employees to work

								coordination of the worker's movements					at height; ensuring a sufficient level of illumination and contrast in the workplace; placement of marked fences and / or nOSH ices (signs, plates, announcements)
19.	GFD	Maintenance, repair of equipment, work on machines, repair of ventilation units	BCS	Normal	Mechanical	Sharp edges of equipment, tools	Cut, injury	Technological features of the equipment	Vibration, low light	2	4	8	Production control over the condition of equipment, tools, machines; use of PPE; use of safety signs; inductions.
20.	GFD	Working with hand tools (including pneumatic , electric, gasoline)	BCS	Normal	Movable parts of machines and mechanisms	Pneumatic grease gun	Injury	Malfunction of the applied equipment, non-use of PPE	Low light	2	4	8	Production control of the state of equipment, serviceability of tools, use of PPE, inductions
21.	GFD	Operation, maintenance, repair of pumping and compressor equipment	BCS	Normal	Movable parts of machines and mechanisms	Compressor equipment	Injury	Malfunction of the applied equipment, non-use of PPE	Low light	2	4	8	Production control of the state of equipment, serviceability of tools, use of PPE, inductions
22.	GFD	Performance of work during the operation, maintenance, repair of equipment, installations, work on machines, machines, mechanisms, installations	BCS	Normal	Movable parts of machines and mechanisms	Movable (stationary) parts of production equipment, machines, moving (stationary) products, blanks, materials	Injury due to pinching between parts of equipment, machines, products, workpieces, materials	Malfunction of the equipment used, non-use of PPE, lack of symbols	Low light	2	4	8	Permanent control by the person responsible for the performance of work over access to the place of work, to equipment, over the regime, over the provision of protective equipment, over the safe performance of work, the use of PPE, inductions
23.	GFD	All processes	BCS	Normal	Cargo moving to a height	Falling objects	Injury	Lack of signs, lack of equipment lock and safety fences	Vibration, low light	2	4	8	Production control over the condition of buildings, structures, expertise of industrial safety; periodic induction; use of PPE; control of the condition of lifting structures, load-handling devices, slings, inductions
24.	GFD	Transportation, waiting for transport provided by the employer, walking on sidewalks, roadsides	BCS	Normal	Vehicle	Road traffic accident	Injury	Inattention of participants in the accident, low lighting	Fog, slippery road, increased noise	4	2	8	Compliance with traffic rules, the order of the director of the GFD on the appointment of bus supervi-

													sors, the use of seat belts, personal caution, inductions, the prohibition of the use of personal vehicles for production and official purposes
25.	GFD	All processes	BCS	Normal	Violence from hostile workers	Inadequate behavior of personnel as a result of exposure to toxic, alcohol-containing drugs, a disease that affects the mental state.	Injuries	Violation of the mode of operation of the breathalyzer , formal medical examination	Vapors of toxic substances	3	2	6	Conducting medical examinations, psychiatric examinations. Competitive selection of employees, Organization of video surveillance of the working area and alarm device ("panic buttons"), Exclusion of unwanted contacts during the performance of work, Training of employees in methods of overcoming conflict situations.
26.	GFD	All processes	BCS	Normal	Wild or domestic animals	Behavioral reactions of animals, bite of an animal (insect, reptile, mammal), poisoning, infection	Injury, health disorder, infection, poisoning with waste products of microorganisms, death	Damage to the integrity of enclosing structures	Low lighting, vapors of toxic substances, increased noise, vibration	2	3	6	Personal care, placement of noise repellents and necessary equipment near premises with dangerous animals, placement of posters (tablets) with warning inscriptions .
27.	GFD	All processes	BCS	Normal	Slippery, icy, greasy , wet ground	Personal negligence	Injury	Non-compliance by workers with the requirements of warning and information signs, the Key Safety Rules of LCC Gazprom	Low light, vibration	3	4	12	Personal caution; use of anti-slip floor coverings; timely cleaning of surfaces exposed to environmental factors (snow, rain, dirt).
28.	GFD	All processes	BCS	Normal	Height difference	Personal negligence	Injury	Non-compliance by employees with the requirements of warning and information signs, the Key Safety Rules of LCC Gazprom	Low light, vibration	3	4	12	Personal caution; installation of anti-slip strips on inclined surfaces; use of handrails or other supports

29.	GFD	All processes	BCS	Abnormal	Mecha-nical	Breakage of a hand pneuma-tic tool	Injury, cuts	Equipment wear	Noise, vibra-tion, non-use of PPE	3	4	12	Timely repair and control of the serviceability of the equipment used
30.	GFD	Repair and diagnostics of process units	BCS	Abnormal	Ther-mal	Breakage of a hand pneuma-tic tool	Burns	Operating errors	Vibration, non-use of PPE	2	5	10	Timely repair and control of the serviceability of the equipment used
31.	GFD	Work in a confined space during repair, mainte-nance, inspection of ves-sels, containers.	BCS	Abnormal	Harmful chemi-cals in the air of the work area	Compres-sor gas leak	Poisoning, health prob-lems	Hose rupture	Increased air temperature, humidity, gas contamination, dustiness	2	4	8	Timely repair of equipment; use of PPE; targeted instruction; installa-tion of gas sensors
32.	GFD	Work in a confined space during repair, mainte-nance, inspection of ves-sels, containers.	BCS	Abnormal	Harmful chemi-cals in the air of the work area	Oil leakage from the compres-sor sys-tem	Poisoning	Hose rupture	Increased air temperature, the appearance of a spark	2	4	8	Timely repair of equipment; use of PPE; targeted instruction; installa-tion of gas sensors
33.	GFD	Work in a confined space during repair, mainte-nance, inspection of ves-sels, containers.	BCS	Abnormal	Harmful chemi-cals in the air of the work area	Freon leak from the com-pressor system	Poisoning, loss of consci-ousness, im-paired health	Hose rupture	elevated air temperature,	2	4	8	Timely repair of equipment; use of PPE; targeted instruction; installa-tion of gas sensors
34.	GFD	Work in a confined space during repair, mainte-nance, inspection of ves-sels, containers.	BCS	Abnormal	Harmful chemi-cals in the air of the work area	Gas leak from the pump system	Poisoning, health prob-lems	Pump wear, cor-rosion	Increased air temperature, humidity, gas contamination, dustiness	2	4	8	Timely repair of equipment; use of PPE; targeted instruction; installa-tion of gas sensors
35.	GFD	All processes	BCS	Emergen cy	Ther-mal	Fire	Burn, death	Compressor overheating	Gas contami-nation, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; syste-matic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire ex-tinguishing equipment in the imme-diate vicinity of the compressor
36.	GFD	All processes	BCS	Emergen cy	Physi-cal	Explosion	Trauma, death	Gas leak from compressor, pump	Violation of the ventilation system, the occurrence of a spark	5	1	5	Timely repair and maintenance of the compressor; timely repair and maintenance of the ventilation sys-tem; installation of gas sensors.

37.	GFD	All processes	BCS	Emergency	Thermal	Fire	Burn, death	Pump overheating	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire extinguishing equipment in the immediate vicinity of the pump
38.	GFD	All processes	BCS	Emergency	Thermal	Fire	Burn, death	Pipeline rupture due to loss of power supply to the pump	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire extinguishing equipment in the immediate vicinity of the pump
39.	GFD	All processes	BCS	Emergency	Physical	Explosion	Burn, death	Violation of the technology of working with the pump	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire extinguishing equipment in the immediate vicinity of the pump
40.	GFD	All processes	BCS	Emergency	Thermal	Fire	Burn, death	Pump overheating	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire extinguishing equipment in the immediate vicinity of the compressor

Technological installations repair mechanic occupational risk card													
No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Map point name	**Structural subdivision**	**Work operation**	**Work operation place**	**Operating mode**	**Hazard type**	**Danger origin**	**Negative event**	**Danger cause**	**Dangerous conditions**	**Negative event consequences severity indicator**	**Negative event occurrence probability**	**Risk value**	**Occupational risk management measures**
1.	GFD	Painting work	BCS	Normal	Harmful chemicals in the air of the work area	Vapors, fine suspension of harmful liquids	Contact of the respiratory organs, mucous membranes with a polluted environment	Damage to the hazardous substance storage container	Increased air temperature, humidity, gas contamination, dustiness	2	4	8	Air control of the working area, the use of PPE, periodic induction; installation of local fans.
2.	GFD	Painting work	BCS	Normal	Harmful chemicals in the air of the work area	Vapors, fine suspension of harmful liquids	Skin diseases (dermatitis)	Evaporation of paint materials	Increased air temperature, humidity, gas contamination, dustiness	2	4	8	Air control of the working area, the use of PPE, periodic induction; installation of local fans.
3.	GFD	Work in a confined space during repair, maintenance, inspection of containers.	BCS	Normal	Toxic fumes	Flammable materials	Poisoning by gaseous products of combustion	Spill of flammable materials	The appearance of a spark	2	4	8	Hermetic packaging of flammable substances, the use of less toxic oils, the use of PPE; installation of local fans.
4.	GFD	Work in a confined space during repair, maintenance, inspection of containers	BCS	Normal	Toxic fumes	Flammable materials	Occupational diseases of a carcinogenic nature as a result of prolonged exposure to fumes on a worker	Lubrication of equipment with compressor oil	Increased indoor air temperature	2	4	8	Hermetic packaging of flammable substances, the use of less toxic oils, the use of PPE; installation of local fans.
5.	GFD	All processes	BCS	Normal	Presence of microorganism-	Bacterial or viral infections, infection	Disease	Non-compliance with hygiene requirements, negligence of workers	High air temperature, humidity	2	4	8	Vaccination, memos, information stands, information letters, inductions, timely seeking medical help; compliance with the requirements

					pro-ducers in the en-viron-ment	transmis-sion, fun-gal infec-tions							of OSH and sanitary and hygienic requirements.
6.	GFD	All processes	Office, produc-tion areas	Normal	Expo-sure to micro-orga-nisms	Seasonal viral in-fections	Disease	Microorganisms, including patho-gens	Low air tem-perature, high humidity	3	4	12	Compliance with OSH and sa-nitary requirements
7.	GFD	All processes	Dining room	Normal	Expo-sure to micro-orga-nisms	Food poi-soning	Gastrointesti-nal disorder caused by the consumption of low-quality drinks or foods	Lack of places to store food), use of low-quality products; unsa-nitary conditions of places where food is cooked	Pulsation of the light flux, high air tem-perature, psycho-emoti-onal overload	5	2	10	Timely check of serviceability of cooling installations; cooking by an organization that has the appropri-ate conclusions, certificates. Com-pliance with food storage rules. Compliance with the rules of per-sonal hygiene
8.	GFD	Maintenance, repair of equipment, work on ma-chines, work with hand tools	BCS	Normal	Aero-sols of predo-mi-nantly fibroge-nic ac-tion	Inorganic dust	Damage to the respiratory and vision systems	Halting of the ventilation sys-tem, halting of the dust supp-ression mecha-nisms	High air tem-perature, humidity, gas contamination, harmful che-micals	2	4	8	Air control of the working area, the use of RPE and PPE; periodic in-duction; installation of local fans.
9.	GFD	All processes	BCS	Normal	Physi-cal fac-tors	Low light	Fall, injury	Halting of the lighting devices	High noise, vibration, gas pollution, dus-tiness, the presence of harmful che-micals	2	4	8	Installation of local lighting fixtures; monitoring the health of lighting equipment.
10.	GFD	All processes	BCS	Normal	Physi-cal fac-tors	Lack of natural light	Decreased performance, fatigue, drowsiness	Insufficient num-ber of windows, cloudiness	Increased noise, psycho-emotional overload	1	5	5	Compliance with the regime of work and rest; alternating indoor and outdoor activities
11.	GFD	All processes	BCS	Normal	Micro-climatic	Tempera-ture con-ditions (high tem-perature)	Overheating of the body, heat stroke	Climatic features of the region	High humidity, dust, high wind speed, vibration, spill of harmful chemicals	2	4	8	Compliance with the regime of work and rest; compliance with the drinking regime; air conditioning

12.	GFD	All processes	BCS	Normal	Micro-climatic	Tempera-ture con-ditions (low tem-perature)	Frostbite of various parts of the body, flu	Climatic features of the region	High humidity, dust, high wind speed, vibration, spill of harmful chemicals	2	4	8	Breaks in work for heating, use of PPE; air conditioning
13.	GFD	All processes	BCS	Normal	Increa-sed noise level and other ad-verse noise charac-teristics	Compres-sor	Diseases, hearing loss	Technological features of the compressor	Vibration	3	4	12	Use of PPE; preventive medical examinations to detect occupatio-nal diseases; limiting the time spent in the zone of increased noise; compliance with the require-ments of the instructions for health and safety; compliance work and rest regimes
14.	GFD	All processes	BCS	Normal	Expo-sure to general vibra-tion	Compres-sor	Occupational diseases of the nervous and musculos-keletal sys-tems	The occurrence of general vibra-tion during the operation of compressors	Intense noise	5	3	15	Vibration damping means applica-tion; systematic check of service-a-bility of means of vibration dam-ping ; use of PPE; organization of mandatory work breaks
15.	GFD	Operation, maintenance, repair of electrical and power equipment	BCS	Normal	Electri-city	Electrical equipmen t	Electrical in-jury	Electrical fault	High humidity	1	4	4	Decommissioning of faulty electri-cal equipment, timely repair and maintenance of electrical equipment , implementation of sa-fety measures set forth in regula-tory documents; use of PPE
16.	GFD	Operation, maintenance, repair of electrical and power equipment	BCS	Normal	Physi-cal fac-tors	Adverse events (light radi-ation of extreme intensity)	Burn, blurred vision	Hardware failure	Increased noise, vibra-tion	2	3	6	Production control over the state of equipment of electrical installati-ons; conducting inductions; use of PPE; equipping the danger zone with warning signs.
17.	GFD	Performing non-destruc-tive testing	BCS	Normal	Physi-cal fac-tors	Radiation radiation	Radiation sickness	Violation of the operating mode of the X-ray ma-chine	Increased noise, vibra-tion	4	3	12	Implementation of production con-trol over the state of equipment; conducting inductions; equipping the danger zone with warning signs.
18.	GFD	Maintenance of BCS equipment, repair of venti-lation units	BCS	Normal	Height diffe-rence	Fall of a worker while wor-king at height	Injury	Lack of safety fences, safety belts, insufficient strength and sta-bility of the floo-ring, impaired	Poor lighting, slippery surfaces	3	4	12	Installation of anti-slip strips on in-clined surfaces; use of handrails or OSH her supports; exclusion of for-eign objects on the floor, their ti-mely cleaning; use of safety har-nesses; training employees to work

								coordination of the worker's movements					at height; ensuring a sufficient level of illumination and contrast in the workplace; placement of marked fences and / or nOSH ices (signs, plates, announcements)
19.	GFD	Maintenance, repair of equipment, work on machines, repair of ventilation units	BCS	Normal	Mechanical	Sharp edges of equipment, tools	Cut, injury	Technological features of the equipment	Vibration, low light	2	4	8	Production control over the condition of equipment, tools, machines; use of PPE; use of safety signs; inductions.
20.	GFD	Working with hand tools (including pneumatic , electric, gasoline)	BCS	Normal	Movable parts of machines and mechanisms	Pneumatic grease gun	Injury	Malfunction of the applied equipment, non-use of PPE	Low light	2	4	8	Production control of the state of equipment, serviceability of tools, use of PPE, inductions
21.	GFD	Operation, maintenance, repair of pumping and compressor equipment	BCS	Normal	Movable parts of machines and mechanisms	Compressor equipment	Injury	Malfunction of the applied equipment, non-use of PPE	Low light	2	4	8	Production control of the state of equipment, serviceability of tools, use of PPE, inductions
22.	GFD	Performance of work during the operation, maintenance, repair of equipment, installations, work on machines, machines, mechanisms, installations	BCS	Normal	Movable parts of machines and mechanisms	Movable (stationary) parts of production equipment, machines, moving (stationary) products, blanks, materials	Injury due to pinching between parts of equipment, machines, products, workpieces, materials	Malfunction of the equipment used, non-use of PPE, lack of symbols	Low light	2	4	8	Permanent control by the person responsible for the performance of work over access to the place of work, to equipment, over the regime, over the provision of protective equipment, over the safe performance of work, the use of PPE, inductions
23.	GFD	All processes	BCS	Normal	Cargo moving to a height	Falling objects	Injury	Lack of signs, lack of equipment lock and safety fences	Vibration, low light	2	4	8	Production control over the condition of buildings, structures, expertise of industrial safety; periodic induction; use of PPE; control of the condition of lifting structures, load-handling devices, slings, inductions
24.	GFD	Transportation, waiting for transport provided by the employer, walking on sidewalks, roadsides	BCS	Normal	Vehicle	Road traffic accident	Injury	Inattention of participants in the accident, low lighting	Fog, slippery road, increased noise	4	2	8	Compliance with traffic rules, the order of the director of the GFD on the appointment of bus supervi-

													sors, the use of seat belts, personal caution, inductions, the prohibition of the use of personal vehicles for production and official purposes
25.	GFD	All processes	BCS	Normal	Violence from hostile workers	Inadequate behavior of personnel as a result of exposure to toxic, alcohol-containing drugs, a disease that affects the mental state.	Injuries	Violation of the mode of operation of the breathalyzer , formal medical examination	Vapors of toxic substances	3	2	6	Conducting medical examinations, psychiatric examinations. Competitive selection of employees, Organization of video surveillance of the working area and alarm device ("panic buttons"), Exclusion of unwanted contacts during the performance of work, Training of employees in methods of overcoming conflict situations.
26.	GFD	All processes	BCS	Normal	Wild or domestic animals	Behavioral reactions of animals, bite of an animal (insect, reptile, mammal), poisoning, infection	Injury, health disorder, infection, poisoning with waste products of microorganisms, death	Damage to the integrity of enclosing structures	Low lighting, vapors of toxic substances, increased noise, vibration	2	3	6	Personal care, placement of noise repellents and necessary equipment near premises with dangerous animals, placement of posters (tablets) with warning inscriptions .
27.	GFD	All processes	BCS	Normal	Slippery, icy, greasy , wet ground	Personal negligence	Injury	Non-compliance by workers with the requirements of warning and information signs, the Key Safety Rules of LCC Gazprom	Low light, vibration	3	4	12	Personal caution; use of anti-slip floor coverings; timely cleaning of surfaces exposed to environmental factors (snow, rain, dirt).
28.	GFD	All processes	BCS	Normal	Height difference	Personal negligence	Injury	Non-compliance by employees with the requirements of warning and information signs, the Key Safety Rules of LCC Gazprom	Low light, vibration	3	4	12	Personal caution; installation of anti-slip strips on inclined surfaces; use of handrails or other supports

29.	GFD	v	BCS	Abnormal	Thermal	Compressor, pump overheating	Burn	Compressor wear	Increased air temperature	3	4	12	Timely repair of equipment; use of PPE; target induction
30.	GFD	Work in a confined space during repair, maintenance, inspection of vessels, containers.	BCS	Abnormal	Harmful chemicals in the air of the work area	Compressor gas leak	Poisoning, health problems	Hose rupture	Increased air temperature, humidity, gas contamination, dustiness	2	4	8	Timely repair of equipment; use of PPE; targeted instruction; installation of gas sensors
31.	GFD	Work in a confined space during repair, maintenance, inspection of vessels, containers.	BCS	Abnormal	Harmful chemicals in the air of the work area	Oil leakage from the compressor system	Poisoning	Hose rupture	Increased air temperature, the appearance of a spark	2	4	8	Timely repair of equipment; use of PPE; targeted instruction; installation of gas sensors
32.	GFD	Work in a confined space during repair, maintenance, inspection of vessels, containers.	BCS	Abnormal	Harmful chemicals in the air of the work area	Freon leak from the compressor system	Poisoning, loss of consciousness, impaired health	Hose rupture	elevated air temperature,	2	4	8	Timely repair of equipment; use of PPE; targeted instruction; installation of gas sensors
33.	GFD	Work in a confined space during repair, maintenance, inspection of vessels, containers.	BCS	Abnormal	Harmful chemicals in the air of the work area	Gas leak from the pump system	Poisoning, health problems	Pump wear, corrosion	Increased air temperature, humidity, gas contamination, dustiness	2	4	8	Timely repair of equipment; use of PPE; targeted instruction; installation of gas sensors
34.	GFD	All processes	BCS	Emergency	Thermal	Fire	Burn, death	Compressor overheating	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire extinguishing equipment in the immediate vicinity of the compressor
35.	GFD	All processes	BCS	Emergency	Physical	Explosion	Trauma, death	Gas leak from compressor, pump	Violation of the ventilation system, the occurrence of a spark	5	1	5	Timely repair and maintenance of the compressor; timely repair and maintenance of the ventilation system; installation of gas sensors.
36.	GFD	All processes	BCS	Emergency	Thermal	Fire	Burn, death	Pump overheating	Gas contamination, high air velocity, presence of	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the

									combustible materials				presence and suitability of fire extinguishing equipment in the immediate vicinity of the pump
37.	GFD	All processes	BCS	Emergency	Thermal	Fire	Burn, death	Pipeline rupture due to loss of power supply to the pump	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire extinguishing equipment in the immediate vicinity of the pump
38.	GFD	All processes	BCS	Emergency	Physical	Explosion	Burn, death	Violation of the technology of working with the pump	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire extinguishing equipment in the immediate vicinity of the pump
39.	GFD	All processes	BCS	Emergency	Thermal	Fire	Burn, death	Pump overheating	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire extinguishing equipment in the immediate vicinity of the compressor

Office and processing area janitor occupational risk card

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Map point name	**Structural subdivision**	**Work operation**	**Work operation place**	**Operating mode**	**Hazard type**	**Danger origin**	**Negative event**	**Danger cause**	**Dangerous conditions**	**Negative event consequences severity indicator**	**Negative event occurrence probability**	**Risk value**	**Occupational risk management measures**	**Responsibility for the implementation of risk treatment measures**
1.	GFD	All processes	BCS	Normal	Slippery ground surfaces	Personal negligence	Falls, bruises	Non-compliance by employees with the requirements of warning and information signs	Low light	2	5	10	Personal caution; use of anti-slip floor coverings; timely cleaning of surfaces exposed to environmental factors (snow, rain, dirt)	Chief OSH Engineer
2.	GFD	All processes	BCS	Normal	The danger associated with the impact of the intensity of the labor process	Work posture hazard	Occupational disease of the musculoskeletal system	Features of the ongoing process	Insufficient lighting, increased noise, vibration	2	5	10	Compliance with the regime of work and rest	Chief OSH Engineer
3.	GFD	All processes	BCS	Normal	Mechanical	Sharp edges of equipment, tools, roughness	Cut, injury	No work on sharp edges, no markings	Vibration, low light	2	4	8	Production control over the condition of equipment, tools, machines; use of PPE; use of safety signs; briefings, instructions on health and safety.	Deputy General Director for General Affairs
4.	GFD	All processes	BCS	Normal	Electricity	Electrical equipment	Electrical injury	Electrical fault	High humidity	2	4	8	Monitoring the state of electrical appliances, electric drives, grounding, the state of power networks, conducting briefings, training, the use of personal and collective pr**OSH**ective equipment	Deputy General Director for General Affairs
5.	GFD	All processes	BCS	Normal	Physical factors	Temperature conditions (elevated temperature)	Overheating of the body, heat stroke	Climatic features of the region	High humidity, dust, high wind speed, vibration, spill of harmful chemicals	2	4	8	Compliance with the regime of work and rest, the use of PPE; compliance with the drinking regime; air conditioning	Chief OSH Engineer

6.	GFD	All processes	All processes	Normal	Physical factors	Temperature conditions (low temperature)	Frostbite of various parts of the body	Climatic features of the region	High humidity, dust, high wind speed, vibration, spill of harmful chemicals	2	4	8	Breaks in work for heating, use of PPE; air conditioning	Chief OSH Engineer
7.	GFD	All processes	BCS	Normal	Chemical	Formation of toxic fumes when heated	Flammable materials	Poisoning by gaseous products of combustion	Spill of flammable materials	2	4	8	Hermetic packaging of flammable substances, the use of less toxic oils, the use of PPE when lubricating equipment; equipping with devices for local exhaust ventilation of industrial equipment, characterized by the release of dust, the operation of which leads to the excess of hygienic standards in the air of the working area with permanent jobs. local ventilation.	Chief OSH Engineer
8.	GFD	All processes	BCS	Normal	Presence of microorganism-producers in the environment	Bacterial or viral infections, infection transmission, fungal infections	Disease	Violation of hygiene requirements, negligence of workers	High air temperature, humidity	2	4	8	Vaccination, memos, information stands, information letters, briefings, timely seeking medical help; compliance with the requirements of labor pr**OSH**ection and sanitary and hygienic requirements.	Chief OSH Engineer
9.	GFD	All processes	BCS	Normal	Aerosols of predominantly fibrogenic action	Inorganic dust	Damage to the respiratory system, vision, health problems	Violation of the ventilation system, violation of the dust suppression mechanisms	Increased air temperature, humidity, gas contamination, harmful chemicals	2	4	8	Air control of the working area, the use of RPE and PPE; periodic briefing; equipping industrial equipment with local exhaust ventilation devices, characterized by the release of dust, the operation of which leads to the excess of hygienic standards in the air of the working area with permanent jobs.	Chief OSH Engineer
10.	GFD	All processes	BCS	Normal	Increased noise level and other adverse	Compressor	Diseases, hearing loss	Technological features of the compressor	Vibration	3	4	12	Use of PPE; preventive medical examinations to detect occupational diseases; limiting the time spent in the zone of in-	Heads of structural divisions of the administration and under

					noise characteristics								creased noise; compliance with the requirements of the instructions for health and safety; development and application of work and rest regimes	the administration
11.	GFD	All processes	BCS	Normal	Exposure to general vibration	Compressor	Occupational diseases of the nervous and musculoskeletal systems	The occurrence of general vibration during the operation of compressors	Intense noise	2	5	10	Compressor equipment with vibration damping means; systematic check of serviceability of vibration damping means; use of PPE; organization of mandatory work breaks	Chief OSH Engineer
12.	GFD	All processes	BCS	Normal	Physical factors	Low light	Fall, injury	Violation of the lighting devices	High noise, vibration, gas pollution, dustiness, the presence of harmful chemicals	2	4	8	Installation of local lighting fixtures; monitoring the health of lighting equipment	Chief OSH Engineer
13.	GFD	All processes	BCS	Normal	Movable parts of machines and mechanisms	Compressor equipment	Health damage	Malfunction of the applied equipment, non-use of PPE	Low light	3	4	12	Production control of the state of equipment, serviceability of tools, working bodies, fastening of working bodies, use of serviceable means of individual and collective pr**OSH**ection, briefings	Chief OSH Engineer
14.	GFD	All processes	BCS	Normal	Cargo moving to a height	Falling objects	Injury	Lack of signs, lack of equipment lock, as well as safety fences	Vibration, low light	1	5	5	Production control over the condition of buildings, structures, expertise of industrial safety; periodic briefing; use of means of individual and collective pr**OSH**ection; control of the condition of lifting structures, load-handling devices, slings, briefings	Chief OSH Engineer
15.	GFD	All processes	BCS	Normal	Vehicle	Road traffic accident (RTA)	Injury	Inattention of participants in the accident, insufficient lighting of the site	Fog, slippery road, increased noise	4	2	8	Compliance with traffic rules, the order of the director of the GFD on the appointment of bus supervisors, the use of seat belts, personal caution, briefings, the prohi-	Chief OSH Engineer

													bition of the use of personal vehicles for production and official purposes	
16.	GFD	All processes	BCS	Normal	Violence from hostile workers/third parties	Inadequate behavior of personnel as a result of exposure to toxic, alcohol-containing drugs, a disease that affects the mental state.	Injuries, diseases	Violation of the mode of operation of the breathalyzer, formal medical examination	Vapors of toxic substances	3	2	6	Conducting medical examinations, psychiatric examinations. Competitive selection of employees, Organization of video surveillance of the working area and an alarm device ("panic buttons"), Exclusion of unwanted contacts during the performance of work, Training employees in methods of overcoming conflict situations	Chief OSH Engineer
17.	GFD	All processes	BCS	Normal	Wild or domestic animals	Behavioral reactions of animals, bite of an animal (insect, reptile, mammal), poisoning, infection	Injury, health disorder, infection, poisoning with waste products of microorganisms, death	Damage to the integrity of enclosing structures	Insufficient lighting, vapors of toxic substances, increased noise, vibration	3	4	12	Personal care, placement of noise repellents and necessary equipment near premises with dangerous animals, placement of posters (tablets) with warning inscriptions .	Chief OSH Engineer
18.	GFD	Work in a confined space during repair, maintenance, inspection of vessels, containers.	BCS	Abnormal	Harmful chemicals in the air of the work area	Compressor gas leak	Poisoning, health problems	Hose rupture	Increased air temperature, humidity, gas contamination, dustiness	2	4	8	Timely repair of equipment; use of PPE; targeted instruction; installation of gas sensors	Chief Engineer of the GFD
19.	GFD	Work in a confined space during repair, maintenance, inspection of vessels, containers.	BCS	Abnormal	Harmful chemicals in the air of the work area	Oil leakage from the compressor system	Poisoning, health problems	Hose rupture	Increased air temperature, the appearance of a spark	2	4	8	Timely repair of equipment; use of PPE; targeted instruction; installation of gas sensors	Chief Engineer of the GFD
20.	GFD	Work in a confined space during repair, maintenance, inspection of vessels, containers.	BCS	Abnormal	Harmful chemicals in the air of the work area	Freon leak from the compressor system	Poisoning, loss of consciousness, impaired health	Hose rupture	Elevated air temperature,	2	4	8	Timely repair of equipment; use of PPE; targeted instruction; installation of gas sensors	Chief Engineer of the GFD

21.	GFD	Work in a confined space during repair, maintenance, inspection of vessels, containers.	BCS	Abnormal	Harmful chemicals in the air of the work area	Gas leak from the pump system	Poisoning, health problems	Pump wear, corrosion	Increased air temperature, humidity, gas contamination, dustiness	2	4	8	Timely repair of equipment; use of PPE; targeted instruction; installation of gas sensors	Chief Engineer of the GFD
22.	GFD	Fulfillment of official duties	BCS	Emergency	Thermal	Fire	Burn, death	Compressor overheating	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire extinguishing equipment in the immediate vicinity of the compressor	Chief Engineer of the GFD
23.	GFD	Fulfillment of official duties	BCS	Emergency	Physical	Explosion	Trauma, death	Gas leak from compressor, pump	Violation of the ventilation system, the occurrence of a spark	5	1	5	Timely repair and maintenance of the compressor; timely repair and maintenance of the ventilation system; installation of gas sensors.	Chief Engineer of the GFD
24.	GFD	Fulfillment of official duties	BCS	Emergency	Thermal	Fire	Burn, death	Pump overheating	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire extinguishing equipment in the immediate vicinity of the pump	Chief Engineer of the GFD
25.	GFD	Fulfillment of official duties	BCS	Emergency	Thermal	Fire	Burn, death	Pipeline rupture due to loss of power supply to the bow pump	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire extinguishing equipment in the immediate vicinity of the pump	Chief Engineer of the GFD
26.	GFD	Fulfillment of official duties	BCS	Emergency	Physical	Explosion	Burn, death	Violation of the technology of working with the pump	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking	Chief Engineer of the GFD

													the presence and suitability of fire extinguishing equipment in the immediate vicinity of the pump	
27.	GFD	Fulfillment of official duties	BCS	Emergency	Thermal	Fire	Burn, death	Pump overheating	Gas contamination, high air velocity, presence of combustible materials	5	1	5	Timely repair of equipment; systematic conduct of false fire alarms; systematic check of serviceability of fire detectors; checking the presence and suitability of fire extinguishing equipment in the immediate vicinity of the compressor	Chief Engineer of the GFD
28.	GFD	Fulfillment of official duties	Office	Emergency	Electricity	Sparks from static electricity buildup	Burn	Spark ignition fire	Increased air speed, shutdown of the ventilation system, lack of fire extinguishers	3	2	6	Decommissioning of faulty electrical equipment; timely repair and maintenance of electrical equipment; checking the correct operation of fire detectors, checking the availability and expiration date of fire extinguishers	Chief engineer for engineering and maintenance
29.	GFD	Fulfillment of official duties	Office	Emergency	Violence from hostile workers/third parties	Terrorist attack	Injury, death	Unsatisfactory work of security services	-	5	1	5	Strengthening control at checkpoints; camera equipment; installation of emergency buttons for security services	Head of Security Department
30.	GFD	Fulfillment of official duties	Office	Emergency	Exposure to unclassified hazards	Fire	Burn	Indoor smoking	High air speed, no fire extinguisher, presence of flammable objects	4	2	8	Training employees in fire safety rules; placement of information stands; installation of video surveillance cameras; checking the correct operation of smoke sensors; checking the availability and expiration date of fire extinguishers	Chief OSH Engineer,
31.	GFD	Fulfillment of official duties	Office	Emergency	Mechanical	Violation of the integrity of the pipe with hot water	Burn	Pipeline wear, corrosion	Electrical works	3	2	6	Timely repair and maintenance of water pipes	Chief engineer of the energy department