Scientific article
UDC 331.453; DOI: 10.61260/2304-0130-2025-1-90-95

IMPROVEMENT OF THE OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM AT OIL AND GAS FACILITIES

✉**Timoshenko Artem L.**
Saint-Petersburg university of State fire service of EMERCOM of Russia, Saint-Petersburg, Russia.
Tabakov Alexander V.
Samara state technical university, Samara, Russia
✉***artem18181@gmail.com***

Abstract. An analysis of the state of occupational safety at oil and gas industry facilities has been carried out and effective measures have been developed to reduce occupational injuries. Despite government support and existing regulations, the number of accidents in the industry remains high. The importance of the introduction and continuous improvement of the occupational safety and health management system in accordance with the requirements of legislation and modern technologies is emphasized. Using the example of one of the oil and gas industry enterprises in the Samara region, the results of the introduction of an occupational safety management system are analyzed, which have significantly reduced the level of injuries. Innovations such as artificial intelligence that prevents workers from being staying in dangerous areas, which increases workplace safety are suggested. The main conclusion is that the continuous improvement of the occupational safety and health management system and the introduction of innovative management methods are key factors for improving occupational safety in the oil and gas industry.

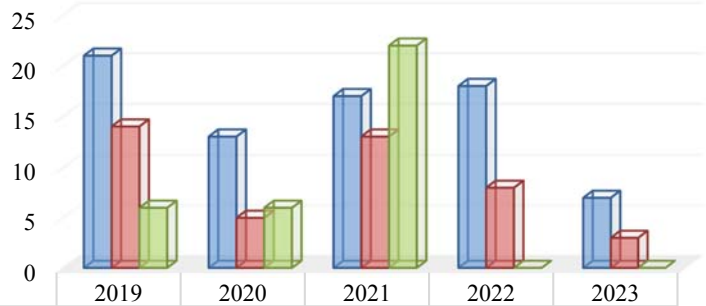
Key words: management system, occupational safety, safety, injury, system improvement, production culture, workplace

For citation: Timoshenko A.L., Tabakov A.V. Improvement of the occupational health and safety management system at oil and gas facilities // Supervisory activities and forensic examination in the security system. 2025. № 1. P. 90–95. DOI: 10.61260/2304-0130-2025-1-90-95.

Introduction

Currently, the state promotes the development of industry and recommends constant monitoring of the state of labor protection. However, according to statistics, the level of occupational injuries remains high.

An analysis of information from official sources of the supervisory authorities of the Russian Federation over the past five years indicates that the peak of occupational injuries at enterprises of the oil and gas industry (OGI) occurred in 2019 (21 cases), and the largest number of deaths was recorded in 2021 (22 people) (fig. 1) [1].



	2019	2020	2021	2022	2023
number of accidents	21	13	17	18	7
number of victims	14	5	13	8	3
number of fatal cases	6	6	22	0	0

Fig. 1. **Dynamics of occupational injuries at oil and gas industry facilities**

The key factors leading to accidents are: insufficient level of production control, violation of technological regulations when performing work, severe divergencies from the established work schedule and discipline, inefficient organization of the production process, as well as insufficient knowledge and violation of the norms and rules of safe work.tion, many enterprises maintain a formal approach to occupational safety issues.

The current situation clearly demonstrates the upmost importance of developing and implementing effective measures to ensure a high level of safety at work. One of the most significant steps in this direction is the step-by-step integration of the occupational safety management system (OSMS), which guarantees the optimization and systematization of the employee protection process. In accordance with the requirements of art. 212 of the Labor Code of the Russian Federation, enterprises need to implement the OSMS and apply it on an ongoing basis [2]. It is important to note that continuous improvement is required to ensure high efficiency.

A significant contribution to the development and modernization of the OSMS was made by Russian researchers, including: A.V. Fedosov, A.R. Gubaidullina, E.N. Abdrakhmanova, R.A. Shaibakov [3], E.V. Glebova [4], I.M. Babintseva [5], A.M. Ganiev [6], Yu.A. Tempel [7]. However, their work is more focused on reviewing the basic tools for improving the OSMS. Nevertheless, the effectiveness of traditional methods of system modernization cannot be denied, since the results of their application demonstrate positive dynamics.

The purpose of the study is to improve the quality management system at OGI facilities. To achieve it, it is necessary to solve the following tasks: to analyze the statistical data of occupational injuries at OGI facilities; to analyze the regulatory framework governing the OGI at OGI facilities; to develop effective measures to improve workplace safety at OGI facilities.

Research methods

The OSMS at OGI facilities is regulated by the Labor Code of the Russian Federation [1], orders of the Ministry of Labor and Social Protection of the Russian Federation [8], orders of the Federal Service for Environmental, Technological and Nuclear Supervision [9], as well as interstate and Russian standards [10].

The main purpose of the QMS is to ensure safety during various types work, as well as the prevention of occupational diseases and possible occupational injuries [11].

The main tasks of the OSMS include staff training in the basics of occupational safety, methodological and informational support in the field of occupational safety, high-quality recruitment, etc.

The main functions of the QMS include monitoring and analyzing the state of working conditions, identifying and investigating the causes of occupational injuries and diseases, assessing the current level of occupational safety, etc..

In the QMS, each employee of the enterprise is charged with a certain range of responsibilities aimed at ensuring safety of working conditions. These responsibilities are consolidated both in job descriptions and in workers' manuals.

The overall responsibility for the state of occupational safety at the enterprise lies with its owner, while the heads of structural divisions are personally responsible for creating and maintaining safe working conditions for subordinates [12].

Thus, each employer is obliged to implement a OSMS, regardless of the number of staff, the specifics of the work and the field of the organization's activity. At the same time, the effective functioning of the OSMS is possible only with its competent development and consistent implementation (fig. 2).

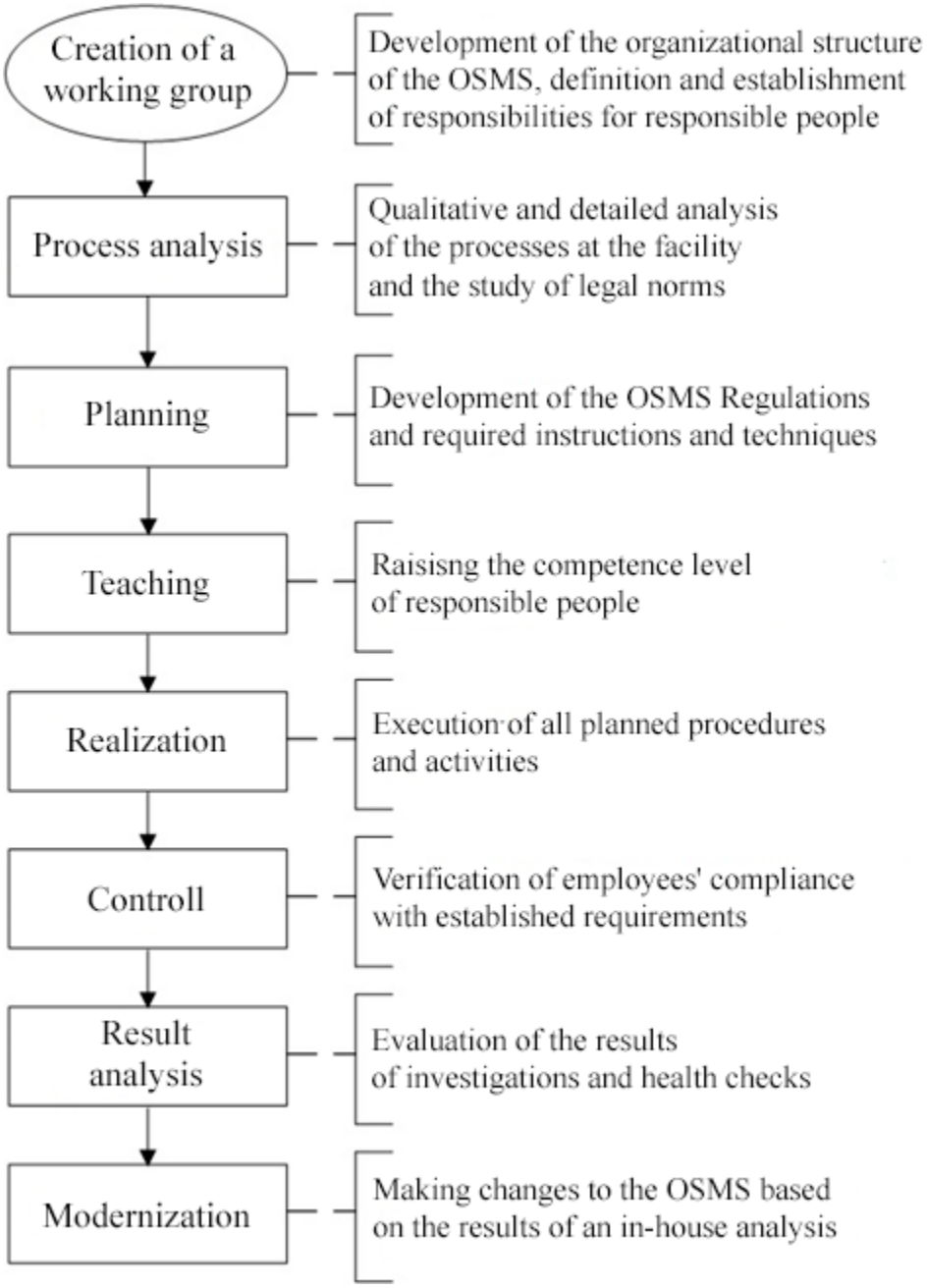


Fig. 2. **Phases of OSMS implementation**

Research implementaion

Since the modernization of the OSMS is a continuous process without a fixed completion point, its development and improvement must be carried out continuously. Every incident that has led to negative consequences for the health of employees, threatening their safety or the company's activities, requires a detailed investigation, analysis of the causes and adjustments to the system based on the lessons learned. In addition, it is important to quickly adapt the OSMS to changes in regulatory requirements established by regulatory authorities.

An analysis of the safety status at one of the OGI enterprises under study in the Samara Region showed that until 2016, when there was no clearly structured OSMS, cases of occupational injuries of varying severity were recorded on a monthly basis. Despite the introduction of the system in 2016, there was no significant reduction in the level of injuries, which indicates that it was formally introduced to comply with labor legislation. However, after a complete revision and implementation in 2021. The improved version of the OSMS, based on previously accumulated

experience, has reduced the number of accidents by more than 60 %. If until 2021, an average of eight incidents per year were recorded, then after the further modernization of the system, injuries continued to decrease, demonstrating a steady trend towards reaching almost zero levels.

To ensure a high level of occupational safety and industrial culture, it is necessary to constantly monitor the state of occupational safety and health. This includes regular audits, the appointment of responsible staff to check up the compliance, and the implementation of an effective reporting system based on the results of these activities. Figure 3 shows the key elements of the process of continuous improvement of the OSMS functioning.

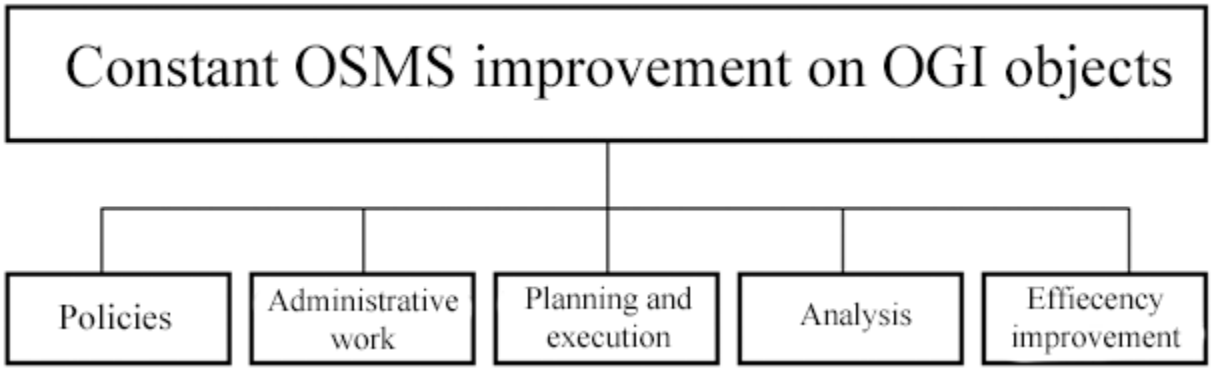


Fig. 3. **The constant improvement of the OSMS functioning scheme**

The main measures for continuous improvement of OSMS at oil and gas industry facilities include:

1. Professional risk analysis and identification of high-risk facilities. This allows for timely development and implementation of preventive measures, minimizing the likelihood of accidents.

2. Occupational safety training. This process should cover both the immediate supervisors responsible for performing hazardous work and the employees employed in these areas. The training should include work safety seminars, studying the use of personal protective equipment, first aid, as well as other regulatory requirements in the field of occupational safety.

3. Development of local documentation. Regulation of issues related to the planning, implementation and control of the effectiveness of the OSMS contributes to its effective implementation and improvement. Local regulations should take into account the specifics of the production process, potential risks and current legal requirements.

As a key measure to improve the OSMS, the authors propose the introduction of software with artificial intelligence technology – a system to prevent personnel from entering dangerous areas, both static and dynamic. This solution minimizes the risks of occupational injuries and increases safety at the facility through continuous monitoring of employee movements.

To implement this technology, occupational safety and industrial safety specialists pre-identify areas where there is a possibility of risks for employees. Then special sensors that record the distance to the employee are installed in these areas. In case of approaching a dangerous area, a vibration signal warning of the risk is transmitted to the employee's personal radio tag. At the same time, light and sound alerts are activated in the danger zone or on the equipment, as well as automatic locking of dangerous mechanisms is triggered, preventing accidents.

As a solution, it is proposed to implement a software and hardware package (SHP), the structure of which is shown in fig. 4.

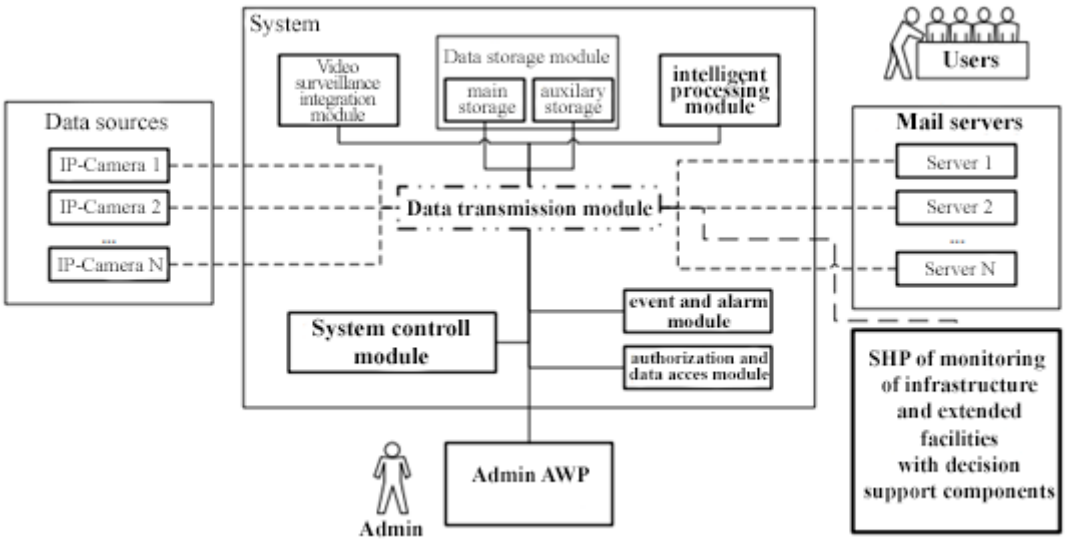


Fig. 4. **The structure of the software with artificial intelligence technology «Systems for personnel entracne prevention in dynamic and static hazardous areas»**

The hardware includes high-resolution stationary cameras, portable geomarks complete with a base station (for identifying a specific employee and determining his location), servers for data processing, data storage (if there is none at the enterprise), switching equipment, information display devices and peripheral components.

The SHP will identify a complete list of types of violations of occupational health and safety regulations: violations of the rules for wearing personal protective equipment (helmets, glasses, earplugs, protective suits), crossing the boundaries of static or dynamic hazardous areas in the immediate vicinity of working equipment, opening protective fences during the operation of equipment, violations of the rules for temporary storage of products (overcrowded containers), the intersection of products or other commodity and material values of special schutz-lines, unauthorized interference in the technological process on working equipment, violations of the rules for rigging operations.

Conclusion

Research shows that, despite continued government support in the field of occupational safety, occupational injuries at NGO facilities remain an urgent problem. The key causes of accidents are insufficient control, deviations from technological processes and non-compliance with safety standards. The introduction, continuous improvement and updating of OSMS at OGI enterprises are important steps towards achieving zero injuries, minimizing risks and improving workplace safety.

The results of the analysis of the implementation of OSMS in OGIs, in particular, using the example of one of the enterprises in the Samara region, confirm the effectiveness of continuous updating and adaptation of the system based on the use of practical experience and taking into account changes in legislation. Reducing the injury rate by more than 60 % after the introduction of new standards and methods of occupational health and safety management demonstrates the positive effect of a systematic approach to solving the problem.

As the main measures for improving the OSMS, the authors proposed the introduction of an artificial intelligence management system into the OSMS – a system for preventing personnel from being in dynamic and static hazardous areas. This measure makes it possible to significantly reduce the level of occupational injuries at oil and gas facilities..

To further improve the QMS, it is necessary to introduce innovative technologies, such as systems using artificial intelligence to prevent workers from being in dangerous areas,

as well as conduct regular audits and training events. It is only through continuous analysis and modernization of the QMS that significant improvements in working conditions and the creation of a safe working environment can be achieved at all levels of the industry.

List of sources

1. Annual reports on the activities of the Federal environmental, technological and nuclear supervision service. URL: https://www.gosnadzor.ru/public/annual_reports/ (date of reference: 09.02.2025).

2. The labor code of the Russian Federation (approved by Federal law of Russian Federation dated 30 Dec. 2001, № 197-FL). Access from the legal system «ConsultantPlus».

3. Analysis of the main factors of effectiveness of the integrated management system for industrial safety and labor protection in the oil and gas industry / A.R. Gubaidullina [et al.] // Oil and gas business. 2019. №. 4. P. 71–92. DOI: 10.17122/ogbus-2019-4-71-92 .

4. Korochkova T.A. Occupational safety management systems. The history of the emergence and current situation in the oil and gas industry // Fundamental and applied scientific research in the modern world: collection of articles of the I International scientific and practical conference. Ufa, 2023. P. 61–83.

5. Babintseva I.M. Measures to improve the efficiency of the occupational safety and health management system // Safety in the electric power industry and electrical engineering: All-Russian. student. scientific conference Izhevsk: Udmurt State university, 2021. P. 131–136.

6. Ganiev A.M. Labor protection at oil and gas industry enterprises // Science alley. 2023. T. 2. № 5 (80). P. 922–931.

7. Tempel Yu.A. Occupational safety and industrial safety management system at oil and gas industry enterprises // Energy saving and innovative technologies in the fuel and energy complex: materials of the All-Russian scientific and practical conference. Tyumen: Tyumen State oil and gas university, 2014. P. 192–196.

8. On the approval of the Approximate regulations on the occupational safety and health management system: order of the Ministry of labor of the Russian Federation dated 29 Oct. 2021, №. 776N. Access from legal system «ConsultantPlus».

9. On the approval of federal norms and rules in the field of industrial safety «Safety rules in the oil and gas industry»: Rostechnadzor order № 534 dated 15 Dec. 2020. Access from legal system «ConsultantPlus».

10. GOST 12.0.230.1–2015. A system of occupational safety standards. Occupational health and safety management systems. Guidelines for the application of GOST 12.0.230–2007. Access from legal system «ConsultantPlus».

11. Gladysheva N.N., Maltseva N.A. Occupational safety and health in preschool institutions. Volgograd: Uchitel, 2015. 375 p.

12. Nedviga V.K. Improving the occupational safety management system // Forum of young scientists. 2019. № 7 (35). P. 205–210.

13. Methodical manual on the development of administrative and regulatory documentation of the occupational safety management system of a construction organization. M.: JSC «CCP», 2008. 100 p.

Information about the article: submitted for edditing: 03.02.2025; accepted for publishing: 05.03.2025

Infromation about authors:

Timoshenko Artem L., lecturer of the department of fire, emergency rescue equipment and automotive industry of Saint-Petersburg university of State fire service of EMERCOM of Russia (196105, Saint-Petersburg, Moskovskiy ave., 149), e-mail: artem18181@gmail.com, https://orcid.org/0000-0002-3927-5613, SPIN: 6923-0111

Tabakov Alexander V., specialist in occupational safety and industrial safety of JSC «Prodmash Plant» (443022, Samara, Zavodskoe sh., 11); student of Samara state technical university (443100, Samara, Molodogvardeyskaya str., 244), e-mail: a.tabakoww@yandex.ru