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**ВЕСТНИК**

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК  
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## **IMPROVING THE FUNCTIONING OF THE INTEGRATED SYSTEM FOR MANAGING LABOR AND INDUSTRIAL SAFETY IN THE OIL AND GAS INDUSTRY**

**Abstract.** The article deals with methodology of improving the functioning of the integrated system for managing labor and industrial safety in the oil and gas sector. This industry is represented by dangerous production facilities and improving safety production become more relevant every year. The main constituent point is an integrated system for managing labor and industrial safety. The fact is that the main production assets become out-of-date, new technologies, normative and technical documentation changes every year. These factors require the necessity to pay attention to safety and put it in accordance with modern requirements. So safety at explosion and fire hazardous industrial facilities is a necessary element of production control. There is examined regulatory framework in the sphere of labor and industrial safety, main principles of construction and realization of an integrated managing system, types of audits, and there are also determined the main criteria for evaluating the performance of the integrated system for managing labor and industry safety.

**Key words:** integrated managing system, industrial safety, labor safety, system design principles, evaluating criteria for efficiency effect, audit, production risks, hazardous production facility, oil and gas industry, risk management.

Internal audit is a means of monitoring the state of working conditions at each workplace and the level of accidents in the facility.

An important task in the framework of the operation for the facility managing system, which is based on the recommendations of international standards, is risk management. This involves the identification of hazards and risk evaluation, setting goals and objectives for reducing risk to acceptable values.

One of the constituent points of the whole method of organizing the administrative management of oil and gas corporations is an integrated system for managing labor and industrial safety. Creating safe working conditions, preserving the life and health of workers, ensuring reliable operation of hazardous production facilities is one of the priorities of any oil and gas company.

When conducting research on risks, special attention is paid to individual risk (risk of death, loss of health, temporary or permanent disability). The main absolute indicator of individual risk is the probability of premature death. One of the important terms in risk management is - «Acceptability».

According to certain criteria, there is made evaluation of the effective functioning of an integrated system for managing labor and industrial safety. The integrated use of performance evaluation criteria in the sphere of industrial safety and labor protection guarantees completeness and a comprehensive evaluation of the effectiveness and production safety.

In order to provide a comprehensive and truthful evaluation of the effective functioning of the ISM for fire and labor safety (hereinafter FS and LS) of industrial safety, there is a complex of quantitative and qualitative indicators.

The goal of this article is to determine the criterion for evaluating the effective functioning of the integrated system for managing labor and industrial safety.

To achieve this goal, there were set the following tasks:

1. To analyze the regulatory framework in the sphere of industrial and labor safety at the oil and gas industry facilities;
2. Analyze the basic principles of construction and realization of an integrated system managing for labor and industrial safety;
3. Determine the functioning of the safety managing system;
4. To analyze the main factors (criteria) determining the effectiveness of an integrated management system for labor and industrial safety in the oil and gas industry.

In the current conditions of increasing the volume of extraction and processing of hydrocarbon raw materials, the work of oil and gas companies is of strategic importance in order to build the country's economy, and their reliable and accident-free activity to large extent determines the energy security and stable socio-financial formation of the Russian Federation [1]. It is possible to achieve a similar result if there is a continuous process of improving safety managing systems at the oil industry facilities.

Integrated system managing (ISM) for labor (LS) and industrial safety (IS) are represented in the form of one of the constituent points of the whole method of organizing the administration of oil and gas corporations. ISM acts as a set of processes, operations, laws, organizational structure and resources that are necessary to realize the ideas of politics achieve goals and manage labor and industrial safety. ISM for industrial safety and labor protection in the oil and gas industry is built on the following principles:

- the involvement of each level of the organization's staff in minimizing production risks and improving the management of FS and LS;
- personal guarantee of any employee of the corporation for complying with the requirements for reducing production risks that could harm the physical condition of workers, the environment and property;
- motivating colleagues to look for opportunities to optimize the regulation of industrial hazards;
- Advantages of precautionary measures over responding measures;
- constant improvement of ISM FS and LS.

The goals in the sphere of FS and LS are oriented to:

- prediction of dangerous situations that can exert a negative impact on the environment, the health of staff and its property;
- reducing the harmful effects of industrial activity on the health of employees;
- absolute elimination of risks at work or reducing them in the presence of suitable circumstances;
- modernization and introduction of the new scientific and technical movements, the use of materials, raw materials and reagents that have a non-hazardous effect in terms of FS and LS;
- rationalization of ISM.

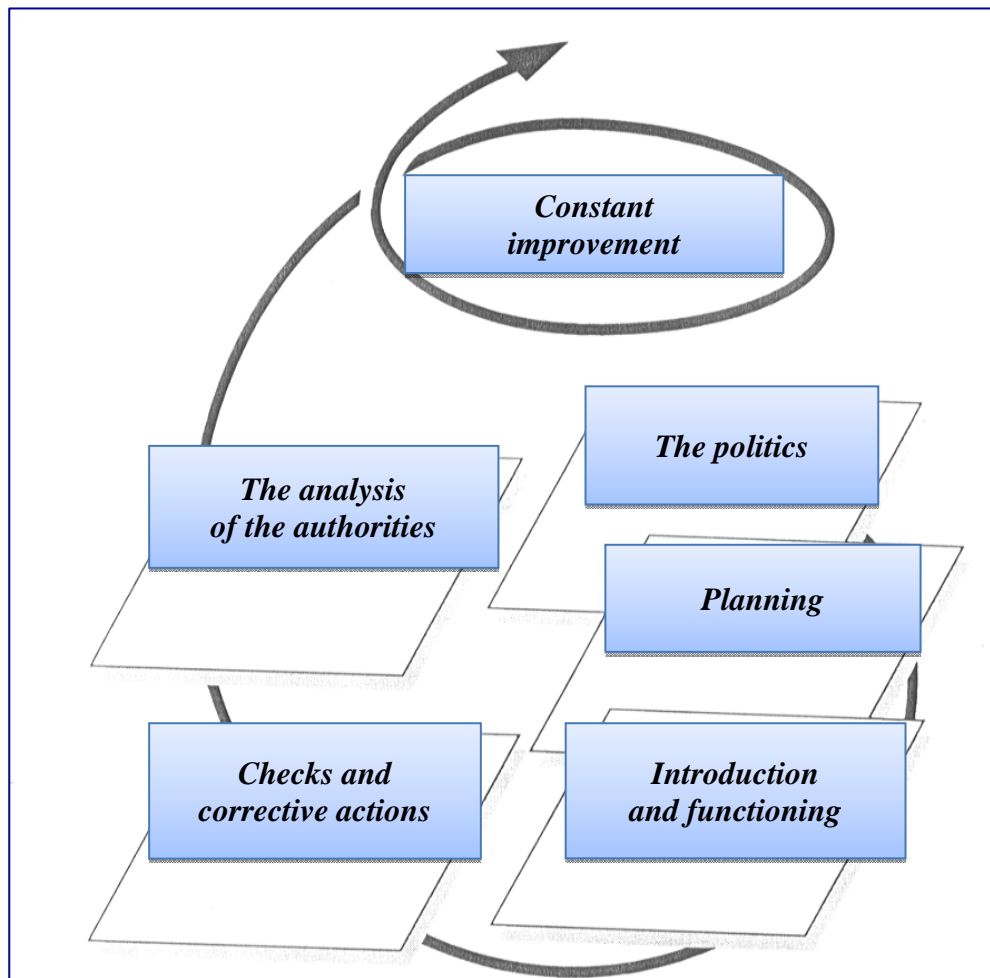
The goals must be measurable, real and exact. When setting collective goals, industrial hazards are foreseen. The realization of the goals of the ISM of FS and LS is carried out by developing special programs. Such programs include:

- events to achieve the goals and objectives of the system;
- methods and deadlines for the set tasks;
- distribution of opportunities and responsibility for the realization of events in the sphere of industrial safety and labor protection.

The policy of the oil and gas industry organization in the sphere of labor and industrial safety should be:

- be fit for work;
- be comparable to the impact on the well-being of the entire staff, the environment and property of these industries;
- be compatible with other corporation rules;
- be introduced and maintained at every level of organization;

- be open to the people involved;
  - fit the applicable law;
  - include the obligation to update the regulatory framework of the ISM for labor and industrial safety;
  - define the main goals and objectives of organizations in the sphere of labor and industrial safety and the environment;
  - warn about all sorts of risks affecting the physical condition of staff and the environment.
- In picture 1 there is shown the functioning scheme of ISM FS and LS.



Picture 1 – Scheme of the functioning processes of ISM

The formation of the legislative base in the Russian Federation is carried out at the federal, territorial, municipal and facility levels. Regulatory legal acts, which have different legal force, are the normative, legal and methodological basis in the sphere of guaranteeing the safety of hazardous production facilities [2].

The basis of the regulatory framework is: RF Constitution, Labor Code of the RF, federal laws, orders, regulations, Government standards, Building regulations and others [3]. In recent years, there has been an increase in the number of regulations in the regulatory legal framework of Russia, which contain the basic methods of risk analysis as a basis for guaranteeing the safety of oil and gas facilities.

Oil companies should be guided in their activities by applicable legal and other requirements. For fulfillment of obligations to comply with legislative and other conditions in the field of labor and industrial safety in the company [4]:

- there is updated information on legislative and other regulations with the introduced periodicity;
- there are defined identification keys;
- there are determined legislative and other regulations;



- the organization's staff is informed of the appropriate legislative and other regulations, and there are admitted relevant personnel of the organization to the already known legislative and other conditions;
- technical documentation covering legislative and different issues;
- there is guaranteed circulation of data on legislative and other regulations at the facility.

The basic document of the production safety managing system is the company's policy in the sphere of ISM FS and LS.

The level of labor and industrial safety at the oil and gas industry facilities is determined using various types of inspections (audits). Audits can be of two types: external and internal audits [5].

The first type of audit is conducted by independent auditors on the basis of an agreement with audited persons or non-affiliated organization (legal entities). During the audit in the sphere of labor and industrial safety, it is possible to identify violations in technological processes. After that, the auditors give the necessary recommendations that are aimed at improving the safety managing system, improving the production process and integrating production safety.

Internal audit is another available means of monitoring the state of working conditions at each workplace and the level of accidents at the facility. [6]. When such audit work completed, the head of the facility uses the material of this audit to compile internal statistics on violations in the sphere of labor and industrial safety, provides the necessary information to shareholders and investors about the effectiveness of their work. The stages of the audit are presented in picture 2.

| The stages of the audit |                          |
|-------------------------|--------------------------|
| 1                       | The preparatory stage    |
| 2                       | Planning stage           |
| 3                       | Audit evidence gathering |
| 4                       | Completion               |

Picture 2 – Audit stages

At certain time, oil companies conduct inspections on the main operations that directly affect the well-being of workers, property and the environment (monitoring and measurement, evaluation of nonconformity). The creation of an integrated system for managing labor and industrial safety in the oil industry has increased the efficiency of this system [7].

Risk management is an important objective within the framework of the facility managing system functioning, which is formed on the basis of recommendations of international standards [8]. This involves the identification of hazards and risk evaluation, setting goals and objectives for reducing risk to acceptable values.

Currently, the risks are very diverse. Special attention in conducting risk research is devoted to the risk of death and loss of health, temporary or permanent disability, that is, individual risk [9, 10]. The main absolute indicator of individual risk is the probability of premature death. «Acceptability» - this is an important risk management term [11, 12].

Evaluation of the effective functioning of the ISM of FS and LS is carried out according to certain criteria. The use of evaluation criteria of effectiveness in the sphere of labor and industrial safety guarantees completeness and a comprehensive evaluation of the effectiveness and production safety [13].

Evaluation of the effective functioning of ISM of FS and LP in the sphere of labor safety is carried out by the criteria given below [14, 15]:

- the ratio of the number of internal audits already conducted to the number of planned ones for the year;
- total number of labor safety meetings;
- availability of labor safety sample surveys for the workers;
- the number of risks already defined at work;
- the number of risk evaluations carried out at a certain stage, in which employees took part;

- the total number of prescription points, non-compliances with the requirements of labor safety revealed during inspections by state bodies and within the organization;
- total number of safe conduct audits conducted in the organization;
- the number of labor safety trainings;
- conducting the procedure for investigating the causes of accidents within the organization;
- strict observance of the rules and deadlines for supplying the employees with personal protective equipment;
- the number of offers received from employees to improve the security system;
- the presence within the organization of local regulatory documents that improve working conditions in the workplace;
- efficiency and visibility of information promotion of safe labor.

In order to provide a comprehensive and truthful evaluation of the effective functioning of the ISM for FS and LS, in terms of industrial safety, there is a set of quantitative and qualitative indicators [16]:

1. General indicators of accidents and injuries at the facility. Here are included: coefficients of frequency and severity of accidents and injuries; the number of accidents, incidents, accidents; general dynamics of the degree of production security.

2. Economic indicators: the total damage caused to the organization as a result of workers' injuries, accidents, incidents and interruptions in production; total costs connected with providing security at the facility.

3. Indicators that determine the current state of the security system (the presence of damage in the equipment, which leads to production risks): professionalism of workers, the effectiveness of the concept of remuneration, staff awareness, conditions causing the manifestation of unsafe production environments. It is possible to achieve efficiency in risk management at work with constant monitoring of compliance with safety requirements and the impact on the main causes of such violations [17,18].

**The conclusions.** Conducting audits allows you to determine the compliance of the activities and results of the organization in the sphere of labor and industrial safety with the existing requirements of the legislation. The effective use of a set of criteria for evaluating the effectiveness of the security system is the key to improving the ISM for FS and LS. Improvement of the ISM for FS and LS prevents the number of accidents, incidents, injuries, deterioration of the health of personnel at the oil industry and leads to a decrease in the negative impact on the environment.

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ЖӘНЕ ЕҢБЕКТІ ҚОРҒАУДЫ БАСҚАРУДЫҢ ИНТЕГРАЦИЯЛАНҒАН ЖҮЙЕСІНІҢ  
ЖҰМЫС ІСТЕУІН ЖЕТІЛДІРУ**

**Аннотация.** Мақалада мұнай-газ саласындағы өнеркәсіптік қауіпсіздікті және еңбекті қорғауды басқарудың интеграцияланған жүйесінің жұмыс істеуін жетілдіру әдіснамасы зерттелді. Мұнай-газ өнеркәсіптік саласы негізінен тұрақты өрт және жарылыс қауіпі бар қауіпті өндірістік объектілер болғандықтан, өндіріс қауіпсіздігін арттыру мәселелері жыл сайын өзекті болып келеді. Мұнай және газ корпорацияларын әкімшілік басқаруды ұйымдастырудың барлық тәсілдерінің құрамдас бірліктерінің бірі өнеркәсіптік қауіпсіздік пен еңбекті қорғауды басқарудың интеграцияланған жүйесі болып табылады. Бұл бір жағынан негізгі өндірістік қорлар жыл сайын ескірген, екінші жағынан жаңа өзекті техника және технологиялар енгізілуде, нормативтік-техникалық құжаттама өзгеруде. Осы факторлардың барлығы мұнай-газ саласында өнеркәсіптік қауіпсіздікке ерекше назар аудару және оны қазіргі заманғы талаптарға сәйкес келтіру қажеттілігін талап етеді. Осылайша, жарылыс өрт қауіпті өнеркәсіптік деректер объектілерде қауіпсіздікті қамтамасыз ету өндірісті басқарудың қажетті және ажырамас элементі болып келеді. Мұнай-газ саласында өнеркәсіптік қауіпсіздік және еңбекті қорғау саласындағы нормативтік құқықтық база, басқарудың интеграцияланған жүйесін құру мен іске асырудың басты қағидалары, аудит түрлері қаралды, сондай-ақ өнеркәсіптік қауіпсіздік пен еңбекті қорғауды басқарудың интеграцияланған жүйесінің жұмыс істеу тиімділігін бағалаудың негізгі өлшемдері анықталды.

**Түйін сөздер:** біріктірілген басқару жүйесі, өнеркәсіптік қауіпсіздік, еңбекті қорғау жүйесін құру принциптері, критерийлер тиімділігін бағалау, аудит, өндірістік тәуекелдерді, қауіпті өндірістік объекті, мұнай-газ саласы, тәуекелдерді басқару.

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### **СОВЕРШЕНСТВОВАНИЕ ФУНКЦИОНИРОВАНИЯ ИНТЕГРИРОВАННОЙ СИСТЕМЫ УПРАВЛЕНИЯ ПРОМЫШЛЕННОЙ БЕЗОПАСНОСТЬЮ И ОХРАНОЙ ТРУДА В НЕФТЕГАЗОВОЙ ОТРАСЛИ**

**Аннотация.** Исследована методология совершенствования функционирования интегрированной системы управления промышленной безопасностью и охраной труда в нефтегазовой сфере. Поскольку нефтегазовая отрасль представлена в основном опасными производственными объектами, обладающими постоянной пожарной и взрывоопасностью, то вопросы повышения безопасности производства с каждым годом становятся все более актуальными. Одной из составляющих единиц всего способа организации административного управления нефтяных и газовых корпораций является интегрированная система управления промышленной безопасностью и охраной труда. Это связано с тем, что с одной стороны основные производственные фонды с каждым годом устаревают, с другой стороны внедряются новые технологии, меняется нормативно-техническая документация. Все эти факторы требуют необходимость уделять особое внимание безопасности и приведения его в соответствие с современными требованиями. Так обеспечение безопасности на взрывопожароопасных промышленных объектах является необходимым и неотъемлемым элементом управления производством. Рассмотрены нормативная правовая база в области промышленной безопасности и охраны труда, главные принципы построения и реализации интегрированной системы управления, виды аудитов, а также определены основные критерии оценки эффективности функционирования интегрированной системы управления промышленной безопасностью и охраной труда.

**Ключевые слова:** интегрированная система управления, промышленная безопасность, охрана труда, принципы построения системы, критерии оценки эффективности, аудит, производственные риски, опасный производственный объект, нефтегазовая отрасль, управление рисками.

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