

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ  
НАЦІОНАЛЬНИЙ ТЕХНІЧНИЙ УНІВЕРСИТЕТ  
«ХАРКІВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ»

**МЕТОДИЧНІ ВКАЗІВКИ**

**до виконання самостійної роботи**

**«Контрольні запитання з лекційного матеріалу для виміру якості  
навчання»**

**з курсу «Охорона праці у нафтогазовій галузі»**

**для студентів спеціальності 185 «Нафтогазова інженерія та  
технології», що вивчають предмет на іноземній мові**

**METHODICAL INSTRUCTIONS**

**for independent work**

**«Control questions on the lecture material to determine the quality of  
learning »**

**on the course «Occupational safety in the oil and gas industry»**

**for students of the specialty 185 «Oil and gas engineering and technology»  
who are studying the subject in English**

Харків 2018

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## **INTRODUCTION**

Injuries have a high level in the system of at oil and gas industry. This is due to the peculiarities of technological processes and production facilities that are classified as especially dangerous in terms of accidents, injuries, occupational diseases and environmental impact. Accordingly, the training of personnel that involved in the industry, on issues of occupational safety and environmental protection is important and that one needs further improvement.

Academic discipline "Occupational safety in the industry" entered to the curricula of higher educational institutions that train professionals in educational level of «Master».

Specialist of oil and gas industry should be familiar with modern forms and methods of determining the risk not only at the design stage of high-risk, but also at their operation, which is one of the important objectives of the said discipline.

Questions of the lecture material of the subject «Occupational safety at industry of oil & gas» for students knowledge self-control, obtained on the lectures, are driven at the methodical indications. Also, the answers on the proposed questions are driven in chaotic order. Its necessary that to invoke of the students thinking about correct answers, answering to the questions.

# 1 CONCEPTUAL PRINCIPLES SECURITY OF BRANCHES OIL AND GAS

## 1. 1 Questions

1. The main disadvantages of the traditional concept of labor protection.
2. The fundamental principles of the concept of "acceptable risk."
3. State of legal regulation in the field of life safety.
4. Issues in the regulation of legal framework of industrial safety and labor protection.
5. Promising directions of improvement of professional training in the field of life safety.

## 1. 2 Answers

Find the correct answers to questions

1. Legal act "On policy of safety" was developed to determine main directions to implement industry control and prevention from all production and services enterprises. This document combines issues of industrial safety and health requirements for the purpose of establishing and maintaining safe working conditions at every workplace (labor protection) and implementation of realistic range of measures to prevent accidents and minimize effect of emergency situations, and in the case they do occur – to perform their localization to bring down their consequences (industrial safety).

One of the examples in this area is the systems of safety management of production, which were developed in line with the requirements of OHSAS at the enterprises of "Naftogaz Ukraine".

2. The concept of security may take two forms: the first form implies that equipment and technology were built to ensure safety of people and the environment; the second form assumes that there is always a probability of hazard manifestation that should be reduced to the minimum level, which makes it

possible under existing conditions lower the risk of negative impact both on employees and the environment.

Significant drawbacks of a given concept have emerged over time. The lack of a systems approach to the analysis of various dangers, as well as direct factors and quantitative characteristics of safety resulted in that it became difficult to differentiate between degree of importance of a particular danger and to estimate the probability of danger occurrence. Conventional practice of analyzing effects of hazardous and harmful factors in the operation of dangerous enterprises, or within their buffer zones, cannot guarantee overall safety of the manufacturing personnel, the environment, population, and all other related objects. Such an approach makes it possible to analyze only specific manifestations of direct hazards. Thus, secondary manifestations of other factors and especially their combinations are ignored.

**3.** One of the prerequisites for Ukraine's integration into the European community is the existence in Ukraine of legislation that would regulate industrial safety at hazardous facilities. New approaches to industrial safety management should comply with the international standards on Occupational health and safety management systems (OHSAS) 18001 and 18002, which require that Ukraine should reform its legal framework in a given area in order to align it with international practice.

**4.** One of the basic concepts, specifically that of "absolute security", has now been replaced with the concept of "acceptable risk" whose underlying principle is to "predict and prevent". This very concept has now become generally accepted in the world.

A given concept implies that while it is impossible to achieve absolute safety in our anthropogenic world, it is feasible to accomplish maximal relative safety by reducing risks to acceptable level.

The concept is based on the following basic principles:

- Any relevant activity is justified only in those cases when the benefit from its implementation exceeds potential losses from accidents, with society ready to accept such risks;

- Cost optimization implies production security by reducing risks of accidents at the expense of profits from production activity;

- Availability of information implies that the employees and society are fully aware of the range of existing hazards with management decisions aimed at ensuring acceptable risk;

- Anthropogenic safety of modern society implies that the needs of future generations of mankind are not compromised under today's industrial conditions.

5. Legal regulation in the field of life safety in Ukraine abides by the Laws "The objects of enhanced risk", "On Labor Protection", "On industrial safety products." New law of Ukraine "On industrial safety" is currently under consideration.

The Law of Ukraine "The objects of enhanced risk" includes measures to protect people from potential industrial accidents by preventing their occurrence, location development, and emergency response.

The Law of Ukraine "On Labor Protection" regulates relations between employees and employers in terms of security of working environment and human health.

State standard ГОСТ 2156-93 defines safety of industrial enterprise (object) under conditions of routine operation and in the event of an accident, with the aim of reducing the impact of sources of danger to employees, population, and environment to the established limits.

## **2 WARNING SUPERVISION ENTERPRISES OIL AND GAS INDUSTRY DURING DESIGN AND CONSTRUCTION**

### **2.1 Questions**

1. Explain the purpose of supervision preventing the design and construction of industrial object.
2. Which specific authorities shall conduct supervision?
3. The content of the task to develop project documentation for constructing an industrial object.
4. The composition of the commission for selecting the site for construction.
5. For which industrial object is mandatory drafting safety declaration that its purpose and what are the main issues it addresses?
6. How accident scale is divided at the Objects of High Hazards (OHH)?
7. The purpose of drafting Plan of Liquidation an Emergency Situation of (PLES) and its contents.
8. The design process of industrial supplies.
9. The value and content of the feasibility of investment.
10. Purpose and contents of the Assessment of environmental impact (EIA) and the procedure for its development.
11. A typical composition project for industrial purpose and the part of "General".
12. Procedure for approval, examination and approval of project documentation.
13. The main requirements of the general plan of OHH.
14. Appointment of Sanitary Protection Zones (SPZ) industry.
15. The main requirements and design standards of the technological part of the project.
16. Specific design standards of oil and gas industry.
17. Design standards of water supply and sanitation.
18. The order of the commissioning process equipment.

## 2. 2 Answers

Find the correct answers to questions

### 1. Order for commissioning the process equipment:

- acts of testing equipment for density;
- acts of trials of idle equipment or under load;
- acts of acceptance of equipment for complex testing;
- acts of lubricant testing for hydraulic and pneumatic systems;
- assembly and welding forms;
- acts of hidden operation of installation of equipment;
- acts for supporting structures, etc.;
- a set of working drawings for the installation of equipment with the signatures of those responsible for the mounting of equipment, performed or amended, agreed with the designer if this takes place during installation.

2. Construction or renovation of industrial enterprises starts with drafting. The issues related to the prevention of possible negative effects of various unfavorable factors in operation or to the prediction of anthropogenic influences on the environment should be considered in the projects in order to ensure their safety, optimal hygienic conditions, high economic efficiency and environment protection. To solve these tasks, designers should be guided by the applicable laws of Ukraine on health and environmental protection, in order to find the most optimal, rational solutions for sanitation, organizational, technological and environmental issues.

The purpose of preventive control and supervision is to verify the rationality of design solutions and their compliance with acting legislation.

3. Central collection points for oil, gas and water production maintenance, development of drilling water for oil reservoirs must be designed with centralized water supply systems. Th return water supply systems are recommended.

Water supply to maintain reservoir pressure of oil reservoirs and flooding reservoirs should be designed in accordance with engineering design of oil fields.

When using groundwater for water supply, the amount of water should be based on the estimated costs for providing water for all wells plus one. The boundaries of the second zone of sanitary protection of groundwater intakes are set based on the sanitary and hydrogeological conditions in the respective estimation.

4. Official bodies of state supervision perform these functions through preliminary examination of project documents or project and working documentation for compliance with the laws and regulations on health and environment.

State supervision over compliance with laws and regulations on labor protection is executed by:

- specialized authorized central executive body for supervision of work (State Service of Ukraine on Labor);
- specialized authorized state agency on radiation safety (State Committee of Ukraine for Nuclear and Radiation Safety);
- specialized authorized state body on fire safety (Fire Protection Department at DSNS of Ukraine);
- specialized authorized state body on health (Sanitary and Hygienic Service of the Ministry of Health of Ukraine).

5. One of the features of designing oil and gas industry facilities is the wide use of block-complete modules of construction objects when working platforms of the building or a structure are delivered as a single unit or its parts.

This method of construction has significant advantages over traditional methods, especially in the location of objects of design (construction) under complex natural and geographical (climatic) conditions (upland, waters, etc.).

Buildings and structures in block-complete implementation contain the equipment that should be designed in accordance with technical requirements.

In addition, oil and gas industry operates under conditions that require assessment of the risk (probability) of accidents at each potential source of

accident and subsequent determination of acceptable risk for the facility as a whole.

It is required, at the stage of design, to take into consideration impact of any adverse factor to employees during operation; in addition, man-induced environmental effects of production should be identified, and evaluated, in order to prevent their possible manifestations.

**6.** Permission for the development of project documentation is granted to entrepreneurs who have appropriate license. Designer receives orders for designing an object from a customer or as a result of the contest.

The task for design should include: implementation of basic directions for designing an industrial facility, requirements for applying new techniques and best practices, effectiveness of investment, reduction of material consumption and lower labor intensity, ways to increase productivity, reduce consumption of raw materials, material and energy resources, etc.

**7.** Technological part of the project describes production characteristics of enterprises, contains data on main production lines, operation modes, raw materials, it substantiates the choice of technical solutions and processes, equipment and location; it specifies labor capacity of production processes; outlines acceptable level of automation. It gives information on emissions of pollutants and ways of treatment them, as well as characteristic of industrial wastewater. It shows communication between industrial workshops, lays out plans and sections of industrial buildings indicating location of main technological equipment and vehicles.

Technological part of the project should provide a possibility to assess the nature of hazardous processes, their compliance with technical and hygienic requirements and safety standards.

Technological part of the project is based on government and industry regulations (construction and sanitary norms, rules and regulations for arranging safe operation of equipment, fire safety, etc.).

**8.** The site for construction is defined by the City Planning and Architecture Department, or a board with representatives acting in the interest of:

- customer and designer;
- local government and city planning and architecture department;
- environmental protection bodies and public health supervision authorities;
  - other state supervision bodies and other stakeholders, depending on specific objects.

**9.** Sanitary Protection Zones (SPZ) are the buffer zones, or any part of them, which cannot be used for expansion of the industrial area. Buffer zones may house buildings for management purposes, research laboratories and other auxiliary facilities.

The areas of buffer zones shall be equipped according to the project, being developed simultaneously with the construction or renovation. Existing green areas must be kept intact within sanitary protection zones.

Such protection zones must be of minimum width of 50 m and a width of 100 m. Green plants within a sanitary protection zone facilitate air exchange, prevent penetration of air pollution into residential areas, purify air from industrial emissions and dust and reduce noise.

**10.** The issues related to health and environment protection are dealt with in the chapter "General Overview" of the project. This chapter is composed of the following:

- initial data on development of the project;
- a brief description of the enterprise
- information on resource requirements;
- stages of preparation, organization, and timing of construction;
- main solutions of the master plan, layout of utilities and communications;
- description of work with characteristics of hazards and danger, applied raw materials, products, production facilities, territories and areas of explosive and fire danger, radius zones of possible destruction, individual and collective protection of

employees from dangerous and harmful factors, availability of premises for sanitary purposes, medical care, etc.;

- estimation of Environmental Impact Assessment (EIA);
- evaluation of effectiveness of design solutions compared with data approved by the feasibility study of investments.

**11.** Acting legislation on the objects of high hazard (OHH) requires that legal entities that own or use at least one OHH or those that intend to start construction of a facility should prepare a declaration on the object safety. Safety declaration is based on the degree of danger at the object, assessment of risk of accidents associated with the operation at the objects. Safety declaration is composed as a separate document.

**12.** Current legislation on the objects of high hazard (OHH) requires preparation of declaration on safety from the owner of the object. Safety declaration is based on the degree of danger, assessment of the risk of accidents associated with operation of the objects. Safety declaration is composed as a separate document.

The first class of danger identified at OHH is the degree of danger based on risk assessment and justification of solutions regarding safe operation.

Safety declaration should include:

- results of the comprehensive study into degree of hazard and risk assessment;
- estimation of operation readiness of OHH;
- a list of solutions and activities implemented to reduce the risk and to prevent accidents;
- information on measures to localization and liquidation of possible consequences of accidents (plan of liquidation of emergency situations - PLES).

**13.** Project documentation for construction, expansion, renovation and technical re-equipment of industrial facilities is defined by the state building norms of Ukraine ДБН Д.2.2-3-97. Permission for the development of project documentation is provided to entrepreneurs who have appropriate license, which must be given before start of design work to ensure that the skills are sufficient to fulfill the tasks.

Orders for designing an object is received by a designer from the customer or upon completion of the contest.

**14.** The declaration of safety must include information on safety measures at the object, activities for localization and liquidation of possible consequences of accidents, the degree of hazard analysis and assessment of the level of risk that may arise: it is denoted as a plan of liquidation of emergency situations – PLES.

**15.** The project generally consists of the following components that are part of the explanatory note:

- Terms;
- General plan and transport;
- Technological part;
- Building solutions;
- Organization of production;
- Civil engineering.

The chapter "General Overview" includes the following information:

- initial data on development of the project;
- brief description of the enterprise;
- information on resource requirements;
- stages of preparation, organization, and timing of the construction;
- basic solutions for the operation of the master plan, layout of utilities and communications;
- description of work with characteristics of hazards and danger, applied raw materials, products, production facilities, territories and areas of explosive and fire danger, radius zones of possible destruction, individual and collective protection of employees from dangerous and harmful factors, availability of premises for sanitary purposes, medical care, etc.;
- estimation of the environmental impact assessment (EIA);
- evaluation of efficiency of design solutions compared with data approved at the stage of feasibility study of investments.

**16.** In a general plan, an enterprise must show mutual accommodation and buildings in conjunction with the scheme of production and local conditions.

In the process of site selection, construction company considers the possibility of building production and auxiliary facilities, internal and external engineering networks and communications inside and outside of area, transport, implementation of measures for improvement of regional planning, organization of secure enterprises, etc. Important in this process is the estimation of buffer zones and the impact of projected activities on the environment.

Industrial enterprises that may be the source of emissions of harmful and unpleasant odorous substances, which produce high levels of industrial noise and vibration, ultrasound, electromagnetic waves, ionizing radiation, static electricity, should be built at a distance from residential areas, with sanitary protection zones, relative to the buildings and facilities that require clean atmospheric air.

**17.** An important step in the development of materials to support a project is the development of environmental impact assessment (EIA) for the projected industrial facilities with initial data, project task to design, and description of the site for construction.

Preparation of this document implies performing a full analysis of possible impacts of existing factors during operation on all environmental components: air, surface and ground water, land, flora and fauna, etc.

The EIA materials consist of the following parts:

- air protection from pollution;
- protection of water from sewage contamination;
- protection of soil, plants, animals, etc.

**18.** Feasibility study of investment defines the need and appropriateness of construction or renovation of industrial objects and their technical capacity, as well as investment efficiency. The document that summarizes it should address decisions made about location, power to be supplied, estimation of the impact of projected activities on the environment. Feasibility study is the basis for further development of project documentation after endorsement and approval.

## **Conclusions**

The methodical indications are developed for the foreign students, whom learning subject «Occupational safety at industry of oil & gas» in English.

Also, the methodical indications are aimed for more deep learning of the lecture material with help of the self-control method.

The questions and answers, which driven in these methodical indications, are at the limits of the lecture material only.

## **LIST OF RECOMMENDED LITERATURE**

1. OHSAS 18001:2007. Occupational health and safety management systems – Requirements (Системи управління гігієною та безпекою праці. Вимоги).
2. BS OHSAS 18001:2008. Occupational health and safety management system – Guidelines for the implementation of OHSAS 18001:2007 (Системи управління гігієною та безпекою праці. Керівні вказівки із впровадження OHSAS 18001:2007).
3. ДСТУ 2156-93. Безпечність промислових підприємств. Терміни та визначення.
4. Радецький І. І., Горобинський С. В., Костанян В. Р., та ін. Удосконалення системи управління безпеки виробництва підприємств нафтогазового комплексу // Нафт. і газова пром-сть. – 2012. – № 6.

## **Методичні вказівки**

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