**DEVELOPMENT OF HUMAN RESOURCES IN THE CONDITIONS OF DIGITALIZATION OF OIL AND GAS INDUSTRY**

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**Abstract**

This paper is devoted to the study of the development of human resources in the digitalization of the oil and gas industry. The authors conclude that one of the main areas of training and retraining of personnel in the digitalization of the oil and gas industry should be the creation of mechanisms for public-private partnership of oil and gas employing companies with universities, which will ensure the digitalization of the industry, the development of higher education and the national economy as a whole.

**Key words:** Human resources, Digitalization, Oil and Gas Industry

Digital technologies in the modern world play an important role in the socio-economic development of countries.

Digital technologies offer several advantages:

- acceleration of information exchange;

- simplification of access of business and the population to public services;

- creation of new digital products, technologies;

- the emergence of new opportunities for business, etc.

The goal of the state program “Digital Kazakhstan” adopted in Kazakhstan is “the progressive development of the national digital ecosystem to increase the competitiveness of the economy and the nation, achieve sustainable economic growth and improve the quality of life of the people of Kazakhstan” [1].

The creation and development of digital oil and gas technology and innovation is associated with the ideology of Hi-Tech (high technology). The ecosystem of the digital oil and gas industry is based on digital acquisition, the subsequent transmission of geological field data, which is encoded into discrete signal pulses [2; 3; 4]. Thus, the digitization of the collection and transmission of geological field data is a key factor in the digitization of the oil and gas industry in Kazakhstan.

Figure 1 shows the key elements of the digitalization of the oil and gas industry.

Key elements of the digitalization of the oil and gas industry

Integrated Operations Management Center

Sensor devices

Drones to watch

Smart devices

Real-time data analysis

3D printers and drones for delivery

Request for the provision of oil services in real time

Figure 1 - Elements of digitalization of the oil and gas industry

Note: compiled by the authors

Thus, with the help of sensory devices, it is planned to detect abnormal changes in pressure, flow, and temperature in installations of the collection and preparation system, wells, drilling rigs.

Upon receipt of a warning signal, engineers of the center for integrated operations begin to conduct a diagnostic study using a virtual or interactive three-dimensional production model [5].

Integrated operations center engineers determine the need for specific services; create a request for service providers. In real time, the most advantageous offer is accepted.

Air drones conduct surveys of surface collection systems, offshore drilling installations, preparation and transport of oil and gas products and transmit video and images to the integrated operations center online [6; 7].

Sometimes workers in the oil and gas fields get to the equipment or oil well for several hours. They will have direct access to the recommendations of experts, using the connection with the digital mobile operator, online information and the possibility to print on the spot on 3D printer small details [8].

The oil and gas industry of the Republic of Kazakhstan, occupying a crucial place in the national economy, must undergo the necessary digitalization (Figure 2).

Smart field

Smart intelligence

Smart drilling

Smart development

Smart booty

Smart water use

Smart energy

Smart transportation

Smart processing and logistics

Smart marketing

Smart oil and gas complex of the Republic of Kazakhstan

Figure 2 – Smart oil and gas complex of the Republic of Kazakhstan

Note: compiled by the authors

According to Schwab Klaus, in 2016, the number of smart oil and gas fields of the 1st generation (including oil and gas fields, where elements of smart technologies were partially introduced) reached 240 units, and the number of smart fields of the 2nd generation - 2 [9].

The revolutionary changes in the global oil and gas industry have recently led to the creation of 110 large centers operating in real time for management:

- search and exploration;

- drilling;

- development;

- preparation and operation;

- transport;

- processing;

- marketing of oil, gas and petroleum products.

Table 1 - The number of development control centers operating in real time of large oil and gas companies in the world

|  |  |  |
| --- | --- | --- |
| Company | Name of the Control Center | Number of control centers |
| 1 | 2 | 3 |
| ВР | Advanced Control Environment  | 10 |
| Chevron | Advanced Decision Environment | 8 |
| Shell | Collaborative Work Environment  | 7 |
| Conoco/Philips | Onshore Operations Centers  | 5 |
| Note: compiled by the authors |

As can be seen from the data in Table 1, in every major oil and gas company in the world, the number of Development Control Centers operating in real time is growing rapidly.

In our opinion, the smart oil and gas complex should be oriented:

- a significant reduction in material and labor resources;

- a significant increase in labor productivity;

- to reduce operating and capital costs;

- on leveling the impact on the environment.

For the labor resources released by the digital oil and gas industry, it is necessary to ensure their conversion with the creation of an integrated system of educational programs using public-private partnership mechanisms.

The list of new specialties of the digital oil and gas industry should include:

- operators of drones and air copters;

- operators of underwater drone;

- mobile operators;

- operators of underwater mining complexes;

- operators of downhole tractors;

- dispatchers of integrated operations, etc.

According to forecasts, the demand for highly qualified specialists in the field of artificial intelligence methods and analytics of large geodata will grow especially quickly.

An important strategic task in the digitalization of the oil and gas industry should be to increase the interest of all stakeholders in the training of highly qualified personnel, training, retraining, the development of creative thinking of employees, the ability to solve non-standard tasks.

The choice of modern means, forms, methods of training and retraining of workers is one of the important steps in the activities of oil and gas companies [10; 11].

Problems of training and retraining of labor resources in the oil and gas industry should be considered in the context of the diversity of relations and relations with the most important macroeconomic and demographic processes in the country, the state of the labor market and employment dynamics in the industry, as well as changes in their structural characteristics.

In modern conditions, serious employers in the oil and gas industry willingly cooperate with Kazakhstani universities, taking an active part in joint educational programs, waiting for competitive specialists [12; 13].

Thus, one of the main areas of training and retraining of personnel in the digitalization of the oil and gas industry should be the creation of mechanisms for public-private partnership of oil and gas employing companies with universities, which will ensure the digitalization of the industry, the development of higher education and the national economy as a whole.

Thus, as was noted, one of the main areas of training and retraining of personnel in the conditions of digitalization of the oil and gas industry should be the creation of mechanisms for public-private partnership of oil and gas employing companies with higher education institutions (Figure 3).

Directions of public-private partnership of oil and gas companies-employers with higher educational institutions in the process of training and retraining of personnel in the conditions of digitalization

creation and continuous improvement of educational standards and programs, training programs and retraining of competitive qualified personnel, taking into account the needs of the domestic labor market and the digitalization of the oil and gas industry;

creation and development of educational and production infrastructure on the basis of universities for the innovation activities of oil and gas companies;

the possibility of attracting students and teaching staff in the process to carrying out research and development projects to solve the problems of the oil and gas business;

creation of additional opportunities for the development of multi-channel and material and technical financing of the educational base;

creating a model of an integrated innovative educational complex (technologies and areas of training and retraining for the oil and gas industry, quality management, new infrastructure).

Figure 3 - Directions of public-private partnership of oil and gas companies-employers with higher education institutions

Note: compiled by the authors

The development of a model of interaction between oil and gas companies-employers with the higher education system in the process of training and retraining personnel at all levels requires an updated regulatory and legal framework for the implementation of organizational and educational support for students' training for the industrial sector of the economy.

The interest of oil and gas companies-employers and professional communities to participate in the interaction with the higher education system in the process of training and retraining of personnel consists primarily in the benefits they receive from the implementation of the public-private partnership mechanism of oil and gas companies-employers with higher education organizations in the training of qualified professionals.

The main areas of cooperation in the framework of the public-private partnership program of oil and gas employing companies with organizations of the higher education system should be:

- conclusion of long-term contracts for targeted training and retraining of qualified personnel for the oil and gas industry;

- internships on the basis of an oil and gas company by students and teachers,

- creation of a training ground in a partner company;

- organization of continuous personnel training for the industry;

- organization of training and retraining of personnel for the oil and gas industry (mastering the latest competencies in the digitalization of the oil and gas industry in Kazakhstan), etc.

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