Methods and priorities for human resource planning in oil and gas projects in Russia and OPEC

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METHODS AND PRIORITIES FOR HUMAN RESOURCE PLANNING IN OIL AND GAS PROJECTS IN RUSSIA AND OPEC

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***Abstract* - The Organization of the Petroleum Exporting Countries and the Russian Federation are the key players on the global hydrocarbon market today. They believe that the successful hydrocarbons development is inextricably linked to the provision of highly qualified personnel for projects being implemented. To develop a universal methodology for planning the number of personnel of certain qualifications for the hydrocarbon deposits development in the shelf area is the main purpose of the study. A tool for prognosis and planning the number of personnel for offshore oil and gas projects is proposed. This methodological tool is based on a model of a static balance between the available human resources potential and the personnel requirements, which is expressed by a system of equations. The calculation is carried out on the example of an offshore project of the oil and gas company.**

1. INTRODUCTION

Human resources are the basis of any organization. It is impossible to build a functioning enterprise and effectively achieve its goals without employees with the necessary qualifications and skills. Therefore, successful companies pay special attention to long-term planning of human resource policy and the creation of a perspective staffing strategy.

Russia and OPEC are partners and the most important players in the global oil market. In the current context the OPEC member countries have a significant impact on the regulation of the world oil market. The development of human resources capacity and planning are the most important management tasks for both Russian oil and gas companies and oil companies of OPEC countries [1].

In the last decade, the concerns about the lack of qualified labor force, especially in the construction and facilities operations developed among the OPEC specialists [2]. The development and significant expansion of the energy industry have led to the requirement to attract experienced and promising personnel, especially geologists, drillers and engineers. Some experts, in particular James Griffin [3], suggest that this can potentially limit the development of the industry, because Human Resource (HR) departments of companies will face with serious tasks such as finding interested young professionals, developing relevant skills in the existing workforce and replacing a significant part of the staff in the whole. Torstein Hagen, Florian Pollner, Christer Tryggestad and Jannik Woxholth [4] emphasize that fundamental changes in HR policies across industries have profound implications for the HR functions of oil and gas companies. In view of this, oil and gas companies should consider updating and revision their HR strategy and HR operating model.

This is especially necessary in modern conditions of the market, when there is a production increase, an investments inflow, the development of small forms of oil and gas business. Many world oil and gas companies feel an urgent need for qualified and promising specialists. For example, Russian oil companies need drilling engineers, design engineers, oil production engineering technologists, field development engineers, occupational health and safety specialists, managers with experience in offshore drilling and operations. There is also a need for specialists in the fields of Automation and Telemechanics, Radioelectronics and Communications Systems, Electronic Computer Technology, Physical Chemistry [5].

On the other hand, the problems of eliminating jobs in depleted fields, reducing investments in the certain regions, lowering world energy prices and the widespread use of new technologies impose conditions for the need to reduce, retrain, and search for new skilled workers.

For a long time, the HR management services of economically developed countries focused mainly on the current necessities of the organization. For the solution of the task the employer expected to recruit the required number of employees who are capable of doing their job without any special long training. The employers had such an opportunity because of the overmanning in the labor market, and the layoffs of workers were not associated with large financial losses. The changes in the operating conditions of organizations make demands to be guided in the formation of resources (including human resources) not only on current needs, but also on long-term prospects [6].

Today the quality of employees, their skills, the desire for self-development, the willingness to take responsibility come to the fore in work with personnel. For these reasons, CEOs of large companies in many countries have abandoned the principle of hiring the necessary labor and making needless workers redundant. The opinion began to prevail that it is necessary to carry out work on HR planning not only in the event of a shortage of employees, but also during the economic growth of companies, developing the existing personnel. Also, companies should pay attention to HR planning during crises and unemployment, because it is not easy to find qualified workers [7].

Kamran Hazini and Maryam Sohrabi [8], as well as Lars Lindholt and Solveig Glomsrød [9] and others [10-21] believe that human resource management in the oil and gas industry differs significantly from the projects in other industries, because in most cases jobs in this industry are located in remote geographic areas with harsh weather and poor infrastructure and transportation. In addition, launching several projects in developing countries with successful field development at the same time by oil and gas companies leads to the problem of a shortage of specialists. It can cause construction or production stops and significantly affect the implementation of tasks set by companies. Consequently, oil and gas companies are supposed to focus on long-term planning in HR policy. In turn, candidates for certain positions should have an idea of the conditions set before them, see the development prospects that the employer can provide them, and be sufficiently motivated for personal development and successful selection.

According to Kamran Hazini and Maryam Sohrabi [8], recruitment includes all the activities that managers undertake to create a pool of qualified candidates for open positions. Managers carry out the selection which means the process when they determine the relative qualifications of candidates for a vacancy and their potential for successful work in a particular position. Careful attention to the selection of project team members will help achieve the project objectives. It is also advisable for HR specialists to prioritize and hire skilled and experienced employees.

Before embarking on recruiting and selecting employees, managers are supposed to complete two important steps: successful human resource planning and job analysis. As part of human resource planning, it is necessary to predict demand and supply of the labor to assess the professional level, the qualifications and number of employees that will be required in the project. The second important step that HR managers need to undertake is the analysis of the position, the creation of its description and specification. It includes the process of defining tasks and responsibilities, as well as the knowledge, skills and abilities needed to get the job done.

For example, the Organization of the Petroleum Exporting Countries requirements for the position of the head of the finance and personnel department include the candidate's advanced leadership, communication, analytical and presentation skills, negotiation skills, ten years of work experience, of which at least four years - in a management position, preferably in large international organizations.

A special place in the search system for specialists in the oil and gas industry is occupied by the system of cooperation between production companies and higher educational institutions. At the moment, there is a growing demand for students with a sufficient level of knowledge and motivation in the labor market. Many educational institutions develop close ties with large mining companies, improve the level of the practical part of education and welcome scientific work.

At the same time, there is a shortage of young workers. This is due to the fact that many applicants for a certain period of time had other, humanitarian and less applied, areas of education in priority. There is a problem of a lack of specialists because of the facts that now a significant part of the staff of many Western companies, as well as in Russia, are people aged 45-60 years and a large number of petroleum engineers around the world are approaching retirement age [5].

To solve this problem, it is necessary to competently inform the university entrants about the oil and gas business, learn to understand the multifaceted perspectives of these professions and give young people the opportunity and time to acquire the necessary level of qualifications.

In connection with the above, it is necessary to develop methodological approaches to the HR planning, the HR potential assessment and its development. In this regard, the authors set the aim of creating a universal methodology for planning the number of personnel in the implementation of complex oil and gas projects on the shelf. This can also be used in projects that are carried out under the auspices of the OPEC. The development of original proposals for quantitative tools for scientific forecasting, analysis and planning of the need for qualified personnel for a wide industrial specialisation has been identified as the main focus of the study.

The authors of this study, however, believe that the development of Arctic marine hydrocarbon resources is a major challenge that threatens natural systems. It may be better to develop fields on land and to increase the oil supply of old fields, where technologies have been tested, including those for environmental protection. But if the company begins to implement offshore projects in the Arctic, environmental and safety issues will be fundamental. The start of such projects must therefore be accompanied by a detailed sustainability assessment, with priority consideration of the environmental factor and of all impacts on local communities.

2. THEORY AND METHODOLOGY

2.1. Planning and prognostication human resource needs: concept, essence and role in oil and gas projects

Human resource planning and prognostication are the main and integral part of the human resource policy of any organization, which allows to establish the qualitative and quantitative composition of human resource for a given period of time. These HR tools are linked to the organization's future development plans, from logistics to human resource costs. Based on the assessment of the company, the goals and strategy of the enterprise, you can successfully determine the required number of human resources. It is important that work with human resource can be viewed both from the side of the company's interest and from the side of the working human resource. But the goals of prognostication and planning the need for human resource should be based on the goals of enterprise development.

Foreign sources understand this only as a subspecies of human resource planning, in turn, highlight a number of other concepts, such as human resource training and development planning, distribution planning for employees, etc.

With the help of human resource planning, you can calculate the number of new human resource and conduct inappropriate, draw up a strategy for working with human resource in accordance with their potential and ensure their development. At the same time, human resource planning is also responsible for organizing remuneration and maintaining staff motivation.

Human resource planning is based on the following principles:

1. Participation of the number of employees of a given organization in the course of work on the plan at the first stages of its preparation. The use of this principle is mandatory, in other cases the use is at the discretion of the managers.

2. Continuity is necessary for stable work with human resource, support and promotion of development, growth. This is why workforce planning should be viewed as a systematic,

iterative process.

3. The development of all planning organizations should be carried out taking into account the fact that they will be used to draw up future plans, but necessarily based on the results of previously implemented plans.

4. There is a need for flexibility in decisions that can change according to the circumstances of the moment. For this purpose, "pillows" are specially laid, which in a critical situation will ensure the safety of that other maneuver.

5. Coordination of plans take place with the help of integration and environment, caused by the unity and interconnectedness of specific parts of the organization. Coordination between subdivisions of the same level (horizontally), integration - between higher and lower subdivisions (vertically). Their need is due to the fact that quite often there is duplication of the same positions in different departments.

6. Taking into account the collective and individual psychology of workers.

7. Availability of the necessary conditions for the implementation of the plan.

8. Creation of conditions for the realization of employees' capabilities.

9. Taking into account the consequences of a social and social nature, according to the result of decisions made.

Considering that today it is a significant and decisive factor in the work of any organization, the speed of achieving goals can be about the effectiveness of human resource planning. It is imperative that when planning human resources, it is necessary to take into account such external factors as: the state of the economy and the specific policy of the enterprise, market policy and the presence of competition, necessarily the financial condition and level of remuneration, and corporate culture.

2.2. Existing methodological approaches to planning and prognostication human resource requirements for oil and gas projects

Planning in a modern market environment means taking into account factors that can be uncontrollable and quite often unpredictable. Therefore, modern planning assumes the definition of benchmarks and the assessment of possible alternatives that may affect further circumstances.

There are several stages of the process of human resource planning and prognostication the need for human resource in an oil and gas company:

1. Assessment of available resources - consideration of the available resources of the company, analysis of plans, goals and strategies of the organization. Creation of a human resource plan based on them.

2. Assessment of projected human resource needs - determination of the required number and qualifications of employees in accordance with the plan and organizational structure of the enterprise, analysis of human resource needs for a specific period. During this stage, HR managers use methods of questioning, observation, interviews, etc.

3. Analysis and assessment of the possibilities of meeting the human resource needs at the expense of the resources available in the company. First, the state of the existing human resources of the enterprise is assessed, then external sources are assessed (graduates of educational institutions, students, the labor market) and the potential of these sources is

assessed. In conclusion, an assessment of the compliance of requirements and resources is carried out, and the quantitative and qualitative requirements for human resource are adjusted.

4. Development of a program for their effective implementation - development of action plans to achieve the desired results, implementation of the necessary adjustments within the enterprise.

Let's take a closer look at these stages.

During the first stage, specialists analyze workplaces, processes and operations at the enterprise. To effectively conduct this analysis, four methods are used: observation, interview, questioning, consideration of the duties and role of the employee in the enterprise system.

Observation is used when the result of the employee's work is obvious. An example is the uniform actions of a worker on a production line. In the case when we cannot visualize the process of work, this method is ineffective - for example, writing a scientific article, the work of a scientist.

The second technique is usually used for an in-depth study of a workflow. During the interview, the analyst receives information about the work performed directly from the employee. In this case, the information may be biased, since the human factor and personal interests of the employee often affect the effectiveness of the interview.

Questioning is usually the most effective technique for revealing reliable information about the work process. The main advantage of a questionnaire survey is the ability to interview a large number of people in a short time with low labor costs.

Consideration of an employee's responsibilities is contrasted with observation. In this case, a list of work processes is compiled, which are not subject to systematization and observation, information is recorded on the time and frequency of performing certain operations.

These techniques help to structure the tasks performed by an employee of a certain profession, and to form an objective view of the position as a whole. The acquired information is used not only for assessing existing capabilities and planning human resource, but also in the selection of candidates for the position, the retraining process, solving internal issues and in many other cases.

In addition to studying work processes, when planning human resource, managers also carry out a structural analysis, considering the qualifications, length of service and the composition of employees.

This is followed by the prognostication stage. In accordance with the tasks set, the assessment and planning of the labor force requirement is carried out. An important role is played here by raising the qualifications of workers, since it is difficult to satisfy the expected needs with one labor market. In addition, it is necessary to take into account the possible risks of temporary loss of labor resources (illness, dismissal, vacation).

During the prognostication stage, the following steps are distinguished: calculating the required number of human resource in accordance with the production plan or workflow, human resource planning (taking into account factors such as the volume of work performed by one employee, the length of the working day) and the development of forecasts of the employment scenario in the region. According to the above, innovations are applied and changes are made in the human resource policy of the enterprise.

The prognostication phase is the basis for further actions in human resource planning. Also, in the course of prognostication, alternative options are created, and, after considering all available scenarios, the most promising is adopted.

The final stage of human resource planning is to develop a project to achieve the goals. It includes: scheduling work, creating projects for recruitment, training and adaptation of human resource.

With the help of competent human resource planning, you can effectively fill vacancies, attract qualified specialists to the service and minimize employee turnover. At the same time, the main task of human resource planning is to ensure that the organization has the required number of people with the appropriate skills at the right time.

There are two sources of human resource attraction: external (attracted from the external environment) and internal (employees of the enterprise). Outsourcing is the most popular because the company's human resources are limited. Internal sources reveal the ability of self-sufficiency in human resource, stimulate staff development within the company.

The main recruiting tools are job descriptions, qualification cards, and competency cards. The job description contains the main functions that the employee must perform; the qualification card contains the necessary set of qualification characteristics and skills; the map of key competencies reflects the desired personal qualities of a person, his social and professional abilities.

An important tool in the human resource planning process is the drawing up of a plan for filling vacancies.

To draw up this plan, you must perform the following sequence of actions:

1. Analyze the staff turnover of the position in question;
2. Identify the planned number of vacancies corresponding to the plan for the implementation of the enterprise program for the period under consideration;
3. Collect information from the structural units in which the replacement of employees will take place (make lists of employees planned for transfer in case of vacancies);
4. Get a list of graduates of targeted training enterprise;
5. Consider potential candidates for the position, draw up priorities and requirements for future specialists;
6. Draw up a plan for filling vacancies, based on the information received;
7. Submit the report and plan to the company management.

In the absence of candidates for targeted training for vacancies, an external personnel reserve is formed. It is worth paying attention to the fact that the consideration of external sources is appropriate only when hiring employees at starting positions. In other cases, priority is given to internal sources.

When urgent vacancies appear that are not provided for by the replacement plan, an application for replacement is sent to the personnel department, indicating the reason for the vacancy, job description and requirements for the candidate for the position. Next, the HR department identifies suitable employees, considers alternatives and sends the finished resume to the head of the department and the head of the HR department.

The organizational structure of many oil companies involves the removal of the work HR department (HR department separation between the cities); lack of specialists at the locations who could timely predict the need for personnel.

The main problem in personnel planning is the chaotic nature of the applications for selection, which is a consequence of the lack of a comprehensive methodology for forecasting personnel needs at present. The head office knows the factors that influence the need, but does not have a system.

In this regard, problems are resolved as they appear, emergency measures are taken to close vacancies, the team works in a mode of increased anxiety.

Operational achievement of a competitive advantage is possible only when realizing the real role of HR services in the enterprise system [22]. An objective assessment of this production structure allows you to fully use the potential of personnel and effectively build a personnel strategy. Specialists who are able to quickly adapt to changing external conditions (environment), striving to constantly gain new experience, having qualification potential, are primarily in demand in the labor market among organizations that seek to take leading positions, to conquer new market segments.

The authors believe that the system of work with personnel must be built in order to increase the number of people with sufficient competence and qualifications in the staff, that without a well-built system of work with human resources, it is difficult to increase the capabilities and potential of an oil and gas enterprise, to adapt to the constantly changing market and the growing level of technology.

There are several methods for forecasting staffing needs. They are based either on judgments or on the application of economic and mathematical methods.

In most cases, when working with personnel, qualitative and quantitative indicators are distinguished.

Demand for specialties, professions, personnel requirements determines the quality need. This indicator is calculated based on the organizational structure of the enterprise and its divisions.

Among qualitative methods, planners usually identify the following methods:

1. The method of expert assessments. Most often, for this method, an external expert is involved who is engaged in analyzing planning problems in the organization, and also conducts a connection of currently existing programs in order to improve them. The result is a clear strategy to achieve the goals, the value of this assessment is that it is independent and more objective.

2. Method of group assessments. In the course of work according to the standard of this principle, groups of specialists are formed, who are faced with the task of developing measures aimed at achieving the set goals. A versatile expert assessment of several employees and managers is taken into account, which implies the possibility of a more accurate calculation of the required number of personnel. On the other hand, specialists are faced with problems of difficulty in collecting information and subjective judgments.

3. Delphi method based on both expert and group methods. Often, the algorithm for applying this method consists of the following steps: interviewing independent experts regarding the task at hand; analysis of the results in group discussions; decision-making.

4. The modeling method is most often implemented through a simplified view of enterprise

personnel. If you change the input data, then personnel discrepancies can be checked for each scenario separately, depending on the need for personnel.

Quantitative personnel planning is based on the determination of the estimated number of personnel and its comparison with the actual availability. Distinguish the total demand and additional demand.

Quantitative planning methods:

• a method based on the use of data on the labor process time. Based on the complexity and useful production time per worker;

• method of calculation according to service standards. Based on data on the number of production facilities serviced by these workers;

• the method of calculation of jobs and the number of regulations. Allows you to determine the required number of employees according to the ratio of work volume and service standards;

• stochastic methods. Based on data analysis of the relationship between the need for personnel and variables (volume production, technical equipment).

Methods for predicting the need for personnel based on the use of mathematical-static methods and modeling methods:

1. Extrapolation. The essence of this method is reduced to the transfer of the current structure, composition, number for the future period in the proportions and quantity of the past period. It is used for short-term forecasting in enterprises with a permanent stable organizational structure.

2. Adjusted extrapolation. It is a method for calculating the projected number of personnel, taking into account changes in all assumed factors (increased labor productivity, increased production, higher prices and tariffs, inflation, etc.).

These methods are effective only when management realizes the real role of qualified personnel in the system and structure of the enterprise, and departments pay special attention to personnel and their professional training. However, there are certain problems, such as the lack of specific requests from managers to the results of departments that carry out work on personnel planning at all structural levels, as well as the lack of personal control over this activity.

Thus, the main reason for these problems can be attributed to the lack of specific requests from managers to the results of departments that are engaged in planning at all levels, as well as the lack of personal control over management activities. This situation requires a more serious attitude of the heads of organizations and departments to their personnel and their training and retraining.

3. RESULTS

3.1. Model of a static balance between the available staff potential and the need for it

Tasks related to the development of the shelf require highly qualified specialists with higher professional education, as well as a whole range of working specialties. Human resources of oil and gas companies implementing projects on the Arctic shelf are formed of the following sources: inhabitants of the Arctic zone where the project is being implemented; employees attracted from other regions of the country, as well as citizens of foreign states [23, 24].

In order to identify the conformity of the qualitative and quantitative characteristics of human resources to emerging needs in the implementation of projects on the shelf, we suggest that the model of the static balance between the available human resources and demanded resources be employed, expressed by a system of equations:

$$\begin{cases} \sum_{j=0}^{J}\left(\sum_{i=0}^{I}(a_i \cdot A_{ji})+\sum_{n=0}^{N}(b_n \cdot A_{jn})+\sum_{k=0}^{K}(c_k \cdot A_{jk})+\sum_{m=0}^{M}(d_m \cdot A_{jm})\right)=\lambda(A_j); \\ \sum_{x=0}^{X}\left(\sum_{i=0}^{I}(a_i \cdot B_{xi})+\sum_{n=0}^{N}(b_n \cdot B_{xn})+\sum_{k=0}^{K}(c_k \cdot B_{xk})+\sum_{m=0}^{M}(d_m \cdot B_{xm})\right)=\lambda(B_x); \\ \sum_{y=0}^{Y}\left(\sum_{i=0}^{I}(a_i \cdot C_{yi})+\sum_{n=0}^{N}(b_n \cdot C_{yn})+\sum_{k=0}^{K}(c_k \cdot C_{yk})+\sum_{m=0}^{M}(d_m \cdot C_{ym})\right)=\lambda(C_y); \\ \sum_{z=0}^{Z}\left(\sum_{i=0}^{I}(a_i \cdot D_{zi})+\sum_{n=0}^{N}(b_n \cdot D_{zn})+\sum_{k=0}^{K}(c_k \cdot D_{zk})+\sum_{m=0}^{M}(d_m \cdot D_{zm})\right)=\lambda(D_z), \end{cases} \tag{1}$$

where A – higher education professionals; B – secondary vocational education professionals; C – auxiliary workers; D – maintenance workers; a – knowledge; b – skills; c – socio-cultural competencies; d – psycho-physiological possibilities; i, n, m – types of knowledge, skills and psycho-physiological possibilities, respectively.

$\varphi(A_j)$ – actual human resources of higher education professionals, corresponding to the expression

$$\sum_{j=0}^{J}\left(\sum_{i=0}^{I}(a_i \cdot A_{ji})+\sum_{n=0}^{N}(b_n \cdot A_{jn})+\sum_{k=0}^{K}(c_k \cdot A_{jk})+\sum_{m=0}^{M}(d_m \cdot A_{jm})\right)=\varphi(A_j); \tag{2}$$

$\varphi(B_x)$ – actual human resources of secondary vocational education professionals, corresponding to the expression

$$\sum_{x=0}^{X}\left(\sum_{i=0}^{I}(a_i \cdot B_{xi})+\sum_{n=0}^{N}(b_n \cdot B_{xn})+\sum_{k=0}^{K}(c_k \cdot B_{xk})+\sum_{m=0}^{M}(d_m \cdot B_{xm})\right)=\varphi(B_x); \tag{3}$$

$\varphi(C_y)$ – actual human resources of auxiliary workers, corresponding to expression

$$\sum_{y=0}^{Y}\left(\sum_{i=0}^{I}(a_i \cdot C_{yi})+\sum_{n=0}^{N}(b_n \cdot C_{yn})+\sum_{k=0}^{K}(c_k \cdot C_{yk})+\sum_{m=0}^{M}(d_m \cdot C_{ym})\right)=\varphi(C_y); \tag{4}$$

$\varphi(D_z)$ – actual human resources of the maintenance workers, corresponding to the expression

$$\sum_{z=0}^{Z}\left(\sum_{i=0}^{I}(a_i \cdot D_{zi})+\sum_{n=0}^{N}(b_n \cdot D_{zn})+\sum_{k=0}^{K}(c_k \cdot D_{zk})+\sum_{m=0}^{M}(d_m \cdot D_{zm})\right)=\varphi(D_z); \tag{5}$$

$\lambda(A_j)$ – regulatory human resources of higher education professionals; $\lambda(B_x)$ – regulatory human resources of secondary vocational education professionals; $\lambda(C_y)$ – regulatory human resources of auxiliary workers; $\lambda(D_z)$ – regulatory human resources of maintenance workers.

$$A \in [0; I],\ A \in N;\ B \in [0; I],\ B \in N;\ C \in [0; I],\ C \in N;\ D \in [0; I],\ D \in N, \tag{6}$$

A_{ji} – the j^{th} employee with higher education, possessing the i^{th} knowledge; A_{jn} – the j^{th} employee with higher education, possessing the n^{th} skill; A_{jk} – the j^{th} employee with higher education, possessing the k^{th} socio-cultural competence; A_{jm} – the j^{th} employee with higher education, possessing the m^{th} psycho-physiological capability; B_{xi} – the x^{th} employee with secondary vocational education, possessing the i^{th} knowledge; B_{xn} – the x^{th} employee with secondary vocational education, possessing the n^{th} skill; B_{xk} – the x^{th} employee with secondary vocational education, possessing the k^{th} socio-cultural competence; B_{xm} – the x^{th} employee with secondary vocational education, possessing the m^{th} psycho-physiological capability; C_{yi} – the y^{th} auxiliary worker possessing the i^{th} knowledge; C_{yn} – the y^{th} auxiliary worker possessing the n^{th} skill; C_{yk} – the y^{th} auxiliary worker possessing the k^{th} socio-cultural competence; C_{ym} – the y^{th} auxiliary worker possessing the m^{th} psycho-physiological capability; D_{zi} – the z^{th} maintenance worker possessing the i^{th} knowledge; D_{zn} – the z^{th} maintenance worker possessing the n^{th} skill; D_{zk} – the z^{th} maintenance worker possessing the k^{th} socio-cultural competence; D_{zm} – the z^{th} maintenance worker possessing the m^{th} psycho-physiological opportunity.

To assess the companies' demand for personnel of various skill levels for implementing projects on the Arctic shelf, let us denote the higher education employees by $\lambda(A_j)$, secondary vocational education employees by $\lambda(B_x)$; auxiliary workers by $\lambda(C_y)$; and maintenance workers by $\lambda(D_z)$.

Thus, there are three alternatives of the relationship between the human resources of these workers and the need for employees of certain qualification. Let us consider the following example of employees with higher education.

Case 1: $\lambda(A_j) < \varphi(A_j)$. The available human resources of this qualification are greater than the need for workers with higher education. In this case, the need is fully provided by the resources available, with a certain additional human resource formed.

Case 2: $\lambda(A_j) = \varphi(A_j)$. The available human resources of this qualification are equal to the need for workers with higher education. Obviously, in this case, the need is fully provided by the resources available. However, in case of development of production, additional investments, aimed at professional retraining and training of personnel, is likely to be required.

Case 3: $\lambda(A_j) > \varphi(A_j)$. The available human resources of this qualification are less than the need for higher education professionals. In this case, in order to ensure implementation of projects, qualified training and professional retraining of personnel is required.

3.2. An example of calculating the staff requirements for an oil and gas projects

We will illustrate the static model using the example of shuttle tankers operating at the Varandey field.

Model assumptions:

1. The number of people who received specialties specialties of higher professional education (HPE), secondary vocational education (SVE), working professions, taken conditionally;
2. Competencies are not all from the Federal State Educational Standards (FSES) of higher professional education and FSES of secondary vocational education, but selectively for example;
3. In the example, only the transport component of the process of exploitation of the Varandey deposit is considered.

Let us consider separately the right and the left-hand sides.

Federal educational standards can be viewed on the website of the State University of Marine and River Fleet named after Admiral S.O. Makarov. Let's define the available potential of the North-West region of the Russian Federation. For the years 2010-2017 the State University of Marine and River Fleet named after Admiral S.O. Makarov (formerly GMA, GUVK) in the specialties of HPE issued:

- on the specialty "Navigation" - 980 people;
- on the specialty "Operation of ship power plants" - 910 people;
- on the specialty "Operation of ship electrical equipment and automation means" – 630 people.

Sedov Marine College on specialties of SPO for 2010-2017 years released:

- on the specialty "Navigation" - 910 people;
- on the specialty "Operation of ship power plants" - 840 people;
- on the specialty "Operation of ship electrical equipment and automation means" - 560 people.

Training on short-term programs in the Sedov Marine College and Training and training center "Marstar" passed:

- on the specialty "Sailor" - 1750 people;
- on the specialty "Engineer" - 1540 people;
- on the specialty "Chef of the ship" - 1260 people.

Suppose that all 100% of graduates have found work in their specialty (training profile). Let's define the available potential of these workers.

Thus, we will find the existing potential of workers with HPE (Table 1).

Table 1 The existing potential of employees with HPE

Profession	Knowledge	Skills	Sociocultural Competences	Psychophysiological Competences
HPE				
Engineer in the specialty "Navigation" – 980 people	1 2 3 4	1 2 3	1 2	1 2 3
Engineer in the specialty "Operation of ship power plants" - 910 people	1 2 5 6	4 5 6	1 2	1 2
Engineer in the specialty "Operation of ship electrical equipment and automation equipment" - 630 people	1 5 7	4 7 8	1 2	1 2

Thus, we will find the potential of workers with HPE:

[980 + 910 + 630] + [980 + 910] + 980 + 980 + [910 + 630] + 910 + 630 =

=9450 people*competences - knowledge of HPE.

That is, competence is measured in units (pieces), and their weight (significance) is not taken into account. We consider only the "Knowledge": the 1st competence is possessed by all - therefore 980 + 910 + 630, and, for example, the 5th - mechanics and electromechanics;

consequently, 910 + 630. Further similarly we find "Skills", "Sociocultural Competences" and "Psychophysiological Competences":

980 + 980 + 980 + [910 + 630] + 910 + 910 + 630 + 630 = 7560 people*competences - HPE skills;

[980 + 910 + 630] + [980 + 910 + 630] = 5040 people*competences - socio-cultural competencies of HPE;

[980 + 910 + 630] + [980 + 910 + 630] +980 = 6020 people*competences - psychophysiological competencies of HPE.

TOTAL: 9450 + 7560 + 5040 + 6020 = 28070 people*competencies.

Define the existing potential of workers with SVE (Table 2).

Table 2 The existing potential of employees with SVE

Profession	Knowledge	Skills	Sociocultural Competences	Psychophysiological Competences
SVE				
Technician in the specialty "Navigation" 910 people	1 2 3	1 2 3	1	1 2 3
Technician on the specialty "Operation of ship power plants" – 840 people	1 5 6	4 5 6	1	1 2
Technician on the specialty "Operation of ship electrical equipment and automation means" – 560 people	5 7	4 7 8	1	1 2

[910 + 840] + 910 + 910 + [840 + 560] + 840 + 560 = 6370 people*competences - knowledge of SVE;

910 + 910 + 910 + [840 + 560] + 840 + 840 + 560 + 560 = 6930 people*competences - SVE skills;

910 + 840 + 560 = 2310 people*competences - sociocultural competences of SVE;

[910 + 840 + 560] + [910 + 840 + 560] + 910 = 5530 people * Competences - psychophysiological competences of SVE.

TOTAL: 6370 + 6930 + 2310 + 5530 = 21140 people*competencies.

Let's define the existing potential of the working professions (Table 3).

Table 3 The existing potential of working professions

Profession	Knowledge	Skills	Sociocultural Competences	Psychophysiological Competences
Sailor– 1750 people	1	9 10	-	1 2 3

Engineer– 1540 people	2	11 12	-	1 2

1750 + 1540 = 3290 people*competencies - knowledge of the rank and file;
1750 + 1750 + 1540 + 1540 = 6580 people*competencies - skills of the rank and file;
[1750 + 1540] + [1750 + 1540] + 1750 = 8330 people*competences - psychophysiological competencies of the rank and file.
TOTAL: 3290 + 6580 + 8330 = 18200 people*competencies.

Let's define the available potential of providing employees (Table 4).

Table 4 The existing potential of providing employees

Profession	Knowledge	Skills	Sociocultural Competences	Psychophysiological Competences
Cook of the ship - 1260 people	8	13 14	-	1 2 4

1260 people*competences - knowledge of providing employees;
1260 + 1260 = 2520 people*competencies - skills of providing employees;
1260 + 1260 + 1260 = 3780 people*competencies - psychophysiological competencies of providing employees.
TOTAL: 1260 + 2520 + 3780 = 7560 people*competencies.

Let's find the right side of the static model, that is, our need for cadres, from the calculation that we are organizing a new production and there is no experience / guideline, how many and which specialists are needed. The model will allow, through human competence, to determine how many people and what professions will be required.
It is necessary to perform a certain amount of work: to transport 12 million tons of oil from the Varandey deposit by 3 tankers of 70000 tons each.
Flights: 2 - to the shore (70 km) and 1 - to Europe; On days: 2 + 2 + 14 = 18, the average duration of the flight is 6 days.
12000/70 = 171.43 - 172 total flight.
172 * 6 = 1032 days = 34.4 months.
We need some time to use a certain competence: for example, 50 hours - 1st competence, 20 hours - 2nd, etc.
For 1 steamer - 1032 days * 24/3 = 6256 hours.

Table 5 Time spent using a specific competency

Profession	Knowledge	Skills	Socio cultural competences	Psychophysiological competences
Bridge	1 * 6256 2 * 6256 3 * 6256 4 * 1376 - 4 hours a	1 * 6256 2 * 6256 3 * 6256	1 * 5504 2 * 1376 – business etiquette with	1 * 6256 2 * 6256 3 * 6256

	day, for example, using GMDSS radio equipment in an unlimited area		the pilot	
Bridge	1 * 6256 2 * 1376 5 * 6256 6 * 6256	4 * 6256 5 * 6256 6 * 6256	1 * 5504 2 * 5504	1 * 6256 2 * 6256
MO	7 * 1376	7 * 1376 8 * 1376	1 * 5504 2 * 5504	1 * 6256 2 * 6256
Maintenance of electrical equipment	1 * 6256	9 * 6256 10 * 6256	-	1 * 6256 2 * 6256 3 * 6256
Deck	2 * 6256	11 * 6256 12 * 6256	-	1 * 6256 2 * 6256
MO - maintenance	8 * 2752	13 * 2752 14 * 2752	-	4 * 2752

1 person in the regular mode works 8 hours a day. The required competence (1) must be multiplied by the number of shifts per day (3), by the number of crews per steamship changing each other (2), multiplied by the replacement insurance during the work period (1, 2), multiplied by (3) , multiply by (3) the contract - according to the terms of the employment contract, for example, one person (2 crew) is provided with 3 contracts (12 months of work) = 64.8 ~ 65 people for those who carry a watch or a working day of 8 hours.

We have 1-, 2- and 3-rd competencies in all navigators, and 4th - only with HPE. Then you can take 2 people. with secondary education after college and 1st - with HPE; the same with mechanics: their 2nd competence is only needed 4 hours - for 1 person with HPE.

You need 1 electromechanic, since his 7th competence is needed 4 hours a day.

You need 1 cook, since his 8-, 13-, 14- and 4-th competence needs 8 hours a day.

Define the need for the potential of workers with HPE (Table 6).

Table 6 The potential of workers with HPE

Profession	**Knowledge**	**Skills**	**Socio cultural competences**	**Psychophysiological competences**
HPE				
Engineer in the specialty "Navigation" – 1 person * 2 * 1, 2 * 3 * 3 = = 21,6 = **22**	1 * 22 2 * 22 3 * 22 4 * 22 **88**	1 * 22 2 * 22 3 * 22 **66**	1 * 22 2 * 22 **44**	1 * 22 2 * 22 3 * 22 **66**
TOTAL**: 88 + 66 + 44 + 66 = 264**				
Engineer in the field of "Operation of ship power plants" – 1 person * 2 * 1, 2	1 * 22 2 * 22 5 * 22 6 * 22 **88**	4 * 22 5 * 22 6 * 22 **66**	1 * 22 2 * 22 **44**	1 * 22 2 * 22 **44**

* 3 * 3 = = 21,6 = **22**				
TOTAL**: 88 + 66 + 44 + 44 = 242**				
Engineer in the field of "Operation of ship electrical equipment and automation equipment" – 1 person * 2 * 1, 2 * 3 * 3 = = 21,6 = **22**	7 * 22 — **22**	7 * 22 8 * 22 **44**	1 * 22 2 * 22 **44**	1 * 22 2 * 22 **44**
TOTAL**: 22 + 44 + 44 + 44 = 154**				

Thus, we will find the potential of workers with HPE:

264 + 242 + 154 = 660 people*competencies - this is less than 28070 people*competencies;
φ <λ for the HPE.

Define the need for the potential of workers with SVE (Table 7).

Table 7 The potential of workers with SVE

Profession	Knowledge	Skills	Socio cultural competences	Psychophysiological competences
SVE				
Technician on the specialty "Navigation" - 2 person * 2 * 1, 2 * 3 * 3 = **44**	1 * 44 2 * 44 3 * 44 **132**	1 * 44 2 * 44 3 * 44 **132**	1 * 44 — **44**	1 * 44 2 * 44 3 * 44 **132**
TOTAL **132 + 132 + 44 + 132 = 440**				
Technician on the specialty "Operation of ship power plants" – 2 person * 2 * 1, 2 * 3 * 3 = **44**	1 * 44 5 * 44 6 * 44 **132**	4 * 44 5 * 44 6 * 44 **132**	1 * 44 — **44**	1 * 44 2 * 44 — **88**
TOTAL **132 + 132 + 44 + 88 = 396**				

Thus, we will find the potential of workers with SVE:

440 + 396 = 836 people*competencies - this is less than 21140 people*competencies;
φ <λ for SVE.

Define the need for the potential of employees of the rank and file (Table 8).

Table 8 The potential of employees of the rank and file

Profession	Knowledge	Skills	Socio cultural competences	Psychophysiological competences
Sailor – 3 person * 2 * 1, 2 * 3 * 3 = 64,8 = **65**	1 * 65 **65**	9 * 65 10 * 65 **130**	-	1 * 65 2 * 65 3 * 65 **195**
TOTAL **65 + 130 + 195 = 390**				
Engineer – 3 person * 2 * 1,2 * 3 * 3 = = 64,8 = **65**	2 * 65 **65**	11 * 65 12 * 65 **130**	-	1 * 65 2 * 65 **130**
TOTAL **65 + 130 + 130 = 325**				

Thus, we will find the potential of workers:

390 + 325 = 715 people*competencies - this is less than 18,200 people*competencies;

$\varphi < \lambda$ for the ordinary composition.

Define the need for the potential of service workers (Table 9).

Table 9 The potential of employees of service workers

Profession	Knowledge	Skills	Socio cultural competences	Psychophysiological competences
Ship's cook – 1 person * 2 * 1, 2 * 3 * 3 = 21,6 = **22**	8 * 22 **22**	13 * 22 14 * 22 **44**	-	4 * 22 **22**
TOTAL **22 + 44 + 22 = 88**				

Thus, we will find the potential of workers:

88 people*competencies - this is less than 7560 people*competencies;

$\varphi < \lambda$ for the ordinary composition.

Thus, actual demand for personnel in the transport component of the exploitation process is less than the available potential of the region, therefore, it can be employed without outsourcing additional labor.

4. CONCLUSIONS & RECOMMENDATION

The proposed model is a formalized description of the balance between the human resources (available capacity of employees of different categories) and the need for qualified personnel, taking into account the prospects for the development of exploration, production and transportation of hydrocarbon raw materials. This model is universal and can be used for forecasting and planning the number of personnel of a certain skill in the implementation of projects on the shelf.

For example, the results of the author's research on the analysis of staffing requirements for Arctic hydrocarbon resource development projects were considered at a meeting of the Management Board of the Sozvezdie Association of Oil and Gas Industry Suppliers. The developed tools for forecasting and planning the number of personnel with certain qualifications for the development of hydrocarbon fields in the Arctic zone are used in a comprehensive analysis of requirements for supporting existing and prospective projects in the Arctic.

The proposed static model is exemplified by shuttle tankers operating at the Varandey field. He considers the transport component of the Varandey field exploitation process.

First, the available potential of the North-West region of the Russian Federation was determined in terms of the number of people who acquired professions under curriculum of institutions of higher vocational education (HVE), secondary vocational education (SVE), and in terms of the number of workers. As estimated, the potential of employees with HVE is 28,070, those with SVE – 21,140, workers – 18,200, and supporting employees – 7,560 people*competencies.

Then the need for personnel in the transport component of the Varandey field operation process was determined. The below data were obtained: the demand for employees with HVE – 660, for SVE employees – 836, for workers – 715, and for supporting employees – 88 people*competencies.

Thus, actual demand for personnel in the transport component of the exploitation process is less than the available potential of the region, therefore, it can be employed without outsourcing additional labor.

The result of using the model for planning and forecasting the need for personnel in oil and gas projects developed by the authors will simplify the selection of personnel, improve mutual understanding between the recruiting department and segment managers, increase the level of personnel loyalty, effectively use the candidates considered earlier, and attract promising employees to the company. The proposed methodology for planning and forecasting the need for personnel will help to preserve finances, reduce the cost of hiring new personnel, bring stability to personnel, reduce the risks of losses and staff turnover.

Thus, the successful development of offshore oil and gas projects is inextricably linked with the provision of ongoing projects with highly qualified personnel. It is human potential, in the fair opinion of the Organization of the Petroleum Exporting Countries, that is the main component of success in making strategic decisions, in solving the most complex engineering, technical and economic challenges facing the development of oil and gas resources.

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