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**METHODS FOR CALCULATING LABOUR COST
FOR THE PROJECT DESIGN SPECIFICATIONS
ON FIELD DEVELOPMENT IN ROSNEFT OIL COMPANY**

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Abstract. *The authors developed methods for calculating labour cost for the project design specifications on field development, which will help to evaluate the cost of works, standard term of project, required number of experts for each stage of work and standard term for each stage.*

The authors present the process of development of the concept step-by-step as well as basic approaches, methods and formulas which have been applied when developing the concept. The article highlights advantages and weak points of the concept, allows to use the described approaches, when analyzing the similar processes, and to estimate extra options. The indicators of Rosneft Oil Company deposits were used as the database for the concept while writing the article.

Keywords: *labour costs, the project design specifications on field development, field development plan, standard term of the project, standard number of specialists*

Currently the main part of project works in oil companies is preparing the project design and estimating specifications for major construction works and drafting design specifications on field development.

Historically labour and works costs for the project design specifications are calculated on the basis of prices and inflation indices which are approved by the Russian governmental institutions on quarterly basis.

But there are no specifications of labour and services cost calculation approved by the governmental institutions for drafting the project design and estimating specifications. Nevertheless several companies like JSC Lukoil and JSC Tatneft have their internal regulations for calculating the cost of such works.

To create a consistent approach to labour and works cost calculation JSC Rosneft has developed and implemented “the method of labour cost calculation for the design and estimation specifications (DES) on field development, for calculating reserves and feasibility studies of recovery efficiency (CS, FS RE)”.

This method should provide for not only an instrument of labour cost calculation, but also should for the solution for additional tasks:

1. To set the rules for labour calculation for the design and estimation specifications on field development.
2. To develop a tool of labour cost calculation for fields different in size and for any type of works (Design and estimation specifications (DES), analysis of develop-

ment (AD), field development plan (FDP), calculation of reserves (CR), feasibility studies of recovery efficiency (FS RE), etc.).

3. To develop additional tools for project evaluation (standard term of project implementation, standard quantity of specialists in relation to blocks of work and standard duration of every work).

4. To achieve the direct correlation between the project's cost on current efficiency and annual growth of Corporate scientific-research institute's (CSRI) efficiency.

5. To achieve actual continuity every year by re-confirmation of adjustment indexes.

The need to solve some of the above-mentioned tasks required the following general provisions and assumptions:

1. Labour costs for DES are calculated within blocks of work which correspond with main stages of modeling and designing.

2. Fundamental algorithms of labour cost calculation are developed for relatively simple fields. Complexity of fields (existence of faults, under-gas-cap zones, high-viscosity oil, rock jointing, etc.) is calculated on the basis of special indexes which increase requisite labour costs.

3. Expert estimations, provided by project institutions in Russia, determined labour costs existing were used as the basis for algorithms of labour cost calculation applied in this method. To integrate this data empiric indexes were implemented. This indexes determine dependence of labour costs on indicators which indicate field's complexity and quantity of processed data.

4. Dependence of duration of works on employees' qualification was taken into account.

5. To stimulate the growth of personnel's qualification level in corporate scientific-research institutes a decreasing index was implemented into the algorithm. This index includes the growth of labour cost efficiency. It is called the index of growth of labour cost's efficiency.

6. The general model of input and output data of the method is presented in the Fig. 1.

To develop a consistent unitary tool the entire cycle of document's creation was divided into several stages.

At the first stage the consecutive order of blocks of design specifications' working up was determined. These blocks also consist of several parts. Six blocks were determined by expertise.

1. Data collection and digitalization block;
2. Geology block
3. Block of development including economic scheme;
4. Technology block;
5. Report, expertise, coordination and defense block.

6. Block of addition to the term of labour cost's project.

The entire process of field development project preparation is presented in the Fig. 2.

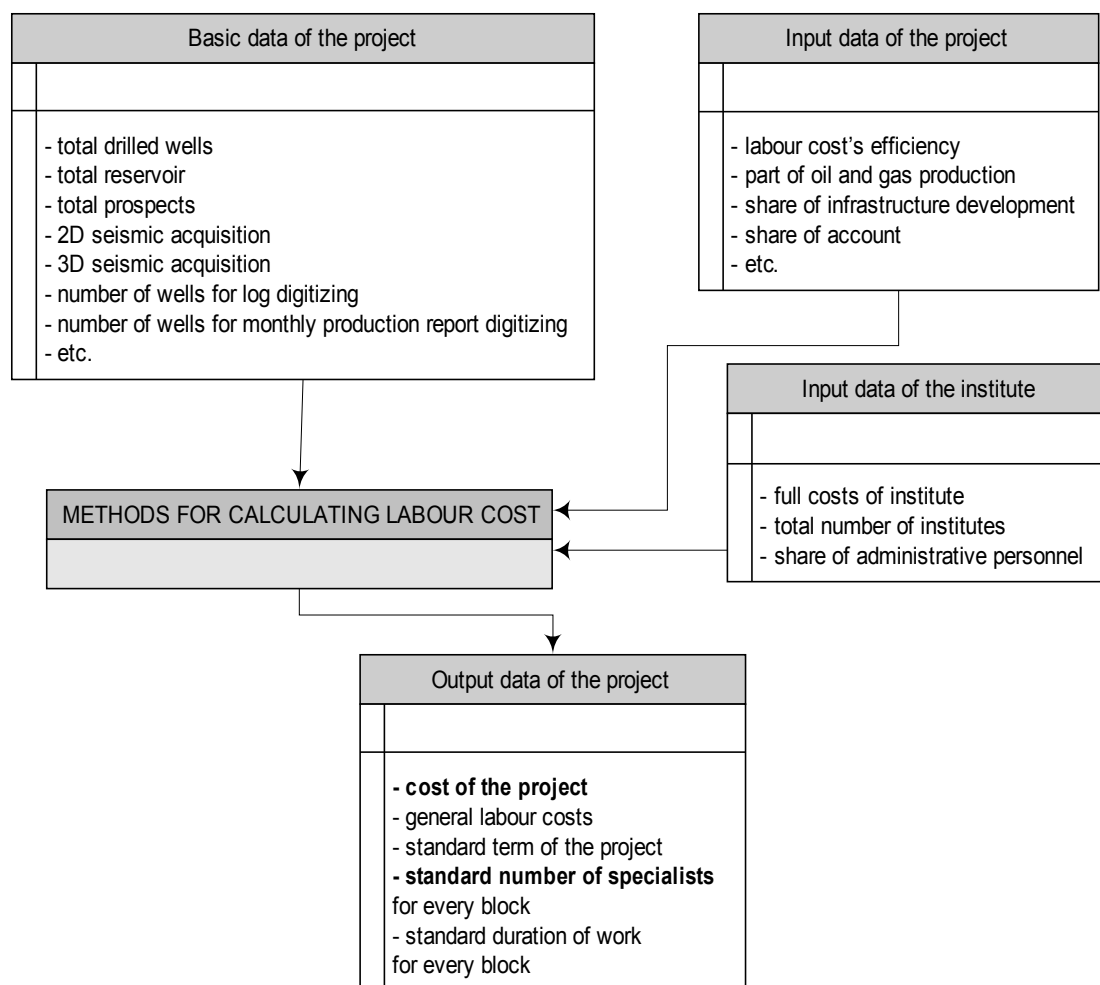


Fig. 1. Input and output data of the method

At the second stage 20 essential and sufficient factors characterizing the field were chosen. These factors were allocated according to blocks of project's development.

At the third stage a general formula of labour cost calculation for development of main blocks of design and estimation specifications' creation was developed:

$$V = \left(\sum_{i=1}^p a_i * N_i^{b_i} \right) / K_{eff},$$

where i – number of the factor;

N_i – basic factor integral to this block;

p – quantity of basic factors of the project;

a_i и b_i – empiric indexes to calculate the impact of every factor on labour costs at every stage;

K_{eff} – the index of growth of labour cost's efficiency of the corporate institute.

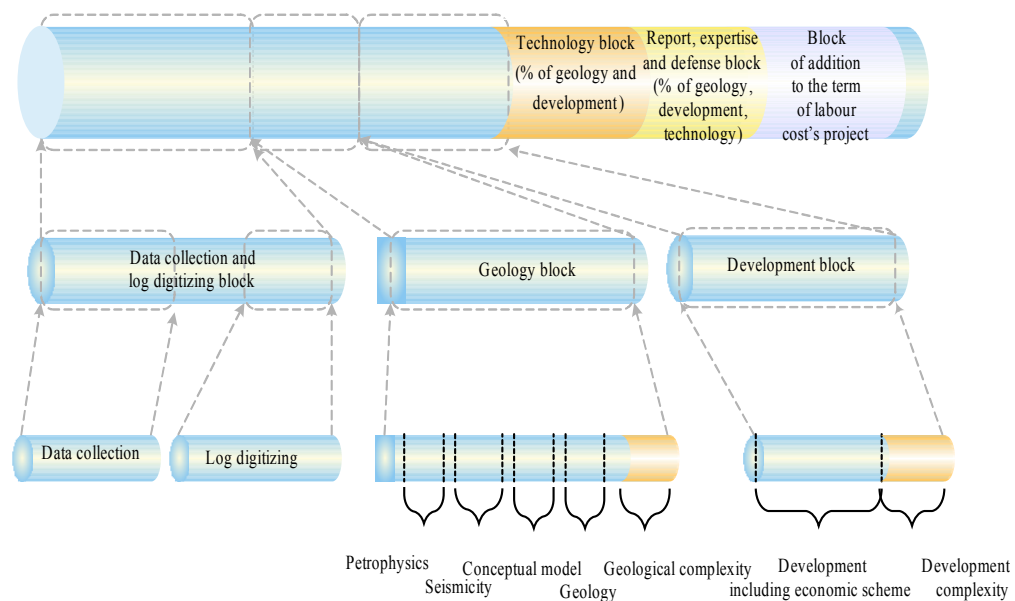


Fig. 2. The process of field development project preparation.

It should be noted that power-law dependence means that growth of labour costs up to average level in the company triggers more expansive growth of specialists' demand than growth of labour costs after reaching the average level.

Besides, linear-pricewise formulas were used. These formulas allow using limits of minimal and maximal labour costs.

All the indexes used in formulas were developed on basis of accumulated statistics and expert estimations of labour costs for designing the development of Rosneft's fields.

Calculation of labour costs of the technology block involves development of integrated projects. Therefore this block requires several additional stages (Fig. 3).

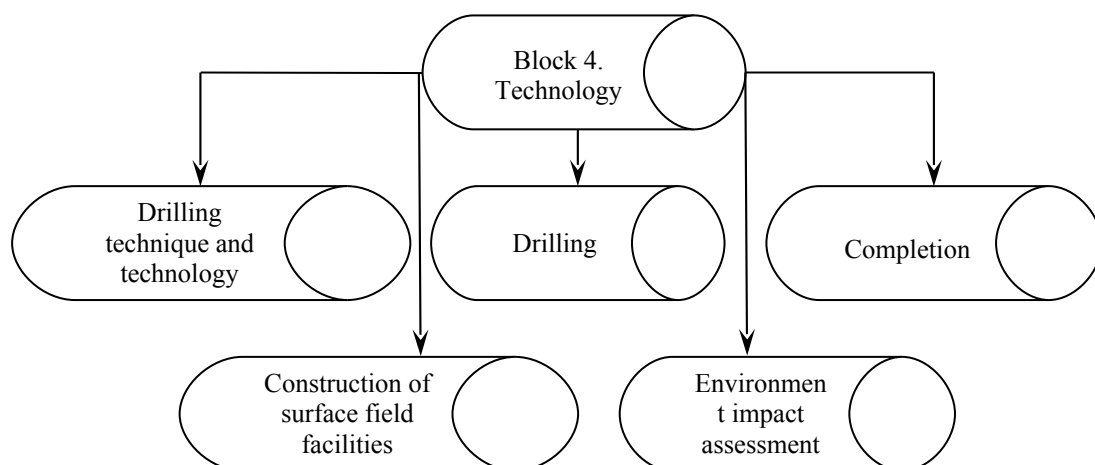


Fig. 3. Stages of the technology block for integrated projects (IEE – impact evaluation on environment)

In this case “integrated designing” is the process consolidating all the processes during the exploration, development and exploitation of the asset/field (geology, development, drilling and completion, oil and gas production, infrastructure development, economic scheme, environmental science, risks analysis) to have an efficient business plan of exploration, development and exploitation processes.

In its turn the method covers calculation of additional labour costs which are caused by objective reasons like labour costs for education, personnel appraisal, etc. Due to the fact that calculations and volumes of labour costs are individual for every project the chief engineer of the project approves and includes them separately when signing the contract.

To calculate labour costs on monitoring of the group of fields regulating indexes were developed. These indexes decrease calculated labour costs requisite for the design project to the extent of current monitoring.

The fourth stage describes the process of calculating the requisite number of specialists for every block of project documentation’s development. Dependence of quantity of requisite specialists for preparing project design documentation on labour costs in accordance with blocks is presented in the Fig. 4.

During the data studies the additional correlation between the quantity of specialists and different scales of fields was revealed. Dependency is shown in the Fig. 5.

The fifth stage of method’s development deals with calculation of the optimum term for drawing up the project documentation.

To determine the optimum term execution periods of every block were used. These periods are calculated by dividing the labour costs of every block by requisite quantity of specialists.

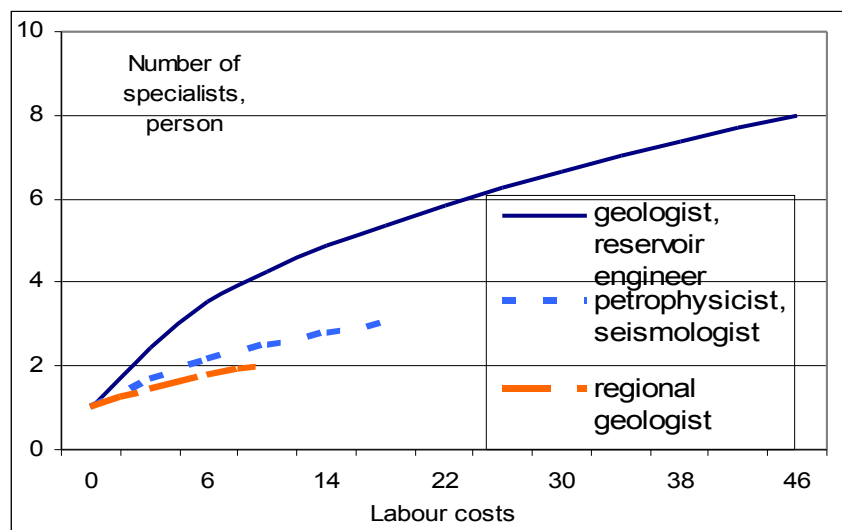


Fig. 4. Dependence of quantity of specialists on labour costs.

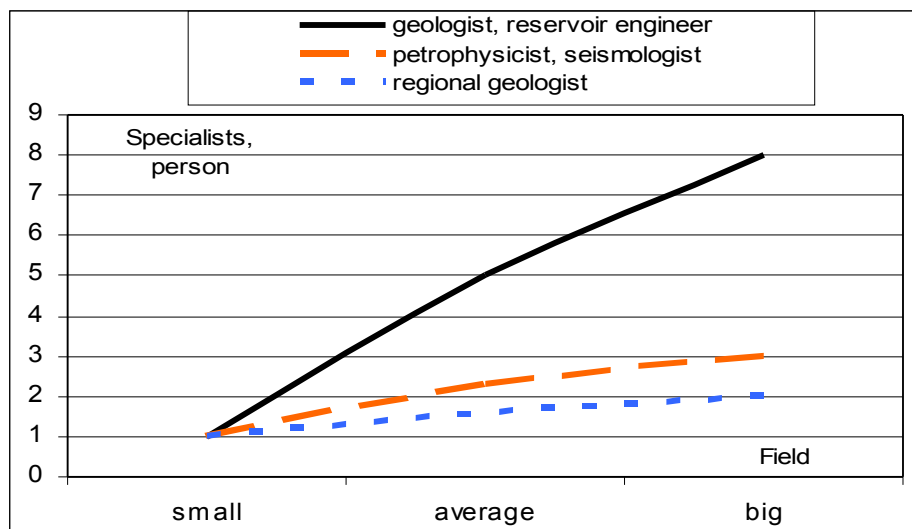


Fig. 5. Dependence of quantity of specialists on the scale of the field.

On the sixth stage one of the variants of project's cost calculation is presented. This calculation is carried out on the basis of costs for execution of works by one specialist and general costs for preparing project design documentation.

Cost of works' execution by one specialist per year:

$$W_{knipi}^{1chel} = \frac{Z_{knipi}}{(Q_{obch} - Q_{obch} * D_{AUP})} * (1 + K_{NDS}) * (1 + K_{invest}),$$

where Z_{knipi} – full costs of corporate institute for scientific research per annum according to approved business plan including operational and non-operational expenses, mln. of roubles;

Q_{obch} – total average number of corporate institutes for scientific research per annum, person;

D_{AUP} – share of administrative and managerial personnel and support of designing in the total number of corporate institutes for scientific research per annum, monetary unit;

K_{NDS} – VAT rate, monetary unit;

K_{invest} – profit ratio to cover investment activities from the approved business plan, monetary unit.

Cost of preparing project design documentation:

$$W^{ptd} = \frac{V^{ptd} * W_{knipi}^{1chel}}{(m + 1)}, \text{ million roubles,}$$

where m^1 – quantity of working months annually, months.

¹ For example: For LLC «RN-SakhalinNIPImorneft» quantity of working months is 10 ($m = 10$)

Above-mentioned 6 stages of method's development and calculations for all fields give an option of drawing the following conclusions:

1. The new method of labour costs calculation for creation of design specifications for any kind of fields is developed;
2. Processes of agreed cost determination between the company and research institutes were unified;
3. Method for calculation of four additional indexes was developed:
 - cost of the project;
 - standard term of the project;
 - standard quantity of specialists per block and standard duration of work for every block,
4. The possibility of exclusion of some blocks of work which do not meet the demand has been stated;
5. The possibility of every year adjusting index approval which will ensure topicality of the developed method hereafter has been stated.

It should be noted that because the simplicity of development and understanding this method could implemented in all Russian companies. To implement this document on the federal scale the unitary database of raw data of all fields (20 factors by every field) should be created and calculated indexes should be like inflationary indexes of government institution annually re-calculated.

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