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**ECONOMIC AND MATHEMATICAL MODELING OF AN OIL AND GAS PRODUCTION COMPANY AS AN INTEGRATED COMPLEX SPECIFIC SYSTEM**

**Abstract.** The following factors were studied and taken into account in the process of economic and mathematical modeling of an oil and gas company as a

complete complex specific system: a significant inertia of a management object; multi-level management structure; irregularity of a management system of an oil and gas company; a need to decompose the system along the weakest lines of communication "vertically" and "horizontally" and build economic and mathematical models of smaller dimensions for each selected element.

Determining an algorithm that connects economic and mathematical models of the technological, tactical and strategic management levels of an oil and gas company is a very difficult task.

Economic and mathematical modeling of the technological level of an oil and gas company should contribute to management of functioning of main technological objects of the oil and gas production: to ensure optimal modes of operation under the selected optimality criteria; must take into account the parallel-sequential flow of operations and is the most studied level of an economic and mathematical management of an oil and gas company.

Economic and mathematical modeling of the tactical level of management of an oil and gas company as optimality criteria involves maximizing profit and minimizing integral costs; and can be formalized in the form of economic and mathematical models of the following interconnected blocks: geological and industrial, production, transport and economic.

Economic and mathematical modeling of the strategic level of an oil and gas company should reflect the strategic goal of the development of a company and the industry. The basis for building an economic and mathematical model of an oil and gas production company is the choice of optimality criterion, which characterizes the entire activity of the company for a certain period of time, in particular, the criterion of maximum profit. However, for making cost-effective decisions in the management of complex systems (an oil and gas production company) in the conditions of a sharp change in market prices, this criterion is impractical. Since economic efficiency does not necessarily mean high profitability, that is, in the conditions of constant changes in the world economy, the most stable position in a long term is the system characterized by maximum efficiency, and not profitability, which also depends on random factors (constant price fluctuations on the energy carrier is the norm of the modern world economy). Objectively, it turned out that the most developed issues of economic and mathematical modeling of the strategic level of management are for processing industries, not extractive ones. Therefore, when building economic and mathematical models of a strategic planning level of an oil and gas production company, researchers face difficulties caused by the specifics of the industry, in particular: product stocks for a given field are always limited; a production cost of 1 ton of conventional hydrocarbon fuel from one field increases significantly during its life cycle; it is difficult to determine the degree of detailing of the models.

The use of economic and mathematical modeling in managerial processes on the part of the information system of an oil and gas production company faces sociological, political and other limitations, which an experienced manager should take into account when making a final decision.

The main task of the oil and gas production complex is to ensure production and a growing renewal of hydrocarbon reserves. The problem of improving quality of a balance of explored reserves should be solved by an oil and gas company by opening new fields, features of which largely determine the specifics of planning, organization of a process and a material and technical base of work, determination of the industrial value of explored reserves, etc. The economic indicators of effectiveness of work on development of discovered reserves should include the amount of capital investments, operating costs, cost of production, profit, profitability, payback period, etc. To determine the total profit of an oil and gas company from the development of reserves, the system of criteria and economic indicators of a subsoil is used. Which is used at all stages of prospecting and development of reserves for:

- substantiating economic feasibility of carrying out work on the search and exploration of oil and gas deposits;
- establishment of a valuation of recoverable hydrocarbon reserves;
- ranking of individual prospective plots into groups according to economic criteria and a sequence of their development;
- forecasting of oil and gas prices, taking into account the level of forecasted cumulative specific costs for preparation and development of reserves and expected profit.

Making managerial decisions regarding investment projects of an oil and gas company requires determining the value of underground reserves (resources) and is characterized by a set of indicators that generally reflect the comparison of expected (obtained) results with necessary costs for participants in a geological exploration process.

In the article, the concept of economic and mathematical modeling of an oil and gas company as a complete complex specific system was further developed. The main factors and limitations are taken into account, the specifics of economic-mathematical modeling of oil and gas company management at the technological, tactical and strategic levels are investigated.

**Keywords:** economic and mathematical modeling, project management, oil&gas exploration and production, Economic Cybernetics.

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## **ЕКОНОМІКО-МАТЕМАТИЧНЕ МОДЕЛЮВАННЯ НАФТОГАЗОВИДОБУВНОЇ КОМПАНІЇ ЯК ЦІЛІСНОЇ КОМПЛЕКСНОЇ СПЕЦИФІЧНОЇ СИСТЕМИ**

**Анотація.** У процесі економіко-математичного моделювання нафтогазового підприємства як цілісної комплексної специфічної системи досліджувалися та враховувалися такі фактори: значна інертність об'єкта управління; багаторівнева структура управління; невідлагодженість системи управління нафтогазовою компанією; необхідність декомпозиції системи по найслабших лініях зв'язку «по вертикалі» і «горизонталі» і побудови економіко-математичних моделей меншої розмірності для кожного обраного елемента.

Визначення алгоритму, що зв'язує економіко-математичні моделі технологічного, тактичного та стратегічного рівнів управління нафтогазовою компанією, є дуже складним завданням.

Економіко-математичне моделювання технологічного рівня нафтогазового підприємства має сприяти управлінню функціонуванням основних технологічних об'єктів нафтогазовидобутку: забезпечити оптимальні режими роботи за обраними критеріями оптимальності; має враховувати паралельно-послідовний перебіг операцій і є найбільш вивченим рівнем економіко-математичного управління нафтогазовою компанією.

Економіко-математичне моделювання тактичного рівня управління нафтогазовим підприємством як критерій оптимальності передбачає максимізацію прибутку та мінімізацію інтегральних витрат; і можуть бути формалізовані у вигляді економіко-математичних моделей наступних взаємопов'язаних блоків: геолого-промислового, виробничого, транспортно-економічного.

Економіко-математичне моделювання стратегічного рівня нафтогазової компанії має відображати стратегічну мету розвитку компанії та галузі. Основою побудови економіко-математичної моделі нафтогазовидобувного підприємства є вибір критерію оптимальності, який характеризує всю діяльність підприємства за певний період часу, зокрема, критерію максимального прибутку. Однак для прийняття економічно ефективних рішень в управлінні складними системами (нафтогазовидобувною компанією) в умовах різкої зміни ринкових цін цей критерій є недоцільним. Оскільки економічна ефективність не обов'язково означає високу рентабельність, тобто в умовах постійних змін у світовій економіці найбільш стабільну позицію в довгостроковій перспективі має система, яка характеризується максимальною ефективністю, а не прибутковістю, яка також залежить від випадкових факторів. (постійні коливання цін на енергоносії є нормою сучасної світової економіки). Об'єктивно виявилось, що найбільш розробленими є питання економіко-математичного моделювання стратегічного рівня управління для переробних галузей, а не видобувних. Тому при побудові економіко-математичних моделей рівня стратегічного планування нафтогазовидобувної компанії дослідники стикаються з труднощами, зумовленими специфікою галузі, зокрема: запаси продукції для даного родовища завжди обмежені; собівартість видобутку 1 тонни умовного вуглеводневого палива з одного родовища значно зростає протягом життєвого циклу; складно визначити ступінь деталізації моделей.

Використання економіко-математичного моделювання в управлінських процесах з боку інформаційної системи нафтогазовидобувної компанії стикається з соціологічними, політичними та іншими обмеженнями, які досвідчений менеджер повинен враховувати при прийнятті остаточного рішення.

Основним завданням нафтогазовидобувного комплексу є забезпечення видобутку та зростаюче відновлення запасів вуглеводнів. Проблема підвищення якості балансу розвіданих запасів нафтогазової компанії повинна вирішуватися шляхом відкриття нових родовищ, особливості яких значною мірою визначають специфіку планування, організації процесу та матеріально-технічної бази роботи, визначення промислового значення розвіданих запасів і т. д. Економічні показники ефективності робіт з розробки виявлених запасів повинні включати обсяг капітальних вкладень, експлуатаційні витрати,

собівартість продукції, прибуток, рентабельність, термін окупності і т. д. Для визначення загального прибутку нафтогазової компанії від розробки запасів використовується система критеріїв та економічних показників надр. Який використовується на всіх етапах пошуку та розробки запасів для:

- обґрунтування економічної доцільності проведення робіт з пошуку та розвідки родовищ нафти і газу;
- встановлення оцінки видобувних запасів вуглеводнів;
- ранжування окремих перспективних ділянок на групи за економічними ознаками та послідовність їх освоєння;
- прогнозування цін на нафту і газ з урахуванням рівня прогнозованих сукупних питомих витрат на підготовку і розробку запасів та очікуваного прибутку.

У статті отримано подальший розвиток концепції економіко-математичного моделювання нафтогазового підприємства як цілісної комплексної специфічної системи. Враховано основні фактори та обмеження, досліджено специфіку економіко-математичного моделювання управління нафтогазовим підприємством на технологічному, тактичному та стратегічному рівнях.

**Ключові слова:** економіко-математичне моделювання, управління проектами, розвідка і видобуток нафти і газу, економічна кібернетика.

**Formulation of the problem.** Economic analysis in the oil and gas production industry estimates costs of transforming resources that can be technologically extracted and economically profitable (at a certain price level) into proven hydrocarbon resources, i.e. reflects the price for the search, development and extraction of a certain amount of estimated resources according to current technology and existing scientific knowledge level of understanding. The main ultimate goal of the economic analysis of geological resources is a better understanding of the economic situation by the top management of the industry and the government. Economic models in oil and gas exploration are used to identify major trends, not precise predictions [1].

The most important conclusion of the economic analysis is that, taking into account the trend of deposits' growth, in order to maintain production in countries with well-explored subsoils (Ukraine, Romania etc.), a significant improvement in the technology of exploration and production of hydrocarbons and the use of all possible innovations in the field of exploration and production management are necessary. Therefore, the growth of reserves of explored deposits due to the introduction of achievements in the field of information systems and information technologies into the oil and gas industry is one of the basic components of the growth of oil and gas reserves in Ukraine. But this increase in reserves has significant uncertainty [2].

The amount of necessary information support for production is determined by the rate of growth of information needs and services, and if all factors of production remain at the previous level, there is an increase in hydrocarbon production due to the use of information resources [3]. The dependence of intensification of oil and gas production on information support rapidly increases a role and importance of information modeling in the oil and gas industry.

Since the information system is an important component of the management system of an oil and gas company, it is important to investigate its specifics [4]. Therefore, the management organization of an oil and gas production company is significantly influenced by:

- the specifics of the main production processes: significant territorial dispersion and consolidation of objects; low informativeness of the main production processes; a continuous technological process and an inseparable system of technological objects; a great inertia of processes occurring in a deposit; uniqueness of a structure and parameters of each deposit and impossibility of repeating development under identical conditions; change over time in a state and performance of control objects;

- traditional economic specifics of the oil and gas industry: huge investments; slow turnover of resources; great economic risk;

- the transition of the domestic oil and gas complex from a centralized economy to a competitive market caused a number of additional restrictions in the management of the domestic oil and gas company: a need to take into account the interests of various subjects of the market economy when making strategic decisions; oil and gas companies are ready to invest significant funds at the initial stages in search and reconnaissance work in order to obtain the most reliable and complete information; change in decision-making methodology: from sequential to integrated, synergistic with wide use of advanced technologies and a need to take into account interdisciplinary uncertainty when making group strategic decisions of an oil and gas company;

- main trends in the management of the global oil and gas industry: consolidation of companies; deepening specialization of main and service industries; growing importance of innovation [5].

It is possible to distinguish 3 levels of management of an oil and gas production company: technological (operational and accounting); tactical (reporting and planning); strategic. At tactical and strategic levels of management, the greatest effect can be obtained today from introduction of information systems and technologies, therefore basic attention should be paid to the use of new methods in management, new economic and mathematical models.

**The purpose of the article.** In the article, the concept of economic and mathematical modeling of an oil and gas company as a complete complex specific system was further developed. The main factors and limitations are taken into

account, the specifics of economic-mathematical modeling of oil and gas company management at the technological, tactical and strategic levels are investigated.

**The main part of the research.** For the most optimal management, it is necessary to use an "ideal" algorithm, in which an infinite amount of information is transmitted and taken into account when making decisions. In practice, management is carried out with insufficiently complete information due to the limitation of time and funds for the collection and transmission of information. Reducing the amount of transmitted information  $H$  reduces the accuracy of management and leads to an increase in economic losses, but at the same time, the costs of collecting and transmitting information are reduced.

The state of the management system of an oil and gas production company, which consists of a large number of geographically distributed divisions, can be characterized by the following formula:

$$H = \alpha \ln B ,$$

where,

$H$  – entropy of the system;

$\alpha$  - some constant;

$B$  – disorder of the system.

The value  $A = 1/B$  characterizes the orderliness of the system, if the company is poorly managed then the disorder is constantly growing.

It is possible to evaluate the company's management system through the amount of additionally entered control information  $I$ , which leads to a decrease in entropy.

$$I = H_0 - H = \alpha \ln \frac{B_0}{B} ,$$

where,

$B_0$  – an initial characteristic of disorder;

$H_0$  – an initial characteristic of entropy.

Irregularity of the oil and gas production company's system depends on equipment downtime, untimely receipt of information, deviation of actual indicators from planned ones, etc. Irregularity leads to underutilization of the potential efficiency of the system, the value of which can be expressed in the form of some function  $\varphi(B)$ . Then the dependence of the efficiency of the complex control system on the amount of information can be expressed by the formula:



$$E = E_{\max} \left[ 1 - B_0 \exp \frac{I}{I_0} \right],$$

where,  $E_{\max}$  – an efficiency of a perfectly functioning company;

$B_0$  – a characteristic of disorder to management;

$I$  - additionally introduced/entered control information.

If we assume that the cost of management systems is directly proportional to the quantitative and qualitative composition of the information used, then the following form characterizes the relationship between the efficiency (for example, profit) of the  $E$  management system of a vertically integrated oil and gas company and the costs  $K$  of the management system:

$$E = E_{\max} \left[ 1 - B_0 \exp \frac{K}{K_0} \right],$$

With the complication of the management system and management algorithms, the increase in the volume and detailing of the information used, the costs  $K$  for the management system and its payback period  $T_0 = dK/dE$  increase rapidly, and the efficiency increases much more slowly. Therefore, the complexity of management systems and algorithms should not exceed a certain economically justified level.

*In connection with the above, it follows the need to take into account uncertainty in the management processes of an oil and gas company, which is examined below.*

*For the practical use of these formulas, it is necessary to use methods that allow in the management system of an oil and gas company to determine irregularity  $B$  and to identify the main sources of uncontrollable stochastic influences  $W$  - and one of the most effective are knowledge-based decision support methods.*

When formulating a general management algorithm for an oil and gas production company, it is necessary to group the entire set of parameters affecting the system:

- 1) input parameters  $X$ , which characterize the actual level of hydrocarbon production, laboratory analysis data, indicators of control devices, etc.;
- 2) parameters  $Z$ , which determine the state of controlling influences;
- 3) initial parameters  $Y$ , which characterize the quality and quantity of the initial product and planned TEI (technical and economic indicators);
- 4) uncontrollable parameters  $W$ , which are random in nature.

In the general case, management at any level of an oil and gas production company consists in establishing the quantitative dependence of output parameters  $Y$  on the joint action of input  $X$  and control  $Z$  parameters, as well as the dependence of  $Z$  on  $X$ . At the same time, it should be taken into account that the operating mode of a company (or its unit of any level) or a process is subject to certain restrictions:

$$X_{\min} \leq X \leq X_{\max},$$

$$Y_{\min} \leq Y \leq Y_{\max},$$

$$Z_{\min} \leq Z \leq Z_{\max}.$$

Since an oil and gas production company is a complex object of management and is characterized by significant inertia, the system of equations for the connection of parameters of the management algorithm has the following form:

$$Y(t) = \varphi[X(t - \tau_3), Z(t - \tau_3)],$$

$$Z(t) = f[X(t - \tau_3)],$$

where,

$\tau_3$  - system reaction delay time.

However, it is worth formalizing in more detail the multi-level of a structure of an oil and gas production company in economic and mathematical modeling:

$$Z_i^{(k-1)} = f^k[X_i^{(k-1)}, Z_i^{(k)}],$$

$$X_i^{(k)} = \varphi^k[X_i^{(k-1)}],$$

where the following actions are formalized:

the management body of the  $k$ -th level receives the management action  $Z_i^{(k)}$  from the management body of the  $(k+1)$ -th level and produces the management action  $Z_i^{(k-1)}$  on the body of the  $(k-1)$ -th level;

at the same time, the management subsystem of the  $k$ -th level of the oil and gas production company receives information  $X_i^{(k-1)}$  about the state of management objects of the  $(k-1)$ -th level and transmits information  $X_i^{(k)}$  about its level to the upper level.

The oil and gas industry is a complex object of management, that is why building an adequate economic and mathematical model even without taking into account some factors and connections is a difficult task. The only way is to decompose the system and to build economic and mathematical models for each

selected element. Decomposition of the management system should be carried out both "vertically" and "horizontally", but always along the weakest lines of communication. As a result, a pyramidal structure is formed. And the formulated economic and mathematical models for individual objects have a smaller dimension: at the lower levels due to the "horizontal" decomposition, at the upper levels - due to the simplification of the aggregated economic-mathematical models (according to the effect of the law of large numbers, the influence of many secondary random factors is mutually compensated and a small number of variables begin to play a decisive role). Defining an algorithm that connects different levels of management is a very difficult task.

*Economic and mathematical modeling* of the technological level of an oil and gas company should contribute to the management of the functioning of the main technological objects of the oil and gas production: to ensure optimal modes of operation under the selected optimality criteria; in addition, it is the most studied level of economic and mathematical management of an oil and gas company and is not the object of this study.

The oil and gas industry is characterized by the parallel-sequential flow of operations (which must be taken into account in economic and mathematical modeling at this level), so the duration of the technological process is determined by the formula: is determined by the formula:

$$T_{zmish} = \sum_{i=1}^m t_i - \sum_{i=1}^m t_{per\ i} ,$$

where,  $m$  – a number of operations in the technical process;

$T_{zmish}$  – total duration of the technical process with a mixed sequence of operations;

$t_i$  – a duration of the  $i$ -th technological operation;

$t_{per\ i}$  – a duration of overlap of the  $i$ -th technological operation.

To take into account the industry specifics of a continuous production process of an oil and gas production company in production planning at all levels of management, it is advisable to use the formula:

$$qr_{\Sigma}^i = qr^i + \sum_{k=1}^K qt^{ik} qv^k ,$$

де  $qr_{\Sigma}^i$  - gross volume of realization of the  $i$ -th subdivision;

$qr^i$  - a number of products of the  $i$ -th subdivision for sale;

$q^{ik}$  - a consumption of hydrocarbons of the  $i$ -th subdivision per unit of output of the  $k$ -th subdivision (technological needs);

$q^v^k$  - gross production of the  $k$ -th subdivision.

The average level of management of an oil and gas company which as optimality criteria involves profit maximization and integral cost minimization; and can be formalized in the form of economic and mathematical models of the following interconnected blocks: geological and industrial (preparation of reserves and putting them into operation), production (options for the development of deposits), transport (main pipelines) and economic.

Economic and mathematical models and indicators of the economic block of the tactical level of management of an oil and gas production company can be classified into:

- production volume indicators;
- cost indicators;
- performance indicators of investment activity;
- indicators of efficiency of innovative activity;
- indicators of effectiveness of the use of material and labor resources;
- performance indicators of IT implementation.

Economic and mathematical modeling of the upper level of an oil and gas company should reflect strategic goal of the development of a company and an industry.

The basis for building an economic and mathematical model of an oil and gas production company is the selection of the criterion of optimality, which characterizes the entire activity of a company for a certain period of time.

One of the variants of a criterion of optimal management at the strategic level of an oil and gas production company is the criterion of maximum profit:

$$P = \max_{t_0} \int_{t_0}^T [c(t)q(t) - Z(q(t))]e^{-\lambda t} dt ,$$

where,  $t_0$ ,  $T$  – time interval;

$c(t)$  – a price of hydrocarbons;

$q(t)$  – an extraction of hydrocarbons;

$Z(q(t))$  – exploration and production costs;

$\lambda$  - a discounting rate.

Or, in an expanded form, the above formula can be used to evaluate options for investment strategies in a certain area:

$$P = \max \int_{t_0}^T \left\{ c(t) \sum_{i=1}^n \sum_{j=1}^m x_i^j q_i^j(t) - \left[ \sum_{i=1}^n \sum_{j=1}^m x_i^j \sum_{l=1}^L d_i^{jl}(t) + \sum_{i=1}^n \sum_{j=1}^m x_i^j \sum_{r=1}^R p_i^{jr}(t) \right] \right\} e^{-\lambda t} dt,$$

where,  $t_0, T$  – time interval;

$\{i\}$  – a variety of deposits of a company,  $i=1, 2, \dots, n$ ;

$$x_i^j = \begin{cases} 1 & i = 1, 2, \dots, n; \quad j = 1, 2, \dots, m, \\ 0 & \sum_{j=1}^m x_i^j = 1, \end{cases}$$

$$\sum_{i=1}^n \sum_{j=1}^m x_i^j \sum_{r=1}^R p_i^{jr}(t) \leq P^r(t), \quad r = 1, 2, \dots, R,$$

$$\sum_{i=1}^n \sum_{j=1}^m x_i^j d_i^{jl}(t) \leq D^l(t), \quad l = 1, 2, \dots, L;$$

$$\sum_{i=1}^n \sum_{j=1}^m x_i^j q_i^j(t) \geq q^s(t),$$

$\{j\}$  – a variety of exploration strategies and field development,  $j=1, 2, \dots, m$ ;

$\{r\}$  – a variety of types of production facilities,  $r=1, 2, \dots, R$ ;

$\{l\}$  – a variety of company resources,  $l=1, 2, \dots, L$ ;

$c(t)$  – a price of hydrocarbons;

$q_i^j(t)$  – an extraction of hydrocarbons from the  $i$ -th field under the  $j$ -th strategy;

$q^s(t)$  – planned production as a whole for the company;

$x_i^j$  – desired intensity of use for the  $i$ -th deposit of the  $j$ -th strategy;

$d_i^{jl}(t)$  – a need for resources of type  $l$  for the  $i$ -th deposit of the  $j$ -th strategy;

$D^l(t)$  – limitation on the resource of type  $l$ ;

$p_i^{jr}(t)$  – a need for production capacities of type  $r$  for the  $i$ -th field of the  $j$ -th strategy;

$P^r(t)$  – limitation of production capacity  $r$ ;

$\lambda$  – a discounting rate;

The disadvantage of this model is the a priori limitations of strategies and the impossibility of research of sensitivity and stability. These disadvantages can be eliminated by the application of knowledge-oriented technology.

However, for making cost-effective decisions in managing complex systems (an oil and gas production company) in the conditions of a sharp change in market prices, the above-described maximum profit criterion may not always be appropriate. As economic efficiency does not necessarily mean high profitability, that is, in the conditions of constant changes in the world conjuncture, the most stable position in the long term has the system characterized by maximum

efficiency, but not profitability, which also depends on random factors (constant price fluctuations on the energy carrier is the norm of the modern world economy).

Thus, it is advisable to apply another variant of the optimal management criterion at the strategic level of an oil and gas production company - a measure of efficiency:

$$P = \frac{\sum_{i=1}^n c_i y_i}{\sum_{j=1}^m z_j x_j},$$

where,  $P$  – a measure of efficiency;

$n$  and  $m$  – respectively, a number of output and input parameters;

$y_i$  and  $x_j$  – respectively, output (production of hydrocarbons and their market value) and input (capital and operating costs, oil and gas reserves, shareholders' dividends) parameters;

$c_i$  – prices of hydrocarbons;

$z_j$  – costs (capital and operating costs per unit of extracted products, percentage of income per share, percentage of rent value of a unit of transitional hydrocarbon reserves).

To compare investment strategies (or oil and gas companies - potential partners), we can use the following indicator - a relative measure of efficiency:

$$PV_s = \frac{P_s}{\max_s P_s},$$

where,  $PV_s$  – relative measure of effectiveness of the  $s$ -th strategy;

$P_s$  – a measure of effectiveness of the  $s$ -th strategy;

$s$  – a number of options for strategies or partner companies.

**Conclusions.** The construction of economic and mathematical models of management of an oil and gas production company at the tactical and strategic levels is determined by the following specifics [6, 7]:

- the specifics of strategic management;
- the specifics of the oil and gas industry;
- the specifics of a hierarchy level;
- the specifics of a particular company.

Objectively, it turned out that the most developed issues of economic and mathematical modeling of the strategic level of management are for processing industries, not extractive ones. *Therefore, when building economic and mathematical models of the strategic planning level of an oil and gas production company, researchers face difficulties caused by the specifics of the industry*, in particular: product stocks for a given field are always limited; the production cost of 1 ton of conventional hydrocarbon fuel from one field increases significantly during its life cycle; it is difficult to determine the degree of detailing of the models.

Therefore, an important function of the information system of an oil and gas production company is to support optimal decision-making (at the operational and strategic levels of management) based on economic and mathematical modeling of functioning of a managed system. To choose the optimal solution, it is necessary to know the quantitative response of the system. Due to the uniqueness and large scale of the oil and gas company's management facilities, sufficiently complex economic and mathematical models are developed for this purpose.

However, the use of economic and mathematical modeling in R&D processes within the information system of an oil and gas production company faces sociological, political and other limitations that an experienced manager should take into account when making a final decision.

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