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The Technological Development of Managerial Decisions on the Productive Capacity of Oil Producing Industrial Building Structures

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Abstract: This study presents an algorithm, based on a program-oriented approach, used to form a program that controls production potential. Development and implementation of managerial decisions occur in 2 interrelated areas, taking into account both the strategic interests of the company and production. This study discloses, the technology used to form the program production potential which is based on a combinatorial approach and the use of methods of multi-criteria optimization.

Key words: Objectives, program, potential, oil company, production, management decisions

INTRODUCTION

With the development of the oil and gas industry, the strengthening market economic conditions formed new, more complicated ways of communication and interactions of economic, institutional and climate factors. Oil and gas companies were forced to adapt quickly to new market needs to adjust their activities depending on the behavior of a dynamically changing environment. This forced the oil companies to periodically make adjustments, not only in the approved action plans but also to the tools of internal corporate planning and management decisions (Lenkova *et al*., 2012).

Application development and management decision making in the planning of production activities was due, on the one hand to the fact that oil companies are complex hierarchical systems and decision-making on the level of production must take into account the interests of all other subsystems. On the other hand, the development of managerial decisions must take into account industry-specific features affecting production activities.

MATERIALS AND METHODS

Planning is one of the main functions of management, so managerial decisions in order to fulfill this function in any production system are quite relevant. A Fayol when defining the function of management states that planning is considered, as an elementary prerequisite for efficient management. An action plan is both the result and anticipated course of action to be followed, as well as the steps that need to be followed and the methods to be applied (Alexeev, 1999). According to foreign experts, the system of internal corporate planning controls the managerial decisions which must be made today in order to ensure the effective operation of the company and its growth in the future. This does not mean, however that planning leads to the possibility of high returns.

Of particular relevance in the planning process, based on the program approach are the methodological issues of forming integrated plans (Raizberg and Lobko, 2002). They include a set of different operational and tactical management decisions aimed at improving the efficiency of production capacity.

In oil and gas enterprises operating in conditions of vertical integration, the planning system should encompass different spheres from geological exploration to processing and marketing to supporting industries which ensure the smooth operation of the main and all other areas of strategic interests (innovation, investment, etc.). Under this approach, development and implementation of managerial decisions occur in 2 interrelated areas.

The 1st includes the strategic direction of the company (Lewis and Slack, 2002) in terms of its: Innovation, direction of investments, energy saving, social and environmental policies.

The 2nd area of managerial decision implementation determines the range of the company's interests in the fields of primary and secondary production with a focus on oil production and increasing the efficiency of production capacity, as the principal activity of oil and gas companies.

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The algorithmization of the formation of programs of industrial potential, based on the scientific approach of management will allow oil companies use their resources at their fullest and most efficient capacity which ensures the maximum possible increase in oil production through the implementation of various managerial decisions. This directly affects the efficiency of the production capacity of oil companies. The algorithm for generating programs must fit within the researchers proposed structuring subsystems and management facilities, as the management of the production potential through a systematic approach does not take place in isolation from other subsystems of management of oil and gas companies but in conjunction with them.

During the development of the programs, a balance of priorities is established in the various activities of the oil company, taking into account resource constraints, identifying priority areas of the company with a managerial emphasis shifted in their direction.

Enlarged the managerial decision making, algorithm is presented in Fig. 1. Areas of primary production: G is exploration; D is oil and gas; P is oil and gas processing; S is sales; areas of auxiliary production: R is repair service; M is logistics; T is transport service; EN is energy supply; Areas of strategic interests: Ip is investment policy; INp is innovation policy; Er is energy saving policy; Ekp is environmental policy; Sp is social policy. According to the same algorithm, managerial decisions to improve efficiency of production capacity of the enterprise are formed.

Stage 1: Initialization of the problem, determining a goal. At this stage, senior managers within the controlling subsystems, such as production, repair service, innovation policy, investment and environmental policies, identify bottlenecks that affect production capacity and carry out joint efforts to eliminate them.

Stage 2: At this stage, information is collected on the set of possible problems and ways to resolve them. Here, an analysis of the obtained information is carried out.

Stage 3: Based on analysis of the information collected many alternatives are developed in order to achieve goals and resolve the identified problematic situations.

Stage 4: In this stage, the criteria by which to evaluate the generated set of alternatives are developed.

From the perspective of the methodological approach, used in the process of selecting alternative managerial decisions, it is appropriate to apply the methods of multi-objective optimization (additive, multiplicative criteria and Euclidean distance). This is due to the fact that the entire set of alternatives must be assessed in advance by the developed system of evaluation criteria which may be multidirectional in efficacy (seek both a maximum and minimum).

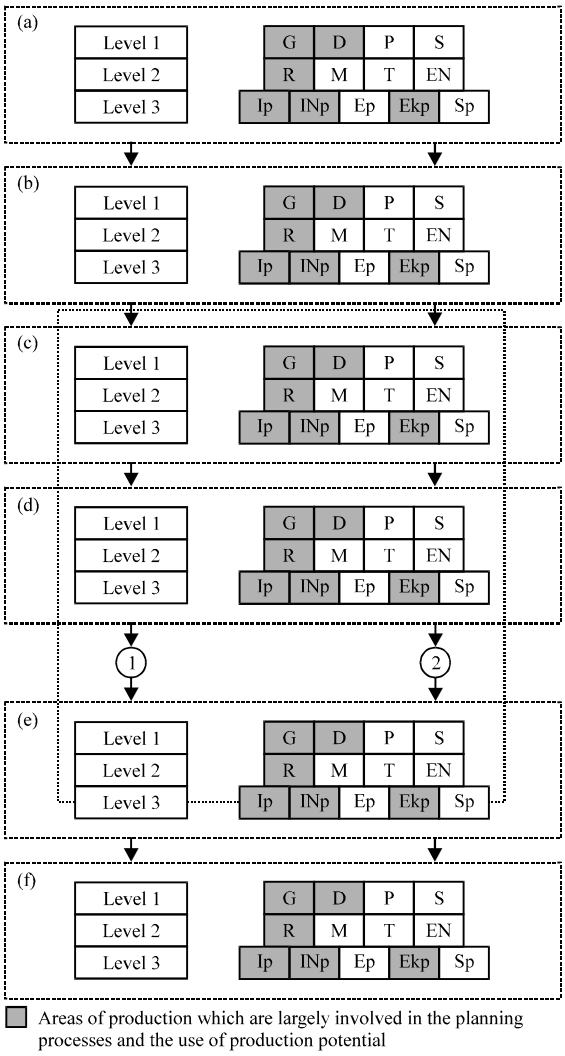

Fig. 1: Algorithm showing the development and implementation of managerial decisions in order to improve the efficiency of production capacity: a) Initialization of the problem, determining a goal determining a goal; b) Collection and processing of the information collected on science-based training solutions in all areas of the oil company; c) Development of multiple alternatives of managerial decisions based on technical limitations; d) Development of evaluation criteria. Assessment based on multi-objective optimization methods; e) Checking consistency of administrative decisions on actives of the oil company; f) Implementation of management decisions, control over execution

The 4th stage, showing the development and implementation of managerial decisions is the most significant.

Among the variety of technical and economic parameters which are used to assess a particular object of the oil industry, there are several indicators that best reflect the condition and dynamics of its development. Therefore, it is on the degree of elaboration of the evaluation criteria that the quality of the managerial decisions in each direction of the company and as a consequence, the cumulative effect from all directions depends.

Stage 5: Checking consistency of administrative decisions on activities.

At this stage, the consistency of alternative goals developed is checked against other management systems in primary and secondary production, as well as against areas of strategic interest. In the 3rd-5th stages of the program the industrial potential is formed.

Stage 6: Implementation of managerial decisions in order to improve the efficiency of production capacity and to control their execution.

The algorithm for generating program production potential is shown in Fig. 2 (Osinovskaya *et al*., 2013; Plenkina *et al*., 2013). This process involves 3 stages.

Stage 1: Formation of alternatives to improve production potential. At this stage, researchers study all possible

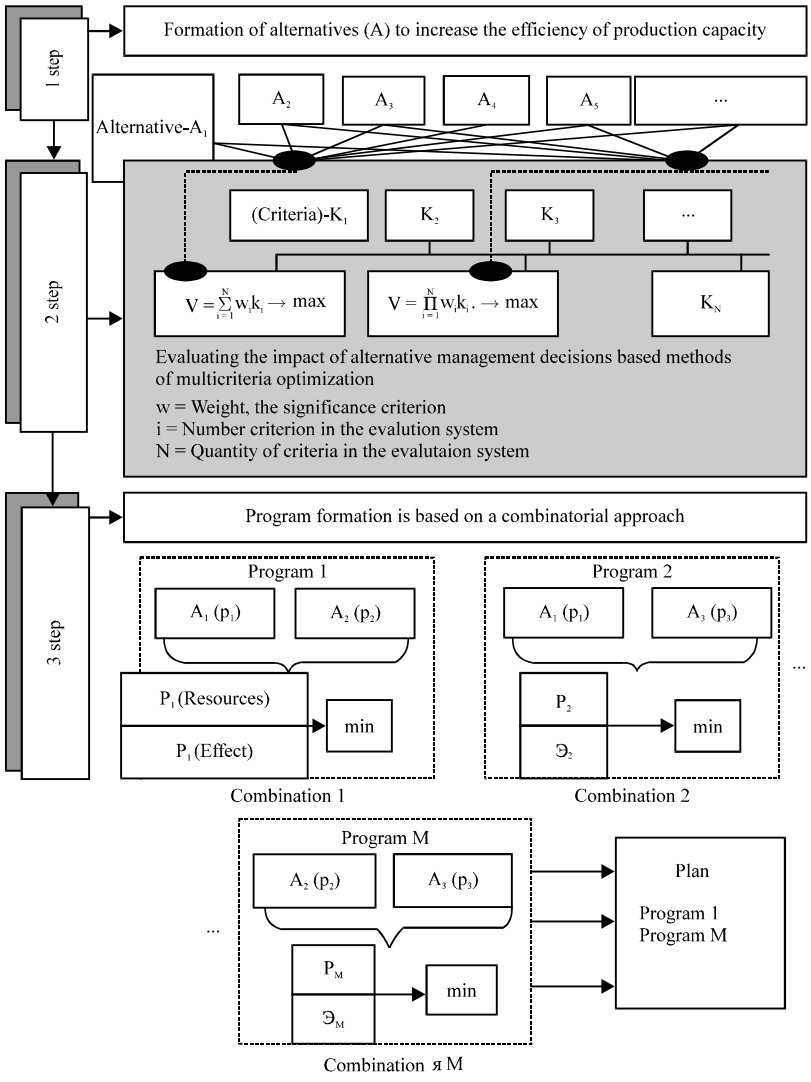

Fig. 2: The algorithm for generating a program for the use of oil and gas production potential of a complicated structure

technical and organizational options for solutions which would allow those components of production capacity to be affected which will lead to the growth of the latter. This segment generates a set of alternatives.

Stage 2: Evaluation of alternatives by a certain set of criteria selected in accordance with the objectives set by the control of production potential. A complex criterion is calculated for each alternative.

Stage 3: Develop a program of industrial potential. This step allows for a combinatorial approach by playing different combinations of alternative managerial solutions that can be implemented within a single program with the limited resources (time, financial, labor, etc.).

Next, measure the effectiveness of each program and select the best combination for maximum effect with minimal resources. In the 3rd phase, researchers solve the problem of the resource allocation between alternatives.

Of interest are combinatorial optimization problems, the simplest of which is finding combinations (alternatives, projects) that maximize the use of the production capacity of the oil and gas companies while minimizing costs.

The general goal for determining the combination of alternatives with maximum efficiency (or efficiency per unit of the requested resource) is to identify combinations of alternatives that satisfy the following objective function (Andreychikov and Andreichikova, 2000):

$$\max Э = \max \sum_{i=1}^{n} Э_i \quad (1)$$

$$\max Э/P_T = \max \left(Э_i \sum_{i=1}^{n} / \sum_{i=1}^{n} P_{Ti}\right) \quad (2)$$

If one of the following conditions:

$$\min\left(P_И - P_T\right) = \min\left(\sum_{i=1}^{n} P_{Иi} - \sum_{i=1}^{n} P_{Ti}\right) \quad (3)$$

$$P_И - P_T \le C,\ P_T \le P_И \quad (4)$$

Where:

$Э$ = Effectiveness of the combination of alternatives being considered, obtained by generating a plurality of combinations with different number of alternatives

$Э_i$ = Effectiveness of the ith alternative, a member of the considered combination of n alternatives

P_T = A required resource in order to consider alternatives

P_{Ti} = Required resource for the ith alternative, a member of the considered combination of n alternatives

$P_и$ = An initially available resource used to consider a combination of alternatives

$P_{иi}$ = An initially available resource for the ith alternative, a member of the considered combination of n alternatives

C = A predetermined threshold value for the resource

Effectiveness of the original set of alternatives can be defined either on a hierarchy that reflects the performance criteria or on the basis of values which reflect costs and benefits derived from their implementation.

RESULTS AND DISCUSSION

An approbation of methodological proposals in order to form a program oriented plan in the subsystem workover, makes it possible to optimize the structure of the workover in the context of these types of repairs, as preparation for hydraulic fracturing (Frac) and the development of the well after fracturing. As a result of playing different combinations of wells on which fracturing technology was used and their inclusion in the plan for the workover, an optimal combination was found, allowing us to obtain a maximum increase in the volume of production due to the workover in a resource-limited setting. Ranking wells on priority repairs allowed for the rising of the levels of additional and restored oil production by an average of 2.5-3% and the unit cost of one repair is reduced to 5%.

Comprehensively assessing the effectiveness of the implementation of program-target technology in the planning system quantifiably is quite difficult. Therefore, an assessment of the performance based planning workover was performed with the assistance of expert practitioners who have experience in managing oil and gas companies. On the basis of the examination of the dispersion, an average concordance coefficient at 0.68 was obtained. It showed a consistent expert opinion that improving the quality of planning, based on the use of program-target technology, provides more effective management decision making, accurate and reliable targets, as well as the flexibility and adaptability to develop plans and programs.

The proposed algorithm of programs formations allows production potential to solve both general and specific objectives of internal corporate planning. It may be noted that its relative versatility and the ability to use it in other areas of an oil and gas corporation.

Thus, the proposed approach to the development of managerial solutions should be used in planning the use of the intranet productive capacity. This is due to the fact that despite the ongoing development of the oil and gas industry, a significant part of the problem remains unsolved. It is not eliminated in the process of the natural functioning of the system on the contrary, it has a tendency to grow. In particular, there are concerns with the issue of the availability and quality of the mineral base, the utilization of its production capacity which differs significantly between various oil companies.

CONCLUSION

Consequently, oil and gas companies need to take special measures, concentrate their efforts and mobilize resource capabilities in order to address the problem of efficient utilization of production capacity.

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