

International Conference on Management مدیریت یکپارچه و صیانت از مخازن نفت و گاز

معصومه چنانی^۱، بابک مرادپور طیبی^۲، سهراب نجفی کشکولی^۳
۱. دانشگاه آزاد اسلامی واحد فیروزآباد

Process of Integrate Management and Maintenance in Oil and Gas Reservoirs

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Abstract

Hydrocarbon reservoirs management appropriate methods exploiting oil and gas reservoirs are of the most important strategies in oil industry in line with national authority, state development and flourishing in economy and other fields. Someone's name it as reservoir management and some others name it as production management; also some specialists consider it as outer, inter, circumferential, humanistic, technologic, politic, economic and environmental factors. Raw oil and gas reservoirs management is the approach to overcome the economic and international challenges and remove the political and economic concerns; that is why nowadays oil-rich industrial countries have programs to develop oil and gas fields. Such management process is to develop the fields and maintain them properly. These different views and definitions indicate different structures in the process management; in line with this article is to describe the important role played by integrate management in oil and gas reservoirs and the process scenario.

Keywords: Process, Scenario, Management and Maintenance, Strategy, Technology, Oil and Gas Reservoir.

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1. Introduction

When underground reservoirs including oil were discovered about 150 years ago it was a starting point to industrialize human life. Great underground oil reservoirs, their easy availability and transfer, liquidity, high amount of energy producible by them and usability have led to increase oil and gas reservoirs exploitation. Although there are many oil reservoirs evidently present industrial life and next generations need increasingly a successful management because oil and gas reservoirs finish one day and there is no substitution for them yet [1]. Reservoirs management knowledge and understanding have developed considerably in recent years in a manner that gradually we see unit methodological formation to facilitate the reservoir management process execution. Primarily reservoir management was equal to production and exploitation engineering; then it became reservoir simulation, but nowadays it means a process based on trial and test of which reservoir simulation and production engineering are only two elements [2].

Most people consider reservoir management as reservoir engineering in a manner that in early 1970 reservoir engineering was considered as the most technical aspect in reservoir management. In recent 20-30 years reservoir management has developed considerably because of superior methods and technologies, sciences development and available more precise and surer data concerning the reservoir conditions and specifications, useful role played by integrated computer networks, private computers to do vast operations on events, management, storage and documenting data, etc., important role of the software in computing and examining previous operation and predicting next reservoir operation and necessity to apply group approach and focus on harmony between scientific and operational sections related to reservoir, etc. In 1970-1980 it became more important the cooperation between engineering and geologic sciences to manage reservoir and geologic and geophysics sciences showed their importance more in reservoir management success. Nowadays most sections related to reservoir (Including geology and geophysics, drilling engineering, operations engineering and exploration, design engineering and economic, legal, environmental, etc. sections formation) are active and cooperate directly in an effective interaction with each other in reservoir management process to achieve related goals [1].

2. Some Definitions for Reservoir Management

In 1991 Thakur defined reservoir management as logic and proper use of sources to maximize economic production. Also Wiggins and Stratzman (1990) defined reservoir management as a complex of decisions and performances by which a described and measured reservoir is produced and developed and supervised and assessed from the discovery to the end. Also in 1996 Rafi Al-Hussaini defined reservoir management as a process maximizing the hydrocarbon of the reservoirs as a capital. They do not consider the value of a hydrocarbon absolute and believe that it may have different meanings for different people in

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different times [1]. By virtue of another definition reservoir management means to exploit from available sources to maximize reservoirs' profitability, their recycling and minimizing operational costs; in other words, reservoir management is to use logically and properly sources to maximize its economic production [3].

Here we mention the key and important goals to be achieved by reservoir management; one of the most important ones is to decrease the risk; the second one may be the oil and gas production increase. Production costs decrease is another reservoir management goal [1].

The reservoir management principles are based on reservoir energy maintenance, using simple scenarios to produce and collect continuously and regularly data, using continuously optimal reservoir enjoyment methods and employing teams with specialties related to oil engineering, etc. [2]. Undoubtedly oil industry organization structure is not appropriate to reservoirs scientific management because the three factors (Discovery, Production and Development) which are important in reservoir management are directed separately and non-correlatively while reservoir management necessitates a team work; the team should work together continuously and monotonously from discovery to final steps [1, 3].

3. Reservoir Management Challenges

Oil and gas reservoirs are in depth of kilometer under earth and essentially are invisible so the risk coefficient increases in all operations and processes related to reservoirs. Reservoirs engineering is like funambulism with many risks and beauties so a little negligence and ignoring any little detail of the program and task lead to a great source destruction which plays an important role in economy so perhaps it can be said that the most essential challenge for a reservoir manager is high risk coefficient. Another problem confronted by the reservoirs management is that each reservoir is unique led to impossible extension of models because a new reservoir is a new problem with new suppositions. Finally it can be said that uncertainty, complexity and variables variety beside outer and environmental variables are essential problems for reservoirs management. The main goal of reservoirs management is to provide some conditions to maximize economic production from the reservoirs with the least possible risks while the production strategy is based on all available data and technology and reservoirs management is possible only when key data are collected and analyzed. Later we discuss about reservoirs management process scenario which is considered as integrate management and by virtue of the scenario the programs are issued and executed by a team of reservoirs specialist team [2].

4. Reservoirs Management Process

Reservoirs management process may include following steps to be executed during the reservoir life: **1) Strategy Definition; 2) Programming; 3) Execution; 4) Supervision; 5)**

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Assessment; 6) Reform and Review. None of above steps is independent from others and the reservoirs management process is successful, if all of them are applied.

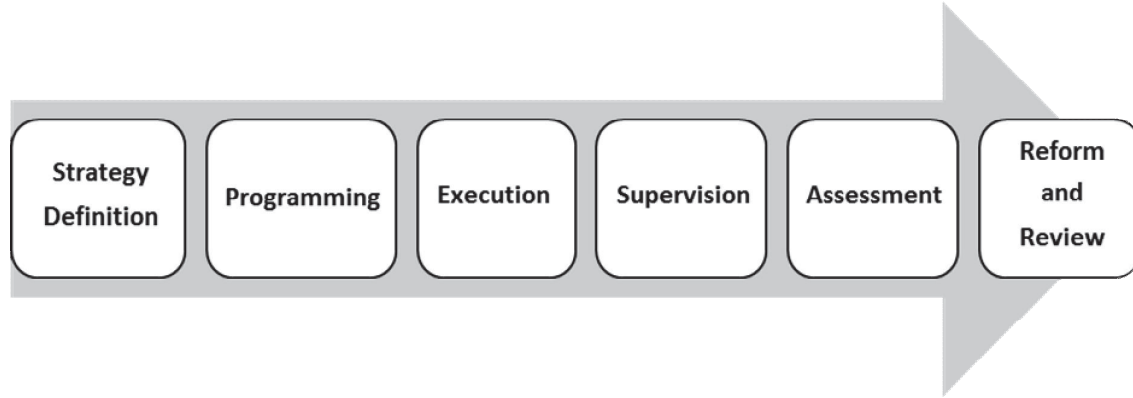


Figure 1. Reservoirs Management Process Steps.

4.1. Strategy Definition

The first step of reservoirs management process is to define the real and achievable strategy so following cases should be taken into consideration: 1) Reservoirs Specifications; 2) Technology; 3) The Milieu and Environment Concerning Decisions. It is necessary to have the data necessary for each of these cases to select and define short and long term strategies in reservoirs management [4].

4.1.1. Reservoirs Specifications

The natural conditions of the reservoirs to be managed play important role in defining the reservoirs management strategy. Real and proper understanding concerning the reservoir nature needs some knowledge about geology, features and specifications of stone and fluid, fluid current and mechanisms to produce, drill and complete well and previous operation of a reservoir, etc. [5].

4.1.2. Technology

The reservoir management success depends more on proper and realistic use of available technologies for discovery, drilling and complete well, production from the reservoir, etc. Each of above technologies had some considerable developments and each one may be fruitful for reservoirs management; for example, the fields with digital wells increase six and ten percent the reservoirs reception and production, respectively and decreases 25 percent the operational costs by managing better reservoirs and decreasing related staff [6].

4.1.3. The Milieu and Space of Decisions

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It is necessary to take into consideration all factors out of reservoir nature in order to define the reservoir management strategy; that is why we should take into consideration all economic, social, political, etc. factors limiting us to define the goals. Other factors such as commercial, conditions, oil and gas prices, fee inflammation, investments, necessary manpower, environmental rules, insurance, legal problems and other affairs relating to culture and social space, etc. are important in defining reservoirs management goals [4].

4.2. Programming

It is very necessary to design a comprehensive program the reservoirs management process in order to be successful in the project; following steps should be realized to achieve the goal:

4.2.1. Field Development Strategy

The most important reservoirs management dimension is related to the strategies emptying the reservoir to produce oil by primary, secondary and finally methods increasing yield. The reservoir development and emptying strategies depend on the reservoir life.

4.2.2. Environmental Considerations

The environmental considerations should be specially taken into consideration in an oil field development. The general following activities are important in order to prepare an effective program in this section: **1) Goals definition; 2) Identifying environmental risks and related special necessities; 3) Defining and assessing environmental activities and 4) Available sufficient sources.**

4.2.3. Analysis of Data

It can be said that the data collection and analysis process plays one of the most essential roles in reservoirs management; the process needs the data collection and analysis, supervising, correcting and reviewing the information necessary for the reservoirs beside other steps in order to develop the field from the program commencement and design. A program effective in data management includes data collection, analysis, storage, review and correction. It is very important to manage the data and their proper storage in reservoirs management in a manner that they become usable for everybody. The data collection and management are of the most necessary and essential elements in reservoirs management [7].

4.2.4. Geologic Model

In fact, it is possible to have a model of the reservoir by virtue of the data gained from sampling, core making and some fields such as geophysics, mineralogy, sedimentary milieus, etc.; such model allows us to have a better and more transparent view concerning the reservoir and its specifications [5].

4.2.5. Reservoir Operation Prediction (Recycling and Production)

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Reservoir operation prediction plays an important role in project success and economic yield of the reservoir and its development program in actual conditions. Thus, it is very important and necessary dimension of reservoirs management process to assess past and present reservoir operations and predict its next one [4].

4.2.6. Economic Optimization

Economic optimization is final goal of the reservoirs management process. The executive states have been identified and the operations have been predicted and now an economic analysis is necessary. The preferable method is to assess the economic value of different operational and risk increase-adjustment methods. The latter method supposes that all choices are compared to actual executive policies and each choice has some risk; the risk may be quantified by one or more cases on following methods: **1)** sensibility analysis; **2)** The predicted amount or value and **3) Monte Carlo** simulation. The economic analysis allows the operational state leading to optimize the manger's goal [8].

4.2.7. Approbation

Finally if the program is approved by the managers, it is executable. The managers support and personnel's undertaking is necessary for the reservoirs management success and project execution.

4.3. Execution

Having examined necessary data and approved the final field development program following steps are necessary for the successful reservoirs management process: **1)** Program commencement and execution with cooperation of all departments related to the project; **2)** Programs flexibility; **3)** Managers support; **4)** Personnel's undertaking to execute the program and **5)** Holding Sessions to Review.

4.4. Control and Supervision

Supervision is unavoidable in reservoirs management process. By virtue of continuous supervision of reservoirs operation it becomes clear if the operation is in accord with the defined program. A group effort and cooperation between different (Engineering, geology, exploration, managers operational personnel, etc.) groups are necessary in order to supervise completely and effectively. It should be noted that in addition to technical data and information some other data such as economic and political information, oil and gas prices, etc. should be continuously examined and supervision fields are not limited to merely the technical ones [4, 9].

4.5. Evaluation

The executed programs should be assessed appropriately to define if the program is well as expected; and on the other hand, if it is the best one for the field development or if it is necessary to change or modify it. The real reservoir operation is compared to the expected operation and behaviour of the program in order to find if the program is successful. However, it is probable that the executed project is successful in technical view but fail in economic

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aspects. Having compared real reservoir operation with what expected from the program it become clear how much the project has been successful in the reservoirs management process to find economic scales and criteria [6].

6.4. Correcting and Reviewing the Program

If the reservoir operation is not in accord with the reservoirs management program or some more precise data gained and a better technology applied or the conditions dominating the decisions change, previous strategies and programs should be corrected as follows: **1)** Finding new data related to know reservoir better; **2)** A new idea for the program; **3)** Presenting a new program and **4)** new technology to execute the program [3].

5. Conclusion

So it is necessary to have following views in relation to precious carbohydrate reservoirs in order to have a significant reservoirs management:

1. Creating a comprehensive strategy appropriate to the oil and gas reservoirs management's goals and then preferable technologic fields in oil and gas industry;
2. Taking into consideration technologic fundamentals in line with vast policies of oil industry and absorbing state and foreign investments to keep the fields and optimal production;
3. Encouraging the technology system of oil industry by increasing study budgets;
4. Creating a defined mechanism to enter the study centers into main current to support oil industry technology;
5. Increasing study investment in oil and gas preferably compared to operational investment capacity;
6. Establishing some centers to create, develop and transfer technology in oil industry and creating a bridge between related organizations and companies.

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