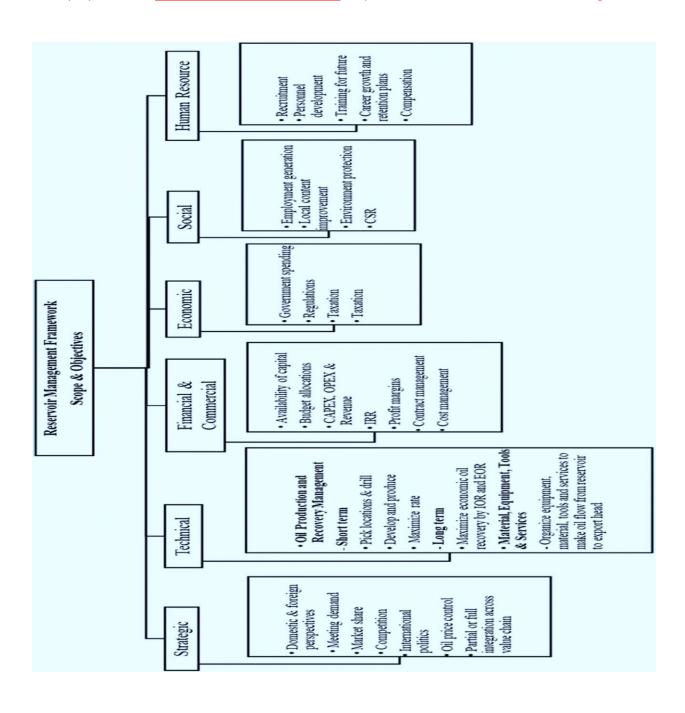
Reservoir Management – Theory

Reservoir Management Requirements - Reservoir Management Framework

The primary goal of a business is to make a profit and enhance asset value for its stakeholders and society. They attain this goal by exploiting petroleum reservoirs at an optimum rate and target recovery. Focus on profit entails the organization to be innovative and conscious of costs. Objectives of achieving optimum rate and recovery require a deep insight into the reservoir characterization and its dynamic behavior. Continuous optimization of production rate, oil recovery, and profit is the ongoing endeavor of a reservoir management plan.

The key aspects of the reservoir management framework are presented below and illustrated in below Figure:



1- Strategies

The objective of strategies aspect is to maximize the strategic value of petroleum by devising a plan under a set of political, environmental, social, and technological (PEST) factors.

Usually, most oil and gas companies have a Strategic Planning team that reports to the company management to manage its strategic elements. This team is supported by SMEs and team leaders who control and manage the activities in their respective areas. There can be various questions that the strategic planning team must be prepared to address. Some of these questions relate to the organization's response to market share, competition, resource allocation, capacity build-up, and so forth. Of equal importance to the management are issues concerning organizational structure and efficiency. The strategic team must have the capability to advise the company management on critical questions such as:

- How should the company split its resources between exploration and development assets?
- What reserves to production ratio (R/P) should the company maintain?
- What are the most appropriate time and sizes of investments in the oil price cycle?
- How should oil and gas production react to changing oil prices?
- How can the company manage the price elasticity of demand to its advantage?

2- Technical

For an asset in the development/production phase, this element deals with core issues of development planning, operations, and reservoir management. Another technical requirement is to know the maximum production potential that a reservoir can sustain for a few years, called the "plateau" rate. Knowing the plateau rate in advance helps design and construct production handling facilities, which have an extended lead time.

Good reservoir management practices require that reservoir pressure should not go below bubble point pressure. The organization must establish specific policies, criteria, and operating guidelines to maintain its reservoirs in good health.

reservoir engineers work with geologists, geophysicists, petrophysicists, and petroleum engineers to prepare a development plan used to support estimates of recovery and expenditure. These plans may only be fit-for-purpose due to significant data gaps in the early stage of field development. In the middle and late stages, the data gap closes, and the quality of the development plans improves. However, introducing a new recovery process such as the secondary or EOR process in the middle or late stages tends to increase complexity in terms of reservoir behavior and open up data gaps, affecting the quality of development plans. The typical reservoir development process as it progresses through a phased development in time. The reservoirs are managed based on a conceptual model tested for its accuracy against the observed reservoir. The level of understanding improves as more data is collected, analyzed, and validated by field observations. Uncertainties and risks associated with the development are substantially reduced with im-proved knowledge of the reservoir and its behavior. When reservoir behavior is different from expected in real life, frequent updates to the development plans become necessary. This phase includes the following plans:

a- Conceptual Development Plan (CDP)

CDP is mostly prepared to highlight the magnitude of initial investments under primary recovery operations based on early estimates of oil-in-place, wells' productivity in different parts of the reservoir, and the number of wells required to be drilled in this phase. The CDP must provide practical solutions to manage effluent water production and excess gas production that is not contracted out for sale. A process needs to be put in place to ascertain well

integrity and manage the full cycle of water/gas production, injection, and disposal or reinjection of produced water.

b- Initial Development Plan (IDP)

IDP is more detailed than the CDP. Its objective is to maximize the production from primary recovery and do the groundwork to apply pressure maintenance or secondary recovery methods. IDP's framework is similar to that of the CDP, except that IDP has a more refined and more extensive data set. IDP's scope is certainly broader, and its insights deeper than the CDP because it is based on the firmer estimates and categories of resources and reserves. The IDP has a good handle on investments as development risks are significantly reduced due to an improved understanding of the reservoir and its dynamic behavior.

c- Final Development Plan (FDP)

FDP is prepared after the reservoir has been mostly drilled, and its performance was observed for a considerable period. By this time:

- i- The Asset Subsurface Team has a good understanding of the reservoir characterization and performance of various sectors
- ii- Artificial Lift methods are in extensive use, and their performance as well as problems are appreciated
- iii- The reservoir has matured, and water cut and GOR trends are stabilized and
- iv- The field-wide implementation of the water/gas injection method is in use

The objective of the FDP is to maximize the recovery from water injection/ waterflood methods. FDP sums up the final well drilling requirement and if any significant inputs are necessary to maintain the production rate and recovery. Well-integrity and water management might pose a substantial challenge in this phase of development. FDP needs to be backed up by a master surveillance plan for maximizing the benefits of water injection. A review of surface facilities in terms of their modification or upgrade may also be necessary

3- Financial and Commercial

The financial aspect deals with the optimum allocation of capital or funds for business activities that bring the highest possible returns. Corporate finance is a very specialized subject today. It aims to manage funds to maximize its wealth, thereby increasing company stock value in the market.

The selection of a reservoir management proposal is very much dependent upon its economic viability decided by the following criteria: • Capital Expenditure (CAPEX) • Operating Expenditure (OPEX) • Price of oil and gas • Discounted cash flow • Payback period • Rate of return on investment • Net present value • Internal rate of return

4- Economic

Economics is quite different from finance, and these two should not be confused with each other. Finance deals with investments, budgeting, expenditure, income, money flow, time value of money, rate of return and profit, and so forth. The goal of economics is to create, optimize, and preserve value. It aims to analyze the interplay of attendant economies globally and make economic decisions within the international trade market. It evaluates the trends of production, distribution, consumption of goods or services, transfer of wealth, and related factors to indicate how a country's economy performs

5- Social

The social aspect of the Reservoir Management Framework is commonly referred to as Corporate Social Responsibility (CSR). The CSR for an ideal oil and gas or any other business organization is characterized by Archie Carroll's Pyramid (see below Figure), which has four crucial layers of responsibilities: economic, legal, ethical, and philanthropic, in that order.

PHILANTHROPIC RESPONSIBILITIES

Be a good corporate citizen.

ETHICAL RESPONSIBILITIES

Be ethical. Do what is right, just, and fair. Avoid harm.

LEGAL RESPONSIBILITIES

Obey the law.

ECONOMIC RESPONSIBILITIES

Be profitable.

6- Human Resor	
employees do not hav	on needs employees to carry out a large number of tasks in a fixed timeframe. Most we the necessary knowledge base or skill set to accomplish the job they are hired for at the lave to be educated by their employer, trained, and groomed suitably for delivering a quality
	End of Lecture
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