5. Importance of Reservoir Management:

Reservoir management is an essential part of maximizing oil production through primary recovery techniques. The process involves monitoring and controlling the flow of oil and gas from the reservoir to the surface. It is important to manage the reservoir to ensure that the right amount of oil and gas is produced, and the reservoir does not get damaged or depleted. Effective reservoir management requires a thorough understanding of the reservoir and the use of advanced technologies to optimize production.

5.1 Reservoir Monitoring

Reservoir monitoring is a critical component of reservoir management. It involves *collecting data on the reservoir's behavior and performance to optimize production*. There are several ways to monitor a reservoir, including:

- ***Seismic Surveys:*** are conducted to map the structure of the reservoir and identify potential areas for drilling.
- ***Pressure monitoring:*** Pressure gauges are installed in the wellbore to measure the pressure changes in the reservoir.
- ***Fluid Sampling:*** Fluid samples are taken from the wellbore to analyze the composition and properties of the reservoir fluids.

5.2 Reservoir Modeling

Reservoir modeling is another important aspect of reservoir management. *It involves creating a computer model of the reservoir to simulate its behavior and predict future production.* The model is based on data collected from the reservoir and includes information on the reservoir's structure, fluid properties, and production history.

5.3 Production Optimization:

Production optimization is the process of maximizing oil and gas production from the reservoir while minimizing costs and risks. It involves using advanced technologies and techniques to optimize production, such as:

- ***Artificial Lift:*** Artificial lift techniques, such as pumps and gas lift, can be used to increase the flow of oil and gas from the reservoir.
- ***Water Injection:*** Water injection can be used to maintain reservoir pressure and increase production rates.
- ***Hydraulic Fracturing:*** Hydraulic fracturing can be used to increase the permeability of the reservoir and improve production rates.

5.4 Environmental Considerations:

Reservoir management also involves considering the environmental impact of oil and gas production. It is important to minimize the impact on the environment and comply with regulations. Some considerations include:

- ***Air Emissions:*** Oil and gas production can result in air emissions, such as greenhouse gases, which contribute to climate change.
- ***Water Management:*** Water is a critical resource for oil and gas production, and it is important to manage it efficiently and responsibly.
- ***Waste Management:*** Oil and gas production generates waste, such as drilling mud and produced water, which must be managed properly to minimize environmental impact.

6- Petroleum Reservoir Lifecycle:

A petroleum reservoir goes through several distinct phases throughout its life. Some reservoirs maintain production on a commercial scale for over 100 years. Typical life cycle of a reservoir, presented in Figure 3, involves ***exploration, appraisal, development, production, and abandonment***. Each of these oilfield phases, has its own set of unique challenges and characteristics. Depending on the size, potential, commercial viability, and business interest, an operating company must devise a strategy to manage the entire reservoir lifecycle to maximize the desired benefits. Good reservoir management strategy is fundamental for higher productivity, economic gains, and extension of the field life.

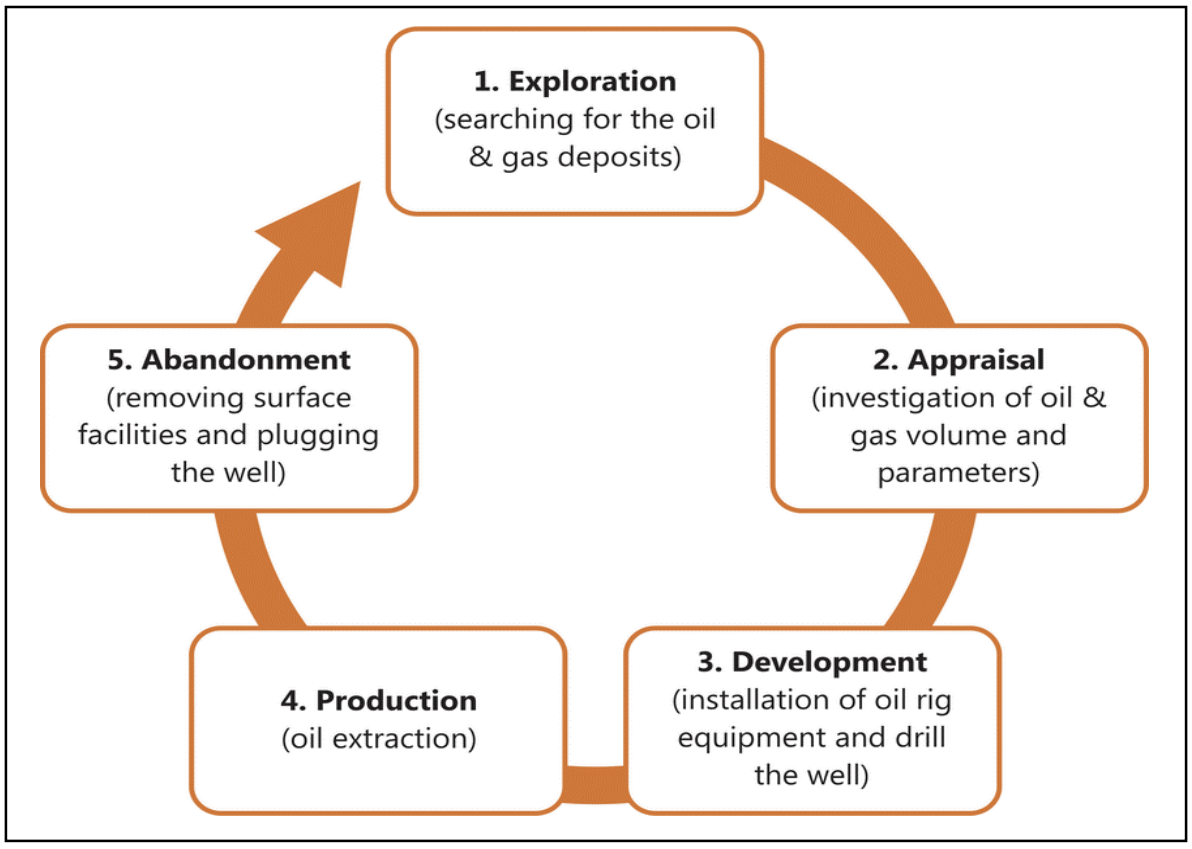

Fig.3: Reservoir life cycle.

Tasks associated with each phase are quite challenging. Professionals from various disciplines, including earth scientists and engineers, *contribute to develop and produce the reservoir*. Apart from technical and financial considerations, *various laws and regulations play important roles in the life cycle of a reservoir*. In developing and operating large oil and gas fields offshore, huge investments, in billions of dollars, are often required.

6- 1 Exploration:

The exploration activities, mainly based on geological and geophysical studies, started with relatively shallow inland fields over 100 years ago. The most fundamental question for a company to pursue exploration work on a geological prospect is to ascertain *the possibility of hydrocarbons*. Exploration is *a risky and costly* business. The work of exploration and production companies involves applying geological and geophysical methods to establish the most favorable location for oil entrapment. Today, with the help of advanced computing systems, geophysicists can interpret the vast and complex 3-D volumes of seismic data relatively quickly and generate an image of the subsurface for locating the possible hydrocarbon accumulation.

Geologists and geophysicists are involved in exploration and contribute to reservoir description. This includes *depth, structure, stratigraphy, fractures, faults, size, aquifer system, and the location of the prospect reservoir*. Tools and techniques include *geological and geophysical surveys, basin analysis*, and others. In certain unconventional reservoirs such as shale gas, geochemical and geomechanical studies are also important in exploration.

Exploration of petroleum starts with play. *A play is a geologic structure that has recognizable features suggesting possible oil and gas storage and entrapment*. Presence of oil and gas accumulation in the same region may provide credence to a play.

6-1-1 Exploration Process:

- ***Drilling:*** An exploratory well is drilled to confirm the presence of oil/gas on a structure. This process proves or disproves the geological hypothesis that is used to drill exploratory wells.
- ***Coring:*** is a direct method to obtain a sample of rock from the wellbore. Several plugs can be extracted from this rock to perform Routine Core Analysis (RCA) and Special Core Analysis (SCAL).
- ***Well-logs:*** provide quantitative estimates of pay thickness and fluid saturations for the geological formations.
- ***Well-test:*** is conducted to measure the production rate of oil, gas, and water.