What is a reservoir?

According to Society of Petroleum Engineers Glossary, a reservoir rock is a rock containing porosity and permeability, sufficient hydrocarbon accumulation and a sealing mechanism to form a reservoir from which commercial flows of hydrocarbons can be produced. Porosity and permeability are the reservoir rock most significant physical properties.

Types of reservoir rocks

As a rock to be named a reservoir has to be a porous and permeable lithological structure. It encompasses sedimentary rocks. These sedimentary rocks may be made of sandstones (quartz sand or arksosic sandstone), carbonates mud or dolomite. Dolomites mostly form good reservoirs because the common reason behind it is that there is Mg, 13% smaller than Ca in a way that during dolomitization, there is a total decrease in volume of the material by 13%, here by 13% porosity is gained.

Sandstone reservoir rocks

The term sand refers to a specific grain with sizes between (62 μm - 2 mm). The performance of the sandstone as a reservoir rock is described by its combination of porosity and permeability depending on the degree to which the sand dominates its. The favorable texture is depicted by packaging of similar sized grains, not a combination of coarse and fine grained composition. The best sandstone reservoirs are those that are composed mainly of quartz grains of sand size of nearly equal sizes or silica cement, with minimal fragmented particles.

Carbonate reservoir rocks

The most fascinating aspects of carbonate reservoir rocks are their content. Carbonates are usually made of fossils which “range from the very small single cell to the larger skeletons animals”. Most carbonate rocks are deposited at or in very close neighborhood to their site of creation. The "best-sorted" carbonate rocks are Oolites in which encompass grains of the same size and shapes even though Oolites are poorly sorted.

Reservoir rock properties, interpretations and their significance on a petroleum system

A. Porosity of reservoir is the property that tells how porous a rock is. It is also defined as a measure of the capacity of reservoir rocks to contain or store fluids. The porosity is genetically classified basing on standard sedimentologic description of reservoir rock; there are primary and secondary porosity.

(a) The primary porosity types are:

i) Inter-particle- In this type by which rock content was quickly lost in muds and carbonate sands through compaction and cementation respectively. This type is mostly found as siliciclastic sands.

ii) Intra particle porosity by which the porosity is made of interiors of carbonate skeletal grains.

(b) Secondary porosity, the porosity formed after deposition leads to other couple of reservoirs types.

i) Dissolution porosity type is made of carbonate dissolution and leaching. It is also called carbonate reservoirs.

ii) Fracture porosity which is characterized by not being voluminous.

B. Permeability is a measure of the ability of a fluid to pass through its porous medium. Permeability is one of important to determine the effective reservoir. Porosity and permeability are two properties describing the reservoir rock capacity with regard to the fluid continence. Moreover, a reservoir rock can be porous without being permeable. For example it is said to be permeable if and only if the pores "communicate". Hence for explorationists, knowing reservoir rock permeability is a key mile stone because it is important for being used to determine if it really has sufficient commercial accumulation of oil, indeed measuring it is very difficult. The measuring of permeability can differently be understood basing on two different ways. When the porous medium is completely saturated by a single fluid, the permeability will be described ***absolute,*** become described as ***effective permeability*** when its porous medium is occupied by more than one fluid.

Other factors affecting the volume of the reservoir rocks

1. Grain size and pattern arrangement: Apart from the arrangement pattern of grains size which effect rock properties, the actual size of the grains does not affects the permeability of a neither reservoir rock nor porosity.
2. Shape of the grains: grains with high sphericity tend to pack themselves well to make a minimum pore space, the fact which increases angularity and hence pore space volume increases.
3. Sorting or uniformity of size of the grains: size of grains has an effect on reservoir properties; the more uniform the grains are sized, the great proper volume of voids spaces. Thereby mixing grains of different sizes tends to decrease total volume of void space.

4. Subsequent action to the sediments (compaction): The more grains are compacted, more the volume of void spaces decreases. However the compaction of sand is less effective than the way clay does.

Methods determining rock properties

Reservoir rock properties such as porosity and permeability are directly or indirectly measured. The direct methods consists of measuring the core sample taken from the parallel lithological area of the reservoir rock to assess them while the indirect methods consist of using data collection, well logs, seismic, production tests, etc., the porosity data are used in the basic reservoir to evaluate volumetric calculation of fluids in the reservoir and calculating fluid saturations and geologic characterization of the reservoir

Physical Characteristics of a Reservoir

Physical characteristics of a reservoir include original deposition and subsequent changes, the type of reservoir, sandstone or carbonate, depth, area, thickness, porosity, permeability, and capillary pressure.

Depth

The physical characteristics of a reservoir are greatly affected by the depth at which they occur.

Shallow reservoir— Created by the folding of relatively thick, moderately compacted reservoir rock with accumulation under an anticline or some trap. The hydrocarbons would generally be better separated as a result of lower internal reservoir pressures, less gas in solution and oil of increased viscosity, resulting from lower temperatures.

Deep reservoir— Typically created by severe faulting. The hydrocarbons would be less separated with more gas in solution and oil of reduced viscosity because of higher temperatures. There is often a reduction in porosity and permeability due to increased compaction.

Area and Thickness

The total area of a reservoir and its thickness are of considerable importance in determining if a reservoir is a commercial one or not. The greater the area and thickness of the reservoir, the greater the potential for large accumulations of oil and gas.

However, there are reservoirs that produce substantial amounts of hydrocarbons that are not of considerable size.