Core analysis

:INTRODUCTION

The task of the reservoir geoscientist is to describe the reservoir as completely and accurately as possible using a variety of methods, from seismic and well testing to logging, cuttings analysis and coring. These methods present the engineers with a valuable range of scales from photomicrograph of a single filament of illite, to the log investigating up to several feet around the borehole, to the well test probing hundreds to thousands of feet in to the formation. Many of these methods allow the engineer to estimate three key formation, escriptors - porosity, fluid saturation, and permeability. But different methods may lead to different values. Porosity, for example, measured on a core, which is removed from in situ pressure, temperature and fluid, then cleaned, dried and re-saturated may not become close to porosity determined from log measurement. To form a commercial reservoir of hydrocarbons ,a formation must exhibit two essential characteristics. There must be a capacity for storage and transmissibility to the fluid concerned, i.e. the reservoir rock must be able to produce and maintain fluids, when development wells are drilled.

In general, several objectives must be met when taking core samples. But in the prime place, a careful on-site examination for hydrocarbon traces is desirable (e.g. gas bubbling or oil seeping from the core, core fluorescence on a freshly exposed surface, fluorescence and staining in solvent cuts etc .).Advances in technology continuously make new improved measurements and experiments available to the industry. Today this process seems to move faster and there is adem and for new standards both for coring and core analysis. Even with the current possibilities in computer technology, much energy is used in the process of transporting data between different software systems and different formats. A potential for improving acquisition and analysis at reduced cost is obvious.

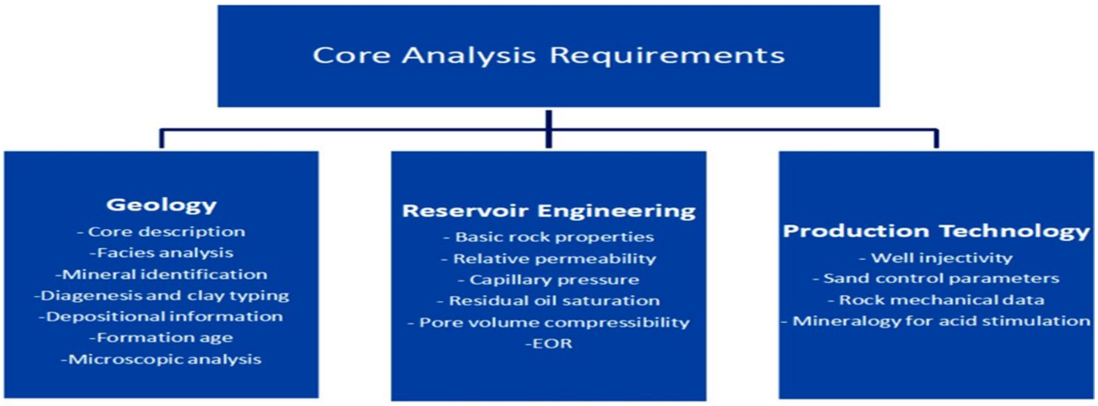


Figure 1. Core analysis requirements for different technical disciplines.

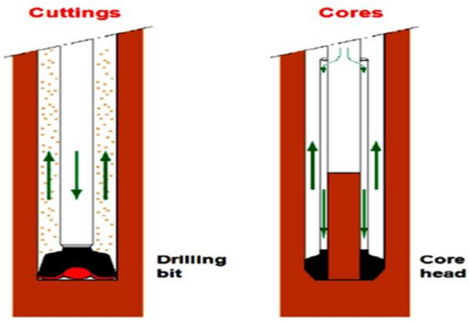


Figure 2. A schematic shows formation sampling. Drill cuttings (left) and core sample (right).

Core:

A core is a sample of rock from the well section, generally obtained by drilling into the formation with a hollow section drill pipe and drill bit. There is a facility to retain the drilled rock as a cylindrical sample with the dimensions of the internal .cross sectional area of the cutting bit and the length of hollow section

Core analysis:

Core analysis:-

can be defined as the laboratory measurement of the physico-chemical properties of samples of recovered core, for purposes of multiple disciplines. A geologist, for example, needs core analysis for facies analysis, mineral identification, clay typing or to obtain depositional information and build static reservoir models. A reservoir engineer uses core analysis for comprehensive interpretation of fluid flow characteristics in field applications in order to design and optimize the recovery processes.

Coring:-

:Coring-

Coring is the process of cutting and removal of rock samples from the well bore. Core samples can be considered as the most direct source of information on subsurface rocks

Therefore, extra care should be taken while planning and executing a coring program. Such considerations include the type of bit, type of core, drilling mud composition, length and type of core barrel, rate at which core should be brought to surface. Proper considerations maximize the amount of core recovered. Furthermore, the case for coring requires a clear definition of the objectives and in many cases economic justification. The added value of a coring program in terms of reducing uncertainty in rock and fluid properties should be clearly indicated. Only after a clear need for a core analysis program is satisfactorily justified and necessary technical precautions are taken, should a coring program be initiated.

types of coring:

There are two main types of coring

*1/ coring from sidewall of the borehole which is called sidewall coring

*2/ coring axial to the well bore which is called bottom hole continuous coring

Bottom hole Continuous Coring:-

As the name suggests, this method cuts the core at the bottom of the borehole, axial to the wellbore. Bottom hole continuous cores are obtained by using a core barrel attached to the bottom of the drill pipe. A coring bit is attached to the outer barrel and a core catcher is fitted to the bottom of the inner barrel. A schematic of the core barrel and coring bit is shown in Fig(3). A cylindrical piece of formation, which is often (9 or 18 m in length and 10 cm in diameter), is put into the core barrel and taken to the surface. Although it is possible to cut the core at different lengths and diameters, a tendency to reduction of the core diameter leads to faster and hence cheaper coring operations. It is also possible to cut oriented cores, which have lines scribed along their length to show the core position relative to the core head. The orientation of the core head is measured by similar techniques to those used to measure the deviation of a well. Oriented cores are particularly valuable where fractures exist in the subsurface.

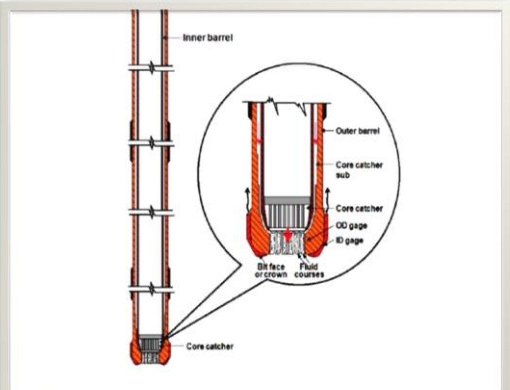
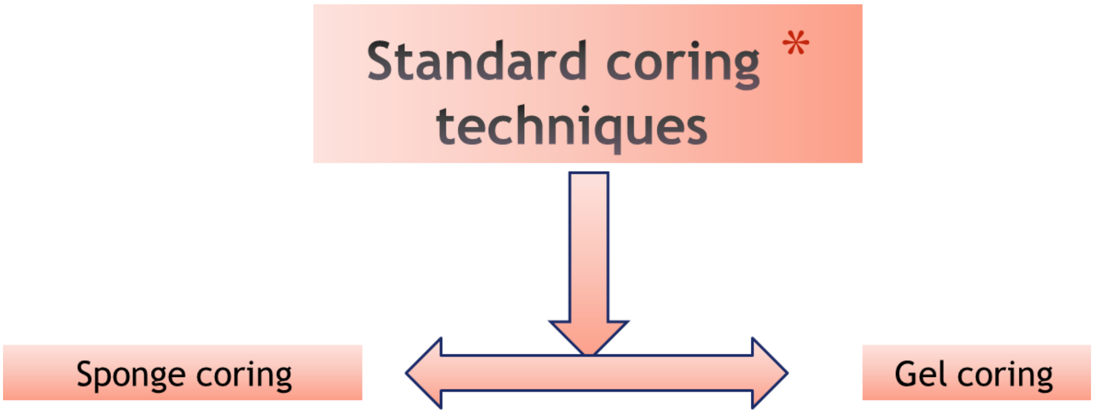


Figure 3. A schematic shows the core barrel and the bit attached to the bottom of the drill pipe



Gel coring:-

uses high viscosity gel for down hole core encapsulation and preservation, which is an alternative to operator-intensive well site core preservation. Core gel is a viscous, high molecular weight, polypropylene glycol with zero spurt loss, which is non-soluble in water and environmentally safe. Because the gel comes in direct contact with the core during and immediately after it is cut, further exposure to core contaminants is minimized. The high viscosity gel stabilizes poorly consolidated rocks with moderate compressive strengths and enhances core integrity. Core gels can be customized to address a wide range of coring situations and rock types.

Sponge coring:-

was developed to improve the accuracy of core-based oil saturation. The core fluids contained in the retrieved core are expelled as a result of depressurization as the core is brought to the surface but are collected and trapped in an absorbent polyurethane material (sponge) lining the inner barrel. The sponge is composed of an open-celled foam with a porosity of 70-80% and a very high interconnectivity between the cells (see Fig 4). The sponge can absorb and collect a volume of fluid up to one magnitude larger than the fluid capacity of most rock materials. Depending on the core analysis objectives, the sponge can be made preferentially oil- or water-wet. An oil-retentive sponge is used with water-based mud. A water-retentive sponge is used with oil-based mud.

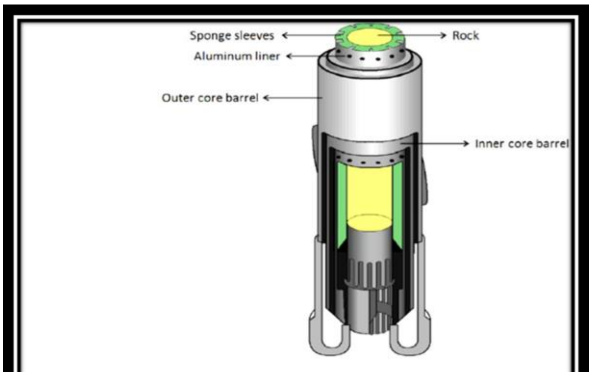


Figure 4. A schematic shows sponge core barrel (Courtesy of Security DBS).