

Tikrit University
The College of Petroleum Processes
Engineering
Petroleum and Gas Refining Engineering
Department

An Introduction to Petroleum Technology

First Class

Lecture (10)

By

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9-1 Hydrocarbon exploration methods:

1- Gravity method: This method depends on measuring the change in ground's gravity. And that the intensity of Earth's gravity varies from place to place according to the density of the rocks under the earth's surface.

The increase in the intensity of ground's gravity, somewhere on the surface of the earth indicates the presence of high-density rocks close to the surface, which confirms the existence of a geological structure that led to the emergence of deep layers with high density upwards, and this geological structure may be an oil trap containing oil, or gas, or both.

And by measuring the intensity of gravity in several locations within a specific area, it is possible to determine the locations of geological fisheries in that area, that is, to determine the locations in which the intensity of Earth's gravity increases, and they are the most likely locations for the presence of oil or gas.

2- Magnetic method: This method is based on measuring the change in the strength of the Earth's magnetic field, and using this change to determine the type of rocks close to the Earth's surface. Sedimentary rocks are non-magnetic rocks,

so the intensity of the magnetic field on the surface of the earth changes with the depth of the base rocks - igneous rocks -.The magnetic field strength increases for the places where the distance between the surface of the earth and those rocks decreases.

3- Geological mapping method: Devices and equipment for photographing the layers of the Earth to identify the differences between the rocky structures, and to determine the areas in which oil can accumulate, and relies on satellites to photograph large areas of the land and identify the mineral and petroleum wealth of the Earth. The geophysical survey is the practical completion of extracting the required information through the images obtained, through which the structure of the ground layers and the identification of oil deposits are identified. Computers have helped to quickly extract useful information.

4- Seismic method: The seismic method is considered one of the most important and widely used methods of searching for oil, and this method has succeeded in discovering the majority of oil and gas fields scattered all over the ground.

Seismic waves move through the ground just as sound waves move through air.

The use of this technique is similar to the use of ultrasound in medicine.

How to obtain a scanning wave, there are a variety of energy sources used to propagate waves, and the sources used on land are called Vibroseis. They are heavy and large vehicles, each weighing between 27,000 and 32,000 kg. Heavy plates are placed on the ground and then shaken using a hydraulic system contained in these vehicles, generating waves that spread to the ground. The other way to generate these waves is through explosives.

Sensors on land are called geophones.

The sensors on lakes and seas are called hydrophones.

After the sound waves bounce off the rocks under the earth's surface, sensors on the earth's surface pick them up for later decomposition. T travels through it as the degree of rock compaction, the presence of fluids between the rocks, and the quality of fluids

The velocity of these waves depends on the properties of the material.

Because of the different rocks along the path of seismic waves, the speed of these waves will also differ, and when their speed varies, a reversal occurs waves and their refraction.

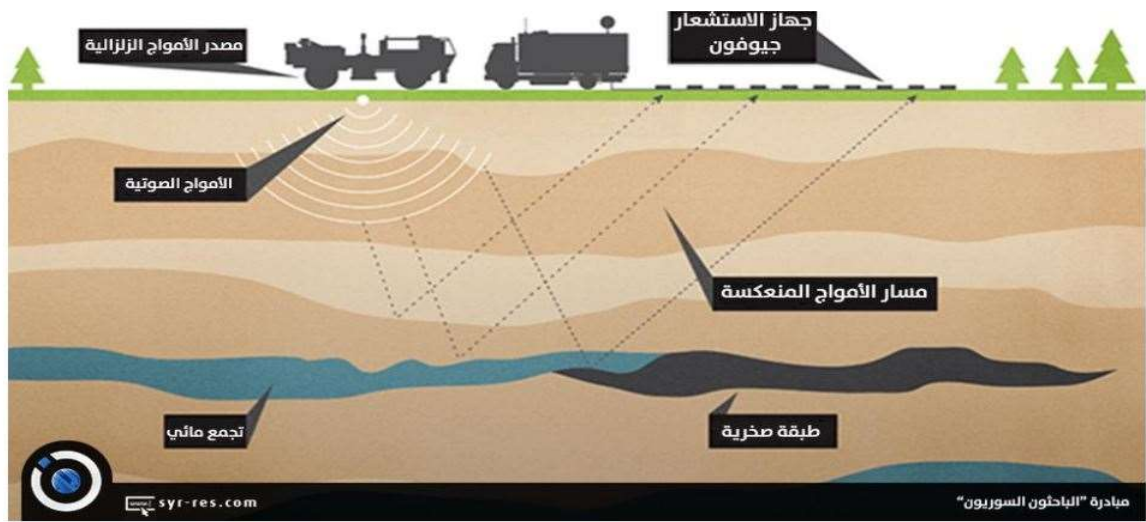
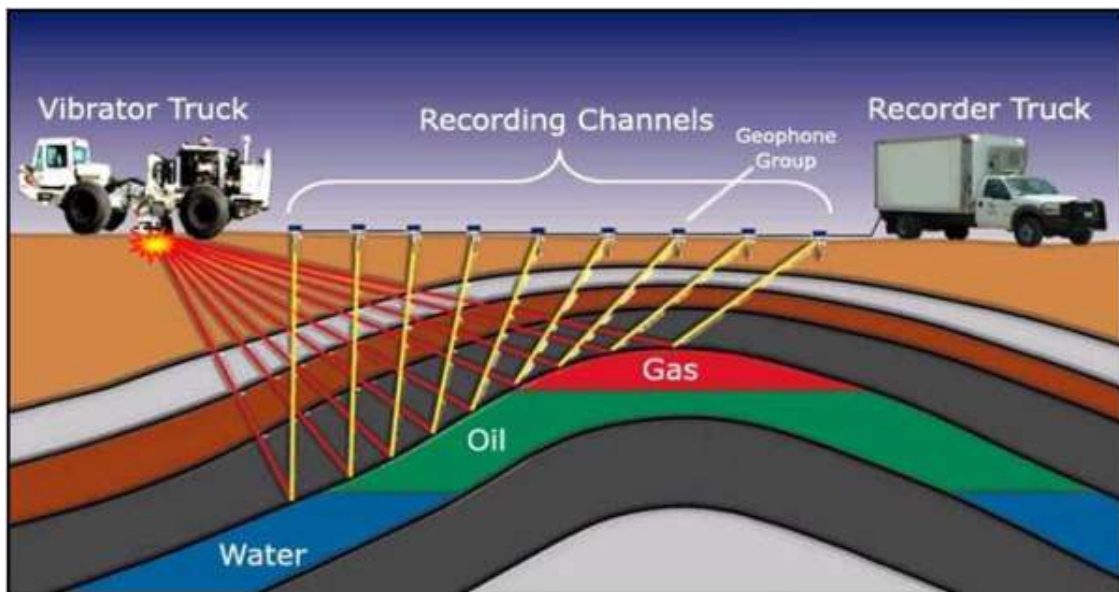
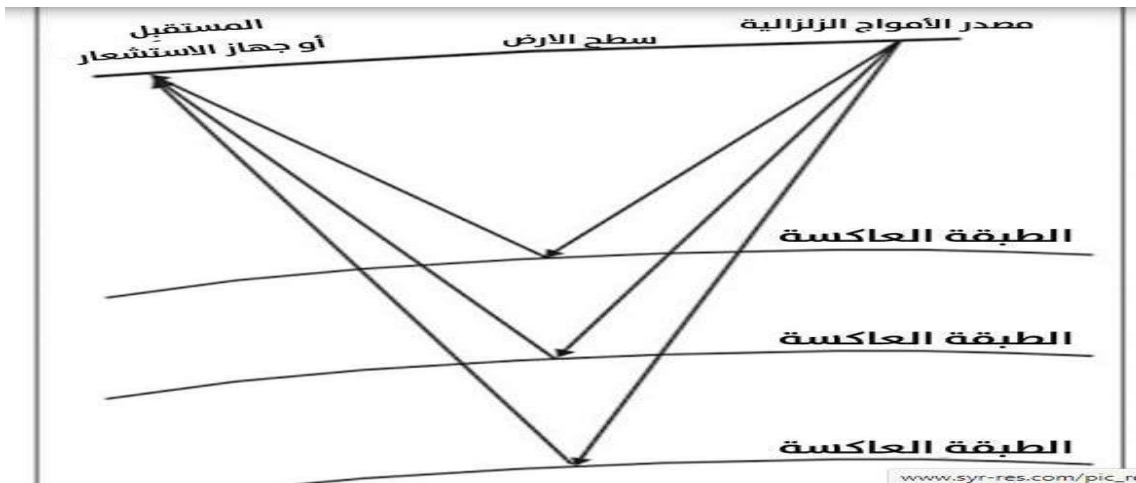


Image: apnea



5- Exploration Wells :

Based on this seismic image and the geological model, a potential reservoir trapped in the anticline structure can now be located in this target zone at .

A potential reservoir is now accurately located but, only by looking at these images, it is impossible to check if this formation is filled with oil or gas.

Drilling a well to reach the potential reservoir is the only way to be sure of the presence of fluid inside the rock which could be oil or gas but also water!

While drilling the exploratory well, the cores are taken from the depths of the well for analysis, water saturation calculation, porosity and permeability of the rock formations, and well logging tools are also downloaded for formation evaluation.

The well logging most commonly used are:

1. SP logs (detect of permeable zone and impermeable zone, determine lithology of rocks and calculating shall volume)
2. Gamma ray logs (detect of permeable zone and impermeable zone, determine lithology of rocks and calculating shall volume)
3. Density logs (calculate the effective porosity of the formations)
4. Neutron logs (calculate the effective porosity of the formations)
- 5- Sonic (Acoustic) logs (calculate the effective porosity of the formations)

6- Resistivity log. (Calculating water and hydrocarbon saturation of rocks and formations and identifying zones that contain movable hydrocarbons that can be product)

